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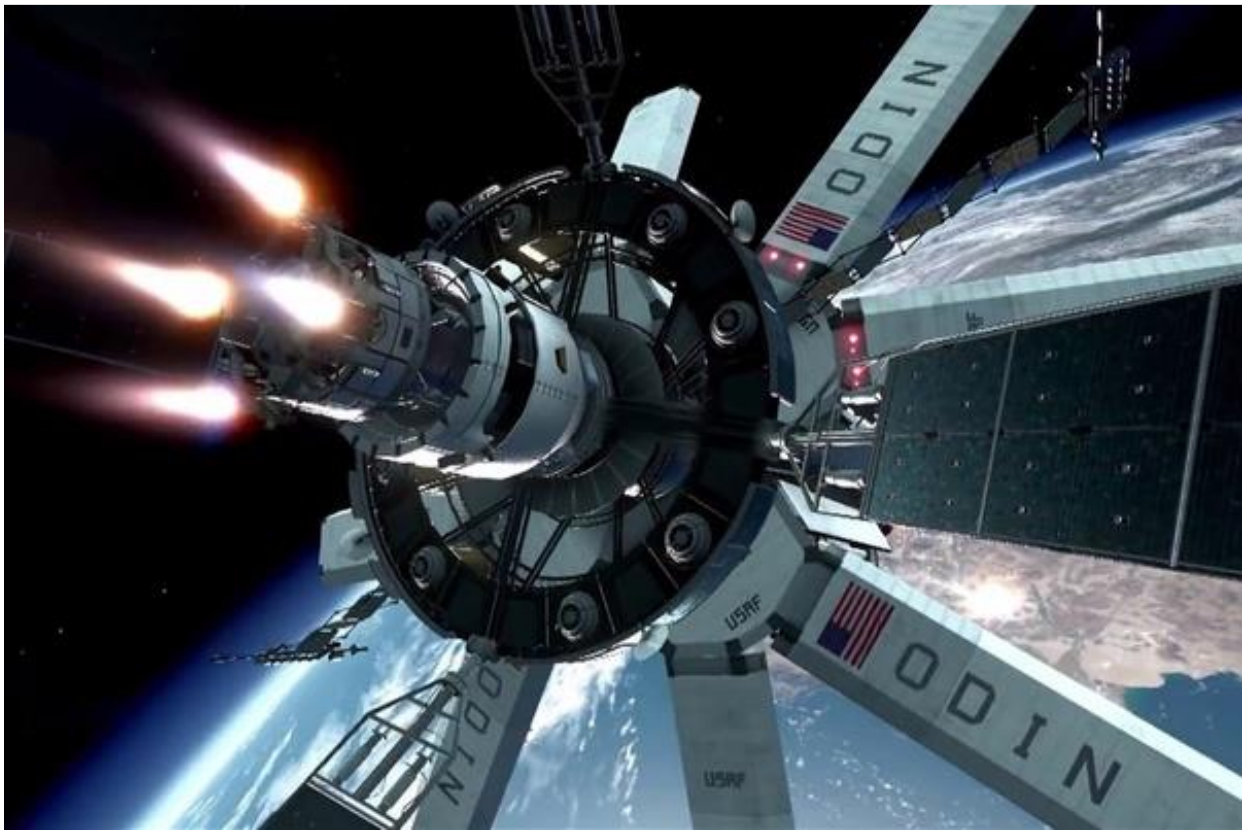

DebateUS!

Formerly Millennial Speech and Debate

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Background

Basic overview of Space Force

Stavridis 20 [Stavridis, James. 01-03-2020, "Commentary: The Space Force is with us; now what?" Herlad, https://www.heraldnet.com/opinion/commentary-the-space-force-is-with-us-now-what/]

With the recent passage of this year's big defense bill, **Congress authorized the creation of a sixth branch of the armed forces: the United States Space Force**. The move reflects the growing militarization of space, as the other branches have grown increasingly reliant on operations there. Despite criticism from spending hawks and late-night comics, the Space Force is an idea whose time has come. But the public, understandably, has questions: What will it look like? What will its mission be? Presidents Day Offer A It's worth pointing out that the U.S. hasn't created a new branch of the military since the Air Force in 1947. While not without controversy at the time, that move simply recognized the reality at the time that air operations were going to become increasingly large and complex. This necessitated a cadre of true experts who would "grow up" thinking, planning, procuring equipment and actually conducting pure aviation in that domain — alongside the Navy at sea and the Army ashore. That is the essential rationale for the U.S. Space Force — given the complexity and scale of operations in space, that domain requires a dedicated mission focus. Unlike **Russia and China,** which **each have had dedicated space forces,** the United States has relied largely on the U.S. Air Force to run space operations, with supporting efforts from the Army and Navy. In many cases, this puts space forces at a disadvantage in a fighter- and bomber-dominated Air Force. The basic mission of the Space Force will be to train, equip and organize to conduct military operations in space. This means running the extensive constellation of U.S. military satellites (currently managed by the services separately depending on function); operating the military's launch facilities such as the Air Force's bases at Vandenberg in California and elsewhere; executing financial planning and programming to purchase satellites and ground support equipment; and above all, training a specialized cadre of space officers and enlisted men and women. It will start small with a few hundred specialists, probably reporting to a chief of space operations (a title resembling that of the head of the U.S. Navy, the chief of naval operations). Over time it will probably grow to 10,000 to 15,000 trainers, operators and leaders whose job will be to deliver capability in space to the 10 U.S. combatant commanders; the jobs I held at four-star level both for Latin America and Europe/NATO.

Affirmative Arguments

Asteroid Mining

NASA and Space Force cooperation will lead to asteroid mining

Hitchens 20 [Hitchens, Theresa. 09-22-2020. "Space Force-NASA Accord Highlights Cooperation Beyond Earth Orbit," Breaking Defense, https://breakingdefense.com/2020/09/space-force-nasa-accord-highlights-cooperation-beyond-earth-orbit/]

NASA and the Space Force inked an MOU on space cooperation today that more firmly pins the US military to future missions in the vast region of space beyond Earth's orbit including, at least indirectly, the Trump administration's neo-gold rush for space resources. The agreement "expands" long-standing NASA-DoD/Air Force space cooperation on space exploration, including on situational awareness, communications and precision navigation. **On top of that it includes efforts to establish "norms of behavior" for activities such as Moon and asteroid mining,** Chief of Space Operations Gen. Jay Raymond said today. "If you look at R&D, and technology roadmaps, and S&T, and partnerships, and the need to understand what's going on the domain, the need for norms of behavior to keep the domain safe for all — there is so much there that's ripe for collaboration, that would be a benefit for both organizations. And that's really what this MoU is focused on," Raymond told told the Mitchell Institute today**. "I think this is a unique time in American history where we can go sustainably to the Moo**n. I will tell you that, given the challenges that exist in space, it is necessary to have security. And that's why it is so important for NASA to to work side by side with with the Space Force," NASA Administrator Jim Bridenstine said during the joint webinar to announce the MoU. Raymond explained that given Space Command's area of responsibility, which extends from 100 kilometers above the Earth to, in theory, infinity (and beyond!), the Space Force is seeking to organize, train and equip personnel for operations beyond Geosynchronous Orbit (some 36,000 kilometers in altitude). While the Air Force traditionally has maintained a strong working partnership with NASA, Raymond said the "expanded" Space Force mission and NASA's re-invigorated push into cislunar space and beyond provides an opportunity for "expansion" of that partnership.

Asteroid mining is key to platinum

Melendez 17 [Melendez, Steven. 06-27-2017. "Forget Coal: Asteroid Mining Is Coming Sooner Than You Think", Fast Company, https://www.fastcompany.com/40419405/theres-gold-and-platinum-and-cobalt-in-them-thar-asteroids]

President Donald Trump is obsessed with returning America to its coal mining past—but scientists and entreprenurs have far more ambitious plans. As the planet's **precious metal reserves tap out,** big business and NASA are looking to the skies. The race to mine asteroids swirling around the solar system is on. Space mining may sound like science fiction, **but it's real**, and big developments are on tap in the next decade. Asteroids are essentially massive rocks that orbit the sun, and many are thought to consist of **platinum**, gold, iron, and more. **A single** 500-meter-wide **asteroid** can contain almost **175 times** Earth's annual **platinum** mining output, according to Massachusetts Institute of Technology research. The metal, worth about $930 per ounce, is used in jewelry and is a byword for luxury—think platinum credit cards—but it's also used in the **catalytic converters** installed in every modern car, in industrial chemical processes, and in many electronics. SPACE MINING ECONOMICS Conventional wisdom may be that going to space to bring back

what is needed on terra firma is economically nuts. Not so, analysts insist. “While the psychological barrier to mining asteroids is high, the actual financial and technological barriers are far lower,” says a recent report prepared on the subject by Goldman Sachs. Proponents say that before long, robots could be traveling to asteroids to extract platinum and other valuable minerals to haul back to Earth or even one day to use in space-based manufacturing plants. A 2012 Caltech study found that it could cost just $2.6 billion to capture an asteroid and bring it into orbit near Earth, making human exploration and robotic mining that much easier. “We expect that systems could be built for less than that given trends in the cost of manufacturing spacecraft and improvements in technology,” the Goldman report says. It also predicts the eventual result would be far lower costs: “Successful asteroid mining would likely crater the global price of platinum” by dramatically increasing the supply. “The market is a big unknown because of things like platinum,” says Jay McMahon, an assistant professor at the University of Colorado’s Center for Astrodynamics Research. “You don’t know what’s going to happen if you bring back a big haul of platinum, what that would do to the market on Earth or how much demand there is.”

Key to hydrogen energy

Ozin, 10-21-**15** - Geoffrey Ozin studied at King’s College London and Oriel College Oxford University, before completing an ICI Postdoctoral Fellowship at Southampton University. He is the Tier 1 Canada Research Chair in Materials Chemistry and Nanochemistry and Distinguished University Professor at the University of Toronto, where he currently spearheads the Solar Fuels Cluster. He is renowned for his work in defining, enabling and popularizing a chemical approach to nanomaterials for innovative nanotechnology in advanced materials and biomedical science, “Is there enough platinum to run a solar-powered hydrogen economy?”, Advanced Science News, https://www.advancedsciencenews.com/is-there-enough-platinum-to-run-a-solar-powered-hydrogen-economy/

Hydrogen as a clean energy source for fuel cells in the transportation and power generation sectors, as well as an effective reducing agent for transforming carbon dioxide to value-added chemicals and fuels, could solve some of the adverse consequences of burning fossil fuels that release greenhouse gas into the atmosphere and chemicals that pollute the environment [1, 2]. Today, hydrogen is produced by steam reforming, gasification and electrolysis. Most of hydrogen is produced from fossil fuels (48% natural gas, 30% oil, 18% coal) while electrolysis of water accounts for only 4%. The electricity to enable water electrolysis has traditionally come from fossil and nuclear sources, which are increasingly being replaced by clean, renewable electrical energy from solar, hydro and wind. The practical realization of the full environmental and security benefits of clean and renewable hydrogen for use in fuel cells and conversion of carbon dioxide to chemicals and fuels, will necessitate the development of large-scale, low-cost hydrogen generation methods from renewable resources with a minimal carbon footprint. Amongst the different options for generating hydrogen, the photo-electrochemical approach, which utilizes sunlight to directly split water is considered to be amongst the most promising technologically and economically. Nevertheless, efficiency, figures-of-merit and longevity issues, requiring basic-directed research to improve loss mechanisms and increase electrodes, materials and device performance and stability, ultimately to develop operationally safe systems, remain the most challenging and critically important issues to enable advances in the field [3]. Photo-electrochemistry is an electrochemical technique, which employs light harvesting catalysts most often based on specialized semiconductor and metal nanostructures and combinations thereof. It is a truism that many research scientists, who recognize the axiom of the ‘**materials dilemma’**, remain skeptical of finding a practical and efficient photo-catalyst that can enable the light-assisted electrochemical H2 evolution reaction from H2O at a sufficiently large scale to facilitate a TW H2 economy. This refers to the challenge often confronted by scientists, engineers, industry and manufacturers trying to discover champion materials for a large scale catalytic process, where **the best** performers are comprised of elemental compositions **in short supply** and **too pricey** while inferior performers consist of earth abundant low cost elemental compositions. This is certainly true for the catalytically active **platinum group metals** Ru, Os, Rh, Ir, Pd and Pt in nanostructured forms as well as the catalytic sites of diverse classes of molecules, clusters, polymers and materials. In the case of the photo-electrochemical H2 evolution reaction from aqueous phase H2O, the champion catalyst remains Pt [Platinum] **despite** **much research devoted** to find a more **abundant cheaper alternative**. This is simply because Pt [platinum] as a H2 evolution catalyst still has the **world-record exchange current density** and **low Tafel slope**. Moreover, Pt is reported to be more durable in acidic environments, which is the common case in photo-electrochemical devices. This illustrates the difficult choice one has to make in translating solar fuels materials science to a technology that could be implemented on a large scale. Should one continue to focus attention on bringing down the cost of rare and expensive superior performance materials like Pt or devote time and effort

to improving the poorer performance of common cheap materials? It turns out not surprisingly that the efficiency of the H2 evolution reaction sensitively depends on the loading and size of the nanostructured Pt catalyst integrated with the photon harvesting, electron transporting photocathode. In this context, it is pertinent that a recent study has quantified how much Pt is actually required to optimise the H2 evolution rate in a photo-electrochemistry experiment using an exceptionally well-defined Pt-TiO2-Ti-pn+Si composite photocathode [4]. In this experiment, the size and loading of Pt nanoparticles were controlled using a sophisticated supersonic molecular beam source that was able to deposit mass-selected Pt nanoparticles from the gas-phase, with retention of their size, onto the photocathode. From detailed materials characterization measurements and in depth photo-electrochemistry experiments, it was found that the size of the most active Pt nanoparticles for the H2 evolution reaction was 5 nm at a loading level of 100 ng/cm2 on the photocathode. For a state-of-the-art over-potential of 50 mV this translated to about 54 tons of Pt in order to create a TW scale photo-electrochemical H2 generation infrastructure. How often this 54 tons have to be replaced is a crucial question. The issue of a well-designed Pt recycling system is clearly advisable. This tonnage amounts to around 30% of the current global annual production of Pt most of which is currently used in automobile catalytic converters and jewellery. In terms of known Pt mineral resources (earth abundance 3.7×10-6 %) this does not seem like an insurmountable obstacle if it was decided by policy makers, the renewable energy industry and process engineers to establish an economically and environmentally viable TW H2 clean and green global technology founded upon the photo-electrochemical splitting of H2O using Pt as the metal of choice. It is pertinent to note that it may prove possible to reduce this amount of Pt by many orders of magnitude if the size of the Pt nanoparticles could be reduced from 5 nm to the atomically dispersed state and the catalytic activity for the H2 evolution reaction maintained if not improved [5]. Encouragingly in this context, a recent report revealed that the readily accessible, nanoporous layered material carbon nitride (C3N4), can anchor individual Pd atoms at the N sites and is able to function as a thermally stable hydrogenation catalyst for the production of many organic substances [6]. If this breakthrough can be extended to Pt atoms on C3N4-based photocathodes, this has the potential to reduce the Pt catalyst tonnage requirement by orders of magnitude. For photo-electrochemical hydrogen generating systems, besides the availability and cost of Pt, techno-economic challenges will also be encountered by constraining the area for water splitting to that of the light harvesting units and the area and cost of required land. The overall cost analysis of this kind of integrated photo-electrochemistry system will have to be compared with the cost efficiency of competing hydrogen producing technologies that employ Pt electro-catalysts based upon electrically integrated photovoltaic-electrolysis systems and grid integration of decoupled photovoltaics and electrolysis systems [7]. It is worth noting that the production of Pt since the early 2000s has varied between just over 150 tons to about 220 tons. Obviously there is scope for further production if necessary. **The price has been volatile**. It was stable from 1992 to 2000 and then steadily rose until it touched about $2,252 per ounce in 2008. It then fell off a cliff later in 2008 falling to $774 per ounce. It has since gone up and down, as high as $1,900 per ounce and today stands at about $950 per ounce [8]. The price of Pt seems to be related to the fortunes of the economy, when the economy is good and growing so does the price of Pt. A big question is, do we want to base a H2 economy on a rare element like Pt, where countries could be held to ransom on either the price or supply rather like the current situation with oil? Perhaps, when more research scientists challenge the doctrine of the 'materials dilemma' by using new value propositions with economic models for producing Pt, they may entice business and industry leaders to produce Pt as if it were a 'common element', one that was absolutely essential for creating a sustainable future. Currently, fossil fuel industry methods remain economically advantageous, despite the adverse consequences on our environment and climate. A transition to clean energy technologies **will take time,** nevertheless many companies have already realized the benefits of this ground-breaking change. An impressive example of the conversion from fossil to H2 fuel is seen with Toyota. After more than twenty years of rigorous research and development they have manufactured automobiles with H2 fuel-cell powered engines to become commercially available later this year [9]. To enable this transition, H2 fuel stations as well as H2 generators integrated into automobiles will have to be rapidly developed. It seems that we should not yet write off rare expensive Pt [platinum] as the catalytic metal of choice for making solar H2 on an industrially significant scale to power a global hydrogen economy. If Pt is selected as the catalyst of choice, there should as well be alternative choices of cheap and abundant elemental compositions, which can quickly take the place of Pt as a photo-catalyst. We shouldn't stop looking for cheaper alternatives as there's a whole bunch of interesting alternative materials out there. To invoke the wisdom of the American novelist, Mark Twain: "It ain't what you don't know that gets you into trouble. It's what you're sure you know that does." If we're so sure that Pt [platinum] is too **rare** and expensive to process on a global industrial scale, we may be adding to our troubles, rather than resolving them with this nano solution.

Hydrogen energy is key to negative emissions AND oceans

DeWeerdt, 6-26-**18** - Seattle-Based Science author specializing in biology, medicine and the environment as a contributor to Anthropocene magazine's Daily Science blog, and her work has appeared in a variety of other publications including Nature, Newsweek, Conservation and Nautilus, "Could the hydrogen economy throw us a climate-change lifeline?", Anthropocene, http://www.anthropocenemagazine.org/2018/06/could-hydrogen-economy-throw-climate-change-lifeline/

According to scientists who track humanity's greenhouse gas budget, it's looking more and more likely that we will emit more carbon dioxide than is compatible with limiting global warming to **2 °C,** let alone 1.5 °C, as envisioned in the Paris Agreement. That reality has focused more attention on negative emissions – technologies for pulling carbon dioxide out of the air and sequestering it more or less permanently. Many attempts to model different emissions pathways and predict future climate now assume that negative emissions will be necessary to plug the hole in our carbon budget. So far, most attention has focused on a method called bioenergy with carbon capture and storage (BECCS): grow certain trees or grasses on large plantations, harvest and burn them for energy, capture the resulting carbon dioxide, and inject it underground. The problem is that **this might not be feasible in practice**. For one thing, **the scale** of carbon removal needed **is so massive** that there may not be enough land to grow bioenergy crops without putting natural ecosystems or food production at risk. And scientists aren't sure that storing huge quantities of carbon dioxide underground will be safe and secure over the long term. But **there may be other options**. According to an analysis published yesterday in Nature Climate Change, negative-emissions methods to produce hydrogen fuel could have **even greater power generation** and **carbon storage potential** than BECCS, and cost less. What's more, negative-energy hydrogen would yield **byproducts** that **fight ocean acidification.** The process uses renewable energy to split water to yield hydrogen fuel. Meanwhile, a series of additional chemical reactions convert dissolved carbon dioxide to bicarbonate. Scientists have recently developed several different methods that are variations on this same basic theme. Bicarbonate is an important component of seawater and is used as raw material by shell-forming organisms. One effect of ocean acidification is that bicarbonate is in shorter supply, making it more difficult for marine organisms to make shells. Negative-emissions hydrogen would **replenish the ocean's stock of bicarbonate while sequestering carbon**. It's essentially an accelerated version of a natural process, called mineral weathering, that has kept ocean chemistry in balance across geologic time scales. In the new analysis, researchers evaluated the potential of negative-emissions hydrogen energy production and carbon dioxide removal. They calculated that the global energy system could produce between 300 and 3,000 exajoules of negative-emissions hydrogen energy per year. (One exajoule is equivalent to the amount of energy contained in 174 million barrels of oil.) The method could remove between 90 and **900 gigatonnes of carbon dioxide** from the air annually. Anthropogenic carbon dioxide emissions are currently about 41 gigatonnes per year. By comparison, other scientists have calculated that **BECCS could** produce as much as 300 exajoules of energy yearly, and **sequester up to 12 gigatonnes** of carbon per year. The new analysis also suggests that negative-emissions hydrogen is more efficient than BECCS, in that it removes about seven times more carbon dioxide per unit of energy generated. How much this would all cost depends on what form of renewable electricity is used. The researchers estimate that using hydropower to split water would cost 7 per kilowatt hour of hydrogen fuel produced, while using high-cost solar electricity would cost 64 cents. Carbon removal would cost between $3 and $161 per tonne, again depending on the form of energy used. Overall, these estimates are less than or roughly equal to the cost of carbon capture and storage in fossil fuel-based systems. They are also equivalent to or much lower than the costs associated with BECCS. On the other hand, a downside of negative-emissions hydrogen is that hydrogen fuel is not as readily used by the global energy system as the electricity produced by BECCS is. But this could change in a future **"hydrogen economy"** as this fuel gets more integrated into the transportation system and the energy grid. Negative-emissions hydrogen could also have its own environmental impacts from mining minerals and water use. And it remains to be seen how well this would work in practice, especially at a large scale. But as an argument that it's worth exploring alternatives to BECCS, negative-emissions hydrogen looks pretty compelling. "The negative-emissions energy field is in its infancy and therefore the methods discussed here are unlikely to be the only ones ultimately worth considering," the researchers write.

Warming causes extinction.

Torres 16 (Phil, PhD candidate @ Rice in tropical conservation biology, affiliate scholar @ Institute for Ethics and Emerging Technologies, July 22, 2016, "Op-ed: **Climate Change Is the Most Urgent Existential Risk**," http://ieet.org/index.php/IEET/more/Torres20160807)

Humanity faces a number of formidable challenges this century. Threats to our collective survival stem from asteroids and comets, supervolcanoes, global pandemics, climate change, biodiversity loss, nuclear weapons,

biotechnology, synthetic biology, nanotechnology, and artificial superintelligence. With such threats in mind, an informal survey conducted by the Future of Humanity Institute placed the probability of human extinction this century at 19%. To put this in perspective, it means that the average American is more than a thousand times more likely to die in a human extinction event than a plane crash.* So, given limited resources, which risks should we prioritize? Many intellectual leaders, including Elon Musk, Stephen Hawking, and Bill Gates, have suggested that artificial superintelligence constitutes one of the most significant risks to humanity. And this may be correct in the long-term. But I would argue that two other risks, namely **climate change** and biodiveristy loss, should **take priority** right now over **every other known threat**. Why? Because these ongoing catastrophes **in slow-motion** will frame our **existential predicament** on Earth not just for the rest of this century, but for literally **thousands of years** to come. As such, they have the capacity to **raise** or lower the **probability of other risks scenarios** unfolding. Multiplying Threats Ask yourself the following: are **wars** more or less likely in a world marked by **extreme weather events**, **megadroughts**, **food supply disruptions**, and sea-level rise? Are **terror**ist attacks **more** or less **likely** in a world beset by **the collapse of global ecosystems**, **ag**ricultural failures, **econ**omic uncertainty, and political instability? Both government officials and scientists agree that the answer is **"more likely."** For example, the current Director of the CIA, John Brennan, recently identified "the impact of **climate change**" as one of the "deeper causes of this rising instability" in countries like **Syria**, **Iraq**, **Yemen**, **Libya**, and **Ukraine**. Similarly, the former Secretary of Defense, Chuck Hagel, has described climate change as a **"threat multiplier"** with "the potential to exacerbate many of the challenges we are dealing with today — from infectious disease to terrorism." The Department of Defense has also affirmed a connection. In a 2015 report, it states, "Global climate change will aggravate problems such as **poverty**, **social tensions**, environmental degradation, **ineffectual leadership** and **weak political institutions** that threaten stability in a number of countries." **Scientific studies have further shown a connection between the environmental crisis and violent conflicts.** For example, a 2015 paper in the Proceedings of the National Academy of Sciences argues that climate change was a causal factor behind the record-breaking 2007-2010 drought in Syria. This drought led to a mass migration of farmers into urban centers, which fueled the 2011 Syrian civil war. Some observers, including myself, have suggested that this struggle could be the beginning of World War III, given the complex tangle of international involvement and overlapping interests. The study's conclusion is also significant because the Syrian civil war was the Petri dish in which the Islamic State consolidated its forces, later emerging as the largest and most powerful terrorist organization in human history. A Perfect Storm The point is that climate change and biodiversity loss could **very easily** push societies **to the brink of collapse**. This will exacerbate **existing geopolitical tensions** and introduce entirely **new power struggles** between state and nonstate actors. At the same time, advanced technologies will very likely become increasingly powerful and accessible. As I've written elsewhere, the malicious agents of the future will have bulldozers rather than shovels to dig mass graves for their enemies. The result is a perfect storm of more conflicts in the world along with unprecedentedly dangerous weapons. If the conversation were to end here, we'd have ample reason for placing climate change and biodiversity loss at the top of our priority lists. But there are other reasons they ought to be considered urgent threats. I would argue that they could make humanity more vulnerable to a catastrophe involving superintelligence and even asteroids. The basic reasoning is the same for both cases. Consider superintelligence first. Programming a superintelligence whose values align with ours is a formidable task even in stable circumstances. As Nick Bostrom argues in his 2014 book, we should recognize the "default outcome" of superintelligence to be "doom." Now imagine trying to solve these problems amidst a rising tide of interstate wars, civil unrest, terrorist attacks, and other tragedies? The societal stress caused by climate change and biodiversity loss will almost certainly compromise important conditions for creating friendly AI, such as sufficient funding, academic programs to train new scientists, conferences on AI, peer-reviewed journal publications, and communication/collaboration between experts of different fields, such as computer science and ethics. It could even make an "AI arms race" more likely, thereby raising the probability of a malevolent superintelligence being created either on purpose or by mistake. Similarly, imagine that astronomers discover a behemoth asteroid barreling toward Earth. Will designing, building, and launching a spacecraft to divert the assassin past our planet be easier or more difficult in a world preoccupied with other survival issues? In a relatively peaceful world, one could imagine an asteroid actually bringing humanity together by directing our attention **toward a common threat**. **But** if the "**conflict multipliers**" of climate change and biodiversity loss have already

catapulted civilization into chaos and turmoil, I strongly suspect that humanity will become more, rather than less, susceptible to dangers of this sort. Context Risks We can describe the dual threats of climate change and biodiversity loss as "context risks." Neither is likely to directly cause the extinction of our species. But **both will define the context in which civilization confronts all the other threats** before us. In this way, they could **indirectly** contribute to the **overall danger of annihilation** — and this worrisome effect could be significant. For example, according to the Intergovernmental Panel on Climate Change, the effects of climate change will be "severe," "pervasive," and "irreversible." Or, as a 2016 study published in Nature and authored by over twenty scientists puts it, the consequences of climate change "will extend longer than the entire history of human civilization thus far." Furthermore, a recent article in Science Advances confirms that humanity has already escorted the biosphere into the sixth mass extinction event in life's 3.8 billion year history on Earth. Yet another study suggests that we could be approaching a **sudden**, **irreversible**, catastrophic **collapse of the global ecosystem**. If this were to occur, it could result in "widespread social unrest, economic instability and loss of human life." Given the potential for environmental degradation to **elevate the likelihood of nuclear wars**, **nuclear terrorism**, **engineered pandemics**, a **superintelligence takeover**, and perhaps even **an impact winter**, it ought to **take precedence over all other risk concerns** — at least in the near-term. Let's make sure we get our priorities straight.

Tipping point now---collisions cascade AND turn every impact.

Ahasan, 1-12-20**18** - Towsif, Associate Researcher at Boston Consulting Group, BA from NU in economics and business, contributed to multiple projects related to security and resilience issues including: the launch of the Global Resilience Institute, the GRRN conference, and the Wildfire: A Changing Landscape report; "Space debris poses growing threat to satellite infrastructure," *Global Resilience Institute* (GRI), https://globalresilience.northeastern.edu/2018/01/space-debris-poses-growing-threat-to-satellite-infrastructure/

Currently, millions of pieces of space debris are orbiting earth at an average speed of **22,000 miles per hour**, creating an environment where, according to NASA, "a 1 centimeter paint fleck is capable of **inflicting the same damage** as a **550 pound object** traveling 60 miles per hour on earth." This debris poses a threat to the 1,738 satellites currently in orbit which **support critical modern communication**, **commerce**, **travel** and **security systems**. Damage to any of these systems can have **cascading impacts** because of **interdependencies** that are invisible at first glance; for example, the GPS satellite system not only enables basic navigation, but also **allows airlines to coordinate routing systems** and provides **timing synchronization** for sectors such as **banking**, **finance and power**. Further, many modern military technologies such as **guided missiles**, **drones**, and **intelligence collections** would be **limited** or **inoperable** without functional satellite systems.

NASA and the Department of Defense Space Surveillance Network currently track about 21,000 pieces of debris in Low Earth and Geosynchronous Orbit, although the **most dangerous** pieces of debris are the millions that are **too small to track**. Multiple trends, including the growing usage of small satellites, the growth of private sector investment in space exploration, and the development of **a**nti-**sat**ellite military technologies are **fueling the growth of space debris**. Testing of anti-satellite missiles by China and the United States has resulted in **thousands of new fragments** in space due to the collision of missiles with target objects. Another major example of where this debris originates from was a collision between a communications satellite owned by the Iridium corporation and an abandoned Russian communication satellite, which resulted in 2,300 new pieces of shrapnel.

The development of small and cheap satellites, such as the popular $40,000 4-inch CubeSAT, has led to the **proliferation of satellites** sent by students, companies, and researchers; SpaceX has taken advantage of this technology to request permission from the FCC to launch 12,000 small satellites into Low Earth Orbit. Long-term growth in space debris creates **two major risks**; first, that space debris could potentially create **unusable regions of orbit** due to pollution. Further, there is a **growing risk** of the onset of the Kessler Syndrome, which occurs when collisions continually create more debris which results in more collisions, creating a **positive feedback loop** and eventually resulting in **new collisions even with no new launches in orbit**.

Efforts to improve satellite resilience against space debris **can be challenging** due to the **global nature** of space exploration, meaning that **cleaning debris requires international collaboration**. Currently, efforts are being undertaken by both governments and some private sector companies. For example, former President George W. Bush attempted to create a terrestrial GPS system known as eLoran; this program was cancelled in 2008 due to budget cuts under the Obama administration. In terms of regulations, the UN Office for Outer Space Affairs has issued **seven** guidelines in an attempt to mitigate the amount of debris in space, with most of the guidelines advising to generally limit harmful activities such as avoiding intentional destruction. Private companies such as SpaceX and Boeing have also acknowledged the threat space debris poses to their own equipment and an industry is developing around tracking debris and selling that information to satellite operators.

Debris

Space Force is needed to protect against Space Debris

Whittington 21 [Whittington, Mark. 01-13-2021. "Why is It So Hard to Go Back to the Moon?" The Hill, https://thehill.com/opinion/international/477919-how-would-the-space-force-wage-war

Clearly the Space Force is going to need more capabilities than satellites that can be maneuvered out of the way of threats. But a 2007 Chinese anti-satellite weapon test illustrated the perils of combat in Earth orbit. The Chinese destroyed a defunct weather satellite with a weapon that blew it to pieces. The explosion created a debris field that included more than 900 individually tracked pieces, hurtling about in low Earth orbit, causing a hazard to space navigation for years. Analysts suggest that the explosion generated thousands of pieces of debris that could not be tracked. One could therefore imagine a nightmare scenario that could happen if war were to break out between two super powers, such as the United States and China. China could launch multiple strikes to destroy or cripple those satellites that the United States relies on, not only for its national security, but for its economic life. Such an attack could fill Earth orbit with hurtling debris that would make it impassable indefinitely. The **people forming the Space Force and its doctrine must therefore develop ways to wage war in the heavens without generating a catastrophic amount of orbiting debris.** Weapons that blow up satellites or other space weapons will simply not do. An article in Space News suggested that **a weapon disguised as a space debris removal spacecraft could also be used to cripple working satellites.** Such a vehicle could attach itself to a working satellite and bend or break its antennae, destroy its solar panels and even drain its fuel tank. Such a weapon could even just take a satellite out of its orbit, thus destroying the satellite's usefulness while leaving it intact. The Earth's gravity and atmosphere would do the rest. Other possibilities include blinding a satellite with a laser or jamming its signal. Besides providing satellites with the ability to elude such threats, some kind of active defense must be mounted. A country could deploy a constellation of "guardian" satellites to intercept such space weapons before enemy satellites could cripple GPS or communications satellites or move them into a death dive into the Earth's atmosphere. Of course, an enemy might respond by including these "guardians" in the initial attack. The United States could also create redundancy for its critical satellites, making them smaller and as stealthy as possible, and thus too numerous to be taken out in one blow. Creating a launch-on-demand capability in which satellites can be replaced as quickly as they are taken out is also a possibility. Should an enemy such as China or Russia be foolish enough to blow up satellites, the Space Force needs to develop a space debris removal capability. That needs to be done and then used in any case, as the proliferation of space debris has become a growing problem in peacetime. Key players to watch in minimum wage fight Biden finds a few Trump moves he'll keep A space-based missile defense system, a dream since SDI was first proposed, would also be useful. Such a system not only could help defend the American homeland against a nuclear attack but also would close space off to the launching of more antisatellite weapons once a conflict breaks out. **In short, the Space Force, now that it has been officially created, has a lot of work to do to become an effective war-fighting service.**

Space debris increases the chance of miscalculation---

Sample 16 [Sample, Ian. 01-22-2016, "Rise in Space Junk Could Provoke Armed Conflict Say Scientists," The Guardian, https://www.theguardian.com/science/2016/jan/22/rise-in-space-junk-could-provoke-armed-conflict-say-

scientists#:~:text=The%20steady%20rise%20in%20space,damage%20or%20destroy%20military%20satellites.

The steady rise in space junk that is floating around the planet could provoke a political row and even armed conflict, according to scientists, who warn that **even tiny pieces of debris have enough energy to damage or destroy military satellites**. Researchers said fragments of spent rockets and other hurtling hardware posed a **"special political danger"** because of the difficulty in confirming that an operational satellite had been struck by flying debris and **had not fallen victim to an intentional attack by another nation**. Space agencies in the US and Russia track more than 23,000 pieces of space junk larger than 10cm, but estimates suggest there could be half a billion fragments ranging from one to 10cm, and trillions of even smaller particles. The junk poses the greatest danger to satellites in low Earth orbit, where debris can slam into spacecraft at a combined speed of more than 30,000mph. This realm of space, which stretches from 100 to 1200 miles above the surface, is where most military satellites are deployed. In a report to be published in the journal Acta Astronautica, Vitaly Adushkin at the Russian Academy of Sciences in Moscow writes that impacts from space junk, especially on military satellites, posed a "special political danger" and **"may provoke political or even armed conflict between space-faring nations**. The owner of the impacted and destroyed satellite **can hardly quickly determine the real cause of the accident.**" Adushkin adds that in recent decades there have been repeated sudden failures of defence satellites which have never been explained. But there are only two possibilities, he claims: either unregistered collisions with space debris, or an aggressive action by an adversary. **"This is a politically dangerous dilemma,"** he writes. The warning comes after an incident in 2013 when a Russian satellite, Blits, was disabled after apparently colliding with debris created when China shot down one of its own old weather satellites in 2007. The Chinese used a missile to destroy its satellite, an act that demonstrated its anti-satellite capabilities, and left 3,000 more pieces of debris in orbit. According to the report, the amount of debris cluttering low Earth orbit has risen dramatically in half a century of spacefaring. Without efforts to clean up the space environment, Adushkin warns of a "cascade process" in which chunks of debris crash into one another and produce ever more smaller fragments. Data in the study from the Russian space agency show that the International Space Station took evasive action five times in 2014 to avoid space debris. **Even small flecks of paint that have flaked off spacecraft can be hazardous.** Nasa's space shuttle was struck by flying paint several times in orbit, forcing ground staff to replace some of the spaceship's windows. The report follows a report commissioned by Nasa in 2011 which warned that the level of space junk was rising exponentially, and **had reached a "tipping point**" in the threat it posed to satellites and the International Space Station.

ASATs create space debris that can start global war due to miscalculation

Union of Concerned Scientists 08 [Union of Concerned Scientists, April 2008, "Space Debris from Anti-Satellite Weapons" http://www.ucsusa.org/assets/documents/nwgs/debris-in-brief-factsheet.pdf**]**

Debris in low Earth orbit travels 30 times faster than a commercial jet aircraft. At these speeds, pieces of debris larger than 1 cm (half an inch) can severely damage or destroy a satellite, and it is not possible to shield effectively against debris of this size. The Chinese destruction of a relatively small satellite roughly

doubled the debris threat to satellites in the most heavily used part of LEO. Fortunately, the debris threat to satellites is still relatively small, but continued testing of destructive ASAT weapons against satellites, or their use against several large satellites in a conflict, could result in a much higher risk. ASAT weapons could therefore significantly increase the cost of using space, and could hinder using regions of space that today are widely used for a range of purposes. Beyond that, the sudden loss of a satellite due to debris during a crisis could remove important capabilities, or could lead to dangerous reactions and the escalation of the crisis, especially if the adversary was known to have an ASAT capability.

Destroyed satellites have tremendous economic costs

Imburgia 11 [Imburgia, Joseph S. May 2011, "Space Debris and Its Threat to National Security: A Proposal for a Binding International Agreement to Clean Up the Junk," Vanderbilt Journal of Transnational Law.]

Because so much of the United States' security depends on satellites, these integral space-based capabilities would, therefore, be costly to lose. That loss would be felt in more than just the security arena. Due to the steep price tags attached to some of the national space security platforms, the economic loss of a satellite due to space debris would also be significant. For example, a pair of new Global Positioning Satellites (GPS), which provides valuable targeting and battle space awareness to military commanders, costs $ 1.5 billion. n166 Accordingly, if a piece of space debris destroys one of these satellites, $ 750 million could be lost instantly. Additionally, NASA invests billions of dollars annually in space assets. Congress provided NASA with $ 18.3 billion to spend on space utilization and exploration for fiscal year 2010, and it provided $ 17.7 billion for fiscal year 2011. n167 Air Force General (retired) Ronald E. Keys, former Commander of Air Combat Command, summed it up best, stating that a great deal "rides on space-borne satellites." n168 Because these space capabilities are so costly yet so vital to the United States' national security and economic well-being, the preservation of these space capabilities should also be vital.

Kessler brink now because of new space and collisions

Bergamini et al **18** [Bergamini, Elisabetta. (Department of Enterprise Engineering University of Rome Tor Vergata Rome Italy) 2018. "The Increasing Risk of Space Debris Impact on Earth: Case Studies, Potential Damages, International Liability Framework and Management Systems" Enhancing CBRNE Safety & Security: Proceedings of the SICC 2017 Conference pp 271-280]

The words "space debris" refer to the uncontrolled and unwanted fall onto Earth of no longer functional space vehicles or parts of any size (no asteroids involved whose trajectories and their potential dangers are considered uninsurable acts of God). This definition1 excludes whatever is generated at launch areas, which are conceived to encompass this risk. Since the beginning of human activities in space, the number of variously defined objects in orbit around the Earth has increased exponentially, and the trend is up now more than ever with the new wave of the so-called small satellites. NASA (US National Aeronautics and Space Administration) and ESA (European Space Agency) estimate in their webpages that there are over 150 million "objects" orbiting between the LEO (low Earth orbit)—up to 10,000 km from Earth's surface—and GEO (geostationary Earth orbit), above this mark, for a total weight of more than ~~5000~~ [five

thousand] tons. This definition applies to objects ranging from submillimetric (propellant dust, paint flakes, etc.) to "baseball" sizes (ca. 20,000 objects) and more. Figure 1 offers, based on the same aforementioned sources, a dynamic ownership's graph of these objects, divided by the launching State's property. The sharp rise of newcomers like China appears very clearly. Fig 1. Space debris: how dangerous is it to people on Earth (Source: Globalnews.ca—Nicole Mortillaro [1]) We reasonably estimate that by the **end of the decade** the overall quantity will **at least triple** for the combined effect of the big increase of small satellite cheap launches (Google—Planet Labs, OneWeb, SpaceX, etc.), space and suborbital tourism finally becoming popular in the more dangerous LEOs. What could amplify these fears is mostly the so-called **Kessler syndrome** [2], which is the massive propagation of debris ensuing collisions in space. As an evidence of this, ESA reports that ~~65~~[sixty-five]% of the ca. ~~20,000~~ [twenty thousand] notable orbiting objects result from 250 breakups and from just 10 collisions [1]. As an example, consider that the Chinese Feng Yun SO1C antisatellite test, in 2007, created 3300 pieces of sizeable debris, and in February 2009, 2200 more fragments were created by the crash between the US Iridium 33 and the Russian Kosmos 2251 satellites. Consider in fact that at an average speed of ~~30,000 km/h~~[thirty thousand kilometers per hour] in LEO, where gravity is stronger [3], even 1-~~cm~~[centimeter]-large (there are approximately 300,000 of them) items can destroy a satellite, while risk mitigating techniques, such as vehicle route monitoring and adjustments, debris cleaning, onboard protections, etc., are still shy of being effective. Although 75% of objects launched into space are recorded as they re-entered into the atmosphere in a controlled way (by saving fuel for the end-of-life assisted deorbiting and demise) and the atmosphere itself, should these manoeuvers fail, is a natural "firewall" that destroys anything re-entering at that speed, the risk of impacts on Earth is surging, and its magnitude might be soon perceivable, on persons, land and properties. An elaboration on NASA-NORAD's archive of catalogued space debris shows that the actual rate of one reported uncontrolled impact a day (>10 wide objects) [4] could increase from **three to ten** times by the **end of the decade**, including large items. Our work examines **case studies** and various levels of debate on the impact of space debris on Earth (legal, liability, surveillance and tracking, debris cleaning techniques, insurance) to identify possible risk management solutions to be developed in the future.

Space debris poses a special political danger that escalates geopolitical conflicts and results in multi-national wars.

Spacedaily 16 [No Author, Staff Writers quote and analyze Vitaly Adushkin from the Russian Academy of Sciences' Institute of Geosphere Dynamics, 2/1/2016, "Will Space Debris be Responsible for WWIII?," http://www.spacedaily.com/reports/Will_Space_Debris_be_Responsible_for_World_War_III_999.html)]

In recent weeks there has been a bit of speculation that collisions between active satellites and space debris could spark WW III. Vitaly Adushkin from the Russian Academy of Sciences' Institute of Geosphere Dynamics has been quoted as saying space debris presents a, "special political danger". He cites the hypothetical case in which a satellite is destroyed by a collision with an unknown object. Given today's relatively low level of space situational awareness (SSA) capabilities it would be all but impossible to definitively determine whether the object was random debris or a stealth offensive space weapon. The Russian speculates that such an incident could be interpreted as an intentional attack, precipitating armed conflict between space-faring nations. To date, we know of only one incident in which a satellite was completely destroyed in a collision with an orbiting object. In that case the satellite was a commercial telephony (Iridium 33) satellite. An after-the-fact analysis concluded that the object was an expired Russian spacecraft (Cosmos 2251). Since not all of the roughly 500,000 potentially damaging orbiting objects are tracked, it was fortunate that the object in this case was identified. Undoubtedly, there will be incidents in which the destroyed satellite is an expensive and critical military spacecraft and the object will not be identified. Since it is common knowledge that at least three countries have the capability to deploy stealth offensive attack spacecraft, any incident involving an element of the national security space infrastructure and an unknown object will likely create a tense political situation. Some of these critical national security satellites have estimated values in excess of $1 billion. They provide key real-time information required by military decision makers and government leaders. Any unattributed loss of such an asset would be treated as a possible attack by an adversary. Should such an event occur in

coincidence with an extreme geopolitical crisis, it appears possible that multi-national war could result. Obviously, such scenarios should be avoided. Unfortunately, technologies, systems and operational capabilities to definitively identify and track every potentially hazardous space object do not yet exist. Given the extent of the growing orbital debris population and the required investment to identify and track every suspicious object, it is highly unlikely that such a capability will be developed. In summary, at some point in the future the space debris issue may lead to an unresolvable conundrum that might change our entire civilization

Space debris provokes armed conflict and political row --- the amount of debris is dramatically increasing and is reaching a tipping point in the threat posed to satellites and the ISS

Sample 16 [Sample, Ian. 01-22-2016, "Rise in Space Junk Could Provoke Armed Conflict Say Scientists," The Guardian, https://www.theguardian.com/science/2016/jan/22/rise-in-space-junk-could-provoke-armed-conflict-say-scientists#:~:text=The%20steady%20rise%20in%20space,damage%20or%20destroy%20military%20satellites.

The steady rise in space junk that is floating around the planet could provoke a political row and even armed conflict, according to scientists, who warn that even tiny pieces of debris have enough energy to damage or destroy military satellites. Researchers said fragments of spent rockets and other hurtling hardware posed a "special political danger" because of the difficulty in confirming that an operational satellite had been struck by flying debris and had not fallen victim to an intentional attack by another nation. Space agencies in the US and Russia track more than 23,000 pieces of space junklarger than 10cm, but estimates suggest there could be half a billion fragments ranging from one to 10cm, and trillions of even smaller particles. The junk poses the greatest danger to satellites in low Earth orbit, where debris can slam into spacecraft at a combined speed of more than 30,000mph. This realm of space, which stretches from 100 to 1200 miles above the surface, is where most military satellites are deployed. In a report to be published in the journal Acta Astronautica, Vitaly Adushkin at the Russian Academy of Sciences in Moscow writes that impacts from space junk, especially on military satellites, posed a "special political danger" and "may provoke political or even armed conflict between space-faring nations. The owner of the impacted and destroyed satellite can hardly quickly determine the real cause of the accident." Adushkin adds that in recent decades there have been repeated sudden failures of defence satellites which have never been explained. But there are only two possibilities, he claims: either unregistered collisions with space debris, or an aggressive action by an adversary. "This is a politically dangerous dilemma," he writes. The warning comes after an incident in 2013 when a Russian satellite, Blits, was disabled after apparently colliding with debris created when China shot down one of its own old weather satellites in 2007. The Chinese used a missile to destroy its satellite, an act that demonstrated its anti-satellite capabilities, and left 3,000 more pieces of debris in orbit. According to the report, the amount of debris cluttering low Earth orbit has risen dramatically in half a century of spacefaring. Without efforts to clean up the space environment, Adushkin warns of a "cascade process" in which chunks of debris crash into one another and produce ever more smaller fragments. Data in the study from the Russian space agency show that the International Space Station took evasive action five times in 2014 to avoid space debris. Even small flecks of paint that have flaked off spacecraft can be hazardous. Nasa's space shuttle was struck by flying paint several times in orbit, forcing ground staff to replace some of the spaceship's windows. The

report follows a report commissioned by Nasa in 2011 which warned that the level of space junk was rising exponentially, and had reached a "tipping point" in the threat it posed to satellites and the International Space Station.

Destroys global satellite capabilities – collapses hegemony and the global economy

Ansdell 10 [Ansdell, Megan. 2010 "Active Space Debris Removal: Needs, Implications, and Recommendations for Today's Geopolitical Environment", http://www.princeton.edu/jpia/past-issues-1/2010/Space-Debris-Removal.pdf]

There are currently hundreds of millions of space debris fragments orbiting the Earth at speeds of up to several kilometers per second. Although the majority of these fragments result from the space activities of only three countries—China, Russia, and the United States—the indiscriminate nature of orbital mechanics means that they pose a continuous threat to all assets in Earth's orbit**.** There are now roughly 300,000 pieces of space debris large enough to completely destroy operating satellites upon impact (Wright 2007, 36; Johnson 2009a, 1). **It is likely that space debris will become a significant problem within the next several decades.** Predictive studies show that if humans do not take action to control the space debris population, an increasing number of unintentional collisions between orbiting objects will lead to the runaway growth of space debris in Earth's orbit (Liou and Johnson 2006). **This uncontrolled growth of space debris threatens the ability of satellites to deliver the services humanity has come to rely on in its day-to-day activities.** For example, Global Positioning System (**GPS**) precision timing and navigation **signals are a significant component of the modern global economy; a GPS failure could disrupt emergency response services, [destroy]**~~cripple~~ **global banking systems, and interrupt electric power grids** (Logsdon 2001). Furthermore, **satellite-enabled military capabilities such as GPS precision-guided munitions are critical enablers of current U.S. military strategies and tactics. They allow the U**nited **S**tates **to not only remain a globally dominant military power, but** also wage war in accordance with its political and ethical values by **enabling faster, less costly warfighting with minimal collateral damage** (Sheldon 2005; Dolman 2006, 163-165). **Given the U.S. military's increasing reliance on satellite-enabled capabilities in recent conflicts**, in particular Operation Desert Storm and Operation Iraqi Freedom, some have argued that **losing access to space would seriously impede the ability of the U**nited **S**tates **to be successful in future conflicts** (Dolman 2006, 165)

Space debris cause war—cascade effect

Orwig 16 [Orwig, Jessica, January 26, 2016, "Russia says a growing problem in space could be enough to spark a war," Yahoo Finance, http://finance.yahoo.com/news/russia-says-growing-problem-space-180015934.html

NASA has already warned that the large amount of space junk around our planet is growing beyond our control, but now a team of Russian scientists has cited another potentially unforeseen consequence of that debris: War. Scientists estimate that **anywhere from 500,000 to 600,000 pieces of human-made space debris between 0.4 and 4 inches in size are currently orbiting the Earth**

and traveling at speeds over 17,000 miles per hour. If one of those pieces smashed into a military satellite it "may provoke political or even armed conflict between space-faring nations," Vitaly Adushkin, a researcher for the Institute of Geosphere Dynamics at the Russian Academy of Sciences, reported in a paper set to be published in the peer-reviewed journal Acta Astronautica, which is sponsored by the International Academy of Astronautics. Say, for example, that a satellite was destroyed or significantly damaged in orbit — something that a 4-inch hunk of space junk could easily do traveling at speeds of 17,500 miles per hour, Adushkin reported. (Even smaller pieces no bigger than size of a pea could cause enough damage to the satellite that it would no longer operate correctly, he notes.) It would be difficult for anyone to determine whether the event was accidental or deliberate. This lack of immediate proof could lead to false accusations, heated arguments and, eventually, war, according to Adushkin and his colleagues. A politically dangerous dilemma In the report, the Adushkin said that there have already been repeated "sudden failures" of military spacecraft in the last two decades that cannot be explained. "So, there are two possible explanations," he wrote. The first is "unregistered collisions with space objects." The second is "machinations" [deliberate action] of the space adversary. "**This is a politically dangerous dilemma**," he added. But these mysterious failures in the past aren't what concerns Adushkin most. It's a future threat of what experts call **the cascade effect that has Adushkin and other scientists around the world extremely concerned**. The Kessler Syndrome In 1978, American astrophysicist Donald Kessler predicted that the amount of space debris around Earth would begin to grow exponentially after the turn of the millennium. Kessler 's predictions rely on the fact that over time, space junk accumulates. We leave most of our defunct satellites in space, and when meteors and other man-made space debris slam into them, you get a cascade of debris. The cascade effect — also known as the Kessler Syndrome — **refers to a critical point wherein the density of space junk grows so large that a single collision could set off a domino effect of increasingly more collisions**. For Kessler, this is a problem because it would "create small debris faster than it can be removed," Kessler said last year. And this cloud of junk could eventually make missions to space too dangerous. For Adushkin, **this would exacerbate the issue of identifying what, or who, could be behind broken satellites**. The future So far, the US and Russian Space Surveillance Systems have catalogued 170,000 pieces of large space debris (between 4 and 8 inches wide) and are currently tracking them to prevent anymore dilemmas like the ones Adushkin and his colleagues cite in their paper. But it's not just the large objects that concern Adushkin, who reported that even small objects (less than 1/3 of an inch) could damage satellites to the point they can't function properly.

Efficiency

Space Force is key to eliminate bureaucratic barriers to space control

Codevilla 18 [Codevilla, Angelo. October 2018, "The Space Force's Value," Strategika, Hoover Institute, Issue 54, https://www.hoover.org/sites/default/files/issues/resources/strategika_54_web.pdf]

Imagine what power would accrue to the nation were its military—on the ground, at sea, and in the air—to be backed by a force able to decide whether or how any other country might benefit from objects in orbital space; if that nation were to control access to orbit, securing such objects and benefits for itself. Today, who can do what to whom in or by using orbital space makes a big difference. The world's significant militaries live by information from and communications through objects in orbital space. Inevitably, sooner or later, one will bid for the comprehensive capacity to control that space. Better that America be first. **Establishing the US Space Force will endow people with the mission—the goal, the will, and the interest—to make US control of space happen**. Ever since 1960, when the United States managed the first orbital rendezvous, and hence the capacity to destroy objects in orbital space, every technology useful for space warfare has made giant strides— computing power, communications, energy storage, miniaturization, reduction of weight and vibrations, all manner of optics, pointing and tracking, control systems, etc. Continuing advances offer ever-more tempting options for offense and defense in orbit. It is impossible to imagine any major war's operations henceforth without competitive destruction of satellites. Because orbital space is ballistic missiles' highway, satellites offer the only prospect of anything like preclusive defense against them through control of access to space. Moreover, orbital fire control systems—which America now lacks—are key to efficient operation of surface-based missile defenses. But for human beings to turn any technology's potential to military effect, those who really want to do it must be in a position to make it happen. Though the logic of war and technology has long counseled establishing a US Space Force, the logic of military bureaucracy has forestalled it. The **existing military services' bureaucratic interests have obscured the fact that orbital space is itself a major theater of operations, victory in which might be decisive for victory everywhere else.** That is why **establishing the US Space Force is no mere rewiring of bureaucratic diagrams.**

Space force helps promote efficiency and allows offloading of tasks from the D.o.D

Spirtas et. al 20 [Spirtas, Michael, Yool Kim, Frank Camm, Shirley M. Ross, Debra Knopman, Forrest E. Morgan, Sebastian Joon Bae, M. Scott Bond, John S. Crown, and Elaine Simmons. 2020, "Creating a Separate Space Force: Challenges and Opportunities for an Effective," RAND Corporation,. https://www.rand.org/pubs/research_briefs/RB10103.html.]

Taking into account the goals of effectiveness, efficiency, independence, and identity, the following activities should be transferred to the Space Force: • Operations and training: The majority of space operational units (and associated space intelligence and training units) in the Department of Defense should be **moved into the Space Force.** Some space control units may reside in their current services until the Space Force's space control missions are further clarified. • Acquisition: The majority of space acquisition organizations (including the Space Development Agency) should be consolidated in the Space Force. Decisions about transferring the Missile Defense Agency's space acquisition activities require more in-depth analyses. Headquarters: Headquarters, Space Force, should include key functions that are essential to the independence and identity of the service (i.e., operational concepts and doctrine development; requirements development and advocacy; planning, programming, budgeting, and execution; and legislative liaisons and public affairs). The **above transfers will likely create new seams between the Space Force and the other services and the organizations it supports.** The services will need to retain appropriate organic space expertise and establish liaisons and new relationships with the Space Force to support their unique needs and requirements. The full report provides detailed unit-by-unit and function-by-function recommendations for transfers to the Space Force

A separate SPACE Force is needed for organizational efficiency

Henningan 20 [Hennigan, W.J. 07-03-2020. "America Really Does Have a Space Force. We Went Inside to See What It Does," Time Magazine https://time.com/5869987/spaceforce/

Another reason for **Space Force's creation is that national satellites are currently controlled by multiple services and agencies**, which can **lead to excessive secrecy and the lack of information sharing known in the intelligence world as hypercompartmentalization.** During the Obama Administration, it once took officials four months to assemble a briefing on U.S. space capabilities for then Vice President Joe Biden because information was scattered among so many top-secret classifications and few officials had access to all of them, recalls Robert Cardillo, former director of the U.S. National Geospatial-Intelligence Agency.

Economy

Space surveillance is needed to protect vital commercial infrastructure

Sinclair & Sadat 21 [Sinclair, Michael; Sadat, Mir. 02-12-2021, "A Pentagon strategy for elevating the space mission," Brookings Institution, https://www.brookings.edu/blog/order-from-chaos/2021/02/12/a-pentagon-strategy-for-elevating-the-space-mission/]

Throughout the 2020s, space activity — especially commercial space activity — will accelerate as new actors, both national and commercial, get in the game. More satellites and spacecraft mean greater urgency to mitigate risks associated with space debris proliferation, traffic management, protected orbits and access to space resources. Protecting commercial, scientific and military objects in space requires surveillance and defense services in and throughout the domain of space, beyond just the "look down" capabilities that constrain today's space defense thinking. As such, Pentagon space operations need the long-range vision, capabilities, human talent,\ and authorities for the next phase of space operations in the medium-term, and they should pursue these things now, primarily through effective Congressional engagement and visionary multi-year budget builds.

Space Force is critical to protecting space infrastructure that is needed for commerce and military readiness

Sinclair & Sadat 21 [Sinclair, Michael; Sadat, Mir. 02-12-2021, "A Pentagon strategy for elevating the space mission," Brookings Institution, https://www.brookings.edu/blog/order-from-chaos/2021/02/12/a-pentagon-strategy-for-elevating-the-space-mission/]

Today, the military is focused on "look down" operations and the defense of United States space assets that facilitate those operations. Make no mistake, this is a critically important defense mission: both our way of warfighting and our **modern way of life rely heavily on space-based services as critical infrastructure in and of itself and as a key component for other types of critical infrastructure.** China and Russia are well aware of space as critical infrastructure and are developing their own space defense and denial capabilities to level the playing field against traditionally overwhelming American commercial and military might. These challenges require the development of resilient space systems supporting worldwide voice communications; internet access; precision navigation and timing; security surveillance; terrestrial, air and maritime domain awareness; climate research; non-proliferation monitoring; and intelligence collection. Concentrating expertise to address these challenges is the reason why Space Force and Space Command came (back) into existence.

A Space Force is meeded to protect against hackers hostile space craft, and asteroids

David 18 [David, Leonard. 09-30-2018, "Would Trump's 'Space Force' Patrol the Moon?" Scientific American, https://www.scientificamerican.com/article/would-trumps-space-force-patrol-the-moon/

"Where we are in space today, we just monitor—hence the need for a space force," Dolman said. "A **U.S. Space Force will** not only **conduct all of the monitoring operations it currently does fairly well, it will have to include rescue and recovery, pirate mitigation—right now mostly from hackers, but in the future from hostile spacecraft.**" A space-forward military agenda in the future will include planetary defense against incoming asteroids and comets "and, most importantly, in my view, defense of the commons from rogue state and non-state actors who would find an asymmetric advantage against their terrestrial opponents by denying space-based capabilities," Dolman said.

Satellites are key to the US economy

Gydesen 6 [Gydesen, Paul W. (Lieutenant Colonel of USAF_, February 2006, "What Is The Impact To National Security Without Commercial Space Applications?" http://www.au.af.mil/au/awc/awcgate/awc/gydesen.pdf]

There is also a significant impact to just-in-time inventory management. Many companies have reduced storage costs and freed up capital by not maintaining a large supply of parts on-hand. This is possible due to computer networking. As new goods are ordered, requests to parts suppliers are simultaneously made. This ensures a just-in-time delivery of parts. It reduces expenses and improves profitability. If businesses are forced to return to holding a large supply of parts on-hand, profitability will decrease, which will lead to a loss of investor confidence and lower stock prices. This sequence of events, repeated throughout many businesses, will start a cascading cycle of second and third order effects. Some of the more direct impacts are easy to identify; however, there will be numerous second and third order effects that will be difficult to predict. History offers numerous examples of human behavior when people are uneasy about the market place. The stock market crash of 1929 caused thousands of individuals to withdraw money from banks. It did not take long for banks to deplete their cash reserves. Once the assets were gone, the banks failed, leaving many people destitute. The withdrawal of capital from the nation's money supply dried up lending and investment opportunities which inhibited growth. Consumers started to panic and stopped spending what little money they had left. The job markets contracted due to decreased sales which led to more business failures. Soon the nation was in a depression. One only needs to look at Hurricane Katrina for a more recent example. Soon after the hurricane, rumors abounded that gasoline supplies were running low. Consumers panicked and started a run on gasoline stations which led to a self-fulfilling prophecy. A large demand was placed on gas supplies at the same time that suppliers were unable to provide additional resources. Customers sat in gas lines for hours to fill their tanks, all the while getting worried over their future ability to buy gas. This demand caused gas prices to rise to exorbitant levels, over $5.00 a gallon in some areas. This rise in prices further led to reductions in consumer spending due to less disposable income and fewer trips to the store in order to save fuel. This action increased speculation of a post-hurricane recession. A widespread loss of

all or numerous satellites will have a global affect on the world economy. Second and third order effects are easier to see in hindsight than they are to predict ahead of time, especially when it comes to satellite services which have become embedded in many parts of the economy. Money and finances project power and wealth; this leads to prosperity and confidence. When the ability to access money and finances is removed, an individual's daily routine is interrupted. This begins a cascading effect driven in part by human behavior and partially by the actual loss of services. One can see both of these examples in the stock market crash and Hurricane Katrina aftermath. If the networks that process and reconcile payments (mortgage, automobile, credit card and student loans), taxes (sales, corporate, income, and social security), and financial transactions (grocery store, retail clothing, restaurant, accounts receivable) are not quickly restored, a loss of confidence will result. When automatic teller machines, instant check-writing approval, and credit and debit card processing stops, individuals will try and turn to cash. When checks do not clear the banking system quickly, business will not have funds to make payroll or tax payments. Without tax payments, cities cannot provide services or make payroll. When individuals revert to cash, there will not be enough cash in the system to supply the demand. Additionally, individuals with large amounts of cash draw attention. Those that are without means to obtain basic needs may turn to violence. As observed during Hurricane Katrina, this will place a greater demand on law enforcement and create further distrust and loss of confidence.

Russia/China Aggression

War in space with China and Russia is inevitable absent credible US deterrence – cooperation has failed, and any attack would be met with force

Bender & Klimas 18 [Bender, Bryan; Klimas, Jacqueline, 4-6-2018, "Space war is coming — and the U.S. is not ready," POLITICO, https://www.politico.com/story/2018/04/06/outer-space-war-defense-russia-china-463067, accessed 11/20/18

War is coming to outer space, and the Pentagon warns it is not yet ready, following years of underinvesting while the military focused on a host of threats on Earth. **Russia and China are years ahead of the United States in developing the means to destroy or disable satellites that the U.S. military depends on for everything from gathering intelligence to guiding precision bombs, missiles and drones.** Now the Pentagon is trying to catch up — pouring billions more dollars into hardening its defenses against anti-satellite weapons, training troops to operate in the event their space lifeline is cut, and honing ways to retaliate against a new form of combat that experts warn could affect millions of people, cause untold collateral damage and spread to battlefields on Earth. “We are now approaching a point where ‘Star Wars’ is not just a movie,” said Steve Isakowitz, CEO of The Aerospace Corp., a government-funded think tank that serves as the military’s leading adviser on space. He said the U.S. can no longer afford to take its dominance for granted. "That supremacy in space has enabled us to have the world’s greatest war-fighting capability ... whether it is our soldiers on the field, our drones that fly overhead, our bombers that travel around the world, intelligence we collect," he told POLITICO. "More and more every day, literally, we become more dependent on it. "And our adversaries know that," he added in an interview. POLITICO Space POLITICO’s weekly must-read briefing on the second space age. Email Your email… Sign Up By signing up you agree to receive email newsletters or alerts from POLITICO. You can unsubscribe at any time. Americans' fears of a possible Soviet military advantage helped inspire the first space race after the Sputnik launch in 1957, and former President Ronald Reagan's "Star Wars" program in the 1980s sought to create a space-based shield against a nuclear missile attack. In recent decades, though, space has mostly been a realm for peaceful exploration and collaboration, typified by the Russian rockets that carry American astronauts to the International Space Station. **But the worry that cooperation could turn to confrontation has been in the background for years**. A 2001 report issued by then-Defense Secretary Donald Rumsfeld warned that an attack on space systems during a conflict “should not be considered an improbable act.” “If the U.S. is to avoid a ‘Space Pearl Harbor,’ it needs to take seriously the possibility of an attack on the U.S. space system,” the report said. Some experts speculate that military leaders never followed through on the warnings, in part because the terrorist attacks later that year drew far more attention to what resulted in two ground wars in the Middle East. One sign of the new urgency is President Donald Trump’s recent call for establishing a “space force” — a separate military branch responsible for ensuring American supremacy in space, a role now primarily played by the Air Force. A model of the Soviet Earth satellite Sputnik 1 is on display at the Prague Czechoslovakia exhibition on Oct. 7, 1957. The actual Sputnik 1 capsule was launched by the Soviet Union three days earlier, starting the first space race with the United States. A model of the Soviet Earth satellite Sputnik 1 is on display at the Prague Czechoslovakia exhibition on Oct. 7, 1957. The actual Sputnik 1 capsule was launched by the Soviet Union three days earlier, starting the first space race with the United States. | AP Photo “My new national strategy for space recognizes that space is a war-fighting domain, just like the land, air and sea,” Trump said last month. He added: “We have the Air Force, we’ll have the space force." Already, the Air Force, which oversees an estimated 90 percent of the military’s space operations, regularly conducts space war games, including one in which troops simulate how to attribute potential attacks on U.S. satellites. One that took place last year was set in 2027 and included international partners from Australia, Canada, New Zealand and the United Kingdom. Army soldiers also now regularly undergo training to operate in the field as if their GPS signals went dark. Meanwhile, Trump's new National Security Strategy, issued late last year, designated space a “vital interest” for the first time and directed military to “advance space as a priority domain." “Any harmful interference with or an attack upon critical components of our space architecture that directly affects this vital U.S. interest will be met with a deliberate response at a time, place, manner, and domain of our choosing,” it says. Trump's attitude has made a big difference, Air Force Secretary Heather Wilson told POLITICO. "We have a president who has said now, publicly, that we have

to expect that space will be a war-fighting domain," Wilson said in an interview. "That's a very big deal." The Trump administration's latest budget request seeks $12.5 billion for military space efforts — not including secret projects. One focus will be what Wilson calls a "more dependable architecture" for the four Air Force satellites designed to provide early warning of missile launches. Those satellites are crucial to U.S. readiness in one of the most perilous global flashpoints, the Korean Peninsula. Secretary of the Air Force Heather Wilson speaks about the need to invest in the future of space operations at the Center for Strategic & International Studies in 2017. Secretary of the Air Force Heather Wilson speaks about the need to invest in the future of space operations at the Center for Strategic & International Studies in 2017. | Wayne A. Clark/U.S. Air Force "We stare at the Earth and look for the telltale signs of a rocket launch and within seconds, detect that launch and detect where it's heading and alert the National Command Center," she explained. "So whenever the television shows that picture of North Korea launched a missile, that arc actually comes from the Air Force." A major focus of the new effort will also be defending the Air Force's 31 Global Positioning System satellites. "The Air Force provides GPS for the world, for about 1 billion people every day," Wilson said. "The timing signal for the New York Stock Exchange comes from the Air Force GPS satellites. If you've gone to an ATM machine, that is connected to GPS satellites for the timing signal so you can't simultaneously take money out of two ATM machines. GPS enables Uber Eats, all kinds of things." "In this budget," she added, "we've proposed to upgrade GPS to what we call GPS III, which is more resistant to jamming." In some ways, GPS is already under assault. During the Iraq War, forces loyal to Saddam Hussein used electronic jammers to try to block the signal for precision-guided munitions that relied on GPS for targeting, according to Brian Weeden, director of program planning at the Secure World Foundation, which promotes sustainable and peaceful uses for space. More recently, Russia has used GPS and satellite jammers to try to disrupt space communications in the conflict in eastern Ukraine, Weeden said. "In that sense, it's already a part of conflict on Earth." The Pentagon is also making new investments in technologies that allow the military to track, in real time, all space assets and ensure that the two dozen military communications satellites rely on an advanced frequency that cannot be jammed. "We must expect that war of any kind will extend into space in any future conflict, and we have to change the way we think and prepare for that eventuality," Air Force chief of staff Gen. David Goldfein told the Air Force Association, an industry group, in February. Some still think it's not enough. War in space "is going to happen," said Rep. Mike Rogers, the Alabama Republican who chairs the House Armed Services Strategic Forces Subcommittee, in an interview. "It's just a matter of whether it happens in the next couple of years or the next five or six years." He said he worries about whether the Air Force is making space enough of a priority. "They always say, 'We got this, we're planning for this in the future,'" Rogers said. "But when you ask them to prioritize space this year, they say they can't. People have to remember when it comes to fighting a war, our eyes and ears are in space. We can't let adversaries take our eyes and ears out." Air Force chief of staff Gen. David Goldfein gives a talk about innovation during the Air Force Association Air Warfare Symposium in February. "We must expect that war of any kind will extend into space in any future conflict, and we have to change the way we think and prepare for that eventuality." Air Force chief of staff Gen. David Goldfein gives a talk about innovation during the Air Force Association Air Warfare Symposium in February. "We must expect that war of any kind will extend into space in any future conflict, and we have to change the way we think and prepare for that eventuality." | Wayne A. Clark/U.S. Air Force When the Pentagon talks about a space war, it doesn't mean troops in celestial camouflage, maneuvering with jet packs and targeting the enemy with laser guns. The conflict could take many different — and largely silent — forms, ranging from jamming a GPS satellite to temporarily blinding a sensor with a laser or relying on a cyberattack to disrupt services. Then there is the potential for an actual physical attack — with a missile or laser — to destroy space assets. Some experts worry the most about that scenario, which was exemplified by a 2008 test in which China tested an anti-satellite laser to blow up one of its own satellites. That kind of space war would impose especially heavy costs on the U.S., because each such explosion creates debris that will linger forever — including the millions of pieces left over from that Chinese test. Even small pieces of matter traveling at 17,000 mph can do serious harm to the satellites that the United States so relies on. For example, a fleck of paint the size of a thumbnail once hit the 6-inch-thick windshield of one of NASA's space shuttles and went about 3 inches into the glass, an Air Force official said. No way exists to clear away the lethal clouds of space junk that a shooting war would create. **"If deterrence fails, we lose**," the Air Force official said. That means that if shots are fired in space, the United States may not respond in kind and instead might fight back through other means — like a cyberattack or political retaliation — to avoid creating more space debris, Brig. Gen. John Shaw, the director of strategic plans, programs, requirements and analysis at Air Force Space Command, told reporters. "We have to be prepared ... for war to extend into space, but we'd like not to do it."

Russia has developed ASAT weapons and US systems are vulnerable

Henningan 20 [Hennigan, W.J. 07-03-2020. "America Really Does Have a Space Force. We Went Inside to See What It Does," Time Magazine https://time.com/5869987/spaceforce/

Treaty advocates say the problem will get harder as time passes. The U.N. recognizes 90 space-faring nations. In March 2019, India tested its antisatellite system, obliterating its own spacecraft. It proudly proclaimed that it had joined the "elite club of space powers." Other nations such as Iran, North Korea and Pakistan have demonstrated space-weapon capabilities or a desire to expand them. **American intelligence analysts have been watching a pair of Russian satellites,** identified as Cosmos 2542 and 2543, for months. Or rather, they have been watching them since they were one satellite, deployed by a Soyuz rocket that took off from the Plesetsk Cosmodrome on Nov. 26, 2019. It was 11 days after that launch that the first satellite split in two, the second somehow "birthed" from the other, and no one in the U.S. military was happy about the new arrival. By mid-January, both Russian satellites had floated near a multibillion–dollar spacecraft known as KH-11, one of the U.S. military's most powerful spy tools, part of a reconnaissance constellation code-named Keyhole/CRYSTAL. It wasn't clear whether the Cosmos satellites were threatening or surveilling the KH-11, which is said to have the resolving power of the Hubble Space Telescope, but it turned out that was only the start of the twins' surprises. After **the U.S. expressed concern to Moscow through diplomatic channels early this year, the pair pulled away from the KH-11 and whizzed around the Earth at more than 17,000 m.p.h.** Then, on July 15, with the U.S. analysts still tracking them, the "birthed" Russian satellite, Cosmos 2543, fired a projectile into outer space, General John "Jay" Raymond, the top general of the newly created U.S. Space Force, told TIME. It was the first time the U.S. military has publicly alleged an instance of a space-based antisatellite weapons test, a troubling new development in the emerging theater of orbital warfare. To Raymond and supporters of Space Force, which is the first new branch of the U.S. military in 72 years, Moscow's "nesting doll" satellites, as the military has labeled the Cosmos triplets, represent a threat not just to one really expensive piece of American spy hardware but to the basic functioning of modern America itself. "**Russia is developing on-orbit capabilities that seek to exploit our reliance on space-based systems**," Raymond says. Whatever the Russian crafts' mission—and Moscow says it is purely peaceful—Raymond's not wrong that Americans have come to rely on satellites in ways they hardly begin to appreciate. Even as the Cosmos 2543 was launching its projectile, Air Force satellites were performing a host of civilian tasks back home in the U.S. Streetlamps timed to global positioning system (GPS) spacecraft were turning on across the country, and businesses were relying on GPS to time-stamp credit-card purchases. Weather satellites were transmitting information for nightly forecasts. Many of the around 650,000 calls made to 911 every day in the U.S. depend on satellites overhead. But for all the ways that civilians and the military rely on it, America's network of roughly 1,000 satellites is virtually unprotected. And just as lightly defended access to deep-water ports or natural resources was a source of war in the past, leaders and strategists worry that America's vulnerable satellite network is an invitation to conflict in our times. Raymond tells TIME that Russia executed a previous, unreported projectile launch in February 2017. China has started training specialized units with weapons that can blast apart objects in orbit. Both countries have deployed ground-based laser and communications–jamming equipment that can disable satellites.

China and Russia developing space power to undermine US power

Henningan 20 [Hennigan, W.J. 07-03-2020. "America Really Does Have a Space Force. We Went Inside to See What It Does," Time Magazine https://time.com/5869987/spaceforce/

Both China and Russia reorganized their militaries in 2015, emphasizing the importance of space operations, according to a Defense Intelligence Agency assessment published last year. "**They view space as important to modern warfare and view counterspace capabilities as a means to reduce U.S.**

and allied military effectiveness," it said, adding that **America's dependence on space is perceived by adversaries as the "Achilles heel" of U.S. military power.**

Russia and China ASATs

Henningan 20 [Hennigan, W.J. 07-03-2020. "America Really Does Have a Space Force. We Went Inside to See What It Does," Time Magazine https://time.com/5869987/spaceforce/

The threats to space-based systems originate on Earth as well. On April 15, Russia tested an antisatellite missile, and in December the Russian military deployed a new laser system designed to blind spy satellites overhead. GPS users in northern Scandinavia since 2017 have reported signal disruptions whenever Russian military exercises are conducted in the region; the Norwegian government says the Russians are jamming the signals. China is developing jammers to target satellite communications over a range of frequency bands, including military–protected extremely high–frequency communications. And **China demonstrated its own antisatellite–missile capability in 2007 when it blasted one of its old weather satellites apart, creating a cloud of more than 3,000 pieces of space debris—a tipping point that arguably started the space arms race unfolding today.**

Satellites

U.S. Space Force key to protecting U.S. satellites and vital infrastructure

Mack 20 [Mack, Eric. 12-20-2020, "US Space Force: Everything you need to know on its first anniversary," CNET, https://www.cnet.com/news/us-space-force-guardians-everything-you-need-to-know-first-anniversary/]

Officials in the Trump administration have made the argument that space is already a "war-fighting domain" and that other global powers like Russia and China are already treating it as such. That phrase echoes what some in the Air Force had been saying for a number of years. The stakes are high. Much of our **21st century economy and lifestyle** -- from bank transactions and weather forecasting to television service and GPS -- **depends on satellites functioning round the clock and without interruption**. The military depends on them too. But space right now is a bit like the Wild West, with a wide-ranging mix of government and commercial satellites, all of them sitting ducks. We've even seen an instance of target practice: In 2007, China shot down one of its own satellites -- mission accomplished in its own right -- and littered orbit with potentially destructive space debris. Many saw that 2007 operation as a veiled display of military power. "Our adversaries are moving deliberately and quickly in order to reduce our advantage [in space]," Raymond said at a conference in September 2020. "**I'm not confident that we can achieve victory, or even compete, in a modern conflict without space power."**

Even in non-combat times. Space is vital for U.S. commercial interests

Cheng 20 [Cheng, Dean. 2020, "Does the United States Need a Space Force?" Heritage Foundation, https://www.heritage.org/space-policy/heritage-explains/does-the-united-states-need-space-force]

Cheng: In peacetime, believe it or not, there's an even bigger set of issues that are involved. If you order something from Amazon and you want to track your package, that's GPS. If you use your credit card at the gas station pump, that's communication satellites and also GPS. So you ha**ve the ability, if you can interfere with satellites systems in peacetime, to affect almost every part of your daily life and a huge part of this country's economic system.** Cordero: I asked Dean if he believes that the next big conflict will be in outer space. And if the United States really needs a Space Force. Cheng: In th**e next conflict, if it involves a major power or even a mid-size power increasing, it will have operations in space.** And by the way, those operations in space while we tend to focus on the really cool images of a kinetic anti-satellite weapon just colliding with and blowing up into fragments, could **also include cyber attacks where the satellite turns itself off for example.** And a lot of countries are developing that set of capabilities. So because a lot of people will have the ability to operate in space, because of the importance of space to us, we need to be thinking about that set of capabilities that is encompassed by our space systems. For better or worse, the only way you're going to do that at this point it seems is to have a service, a Space Force if you will, whose job is to be thinking about this. Living, eating, breathing, sleeping space. And thinking about what kinds of systems to acquire and part of that of course is how to pay for it.

Satellites are key to the U.S. nuclear deterrent and to respond to rogue states such as Iran and North Korea

Codevilla 18 [Codevilla, Angelo. October 2018, "The Space Force's Value," Strategika, Hoover Institute, Issue 54, https://www.hoover.org/sites/default/files/issues/resources/strategika_54_web.pdf]

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 the United States' 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

Satellites are key to counterterrorism initiatives that are able to prevent nuclear terrorism and rogue-state bioweapons

Gallagher & Steinbruner 08 [Gallagher, Nany (Associate Director for Research at the Center for International and Security Studies at Maryland (CISSM) and a Senior Research Scholar at the University of Maryland's School of Public Policy); Steinbruner, David. January 2008. "Reconsidering the Rules for Space Security," *American Academy of Arts & Science* https://www.amacad.org/publication/reconsidering-rules-space-security/section/14]

Force enhancement: From SPACECOM's perspective, satellites are **invaluable** because of "their ultimate 'high ground' access, their ability to rapidly forward deploy with minimal logistics tail, and their **relative immunity from threats**."92SPACECOM wants to **modernize** current capabilities to provide more precise and comprehensive information, faster and more securely, in a manner that is integrated into a **single network-centric system-of-systems** rather than the current mission-unique, stove-piped approach. In the area of satellite communications, DOD plans include launching a number of Advanced Extremely High Frequency satellites to replenish its current Military Strategic and Tactical Relay (MILSTAR) secure communications satellites with a constellation that can provide **more capacity and speed**, then replacing that system with the Transformational Satellite Communications System (TSAT), an ultra-large bandwidth secure communications system that would use lasers to **rapidly move information** to and from friendly forces operating

in **even the most remote locations**.93 To address emerging challenges such as **rogue states**, **terrorists armed with WMD**, or other small-scale threats that are **difficult to identify and destroy**, the Air Force transformation plans include a space radar that can see moving targets **even at night** or **in cloudy weather** and a hyperspectral imaging system that can **detect chemical**, **biological**, **radiological**, **nuclear**, and **high explosive** materials.94 The National Reconnaissance Office (NRO), which builds and manages spy satellites, also has several ambitious and expensive programs, including efforts to deploy a larger constellation of smaller, lighter satellites with radar and electro-optical imagery capabilities to provide **more valuable data**, on a more frequent schedule, in forms that can easily be integrated with other intelligence information.95 The most ambitious SPACECOM supporters depict these future satellites as the **key to having an** "**unblinking eye**" that can be used to find and target any potential threat to U.S. security, allowing them "**to know something about everything at all times**" and to be able to "switch on the spotlight" to get detailed information if the "illuminator" revealed a potential problem.96

Satellites are key to overfishing enforcement- drastically reduces fishing

Mathiesen 16 [Mathiesen, Karl. 01-04-2016 "How satellite technology is helping to fight illegal fishing," The Guardian, https://www.theguardian.com/environment/2016/jan/04/how-satellite-technology-is-helping-to-fight-illegal-fishing]

Despite a proliferation of huge, publicly lauded marine reserves, actually stopping fishing in many remote areas has previously been almost impossible. Fishing vessels are required to carry a transponder that tracks their movements and allows authorities to monitor their behaviour. But illegal fishers simply switch off the machine, disappearing from the system. A UK-funded initiative, developed by Satellite Applications Catapult (SAC) and the Pew Charitable Trusts, uses satellite radars to track these "dark targets". Now, instead of blindly patrolling vast areas of ocean, coastguard vessels use the satellite intelligence to target their search. "We don't put a cop on every corner 24 hours a day. So let's at least know what the situation out on the water is [before sending boats to investigate]," said Bradley Soule, senior fisheries analyst for SAC. Satellite radar has traditionally been used by the military and law enforcement agencies. But the cost has dropped dramatically, opening up the data for private companies to use. "It is definitely a big deal," he said. "[The global satellite tracking] gives you a sense of the scope ... It is a wide-ranging problem." Roughly **one in every five fish** landed around the world is caught illegally.

Overfishing collapses food security

Hillborn & Hillborn 19 [Hillborn, Ray; Hilborn, Ulrike. 2019 "Ocean Recovery: A sustainable future for global fisheries," University of Washington.

Why write a book about world fisheries? Because fisheries are **vitally important** to **global food security**. But, by their very nature—fishing boats are far out at sea—their importance is mostly unnoticed or worse, their very existence is being challenged and portrayed as evil. For several decades now, the public narrative, particularly about marine fisheries, has been to vilify ocean fishing with half-truths, plain-old lies, and more than a bucketful of misguided emotion. In light of the ever-increasing population of our world, it seems **downright reckless** to use political pressure via public misinformation to potentially **reduce everyone's food supply**. More than 40 million people are professionally catching and processing fish, and more than **1 billion** of the poorest people on earth **depend on fish protein** for a substantial part of their diet. Global capture fisheries produce more food than global beef production does. When we add the badly documented freshwater fisheries, capture-fish production may well exceed global pork and poultry. The world is eating a lot of fish.

Moon Base

Space force will establish a base on the moon of robots

Steffen 20 [Steffen, Andrea D. 10-05-2020, "The US Space Force Is Planning To Build A Moon Base," Intelligent Living, https://www.intelligentliving.co/space-force-build-moon-base/]

However, the recruitment doesn't mean that the chosen cadets will be a human presence in space. According to Space Force officials, they won't be sending anyone into orbit any time soon. **Those commissioned into the Space Force will be in charge of ground support to the nation's space assets – like robots**. Meaning, **robots will be stationed on the Moon, and Space Force officers will be controlling them from here on Earth**. Astronaut, Maj. Gen. John Shaw said during the AFWERX Engage Space event on September 29th that anyone joining the Space Force might go into space someday, but not any time soon.

In the long-term space force plans on establishing a moon colony with human troops

Tangermann 20 [Tangermann, Victor. 09-03-2020 "US GENERAL: SPACE FORCE MAY BUILD A MOON BASE," The Byte, https://futurism.com/the-byte/space-force-moon-base]

It may be many years away — but the **US Space Force is already considering the possibility of launching the first troops into space and even establishing a lunar base**. Speaking at the Air Force's AFWERX Engage Space Conference, U.S. Space Command leader John Shaw confirmed on Tuesday that "**at some point, yes, we will be putting humans into space,"** as C4ISRNET reports. "They may be operating a command center somewhere in the lunar environment or someplace else that we are continuing to operate architecture that is largely autonomous," he added. The news comes after NASA and the U.S. Space Force just formally teamed up last week on a number of objectives ranging from human spaceflight to planetary defense.

The moon is an important first step to future efforts of colonization

Neal 16 [Neal, Clive. 07-01-2016 "If We Want to Send Astronauts to Mars, We Must Go Back to the Moon First," Scientific American, https://www.scientificamerican.com/article/if-we-want-to-send-astronauts-to-mars-we-must-go-back-to-the-moon-first/]

A few months ago, when European Space Agency director general Johann-Dietrich Woerner laid out a vision for his agency to lead the way in establishing an international Moon Village, I had a feeling of déjà vu. In January 2004 President George W. Bush announced his own Vision for Space Exploration, in which the U.S. would lead the world back to the moon. Once we had gone there, and humans had learned to live and work successfully on another world, we would head on to Mars as the ultimate

destination. Bush's idea was inspiring enough that, in addition to NASA, no fewer than 13 international space agencies signed on to participate in developing a plan for reaching the moon. Unfortunately, the plan's implementation was badly flawed. NASA tried to relive the glory days of Apollo by focusing on one-use vehicles that would transport everything to the moon from Earth. Apollo was a fantastic achievement, but it was not sustainable, which was in part why the program was canceled in the early 1970s. Bush's vision proved too expensive to sustain as well, and in 2010 President Barack Obama declared that the U.S. had no need to go back to the moon, saying, in essence, that we've been there, done that. Instead, he said, we would go to Mars without taking that interim step. But **a return to the moon is crucial to the future of human space exploration**—and not just for the experience it would give us in off-world living. **Our satellite is also rich in resources, notably water ice, which can be split via electrolysis into oxygen and hydrogen. These** elements can . If we are ultimately heading to Mars (or anywhere else), hauling that fuel off the surface of Earth is terribly inefficient. Much better to launch it from the moon, where gravity is one sixth as strong.

The moon has tremendously valuable resources that could be used to benefit the economy

Xu 20 [Xu, Adam. 12-02-2020, "China Joins Race to Mine Moon for Resources," VOA News, https://www.voanews.com/science-health/china-joins-race-mine-moon-resources]

The early detection results of lunar resources have given people a lot of hope. For example, the current director of NASA, Jim Bridenstine, said last July that collecting rare-earth metals from the moon would be possible this century. "**There could be tons and tons of platinum group metals on the moon, rare-earth metals, which are tremendously valuable on the Earth,**" Bridenstine told CNBC in an interview. Harrison said some of the **metal resources that exist on the moon could become materials for future human space bases, "either structures on the moon itself for habitation or for other science missions,"** as well as "structures in space around the Earth." **Some rare-earth metals are considered strategically important because they are an integral part of the manufacturing of electronic devices, electric vehicle batteries and military equipment.** Currently, more than 80% of U.S. rare-earth imports come from China. Analysts say moon mining is not feasible in the near future, but recent observations confirming the presence of water on the moon may help promote further exploration of space. "Probably the most important material to look for on the lunar surface initially is going to be water ice," Harrison said, "because you can turn that water into rocket fuel to power missions back to the Earth or to other places in space, and also use it to support life on the lunar surface." **With very low gravity levels, launching rockets from the moon will be more energy-efficient than from the Earth**. Print this page Science & Health China Joins Race to Mine Moon for Resources By Adam Xu December 02, 2020 04:20 PM FILE PHOTO: The Long March-5 Y5 rocket, carrying the Chang'e-5 lunar probe, takes off from Wenchang Space Launch Center, in… FILE - The Long March-5 Y5 rocket, carrying the Chang'e-5 lunar probe, takes off from Wenchang Space Launch Center, in Wenchang, Hainan province, China, Nov. 24, 2020. China's space program celebrated a major accomplishment this week when its Chang'e 5 lunar probe mission safely landed on the moon. The landing Tuesday brought Beijing a step closer to becoming the third country in the world to retrieve geological samples from the moon, but more important, analysts say, is that China is accruing experience for more ambitious plans. The goal of this mission is to extract 2 kilograms of sample from the moon's northern Mons Rümker region and bring it back to the Earth. If the mission succeeds, China will join the U.S. and the former Soviet Union as the only countries to have collected lunar samples. Analysts say the complexity of Chang'e 5's unmanned exploration mission shows the great progress of China's space capabilities, and, if successful, will likely help Beijing realize future plans for manned moon landings and the construction of bases. Namrata Goswami, an Indian defense expert and now a space policy and geopolitical scholar living in the U.S., told VOA that Chang'e 5 would allow China to advance "their understanding of rendezvous and docking, especially when they are planning on human landing." While reaching the moon remains a significant accomplishment for any space program, Beijing's space program is still in its early stages and is still building experience. "They're catching up to where the United States was in the 1960s," said Todd Harrison, director of defense budget analysis and space security at the Center for Strategic and International Studies, a Washington think tank. "The United States has already sent not just

probes to the moon but humans and returned to the Earth and brought back samples of lunar rocks. So China is catching up in that respect, but they're still not where the United States is in terms of space technology. But it is nevertheless a competition for science." Between 1969 and 1972, the U.S. brought back a total of 382 kilograms of lunar soil through seven Apollo manned spacecraft missions, six of which succeeded. The former Soviet Union used unmanned probes to take 301 grams of moon soil samples between 1970 and 1976. An image taken by Chang'e 5 spacecraft after its landing on the moon is seen in this handout provided by China National Space… An image taken by the Chang'e 5 spacecraft after its landing on the moon is seen in this handout provided by China National Space Administration. Lunar missions' importance The early detection results of lunar resources have given people a lot of hope. For example, the current director of NASA, Jim Bridenstine, said last July that collecting rare-earth metals from the moon would be possible this century. "There could be tons and tons of platinum group metals on the moon, rare-earth metals, which are tremendously valuable on the Earth," Bridenstine told CNBC in an interview. **Harrison said some of the metal resources that exist on the moon could become materials for future human space bases,** "**either structures on the moon itself for habitation or for other science missions,"** as well as "structures in space around the Earth." Some rare-earth metals are considered strategically important because they are an integral part of the manufacturing of electronic devices, electric vehicle batteries and military equipment. Currently, more than 80% of U.S. rare-earth imports come from China. Analysts say moon mining is not feasible in the near future, but recent observations confirming the presence of water on the moon may help promote further exploration of space. "Probably the most important material to look for on the lunar surface initially is going to be water ice," Harrison said, "because you can turn that water into rocket fuel to power missions back to the Earth or to other places in space, and also use it to support life on the lunar surface." With very low gravity levels, launching rockets from the moon will be more energy-efficient than from the Earth. FILE PHOTO: An image of Chinese President Xi Jinping is seen inside a building at the Wenchang Space Launch Center before the… FILE - An image of Chinese President Xi Jinping is seen inside a building at the Wenchang Space Launch Center, in Hainan province, China, Nov. 23, 2020. Another lunar resource of potential development value is helium-3, which can be used for nuclear fusion fuel. Helium-3 is scarce on the Earth. Early lunar exploration estimates put the moon's shallow helium-3 content at millions of tons. Goswami said, "The fusion is the future because if you want to travel from the Earth to Mars in a very limited time, the helium-3 that is there on the moon is going to form a part of that extracted mineral that is going to be turned to support nuclear fusion." Although China is still behind the U.S. in the space competition, experts believe that China's lunar exploration project is making steady progress and could evolve into a space force with strategic military uses. Goswami said that if a country acquires the capability to use space weapons in lunar orbit, it will provide a superior military strategic advantage. "If you are in lunar orbit from a military scenario perspective, you can look down on the geosynchronous orbit satellite and even at times blind or disable them," she said.

Moon colonization would boost recruitment into space programs and STEM field more generally

Neal 16 [Neal, Clive. 07-01-2016 "If We Want to Send Astronauts to Mars, We Must Go Back to the Moon First," Scientific American, https://www.scientificamerican.com/article/if-we-want-to-send-astronauts-to-mars-we-must-go-back-to-the-moon-first/]

A **return to the moon could also inspire the next generation and advance technology just as Apollo did—but do so in a sustainable, stepwise manner**. The **taxpayer needs to see a return on investment for this endeavor and not only in technology development**. **For** example, a spacecraft-refueling depot orbiting the moon—supplied with fuel refined from lunar resources, privately operated and selling its products to various space agencies—is one commercial on-ramp to bring the moon into our economic sphere of influence. Such activities could result in a major reduction in launch mass from Earth's surface, thereby cutting the cost of space missions. This has the potential to create a slew of industries that in turn create high-tech and well-paid jobs. The immediate next step in lunar exploration should be robotic prospectors on the lunar surface to define the extent, form, distribution, and ease of extractability and refinement of those resources identified from orbit. An international effort could facilitate this critical operation. NASA does have a Resource Prospector mission in development, but it is being done on a shoestring budget that could be cut at any time. Russia also has a Lunar-Resurs program under development, partnering closely with the European Space Agency. And let us not forget China, which became in 2013 the third nation to successfully soft-land on the moon. China plans to return lunar samples to Earth within the next couple of years, again following the U.S. and Russia. Currently **the U.S. vision for human space exploration is to use a robotic spacecraft to capture a small boulder from an asteroid,** about one meter in diameter, and redirect it to an orbit around the moon. Humans will then explore that boulder as practice for an eventual voyage to Mars. But this so-called Asteroid Redirect Mission will have no applicability to Mars, largely because working in microgravity is a very different proposition from working on the surface of a planet. Basically, it is a fast track to nowhere. Which brings us back to Woerner's Moon Village, which spacefaring nations applauded when it was presented at the ESA-led "Moon 2020-2030" meeting last December. **Right now the U.S. is standing on**

the sidelines, watching other nations move on. Yes, Mars is the ultimate destination, but our country has an ill-defined pathway on how to get there. The **moon is the enabling asset and the key to our achieving that goa**l. We need to redefine the way we look at **human space exploration such that any money spent on space travel can be viewed as an investment in the future.**

Space Exploration/Colonization

U.S. Space Force helps to enhance NASA in space exploration missions

Gohd 20 [Gohd, Chelsea. 09-22-2020. "NASA and US Space Force team up for planetary defense, moon trips and more," Space Magazine, https://www.space.com/nasa--space-force-moon-planetary-defense-collaboration.html]

While advancing plans for unprecedented lunar exploration under the Artemis program, NASA also is building on a longstanding partnership with the Department of Defense with a new memorandum of understanding announced today by NASA Administrator Jim Bridenstine and U.S. Space Force (USSF) Chief of Space Operations Gen. John "Jay" Raymond. The agreement, discussed during a Sept. 22 Mitchell Institute virtual event, commits the two organizations to broad collaboration in areas including human spaceflight, U.S. space policy, space transportation, standards and best practices for safe operations in space, scientific research, and planetary defense. "**NASA's partnerships are vital to ensuring America continues to lead the world in the peaceful uses of outer space**," Bridenstine said. "This **agreement with the U.S. Space Force reaffirms and continues our rich legacy of collaboration with the Defense Department and provides a critical foundation to investigate areas of mutual interest for our distinct civil and defense roles in space**." The memorandum replaces an agreement signed 14 years ago between NASA and the U.S. Air Force Space Command, under which the two organizations exchanged research and development information, sought to reduce duplication of system development, and collaborated in the long-term planning of each organization's space roadmaps. "NASA and the military share a long history dating back to the late 1950s; there is power in our partnership," Raymond said. "**A secure, stable, and accessible space domain underpins our nation's security, prosperity and scientific achievement. Space Force looks forward to future collaboration, as NASA pushes farther into the universe for the benefit of all." Freedom of action in space provides NASA and allied-nation space agencies the ability to explore and discover, and will enable America's return to the Moon and subsequent exploration of Mars.** The USSF will secure the peaceful use of space, free for any who seek to expand their understanding of the universe, by organizing, training and equipping forces to protect U.S. and allied interests in space. As part of its Artemis program, NASA plans to send the first woman and next man to the lunar surface in 2024 and establish a sustainable presence there by the end of the decade. The agency will use the Moon to prepare for its next giant leap – human exploration of Mars. Learn more about how NASA is returning to the Moon to prepare for Mars, go to:

Space force enhances all aspects of NASA. You need security before any successful mission in space can happen

Scoles 20 [Scoles, Sarah. 09-22-2020. "NASA, Space Force partnership aims to make space exploration safe," Science Magazine, https://www.sciencemag.org/news/2020/09/nasa-space-force-partnership-aims-make-space-exploration-safe]

The agreement replaces one put in place 14 years ago by NASA and the Air Force Space Command. But blurred boundaries between the U.S. civil and military space enterprises stretch much further into the past. "The **history of collaboration between NASA and the Air Force, as the predecessor service that had space capabilities**, is very long and extensive and goes back basically to the beginning," says Robin Dickey, a space policy and strategy analyst at the Aerospace Corporation, a federally funded R&D center. The **first astronauts,** for instance, **were all military pilots.** Many today still come from the service. The Space Shuttle sometimes landed not at Kennedy Space Center but at Edwards Air Force Base. NASA has launched classified payloads. "**The U.S. space program, from the very beginning, has been inherently military in nature,"** says Victoria Samson, Washington, D.C., office director of the Secure World Foundation, a space sustainability think tank. Samson says a deeper or more apparent marriage between the organizations could present challenges for NASA as it pursues joint missions with other nations, if they see the space agency as too attached to the military. "The question is, does that affect others' perceptions of NASA?" Samson says, although she notes that because the agreement builds on an existing one, "it's not as big of a change as it might seem." The question is particularly relevant as NASA seeks international partners for Artemis. In fact, at today's event, Bridenstine cited Artemis's appeal as a diplomatic tool, a way to establish norms of good behavior in space. He noted that a recent Artemis meeting to foster collaboration drew representatives from 26 countries. At the same time, programs like Artemis—plus increased commercial activity in space—could need an expanded military presence for protection and peacekeeping. As major stakeholders working in the same space, Samson says, they are both invested in establishing and reinforcing good behavior. "There's obviously interest in keeping that space stable and predictable," she says. "It makes sense you'd have a whole-government approach." Although NASA is a civil and scientific organization, it still can play a political role for the nation. Bridenstine said at the forum. "**We are an instrument of national power,"** he said. "It is soft power. It is diplomatic power. It is information power. It is economic power. But … **we can't do any of those things if space is not secure**. **And that's why it was important to create the Space Force. That's why it's important for NASA to partner with the Space Force."**

Space Forcer critical to protecting space and getting into orbit and any effort toward colonization

David 18 [David, Leonard. 09-30-2018, "Would Trump's 'Space Force' Patrol the Moon?" Scientific American, https://www.scientificamerican.com/article/would-trumps-space-force-patrol-the-moon/

"What you are asking is the long-term dream of the Air Force space cadets, one that they have kept from achieving," said Roger Handberg, a professor of political science that specializes in space policy at the University of Central Florida in Orlando. "The irony is that **the Space Force, in whatever form it takes, will be the vehicle for getting to orbit, although not necessarily with humans initially**." Practically speaking, Handberg said, the military is probably focused on near-Earth space—from geosynchronous orbit inward—because that is where all critical space assets currently reside. "What they will argue is that they should resurrect the old expeditionary model of the military leading exploration teams, à la Lewis and Clark in 1803 or so, to the moon and outward," Handberg said, "but that would be a long-term goal."

Space colonization is vital to preventing multiple threats of extinction including climate change, disease, asteroids, comets, biodiversity, water, super volcanoes, and gamma ray bursts – psychological biases lead us to underrepresent the threat

Schwab 05 [Schwab, Martin. 2005, "Homeplanet Defense: Strategic Thought for a World in Crisis," Homeplanet Defense Institute, Chapter 1]

We now face multiple threats to our very existence. Rapid climate change, sudden pandemics of disease, asteroid and comet impacts, space warfare leading to auto nuclear annihilation, biodiversity decline, scarcity of fresh water, super volcanoes and gamma-ray bursts from within our galaxy all have the potential to end global civilization. History demands that we do our duty. We must attack the assorted threats in unison. Six billion together cannot fail. All global threats can be defeated by an expanded human presence in space, if for no other reason than evacuation followed by back-populating Earth. Continued medical experimentation aboard the International Space Station (**ISS) could yield breakthrough defenses against SARS, the Ebola virus and AIDS, each of which potentially threatens global civilization**, as we know it. **Surveillance satellites**, in addition to monitoring Earth's natural systems, can aid various intelligence agencies around the world to prevent nuclear terrorist attacks against our global civilization. Chapter four of this work examines how harnessing solar power in space can help fight rapid climate change on the renewable energy front, without damaging our interdependent economies by over-reducing global carbon emission. There are many natural disasters that inflict death around our world. However, at our current level of understanding, floods, tornadoes, hurricanes, mudslides, earthquakes and tsunamis do not pose planetary threats, nor are they preventable. Their effects on human life and property can only be mitigated. Asteroid and comet impacts are potentially catastrophic planetary threats as well as being the only preventable natural disaster. There is simply no excuse for inadequate planetary defense. There is extensive evidence on Earth, Earth's moon, Mercury and Mars of major asteroid and/or comet impacts. There have been many recent observations of minor impacts and near impacts between Earth's orbit and the orbits of asteroids and comets of various sizes, velocities and masses. In 1994, we even witnessed multiple comet impacts into Jupiter, each of which would have obliterated Earth.' Given the overwhelming evidence available to our policy makers of this reoccurring natural disaster, I can only conclude that the lack of urgency in planning countermeasures is due to natural psychological defense mechanisms of the human mind. After many discussions with genuinely good people, I see that there exists, in many quarters for different reasons, a self-loathing of the human spirit. This contributes heavily to our lack of home planet defense against all global threats. Rational people would agree that failure of continued human existence on Earth and beyond is an unacceptable option. What is a shame is that even with our relatively advanced level of technology, lack of focus still endangers us to being wiped out, the way the dinosaurs became extinct from an asteroid impact. Part of this looming tragedy that needs to be avoided is to not let our technology become nipped in the bud before we ourselves can expand and evolve in cooperation with each other throughout our solar system. Prospects for this peaceful cooperation exist on Mars, the moons of Jupiter and Saturn, on our own moon, on captured asteroids and in space stations.2 Willful ignorance and inaction are very real threats to human existence. Astronomers note that the science of studying Earth cannot progress much further because it is a study of only one case in an infinite universe. For example, by sending unmanned probes to Venus, Mars and Jupiter, meteorologists now have a better understanding of earthly problems such as the interactions of pollution and acid rain within Earth's atmosphere.' If there is evidence that Mars once had a northern ocean and perhaps life, what made Mars die and what implications, if any, does this have for Earth? Only as we explore the climates, atmospheres and geologic records, of worlds in our own solar system, will we understand how Earth really works. All too often, debates within public policy and international affairs ignore the centrality of space science and exploration in our daily lives. All too often, debates within space policy, including the debate over the weaponization of space, ignore the critical element of the human spirit to create new *capabilities* in space. Within these same debates, too often the distinction between "space exploration" and "space science" are not made, not that these two terms are mutually exclusive. A good way to reconcile these two competing forces in policy would be for the International Space Station to be primarily dedicated to researching the long-term effects of the space environment on human physiology and psychology in preparation for missions to Mars and eventually beyond.

Space Colonization is the only ethical priority

Bates 17 [Bates, Jordan. 05-17-2017, "In Order to Ensure Our Survival, We Must Become a Multi-Planetary Species," Futurism Magazine, https://futurism.com/in-order-to-ensure-human-survival-we-must-become-a-multi-planetary-species]

And so the thesis goes as follows: If we think there is value (to the cosmos) in allowing our branch of evolution to continue to blossom and complexify in whatever ways it may, then we need to make damn sure not to prematurely sever this branch of evolution. The speaker argued that our present historical moment is a crucial juncture in the unfolding story of the universe, because we now have the power to end all life on Earth. We possess thousands of nuclear warheads capable of occasioning an existential catastrophe, and we are at the liberty of a fairly fragile global ecosystem with limited resources. Beyond that, our being confined to this single planet means that a single asteroid collision or some other unforeseen cataclysmic event could wipe out our entire species and potentially all intelligent life on Earth. There are numerous other theorized existential risks (e.g. risks arising from advances in artificial intelligence, biotech, nanotech, etc.) as well. In his pioneering 2002 paper, Dr. Nick Bostrom defined "existential risk" as follows: "Existential risk – One where an adverse outcome would either annihilate Earth-originating intelligent life or permanently and drastically curtail its potential. An existential risk is one where humankind as a whole is imperiled. Existential disasters have major adverse consequences for the course of human civilization for all time to come." If it sounds far-fetched to consider earthly extinction scenarios, it shouldn't. Many intelligent people are discussing this topic, and many are even devoting their lives to attempting to avert crisis situations that could decimate earthly intelligent life. The Future of Life Institute, Future of Humanity Institute, Global Catastrophic Risk Institute, and Centre for the Study of Existential Risk are a few prominent organizations specifically dedicated to this cause. According to Muller and Bostrom (2014), a sample of the top 100 most-cited authors on artificial intelligence ascribed a 10% chance of existential catastrophe when and if AI reaches human-level intelligence. In 2008, a group of experts at the Global Catastrophic Risk Conference at Oxford estimated a 19% chance of human extinction before 2100. If you're curious to know more about existential risk, Bostrom's landmark 2002 paper is the place to start. You may also want to follow this list I compiled on Twitter of the best sources of information related to existential risk. How To Ensure The Continuation Of Our Evolutionary Branch The various existential risks that threaten to decimate humanity and the entire earthly biosphere in the coming decades and centuries have, as I said, compelled a multitude of very smart people to consider how best to avoid the potential catastrophes we've identified and how best to identify potential catastrophes that we have yet to notice. Other smart folks have begun asking a similar question: If a catastrophe does occur, how can we at least ensure that our evolutionary branch will persist? One popular answer, in certain circles, is that we must become a multi-planetary species as soon as possible. Among those advocating for the expansion of the human enterprise to other planets, Elon Musk is probably the most iconic. Musk is the CEO of SpaceX, an aerospace manufacturer and space transport services company. As I mentioned in the introduction, Musk and SpaceX hope to create the first city-like colony on Mars by the year 2040. In a supremely fascinating interview with Aeon, Musk said the following of his plans: "I think there is a strong humanitarian argument for making life multi-planetary, in order to safeguard the existence of humanity in the event that something catastrophic were to happen, in which case being poor or having a disease would be irrelevant, because humanity would be extinct. It would be like, 'Good news, the problems of poverty and disease have been solved, but the bad news is there aren't any humans left.'" […] "Not everyone loves humanity. Either explicitly or implicitly, some people seem to think that humans are a blight on the Earth's surface. They say things like, 'Nature is so wonderful; things are always better in the countryside where there are no people around.' They imply that humanity and civilization are less good than their absence. But I'm not in that school. I think we have a duty to maintain the light of consciousness, to make sure it continues into the future." Musk isn't alone in thinking this way. Vinay Gupta, a software engineer, inventor, and global resilience guru, is another notable genius thinking along these lines. In an extraordinary interview with Vice, Gupta said: "Making life interplanetary, and then interstellar, enables creation to generate untold wonders over potentially trillions of years. We have no idea how long human life could last, if we can get it off this one fragile, risk-filled, tiny sphere into the ocean of darkness and light above our heads, and into every nook and cranny of the observable sphere. We owe all the potential futures that could emerge from our present the possibility of existence, and to accomplish this, we must go not only into space, but eventually, by any means found necessary,

into the stars." Gupta and Musk are at the forefront of a growing movement of thinkers and technologists who are advocating for a multi-planetary civilization. Given the (increasingly) precarious nature of our existence on Earth, this group has arrived at the conclusion that the first question we must ask ourselves is: How do we ensure the continuation of humanity? Becoming a multi-planetary and eventually an interstellar or even intergalactic species is, for these folks, an obvious solution and one which we must pursue with a sense of urgency. Artist's conception of the Mars Excursion Module (MEM), proposed in a NASA study in 1964. Source: Wiki Commons Objections As Musk indicated in the above-cited quote, there are plenty of people who object to this conclusion. Some claim that a focus on leaving Earth distracts from the various challenges and issues presently faced by humanity. Many of these people also argue that becoming multi-planetary would divert precious resources away from our present challenges/issues. Some claim that leaving Earth is akin to giving up on our home planet—an admission that we aren't going to be capable of "saving" our home or reversing/averting various human-made crises. Some are Luddites who disagree on principle with the idea that we should invent more technology to address our current global issues, many of which arose as a result of our technology in the first place. Others assert that it is technologically unfeasible to colonize Mars, claiming that people like Musk fail to appreciate the truly immense challenge of shipping a bunch of humans to Mars and establishing a sustainable colony of some kind. Others, some of whom probably identify with the Voluntary Human Extinction Movement, view humanity as a kind of virus that is destroying the Earth and wishes to expand outward to "infect" more of the universe. Thus, they wish for humanity to be "contained" on Earth and possibly eradicated altogether. Addressing The Objections From my vantage point, these objections range from reasonable and compelling to totally ludicrous. I think the two strongest arguments against becoming a multi-planetary species are probably the Distraction From Earth's Issues argument and the Technological Unfeasibility argument, so I'll respond to each of those here. The first part of my response to those who claim that becoming multi-planetary would distract from Earth's present challenges/issues, or would divert precious resources away from those challenges/issues, is essentially the same as Elon Musk's: Earth's challenges/issues won't matter if all intelligent life on Earth is destroyed. The challenges/issues confronted by sentient beings on Earth only matter so long as there are sentient beings on Earth. And we find ourselves at a precarious historical moment in which we can be nearly certain that there is at least a small risk of various catastrophes occurring that could threaten all life on Earth. Or, at the very least, there are various foreseeable catastrophes that could wipe out humanity and essentially rewind the evolutionary process to a point millions of years in the past, with no guarantee that self-awareness and intelligence would once again emerge as they did within our species. When viewed from this vantage point, it seems clear that if we care about fighting for issues that affect the community of sentient life, we must ask ourselves how to ensure that there is a community of sentient life to fight for. And if we believe that the flame of human consciousness is something rare and precious, we must ask ourselves how to ensure that the fire is not extinguished, as it were. One might also here note that colonizing Mars could be the key to solving many of our issues on Earth. Powerful, new technological solutions to previously intractable problems could be developed on Mars or in the process of colonizing it. It's also possible that becoming multi-planetary will have a unifying/pacifying effect on humanity, helping those on Earth to see themselves as members of a single species that is now advancing out into the cosmos. Don't get me wrong: I think it is tremendously important for us to address global poverty, the refugee crisis, human trafficking/slavery, industrial farming, various environmental crises, etc. But those issues won't matter at all if all intelligent life in the biosphere is obliterated. It's also important that we view those issues, and the present population of sentient beings on Earth, within the context of a timespan of potentially trillions of years, because that's how long our evolutionary branch could, theoretically, persist. The existence of trillions or quadrillions of potential future intelligent life-forms hinges on our ability to avoid catastrophes that might obliterate intelligent life on Earth. Think of that for a moment: Trillions, quadrillions of potential human and post-human beings will never taste this existence unless we ensure the continuation of our evolutionary branch. We cannot fathom what these beings might become, or what untold wonders they might create, in this universe. If we value each of them even 0.00000000001% [one trillionth] as much as we value each sentient being presently existing on Earth, we must admit that our top priority should be to ensure their existence, to ensure that the biological roadshow continues. To those who claim that it is technologically unfeasible to colonize Mars, I would ask: How certain are you? And would you be willing to stake the lives of quadrillions of future life-forms on it? We've already made significant advances in the domain of space travel, and our technological/scientific understanding continues to improve all the time. Surely we must be approaching a point at which we will be able to colonize Mars, if we aren't there already. Given the myriad existential risks we've already identified and the numerous others that we likely have yet to identify, becoming a multi-planetary species is potentially an extremely urgent matter. If we care at all, for any reason, about the preservation of our evolutionary branch, we must take this task seriously. And thus, even if it is unlikely that colonizing Mars is currently technologically

feasible (which I'm not sure of), can one really claim in good conscience that we should be devoting zero time and resources to the matter? Even if there is a minuscule chance of success, the colossal stakes would seem to necessitate that we dedicate a certain portion of our collective time and resources to becoming multi-planetary. Full Circle This essay began by reflecting on the idea that the universe might "prefer" increasing complexity, or that it might "prefer" to experience itself in increasingly diverse and novel ways. I discounted this hypothesis, noting that our current body of scientific evidence gives no indication that the cosmos has any sort of human-like preference for certain states of affairs to occur. Nonetheless, consider the possibility that this hypothesis is true. In that case, it would actually be of unfathomable importance for us to ensure the continuation of our evolutionary branch: The entire cosmos would prefer it. Like, holy shit. But even if you, like me, think that the universe probably doesn't have any innate preference for how it unfolds through time, there are still a multitude of reasons why you might think that our top priority, as a species, should be to ensure the continuation of our evolutionary branch. Maybe you value the awesome biodiversity of our Earth and want to see it preserved in whatever way possible. Maybe you think the capacity of human intelligence to engage in things like art, science, and philosophy is magnificent, and that our flicker of consciousness must therefore be safeguarded. Maybe you think the universe is just a lot more wonderful with life doing its thing and would rather not see the only known biological dance squelched out just as things are getting really interesting. One of the most basic and compelling reasons, in my opinion, is the fact that we are life. We are life. Our most basic drive in this universe is to act in such a way so as to perpetuate our species and life as whole. In a strictly evolutionary sense, this is what we are born to do. Does it not follow, then, that the continuation of life into the deep, deep future should be our highest priority as a species, as sentient beings in the cosmos? Perhaps you don't think so. Perhaps you're one of the people who thinks we should value potential future beings approximately ~0% as much as we value present beings. Or perhaps you think that humanity has been destroying the Earth and would only go on to destroy other parts of the universe, if given the chance to persist for countless millennia. To be honest, it wasn't too long ago that I would have been quite sympathetic to either of those positions, as well as some of the other objections I mentioned earlier. But in the course of considering the matters I've discussed in this essay the past couple years, I've settled decidedly upon the position of wholehearted support for a multi-planetary human civilization. I have determined that my allegiance is to life. Earthly life has evolved over billions of years to achieve previously unimaginable and wondrous forms. The biosphere has developed into an inconceivably rich apparatus for experiencing the universe. Life has already become so much, and it can become so much more, if given the chance. It can become something more complex and marvelous than anything of which we can come close to conceiving. The future human and post-human enterprise—the existence of quadrillions of future beings—hinges upon our ability to ensure that our evolutionary branch is not destroyed. It might be true that the universe doesn't care at all about these beings—about whether or not life persists. But even if it doesn't, can you imagine a more epic purpose for humanity than to give these beings a chance to exist? To ensure that life can develop in near-infinite ways which we cannot fathom? I can't. In a godless universe, this, to me, is the most magnificent collective purpose ever conceived.

Even if not successful. Attempts to colonize space will lead to technological breakthroughs that will help us solve the problems on Earth

Andrews 19 [Andrews, Robin G. 09-06-2019, "Can Spaceflight Save the Planet?" Scientific American, https://www.scientificamerican.com/article/can-spaceflight-save-the-planet/]

Spin-offs from space science and exploration offer eco-friendly benefits for Earth \\\ The planet is warming, the oceans are acidifying, the Amazon is burning down, and plastic is snowing on the Arctic. Humanity's environmental devastation is so severe, experts say, that a global-scale ecological catastrophe is already underway. Even those holding sunnier views would be hard-pressed to deny that our global footprint is presently less a light touch and more a boot stamping on Earth's face. Against this dark background, one might ask if spending lavish sums to send humans to other worlds is a foolhardy distraction—or a cynical hedge against life's downward spiral on this one. \\\ Spaceflight, however, has the potential to be more than just a planetary escape hatch for eccentric billionaires. Whether in today's Earth-orbiting spacecraft or the outposts that may someday be built on the moon and Mars, to exist beyond Earth, we must somehow replicate all of our planet's life-giving essentials off-world. Technologies that recycle practically everything—that make water, air and food as renewable and self-sustaining as possible—are essential for current and future human spaceflight. \\\ Then again, we already know how we are jeopardizing the planet and what needs to be done about it. "We have almost all of the tools we need to live sustainably right here, right now," says Kate Marvel, a climate scientist at Columbia University and NASA. "Our failure to address climate change is not just because we're interested in space." Similarly, spaceflight alone cannot save Earth, but that does not mean it solely aids and abets naive dreams of leaving our planet behind. \\\ TIN CAN AGRICULTURE \\\ Astronauts need technological innovations to survive in space, but in the past, those solutions have been somewhat temporary—think of NASA's crewed Apollo missions to the moon, which maxed out at just more than 12 days in duration. Change is afoot: the Trump administration now wants boots on the moon by 2024. Luke Roberson, senior principal investigator for flight research at NASA's Kennedy Space Center, says the agency is pursuing sustainable architecture on the lunar surface as early as 2028—the sort requiring technology to provide long-term, regenerating caches of food, air and water. \\\ Some of this tech may not remain in space. After all, a surprising number of inventions funded or designed by space agencies have been **transferred to the commercial sector.** These include several **ecology-focused projects**, including one to make sustainable oil and another that uses LED color combinations, or "light recipes," to trigger different styles of crop growth. \\\ **Growing crops in space is anything but trivial**. But, says Gioia Massa, a plant scientist at NASA, technologies such as specialized lighting and advanced sensors are of vital importance onboard the International Space Station (ISS), where experiments such as the Veggie system showcase energy-efficient food production. The system's use of LEDs for plant growth was a concept conceived by NASA-funded research in the 1980s. That tech, Massa says, is now **saving a lot of energy for indoor agriculture**. \\\ NASA has also worked with Florikan, a company that developed a fertilizer whose polymer coating allows for a controlled, slow release of nutrients. It is designed to reduce the runoff of fertilizer into the environment, which can cause ecological havoc. This fertilizer is being used in space, Massa says, and it has demonstrated its ability to enhance plant growth on the ISS. These products, tweaked for continued use in space, are also being marketed to commercial

greenhouse owners. \\\ Some eco-friendly innovations result from NASA simply trying to be environmentally responsible, says Daniel Lockney, who oversees the agency's technology transfer efforts. Building spacefaring equipment on Earth is a dirty business, with fuels, paints, solvents and other toxic materials threatening to infiltrate the natural environment. That is why NASA has developed emulsified zero-valent iron (EZVI), a material that adheres to chlorinated solvents in groundwater. When dirty launchpads are scrubbed with potent chemicals, EZVI helps clean them up afterward. Beyond the launchpad, the compound has entered routine use at chemical-manufacturing plants and severely polluted Superfund sites across the country. \\\ A supply of potable water is also paramount for both spacefarers and surface dwellers. And water pollution happens to contribute to the deaths of millions every year, so any tech that could help nix that tragedy would be welcome. \\\ Lockney points to the microbial check valve as a solid example of how NASA can assuage this issue. Originally developed for the agency's fleet of space shuttles, a more advanced version of the system now passively stops harmful microbes in wastewater from swimming back into potable-water reservoirs onboard the ISS. Other versions are at work right here on Earth, keeping water clean with minimal energy in areas with dirty water and without electricity access, as well as in dentists' offices. (Remember the liquid you swish around in your mouth after a dental examination? That water is often purified by the very same valve to minimize the risk of oral infections.) \\\ Roberson and Melanie Pickett, a postdoctoral research fellow at NASA, both work on water-purification systems for spaceflight, including on the ISS. Wastewater there is typically broken down with chemical concoctions. "But that chemistry isn't sustainable," Roberson says, because it requires regular refills via resupply missions from Earth. He and Pickett are now designing systems harnessing plants and microbes to recycle waste more sustainably, and these approaches may eventually help redesign toilets and septic tanks on Earth. \\\ As is the case for water, it is far from easy to make breathable air a limitless resource in space. Up on the ISS, oxygen is traditionally extracted from water that has to be brought from Earth, which is costly and wasteful. As of 2018, the European Space Agency (ESA) is changing that status quo with its new Advanced Closed Loop System, which scrubs the Space Station's environs of carbon dioxide and, in the process, siphons out oxygen to replenish supplies of breathable air while saving water at the same time. \\\ Although on a far larger scale and with somewhat different operational requirements, carbon-capture systems are probably needed on Earth as part of a larger mix to slow down the pace of climate change. Technology developed for use in orbit may inform plans to do the same on our planet. \\\ SERENDIPITOUS SPIN-OFFS \\\ Not leaving anything to waste is the underlying principle of many of these innovations. In space, Massa says, waste must be seen as a resource, not something to mindlessly discard. That is part and parcel of so-called closed-loop systems: if such a system is perfect, all its components are recycled, and nothing is ejected from it as waste. Just think of sealed terraria, in which miniature plant ecosystems thrive by themselves for decades with no outside intervention. \\\ The Micro Ecological Life Support System Alternative (MELiSSA) project strongly abides by that ideal. Featuring a constantly tweaked "pilot plant" test facility in Barcelona, the target of this ESA-led endeavor is to create a self-sustaining, biologically driven closed-loop life-support system. \\\ The pilot plant, whose compartments attempt to degrade waste and use photosynthesis to clean the air, provide oxygen and produce food, employs a cohort of rats as astronaut stand-ins to see how effective the system could be at sustaining a crew for months at a time. Several generations of rats have been used, and so far, there have been zero casualties. Some MELiSSA-derived experiments, such as the photosynthesis-powered oxygen- and edible-biomass-making ARTEMISS, are being flown up to the ISS to see how they fare. \\\ The project, started in 1989, is intended to mature into a system capable of sustaining a human crew on a long-duration interplanetary voyage by the mid-2020s. In the meantime, its spin-offs are already showing promise, says Christophe Lasseur, head of MELiSSA at ESA. For instance, its urine-recycling tech could eventually be deployed in remote places and disaster sites to provide potable water in a cost-effective manner, with minimal environmental impact, obviating the need for porting in supplies of clean water from far afield. \\\ Lofty ideals are one thing, but the proof, as always, is in the pudding. Not all innovative ideas may become a reality, and for those that do, their development and transference from space to Earth hardly happen overnight. Roberson explains that his own inventions take, on average, seven to 10 years to be commercialized. MELiSSA is considered to be a 50-year effort. \\\ Patience is certainly a virtue. "There's a serendipity to it," Lockney says. "Just like we know that water is wet, we know that investment in these new missions will yield inventions that are of benefit to all of humankind." \\\ If anything, these innovations underline why investment in basic R&D can be so worthwhile. "The really cool thing about science is that you really don't know what's going to come out of it," Marvel says. After all, no one thought the World Wide Web would come out of the same journey that led to the Large Hadron Collider. \\\ Lengthy engineering timescales and unpredictability aside, spaceflight has already resulted in a range of effective (if not **game-changing) eco-friendly by-products for consumers.** So why do they remain so relatively unknown? Chad Anderson, CEO of venture capitalist group Space Angels, suspects that it partially comes down to poor marketing. \\\ Technology transfer from space-related R&D, Anderson says, has sparked significant innovations not only in eco-friendly products but also in the broader fields of transportation, health care and communications. The problem is that space agencies are not effectively communicating such success stories to the general public. "Space companies are notoriously bad at talking about what they are doing," Anderson says. \\\ Some efforts to combat this situation, Anderson says, are ironically emblematic of the overarching problem. Consider NASA's in-house publication, Spinoff, which the space agency has used to highlight successful technology transfers since 1976. Despite that pedigree, Anderson says, the magazine remains a very technical, relatively inaccessible periodical that very few people actually read, let alone know about. To boost public engagement and recognition, Anderson recommends making more explicit and personally relatable linkages between spaceflight research and its impacts on our everyday lives. \\\ **HONEY, I SHRUNK THE PLANET** \\\ In any event, these eco innovations are welcome, but we should not rely on technological solutions to save us. Earth is already livable, Marvel says, and we should not aspire to live in tin cans. Fortunately, some research projects help us understand our planet, as well as improving our ability to survive in space. \\\ Take the famous Biosphere 2 facility in Arizona. It was initially the site of a pioneering 1990s experiment that locked men and women in a habitat sealed off from the rest of the world to see how they and the environment within developed over the course of two years. (Earth is dubbed "Biosphere 1.") \\\ Although most remembered for plummeting oxygen levels that endangered the inhabitants and required outside intervention, the Biosphere 2 experiment was more successful than people may recall; it led to a **better understanding of Earth's life-support systems** and a cornucopia of scientific papers. Indeed, that was the project's original purpose: to improve our understanding of Earth's various systems so that we might become "better stewards, overall, of the planet," says John Adams, current deputy director of the facility, which is now owned and operated by the University of Arizona. \\\ Today the facility consists of several model ecosystems, ranging from realistic rain forests to ocean environments. By controlling the elements within these ecosystems, **scientists can understand how** the **real-world equivalents operate**—and can be perturbed—in isolation. \\\ At the same site but not part of the original Biosphere 2 experiment, one can find the Landscape Evolution Observatory (LEO), which consists of three massive structures build on a hillside of volcanic basalt that, in many respects, resembles Mars's terrain. Peter Troch, the science director of Biosphere 2, explains that LEO can be used to understand how to turn a lifeless landscape into something that could sustain biology. "Typically, the physical and the biological worlds are stitched together outside, and it's really difficult to unstitch them, understand the dynamics and stitch them back together," Adams says. Experiments such as LEO permit this ecological dissection. \\\ While having clear implications for understanding off-world habitats, Troch says, insights from this work could also aid the **restoration of some of Earth's most degraded ecosystems.** "Between space and ground activities, we are trying to solve the same problems," says Daniele Laurini, ESA's head of exploration systems. \\\ **Comprehending Earth, however, is paramount**. "If we can't understand [Earth's] systems—those we live on and among and depend on—how can we think that we're ever going to re-create anything that's going to support us?" Adams asks. \\\ Space tech certainly plays a key role and not just when it comes to life-support systems. After all, satellites have allowed us to watch the planet in remarkable detail over several decades, a game-changing tool for atmospheric and environmental scientists, Marvel says. \\\ But if we do not ensure Earth remains a livable world for many—a crisis we can already

capably address—what would be the point in aiming for the stars? We may want to produce oxygen to breathe on Mars and grow salads to eat on the moon, but "Earth does all these things for us" already, Massa says. Perhaps, she speculates, the troubles of living in space might make people better appreciate the things we take for granted back home.

Power Projection

Launching the Space Force provides opportunity to increase U.S. military capability

Spirtas 20 [Spirtas, Michael. 03-13-2020, "New Space Force Will Need Resources, Clear Definition of Warfighting Mission," RAND Corporation, https://www.rand.org/news/press/2020/03/13.html

As the United States stands up the Space Force as a service within the Department of the Air Force, RAND was asked to assess which units to bring into the Space Force, analyze its career field sustainability and draw lessons from other defense organizations. The report focuses on effectiveness, efficiency, independence and sense of identity for the new service—the first created in the United States in 72 years. The expectation for having a separate armed service for space is that it will create a champion within the U.S. armed forces to advocate for and develop new capabilities that can outpace current and projected military threats from space. "**Launching a Space Force offers the opportunity to increase U.S. military capability, particularly when the United States has to give more consideration to potential threats from other nations in space,**" said lead author Michael Spirtas, a senior political scientist and associate director of RAND's International Security and Defense Policy Center. Each of the four military service branches has functions that deal with space, such as Air Force units that deal with satellite operations and the U.S. Army's space brigade. The report says most space operational units and space acquisition organizations (including the Space Development Agency) **should be moved into the Space Force, though decisions about transferring the Missile Defense Agency's space acquisition activities requires more in-depth analyses.** The Space Force headquarters should include key functions that are essential to the independence and identity of the service, such as operational concepts and doctrine development; requirements development and advocacy; planning, programming, budgeting, and execution; and legislative liaisons and public affairs.

Next war will involve space operations—maintaining power in space is crucial to United States ability to defend strategic assets

Cheng 20 [Cheng, Dean. 2020, "Does the United States Need a Space Force?" Heritage Foundation, https://www.heritage.org/space-policy/heritage-explains/does-the-united-states-need-space-force]

Cheng: In peacetime, believe it or not, there's an even bigger set of issues that are involved. If you order something from Amazon and you want to track your package, that's GPS. If you use your credit card at the gas station pump, that's communication satellites and also GPS. So you have the ability, if you can interfere with satellites systems in peacetime, to affect almost every part of your daily life and a huge part of this country's economic system. Cordero: I asked Dean if he believes that the next big conflict will be in outer space. And if the United States really needs a Space Force. Cheng: In th**e next conflict, if it involves a major power or even a mid-size power increasing, it will have operations in space.** And by the way, those operations in space while we tend to focus on the really

cool images of a kinetic anti-satellite weapon just colliding with and blowing up into fragments, could **also include cyber attacks where the satellite turns itself off for example.** And a lot of countries are developing that set of capabilities. So because a lot of people will have the ability to operate in space, because of the importance of space to us, we need to be thinking about that set of capabilities that is encompassed by our space systems. For better or worse, the only way you're going to do that at this point it seems is to have a service, a Space Force if you will, whose job is to be thinking about this. Living, eating, breathing, sleeping space. And thinking about what kinds of systems to acquire and part of that of course is how to pay for it.

Space Force is key to U.S. power projection

Perry et. al 19 [Perry, William (former U.S. Secretary of Defense); Blair, Dennis; McConnell, Mike; Walker, Robert; Work, Robert; Aldridge, Edward; Welch, Larry; Fogleman, Ronald; Ellis, James; Andrews, Duane; Moorman, Thomas; Lyles, Lester. May 2019, "Open Letter in Support of Establishing the U.S. Space Force," Politico, May 2019, https://www.politico.com/f/?id=0000016a-8f91-d79f-adfb-af9179b90001]

The United States is the world's leader in the exploration and uses of outer space. America's preeminent position in space activities has contributed to the nation's political prestige, international influence, scientific knowledge, technological advancement, homeland security, and national defense. In addition, space contributes powerfully to America's economic prosperity; indeed, practically every aspect of our daily lives is dependent on space capabilities. Consequently, U.S. National Security Strategy has for decades stated that **freedom of access to and use of outer space is a vital national interest.** Foreign powers are seeking to undermine the United States' leadership position in space. China and Russia are developing, testing, and fielding space and counterspace weapon systems that threaten our ability to use space for national security and economic purposes, jeopardize U.S. and allied military forces, and put the U.S. homeland at risk. America's long-standing strategic advantage in space is eroding. National security space organization and management has been a recurring issue for decades. The establishment of the U.S. Space Force as an independent armed service within the Department of the Air Force is a fiscally responsible approach to address the issue. The U.S. **Space Force will organize, train, and equip forces to enable U.S. Space Command's plans and operations**, to include activities in support of other Combatant Commands and military services. **The U.S. Space Force will develop military space culture and ethos; recruit, train, educate, promote, and retain scientists, engineers, and warriors with world-class space skills and talent; advocate for space requirements and resources; develop space doctrine and operational art; develop, field, and deliver advanced space capabilities**; and steward resources to **sustain America's strategic advantage** and preeminence in national security space activities. The establishment of a new military service for space is necessary for putting America on a path to effectively deter conflict from beginning in or extending into space, and, if deterrence fails, to defeat hostile actions and protect our economic and national security interests in space. We endorse the position of General John Hyten, USAF, Commander of U.S. Strategic Command, who recently testified, "We're going to have a Space Force someday. I think what the Committee has to decide is when is that going to happen, and I think now is the time...you want to get ahead of the problem, not trail it, not come in response to a catastrophe. Get ahead of the problem." And we applaud the statement of General Joseph Dunford, USMC, Chairman of the Joint Chiefs of Staff, who recently testified, "My best military advice, given the importance of space and the consequences of not doing all we can to optimize the Department to move forward in space, would be to

move out now with what might be the 80% solution, refine as we go, and the Committee will have an opportunity to provide oversight to address some of the issues that have been raised." Therefore, we strongly encourage action to establish the U.S. Space Force, to realize the full potential of space power and space capabilities in order to protect and advance U.S. vital national interests.

Absent U.S. hegemony, great power wars are inevitable

Zhang, 11 [Zhang, Yuhan; Shi, Lin, independent consultant for the Eurasia Group and a consultant for the World Bank, 1-22-2011, "America's decline: A harbinger of conflict and rivalry," East Asia Forum, 1-22-11, Carnegie Endowment Center, www.eastasiaforum.org/2011/01/22/americas-decline-a-harbinger-of-conflict-and-rivalry/, accessed 10-19-12]

This does not necessarily mean that the US is in systemic decline, but it encompasses a trend that appears to be negative and perhaps alarming. Although the US still possesses incomparable military prowess and its economy remains the world's largest, the once seemingly indomitable chasm that separated America from anyone else is narrowing. Thus, the global distribution of power is shifting, and the inevitable result will be a world that is less peaceful, liberal and prosperous, burdened by a dearth of effective conflict regulation. **Over the past two decades, no other state has had the ability to seriously challenge the US military. Under these circumstances**, motivated by both opportunity and fear, **many actors have bandwagoned with US hegemony** and accepted a subordinate role. Canada, most of Western Europe, India, Japan, South Korea, Australia, Singapore and the Philippines have all joined the US, creating a status quo that has tended to **mute great power conflict**s. However, as the hegemony that drew these powers together withers, so will the pulling power behind the US alliance. The result will be an international order where power is more diffuse, American interests and influence can be more readily challenged, and conflicts or wars may be harder to avoid. **As history attests, power decline** and redistribution **result in military confrontation**. For example, in the late 19th century America's emergence as a regional power saw it launch its first overseas war of conquest towards Spain. By the turn of the 20th century, accompanying the increase in US power and waning of British power, the American Navy had begun to challenge the notion that Britain 'rules the waves.' Such a notion would eventually see the US attain the status of sole guardians of the Western Hemisphere's security to become the order-creating Leviathan shaping the international system with democracy and rule of law. Defining this US-centred system are three key characteristics: enforcement of property rights, constraints on the actions of powerful individuals and groups and some degree of equal opportunities for broad segments of society. As a result of such political stability, free markets, liberal trade and flexible financial mechanisms have appeared. And, with this, many countries have sought opportunities to enter this system, proliferating stable and cooperative relations. However, what will happen to these advances as America's influence declines? Given that America's authority, although sullied at times, has benefited people across much of Latin America, Central and Eastern Europe, the Balkans, as well as parts of Africa and, quite extensively, Asia, the answer to this question could affect global society in a profoundly detrimental way. Public imagination and academia have anticipated that a post-hegemonic world would return to the problems of the 1930s: regional blocs, trade conflicts and strategic rivalry. Furthermore, multilateral institutions such as the IMF, the World Bank or the WTO might give way to regional organisations. For example, Europe and East Asia would each step forward to fill the vacuum left by Washington's withering leadership to pursue their own visions of regional political and economic orders. Free markets would become more politicised — and, well, less free — and major powers would compete for supremacy. Additionally, such power plays have historically possessed a zero-sum element. In the late 1960s and 1970s, US economic power declined relative to the rise of the Japanese and Western European economies, with the US dollar also becoming less attractive. And, as American power eroded, so did international regimes (such as the Bretton Woods System in 1973). A world without American hegemony

is one where **great power wars re-emerge**, the liberal international system is supplanted by an authoritarian one, and trade protectionism devolves into restrictive, anti-globalisation barriers. This, at least, is one possibility we can forecast in a future that will inevitably be devoid of unrivalled US primacy.

Power projection in space decreases the likelihood of war while providing benefits to society

Codevilla 18 [Codevilla, Angelo. October 2018, "The Space Force's Value," Strategika, Hoover Institute, Issue 54, https://www.hoover.org/sites/default/files/issues/resources/strategika_54_web.pdf]

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 preemptive deterrence.** Every environment—land, air, water, and now space—has become an arena for combat. The Uni**ted States 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.**

Space dominance is key to military dominance- space acts as a force-multiplier to other U.S. military ambitions

Marcetic 18 [Marcetic, Branko. 10-16-18, "Trump's Space Force is No Joke," In These Times, inthesetimes.com/article/21480/space-force-trump-militarize-space-war-china-russia]

U.S. military dominance in space is really about maintaining military dominance back on Earth. Space infrastructure, particularly satellites, **is key to the U.S. military's global reach, servicing everything from navigation to weapons targeting to communications**. A 2018 report from the Center for Strategic and International Studies (CSIS) trumpets: "Space capabilities enable the American way of warfare." The global space arms race began with the Cold War, when both the United States and the USSR began testing ground-based anti-satellite (ASAT) weapons. Reagan's Air Force became the first to test one on a spacecraft, destroying an old observation satellite in 1985. (Reagan also, infamously, attempted to put in place the so-called "Star Wars" program, which would have used spacebased lasers to shoot down incoming Soviet nuclear warheads.) The 1990 Gulf War—known now as the first "space war"—made U.S. empire and satellites inseparable. With 24-hour satellite support, U.S. forces could not only communicate across broad channels, but map out terrain, observe and predict enemy actions, and use new guided, "smart" weapons that were, in theory, less indiscriminate. Satellites make today's drone warfare possible.

Hegemonic strategy inevitable- just a question of efficacy

Kagan 11 [Kagan, Robert, 1-24-2011. "The Price of Power," Weekly Standard, www.weeklystandard.com/articles/price-power_533696.html?page=3]

In theory, the United States could refrain from intervening abroad. But, in practice, will it? Many assume today that the American public has had it with interventions, and Alice Rivlin certainly reflects a strong current of opinion when she says that "much of the public does not believe that we need to go in and take over other people's countries." That sentiment has often been heard after interventions, especially those with mixed or dubious results. It was heard after the four-year-long war in the Philippines, which cost 4,000 American lives and untold Filipino casualties. It was heard after Korea and after Vietnam. It was heard after Somalia. Yet the reality has been that after each intervention, the sentiment against foreign involvement has faded, and the United States has intervened again. Depending on how one chooses to count, the United States has undertaken roughly 25 overseas interventions since 1898: That is one intervention every 4.5 years on average. Overall, the United States has intervened or been engaged in combat somewhere in 52 out of the last 112 years, or roughly 47 percent of the time. Since the end of the Cold War, it is true, the rate of U.S. interventions has increased, with an intervention roughly once every 2.5 years and American troops intervening or engaged in combat in 16 out of 22 years, or over 70 percent of the time, since the fall of the Berlin Wall. The argument for returning to "normal" begs the question: What is normal for the United States? The historical record of the last century suggests that it is not a policy of nonintervention. This record ought to raise doubts about the theory that American behavior these past two decades is the product of certain unique ideological or doctrinal movements, whether "liberal imperialism" or "neoconservatism." Allegedly "realist" presidents in this era have been just as likely to order interventions as their more idealistic colleagues. George H.W. Bush was as profligate an intervener as Bill Clinton. He invaded Panama in 1989, intervened in Somalia in 1992—both on primarily idealistic and humanitarian grounds—which along with the first Persian Gulf war in 1991 made for three interventions in a single four-year term. Since 1898 the list of presidents who ordered armed interventions abroad has included William McKinley, Theodore Roose-velt, William Howard Taft, Woodrow Wilson, Franklin Roosevelt, Harry Truman, Dwight Eisenhower, John F. Kennedy, Ronald Reagan, George H.W. Bush, Bill Clinton, and George W. Bush. One would be hard-pressed to find a common ideological or doctrinal thread among them—unless it is the doctrine and ideology of a mainstream American foreign policy that leans more toward intervention than many imagine or would care to admit. Many don't want to admit it, and the only thing as consistent as this pattern of American behavior has been the claim by contemporary critics that it is abnormal and a departure from American traditions. The anti-imperialists of the late 1890s, the isolationists of the 1920s and 1930s, the critics of Korea and Vietnam, and the critics of the first Persian Gulf war, the interventions in the Balkans, and the more recent wars of the Bush years have all insisted that the nation had in those instances behaved unusually or irrationally. And yet the behavior has continued. To note this consistency is not the same as justifying it. The United States may have been wrong for much of the past 112 years. Some critics would endorse the sentiment expressed by the historian Howard K. Beale in the 1950s, that "the men of 1900" had steered the United States onto a disastrous course of world power which for the subsequent half-century had done the United States and the world no end of harm. But whether one lauds or condemns this past century of American foreign policy—and one can find reasons

to do both—the fact of this consistency remains. It would require not just a modest reshaping of American foreign policy priorities but a sharp departure from this tradition to bring about the kinds of changes that would allow the United States to make do with a substantially smaller force structure. Is such a sharp departure in the offing? It is no doubt true that many Americans are unhappy with the on-going warfare in Afghanistan and to a lesser extent in Iraq, and that, if asked, a majority would say the United States should intervene less frequently in foreign nations, or perhaps not at all. It may also be true that the effect of long military involvements in Iraq and Afghanistan may cause Americans and their leaders to shun further interventions at least for a few years—as they did for nine years after World War I, five years after World War II, and a decade after Vietnam. This may be further reinforced by the difficult economic times in which Americans are currently suffering. The longest period of nonintervention in the past century was during the 1930s, when unhappy memories of World War I combined with the economic catastrophe of the Great Depression to constrain American interventionism to an unusual degree and produce the first and perhaps only genuinely isolationist period in American history. So are we back to the mentality of the 1930s? It wouldn't appear so. There is no great wave of isolationism sweeping the country. There is not even the equivalent of a Patrick Buchanan, who received 3 million votes in the 1992 Republican primaries. Any isolationist tendencies that might exist are severely tempered by continuing fears of terrorist attacks that might be launched from overseas. Nor are the vast majority of Americans suffering from economic calamity to nearly the degree that they did in the Great Depression. Even if we were to repeat the policies of the 1930s, however, it is worth recalling that the unusual restraint of those years was not sufficient to keep the United States out of war. On the contrary, the United States took actions which ultimately led to the greatest and most costly foreign intervention in its history. Even the most determined and in those years powerful isolationists could not prevent it. Today there are a number of obvious possible contingencies that might lead the United States to substantial interventions overseas, notwithstanding the preference of the public and its political leaders to avoid them. Few Americans want a war with Iran, for instance. But it is not implausible that a president—indeed, this president—might find himself in a situation where military conflict at some level is hard to avoid. The continued success of the international sanctions regime that the Obama administration has so skillfully put into place, for instance, might eventually cause the Iranian government to lash out in some way—perhaps by attempting to close the Strait of Hormuz. Recall that Japan launched its attack on Pearl Harbor in no small part as a response to oil sanctions imposed by a Roosevelt administration that had not the slightest interest or intention of fighting a war against Japan but was merely expressing moral outrage at Japanese behavior on the Chinese mainland. Perhaps in an Iranian contingency, the military actions would stay limited. But perhaps, too, they would escalate. One could well imagine an American public, now so eager to avoid intervention, suddenly demanding that their president retaliate. Then there is the possibility that a military exchange between Israel and Iran, initiated by Israel, could drag the United States into conflict with Iran. Are such scenarios so farfetched that they can be ruled out by Pentagon planners? Other possible contingencies include a war on the Korean Peninsula, where the United States is bound by treaty to come to the aid of its South Korean ally; and possible interventions in Yemen or Somalia, should those states fail even more than they already have and become even more fertile ground for al Qaeda and other terrorist groups. And what about those "humanitarian" interventions that are first on everyone's list to be avoided? Should another earthquake or some other natural or man-made catastrophe strike, say, Haiti and present the looming prospect of mass starvation and disease and political anarchy just a few hundred miles off U.S. shores, with the possibility of thousands if not hundreds of thousands of refugees, can anyone be confident that an American president will not feel compelled to send an intervention force to help? Some may hope that a smaller U.S. military, compelled by the necessity of budget constraints, would prevent a president from intervening. **More likely, however, it would simply prevent a president from intervening effectively**. This, after all, was the experience of the Bush administration in Iraq and Afghanistan. Both because of constraints and as a conscious strategic choice, the Bush administration sent too few troops to both countries. The results were lengthy, unsuccessful conflicts, burgeoning counterinsurgencies, and loss of confidence in American will and capacity, as well as large annual expenditures. Would it not have been better, and also cheaper, to have sent larger numbers of forces initially to both places and brought about a more rapid conclusion to the fighting? The point is, it may prove cheaper in the long run to have larger forces that can fight wars quickly and conclusively, as Colin Powell long ago suggested, than to have smaller forces that can't. Would a defense planner trying to anticipate future American actions be wise to base planned force structure on the assumption that the United States is out of the intervention business? Or would that be the kind of penny-wise, pound-foolish calculation that, in matters of national security, can prove so unfortunate? The debates over whether and how the United States should respond to the world's strategic challenges will and should continue. Armed interventions overseas should be weighed carefully, as always, with an eye to whether the risk of inaction is greater than the risks of action. And as always, these judgments will be merely that: judgments, made with inadequate information and intelligence and no certainty about the outcomes. No foreign policy doctrine can avoid errors of omission and commission. But history has provided some lessons, and for the United States the lesson has been fairly clear: The world is better off, and the United States is better off, in the kind of international system that American power has built and defended.

Effective heg prevents global instability and is a pre-req to solve every issue

Brzezinski 12 [Brzezinski, Zbigniew (Zbigniew, national security advisor under U.S. President Jimmy Carter, currently Robert E. Osgood Professor of American Foreign Policy at Johns Hopkins University's School of Advanced International Studies, a scholar at the Center for Strategic and International Studies, and a member of various boards and council). 2012. "After America," Foreign Policy, www.foreignpolicy.com/articles/2012/01/03/after_america]

How does the world look in an age of U.S. decline? Dangerously unstable. Not so long ago, a high-ranking Chinese official, who obviously had concluded that America's decline and China's rise were both inevitable, noted in a burst of candor to a senior U.S. official: "But, please, let America not decline too quickly." Although the inevitability of the Chinese leader's expectation is still far from certain, he was right to be cautious when looking forward to America's demise. For if America falters, the world is unlikely to be dominated by a single preeminent successor -- not even China. International uncertainty, increased tension among global competitors, and even **outright chaos** would be far more likely outcomes. While a sudden, massive crisis of the American system -- for instance, another financial crisis -- would produce a fast-moving chain reaction leading to global political and economic disorder, a steady drift by America into increasingly pervasive decay or endlessly widening warfare with Islam would be unlikely to produce, even by 2025, an effective global successor. **No** single **power will be ready** by then to exercise the role that the world, upon the fall of the Soviet Union in 1991, expected the United States **to play: the leader of** a new, globally **cooperative world order.** More probable would be a protracted phase of rather inconclusive realignments of both global and regional power, with no grand winners and many more losers, in a setting of international uncertainty and even of potentially fatal risks to global well-being. Rather than a world where dreams of democracy flourish, a Hobbesian world of enhanced national security based on varying fusions of authoritarianism, nationalism, and religion could ensue. The leaders of the world's second-rank powers, among them India, Japan, Russia, and some European countries, are already assessing the potential impact of U.S. decline on their respective national interests. The Japanese, fearful of an assertive China dominating the Asian mainland, may be thinking of closer links with Europe. Leaders in India and Japan may be considering closer political and even military cooperation in case America falters and China rises. Russia, while perhaps engaging in wishful thinking (even schadenfreude) about America's uncertain prospects, will almost certainly have its eye on the independent states of the former Soviet Union. Europe, not yet cohesive, would likely be pulled in several directions: Germany and Italy toward Russia because of commercial interests, France and insecure Central Europe in favor of a politically tighter European Union, and Britain toward manipulating a balance within the EU while preserving its special relationship with a declining United States. Others may move more rapidly to carve out their own regional spheres: Turkey in the area of the old Ottoman Empire, Brazil in the Southern Hemisphere, and so forth. None of these countries, however, will have the requisite combination of economic, financial, technological, and military power even to consider inheriting America's leading role. China, invariably mentioned as America's prospective successor, has an impressive imperial lineage and a strategic tradition of carefully calibrated patience, both of which have been critical to its overwhelmingly successful, several-thousand-year-long history. China thus prudently accepts the existing international system, even if it does not view the prevailing hierarchy as permanent. It recognizes that success depends not on the system's dramatic collapse but on its evolution toward a gradual redistribution of power. Moreover, the basic reality is that China is not yet ready to assume in full America's role in the world. Beijing's leaders themselves have repeatedly emphasized that on every important measure of development, wealth, and power, China will still be a modernizing and developing state several decades from now, significantly behind not only the United States but also Europe and Japan in the major per capita indices of modernity and national power. Accordingly, Chinese leaders have been restrained in laying any overt claims to global leadership. At some stage, however, a more assertive Chinese nationalism could arise and damage China's international interests. A swaggering, nationalistic Beijing would unintentionally mobilize a powerful regional coalition against itself. None of China's key neighbors -- India, Japan, and Russia -- is ready to acknowledge China's entitlement to America's place on the global totem pole. They might even seek support from a waning America to offset an overly assertive China. The resulting regional scramble could become intense, especially given the similar nationalistic tendencies among China's neighbors. A phase of acute international tension in Asia could ensue. Asia of the 21st century could then begin to resemble Europe of the 20th century -- **violent and bloodthirsty**. At the same time, the security of a number of weaker states located geographically next to major regional powers also depends on the international status quo reinforced by America's global preeminence -- and would be made significantly more vulnerable in proportion to America's decline. The states in that exposed position -- including **Georgia, Taiwan, South Korea,** Belarus**,** Ukraine**, Afghanistan, Pakistan, Israel, and the greater Mid**dle **East** -- are today's geopolitical equivalents of nature's most endangered species. Their **fates are** closely **tied to** the nature of **the** international **environment left** behind **by a waning America**, be it ordered and restrained or,

much more likely, self-serving and expansionist. A faltering United States could also find its strategic partnership with Mexico in jeopardy. America's economic resilience and political stability have so far mitigated many of the challenges posed by such sensitive neighborhood issues as economic dependence, immigration, and the narcotics trade. A decline in American power, however, would likely undermine the health and good judgment of the U.S. economic and political systems. A waning United States would likely be more nationalistic, more defensive about its national identity, more paranoid about its homeland security, and **less willing to sacrifice resources for** the sake of **others'** development. The worsening of relations between a declining America and an internally troubled Mexico could even give rise to a particularly ominous phenomenon: the emergence, as a major issue in nationalistically aroused Mexican politics, of territorial claims justified by history and ignited by cross-border incidents. Another **consequence** of American decline **could be** a **corrosion of the** generally **cooperative** management of the **global commons -- shared interests such as sea lanes, space, cyberspace,** and **the environment,** whose protection is imperative to the long-term growth of the global economy **and** the continuation of **basic geopolitical stability**. In almost every case, the potential absence of a constructive and influential U.S. role would fatally undermine the essential communality of the global commons because the superiority and ubiquity of American power creates order where there would normally be conflict.

Specialization

Space Forces solves- specialized human capital and organizational focus

Weeden 19 [Weeden, Brian. 07-08-2019. "Space Force is more important than Space Command," War on the Rocks, https://warontherocks.com/2019/07/space-force-is-more-important-than-space-command/]

Shifting the operate, train, and equip functions for military space activities to a separate organization makes sense to address current problems. For one, it would provide the U.S. military with the ability to inculcate a new **generation of space professionals who understand the unique dynamics of** the **space** domain and **how it fits into future conflicts and military activitie**s — a challenging task for a service dedicated to the air domain. Creating a new organization would also help **break** the **organizational and cultural shackles** that currently prevent the U.S. military from **adapting to changes in the space domain**. The Air Force has built an acquisitions culture around building very large, expensive, and vulnerable satellites for decades and that culture has resisted policy directives to develop new space architectures that provide better space mission assurance.

Space Force consolidates the human capital- leads to ingenious solutions that solve space policy and serial policy failure

Galer 19 [Galer, John. 06-09-2019, "Only a separate service can create a space culture," Space News, https://spacenews.com/op-ed-only-a-separate-service-can-create-a-space-culture/]

Today, a distinct space warfighting culture is nonexistent inside the Department of Defense. **Without this foundation, there stands no single organization that consolidates space expertise to field, develop, and operate the world's most sophisticated space capabilities.** There is no single author of space-specific warfighting doctrine, and most importantly, no ecosystem to foster growth of the space professional cadre and provide space the proper voice in the most senior ranks of the military. Absent these cornerstones, the U.S. will not preserve its superiority in space. Congress has the power to alter this inadequate status quo and is beginning to reveal its plans to reorganize national security space. Lawmakers must take bold action and create a separate branch of the armed forces dedicated to space. Three more visible issues have garnered the most attention and have so far been the focus for reform. First, the strategic environment is rapidly changing and Russian and Chinese military threats are offsetting U.S. advantages in space. Next, the acquisition process for new, resilient space capabilities is too slow, too costly and inflexible. Finally, military space programs, the majority of which reside in the Air Force, have not been appropriately prioritized for funding against other service priorities. Both Congress and the DoD should be commended for their recognition of these challenges. There have and will continue to be incremental improvements made in the near-term. However, **minor** bureaucratic **successes**, promises, and the lack of a catastrophic event in space continues to **lull senior leaders** and lawmakers **into complacency** Efforts so far are nothing more than **symptomatic triage** rather than **long-term solutions**. The real problem has festered for decades and is continually downplayed in the debate precisely because it requires visionary and controversial action: how to reform a marginalized military space culture that is stifling the advancement and cultivation of civilian and uniformed military space talent If the culture issue is not addressed, the current organization will fail to develop the human capital required to preserve U.S. dominance in space against competitors. Instead a second-class space cadre will find its most visionary members driven out through exasperation, greener pastures in commercial space, or forced to compromise themselves to promote within the dominant service culture of the other military branches. America's military triumphs because of its outstanding service members cultivated in mission-focused services charged with mastery of their domain. The members and culture are inextricably linked. There is no debate that the U.S. Army creates the world's best warriors for movement and maneuver on land, that the U.S. Navy is the very best at dominating the seas, or that the U.S. Air Force is the same in the air. Human talent, coupled with a distinct and credible warrior culture, is what **fuels** not just the world's greatest military, but a broader spirit of American **ingenuity** and perseverance that allies seek and enemies fear. Expecting a single service to dominate in two domains is a dangerous proposition. The Air Force's culture has never shifted from

flying and supporting air operations even with an increasing military reliance on space. Air dominance remains the core of the Air Force's existence and the service must stay laser-focused on developing the warriors and systems necessary to maintain it. This weighty responsibility comes at a cost; and when resources and manpower are constrained, the choice of competencies to defer is obvious — space. But rather than advance from repeated calls for reorganization over the past two decades, space-mindedness has continued to suffocate in an air-centric culture that has stifled growth of national security space leaders. The cruelty of this reality for Air Force space professionals begins early in a member's career. To appease promotion boards made up primarily of officers from aviation or aviation support specialties, space officers must mimic aviation cultural behaviors in their duties, performance reports and even dialect, adopting jargon as needed. "Write your accomplishment so a pilot can get it" is genuinely mentored to new lieutenants in space operations to help them succeed. This tacitly dilutes space domain-specific accomplishments and subsumes the fledgling space culture into the broader air-dominated service culture. It is difficult to build a culture or manage talent when the space mission's makeup, deliberate development and education are random and loosely managed. The career field called Space Operations, the pipeline for most senior space military leaders, is not a selectively manned officer career field, rather it is filled with both volunteers and non-volunteers. Routinely, officers bypassed for pilot duties or unable to complete flying training are placed in the field mostly on a non-volunteer basis. It is difficult to understate just how damaging this is to accessing the precise foundation of space cadre from day one. In addition, space engineering and acquisition careers are managed separately, not deliberately integrated with those of space operators, with many engineers and program managers forced to work years outside of space-related programs. Other career fields critical to space superiority, such as intelligence and cyber, lack space specialization and deliberate personnel development starting early in their careers. When it comes to workforce education, rather than create or utilize existing, domain-specific education, space personnel are largely sent to service schools focused on air, ground, or sea power. Most military solutions to space problems offered by Air Force space professionals, owing to the dominance of the air culture, naturally begin their intellectual foundation from airpower concepts and doctrine. The methodology to prepare and present space forces, the space mission force, is modeled after similar models for the combat and mobility air forces. The premier space mission planning training event, Space Flag, takes its name from the service's elite aerial combat training exercise, Red Flag. While imitation is the sincerest form of flattery, it does nothing to develop a culture, but rather conforms its people to the airpower lineage of the service. Understanding these realities, it will come as no surprise that space personnel will be selected for promotion and developmental education at lower rates than aviation counterparts in the Air Force or other communities in the Army and Navy. Well intentioned efforts to boost these rates, such as separating space from aviation personnel on promotion boards or increasing school slots, actually exacerbate the problem, arbitrarily shaping the ranks of the workforce without legitimate and focused talent development. Until a cadre of space professionals is removed from the shadow of the air-centric culture of the Air Force and establish their own service, one that deliberately grows, educates and promotes its best, the DoD will never truly maximize space warfighting capability. Space Force (or whatever title Congress settles on) provides an incredible opportunity to build a service culture from the ground up, implementing lessons learned from decades of personnel administration failures across the services and adopting contemporary ideas for an ultra-modern domain. Together, DoD and Congress can shape Space Force at the outset, stipulate relief from harmful personnel management legislation and break the Pentagon's bureaucratic mold of rank by seniority, establishing a genuine meritocracy that rewards, promotes and preserves top talent. Space Force should be able to recruit train, educate, and retain the **best and brightest** from not just commissioning and enlistment sources, but also academia, industry, think tanks, and government service, while encouraging members to cycle in and out to diversify expertise. By breaking traditional restraints and predispositions on human capital management and creating a distinct separate service, Space Force can be the incubator for a culture that develops all members toward a specific goal: domain-specific excellence. Space Force members will establish an identity as space warfighters and will **master, rather than triage, the problems of today**, while ensuring dominance in the future.

Space Force solves previous bureaucratic shortfalls by incentivizing specialization—jealous advocacy is necessary to ensure substantial change

Loverro 18 [Loverro, Doug. 06-25-2018, "Why the United States needs a Space Force," Space News, https://spacenews.com/why-the-united-states-needs-a-space-force/]

Why the United States needs a Space Force **Space needs jealous advocacy** When the Chinese shot down their own satellite in 2007, Air Force and other DoD leaders were heard saying that there was no way to defend space. The president got it right. We need a Space Force. **Space is too critical for the nation's defense not to have an organization that speaks for its importance, defends it against all comers, and jealously advocates for new missions** and new responsibilities. **Space is too crucial to national security to be stalled by a lack of focus and an unwillingness to respond until pushed.** President Trump on June 18 ordered the Pentagon to create a separate military service to focus on national security space. Outside a cohort of people who have worked this issue for many years, the announcement was met with a different mixture of reactions — Star Wars humor, political derision and interservice sarcasm. The reactions reveal a broad misunderstanding of what a Space Force would do or what it would look like. The most common critique was that the president had suddenly militarized space. He hadn't. That process began decades ago under President Eisenhower. In the National Aeronautics and Space Act of 1958, President Eisenhower and the Congress created NASA to control all U.S. space activities except those "peculiar to or primarily associated with the development of weapons, military space operations, or the defense of the United States." That military job was handed to the Department of Defense. That same year, DoD created the Advanced Research Projects Agency (ARPA then, Defense ARPA or DARPA now) specifically to prevent the kind of technological surprise that Sputnik represented. ARPA quickly became the lead for all military space activities. While work actually took place in the Army, Navy, and Air Force, ARPA guided it; and over the next decade, just about every military mission we do today in space was birthed and tested. While in a classic sense many of those missions did not appear to be military weapons, they quickly became an integral part of the way the U.S. planned to execute war, specifically nuclear war. And in the nation's first space policy, National Security Council Planning Board memo 5814, Eisenhower envisioned that "The effective use of outer space…will enhance [our] military capabilities. Military uses of outer space would include anti-ballistic missiles; communications, weather and navigation; defensive outer space vehicles; and even bombardment from space. Space has been militarized from the very beginning. And that's a good thing. Over the decades, those military space missions have saved tens of thousands of American, allied, and non-combatant lives, led to dramatic decreases in collateral damage, and allowed the U.S. and others to provide swift and timely responses to humanitarian needs and security crises worldwide. Many of the president's detractors pointed out, incorrectly, that the Outer Space Treaty reserves space for only peaceful purposes, but that's just not true. It is true that the treaty specifically restricts the Moon or other celestial bodies for peaceful purposes, but it was intentionally silent with regards to outer space — simply because the two major signatories, the United States and the Soviet Union, were already using space for military applications and planned to continue to do so into the future. But these points don't really answer the questions on the minds of most Americans, "Why do we need a Space Force? Doesn't the Air Force already do this job? Isn't this just more, new unnecessary bureaucracy?" In a word, no. What the president proclaimed was not the beginning of the militarization of space, nor the start of a space arms race, but rather that military professionals who concentrate on space needed their own organization to truly focus their efforts on a singular task – to protect and defend U.S. and allied interests in space and to assure their other service brethren never find themselves lacking the space support they need. To do that would require a career of training, experiences, motivations, and insights, and a mixture of skills and specialties with a focus on space, that can't be developed within the constraints of the current military branches To develop the proper culture of space professionals who marry their personal and organizational identity to this domain, and jealously advocate for its advancement, takes more than a loose assemblage of individuals from different career fields who dabble in space during their career. but all too often view space as an assignment rather than as a home Lessons from Army Air Corps This idea, that military space requires an organization of its own to reach its true potential for the nation is not a new concept. It's the exact same argument made in the 1930s by Army Air Corps leaders as to why the nation required a separate Air Force, one not focused on the business of the Army, but rather, the air defense of the nation. As one of those founding leaders General Frank Andrews, a revered Air Force pioneer for whom Andrews Air Force base is named, wrote: "I don't believe any balanced plan to provide the nation with an adequate, effective Air Force… can be obtained…within the War Department [Army]…and without providing an organization, individual to the needs of such an Air Force. Legislation to establish such an organization…will continue to appear until this turbulent and vital problem is satisfactorily solved." Andrews knew what any organizational theorist knows, that these twin ideas of "organizational identity" and "jealous advocacy" are the crucial

elements in the success of any enterprise Organizational identity pushes organizations to defend and define the rationale for their own existence, anytime that existence is threatened or questioned. In the 1860s, when the first U.S. naval vessel was sunk by a new machine called a submarine, the Navy did not retreat from the water; rather it developed a whole new school of undersea warfare. Similarly, when naval relevance was called into question at the end of the Cold War, the Navy discovered that there was an entirely new mission for it to execute — littoral operations. Jealous advocacy works in a similar fashion to shape and strengthen an institution. **Institutions that understand their domain and can see future changes and potential threats, jealously advocate for changes to their mission to stay in the lead. They do so in a bureaucratic struggle for resources and importance** As the role of unmanned aerial vehicles began to grow during operations in Afghanistan and Iraq, and services other than the Air Force began to fly them, Air Force leadership made the argument that only they should fly UAVs. At the end of the day, they lost that fight and other services retained their own UAVs. But the point is the Air Force saw UAV operations as its mission and jealously advocated that position. Just as generations before, early air leaders had jealously advocated for an air service, which became the Air Force. It's a dynamic at play in every bureaucratic structure and **that competition keeps every piece strong.** But these fundamental forces have thus far been absent from space. When the Chinese shot down their own satellite in 2007, both Air Force and non-Air Force leaders throughout the Pentagon could be heard saying that there was no way to defend space, and that we should move to non-space alternatives. The Air Force, in fact, famously initiated a series of exercises labeled "a day without space" so they could figure out how to conduct air operations without space capabilities. How different from the Navy's submarine experience where the threat was met not by retreat, but by boldly pioneering a new means of warfare. Space not part of Air Force identity In fact, in the seven years after the Chinese attack from 2007 till 2014, the Air Force had yet to even begin to articulate the need to respond, much less begin to change their structure or their budget to do so. It took action from space advocates in the office of the secretary of defense, rather than on the Air Staff, to begin that change. The Air Force failed to identify space as essential to their identity. **A Space Force would have had no such qualms. A Space Force would have used the opportunity** of the threat to **push** even **hard**er **and faster to defend U.S. space assets, not engage in a retreat — because if they did not, they would no longer matter.** Similarly, while the Air Force jealously advocates for more and more resources for air operations, and consistently attempts to expand its mission space to engage in new areas of warfare, it consistently tries to shed space missions as unnecessary or unessential. Such was the case when the Air force failed to craft a future space weather program after the cancellation of their joint effort with NOAA in 2010, famously cancelling the launch of an already built and paid for half billion-dollar weather satellite, DMSP-20. And as the Air Force grudgingly moved to respond to the threats in space they were forced by DoD to address, they adopted a strategy that viewed that move as a zero-sum game. Future reduced capabilities would be provided to the other services in exchange for space defense, coining the term, "warfighter essential requirements" as shorthand for the cuts. **A space service would have demanded increased resources and would have promised even more valuable services rather than fewer.** The difference in action and impact is most clearly seen today in the DoD-congressional struggle that is playing out in the field of missile defense. Remarkably, the service least invested in missile defense — that has almost zero dollars or people — is the Air Force, the same force that is supposed to defend the space through which every missile flies. The Congress has been pushing DoD to structure a space-based missile defense sensing system for the last four years. In any sensical world, the service that "owned" space would be arguing strongly for that mission, those needs, and by extension, those resources. They would insist that they owned that mission in the same way that the Air Force insisted it owned UAV operations. Yet, in their actual legislative proposal, the Air Force was silent on the mission, and their internal plans reveal that they would cede that mission to the Missile Defense Agency and use it to reduce the cost of the Air Force's own future space missile warning system. Now while it may be true that MDA is the best place for such a system, this reaction is the exact opposite of jealous advocacy and organizational identity. A true space service would fight for that mission and push it more quickly and more aggressively. And the tragedy of this is not that the Air Force gets less money, it's that the nation gets less missile defense. The internal, messy, lack of identity and advocacy mean things get done more slowly, resources fail to be moved to areas of importance, other nations catch up, and the U.S. lead shrinks Space is too vital for the nation to not have a military service devoted to the idea that its singular job is to keep the U.S. in the lead. The Air Force has done a fine job of birthing U.S. space services, but it will take a Space Force to rocket them to the forefront.

Blocks to Negative Arguments

Answer to Air Force does the Same Thing

Space Force solves administrative barriers that prevent effective recruiting. Additionally, air and space have developed to the point where they're completely separate domains

Virts 18 [Virts, Terry. 08-23-2018, "I was an astronaut. We need a Space Force," The Washington Post, https://www.washingtonpost.com/opinions/i-was-an-astronaut-we-need-a-space-force/2018/08/23/637667e6-a6fb-11e8-b76b-d513a40042f6_story.html]

But the Space Force could address serious shortcomings in how effectively our military is organized. As the administration laid out this month, the first steps toward creating a Space Force would include creating a subunified Space Command, a Space Operations Force that would initially recruit from the ranks of current military members and a Space Development Agency tasked with procuring space hardware. Though these steps can be taken without major congressional legislation, the final and most important step in creating the Space Force would require legislators to rewrite Title 10 of the U.S. Code, which outlines the role of armed forces. The last major rewrite was undertaken when the Air Force was created after World War II. Why should Congress make the Space Force a reality? Because space is important and unique enough to deserve its own place at the Defense Department table to **ensure rightful allocation of budget resources and power**. Our military uses a principle known as "multidomain warfare," meaning that when tasked with combat, different services all work jointly across the five domains — air, sea, land, space and cyber. However, in peacetime, the Army, Navy, Air Force, Marine Corps and Coast Guard only "organize, train and equip" by their specific domain. Space as a domain is now mature enough to stand alone. Today, there are officers who "grew up" in Air Force Space Command, beginning as second lieutenants and making their way through the ranks to four-star general. It simply defies logic to keep that domain in the Air Force — akin to having the infantry in the Navy. **Air and space are completely unrelated domains, and the equipment, techniques and culture required to operate airplanes are entirely different from those required to launch and operate in space**.

Answer to Ineffective

Lightweight nature means Space Force will be effective day one

Everstine 19 [Everstine, Brian. 2019, "USAF Officials: Create Space Forces to be Effective on Day One," Air Force Magazine, https://www.airforcemag.com/usaf-officials-create-space-force-to-be-effective-on-day-one/]

The architects and initial leaders of the prospective Space Force need to ensure it is **immediately ready** to be an equal among established military branches, while the formation of the new service should be used as a way to shake up established acquisition processes, top USAF officials said. "The US Space Force has got to be **effective** inside the national security environment **on Day One**, " Lt. Gen. David Thompson, the vice commander of Air Force Space Command, said Dec. 6 at the West Coast Aerospace Forum in Santa Monica, Calif. The forum is sponsored by AFA's Mitchell Institute, RAND Corp., Mitre Aerospace Corp, and the Center for Strategic and International Studies. "It will be smaller than the other forces … it will be a **light weight** in a ring full of sumo wrestlers." House and Senate negotiators are still hung up on finalizing the Fiscal 2020 National Defense Authorization Act, which is expected to create the Space Force. While the exact way forward is yet to be announced, top USAF space officials said the fact that the process has progressed this far shows the country is taking seriously the importance of space in future military operations.

Answer to War with China

Non unique. Tons of diplomatic cooperation on space between the US and China now despite the creation of space force

Rose 19 [Rose, Frank A (Senior Fellow of Security and Strategy & The Brookings Institution). 3-13-2019, "America in Space: Future Visions, Current Issues", Statement before the House Committee on Science, Space and Technology, https://science.house.gov/imo/media/doc/Rose%20Testimony.pdf]

During the last two years of the Obama administration, the United States worked to advance a **pragmatic discussion** with China on **space security** and **sustainability** issues, which I participated in actively as assistant secretary of state. For example, in 2015, the United States established a direct link between the U.S. Joint Space Operations Center (JSPOC) and the Beijing Institute for Telecommunications and Tracking (BITT) to provide China more **timely conjunction assessment** and **collision avoidance notifications**.24 Prior to that, all notifications were sent to China via the Chinese Ministry of Foreign Affairs, which was not the most effective way to share these types of notifications. Furthermore, in May 2016, the United States and China convened the first ever **U.S.- China Space Security Talks**, which I chaired with my Chinese counterpart from the Ministry of Foreign Affairs. 25 A second meeting of the group was held in December 2016 in Beijing. In addition to the **orbital debris issue**, the talks addressed measures to **build mutual confidence** and **reduce the risk of miscalculation** in outer space. The two sides also established a complementary **Civil Space Dialogue**, focused on exploring options for increasing **bilateral** and **multilateral civil space cooperation**.26 During President Obama's September 2016 visit to China, the White House released a jointly negotiated fact sheet noting the commitment of China and the United States to work together to **reduce orbital debris**. The fact sheet states: The United States and China recognized that space debris can be catastrophic to satellite and human spaceflight, and that, due to the global dependence on space-based capabilities, the creation of space debris can seriously affect all nations. Therefore, as two Permanent Members of the UN Security Council with major space programs, the United States and China committed to **intensify cooperation** to address the common challenge of the creation of space debris and to promote cooperation on this issue in the international community.27 While the production of a fact sheet in itself is not a major development, it is an example of certain level of bilateral progress that had been made to address space sustainability issues, especially orbital debris. To date, the **Trump** administration has conducted limited bilateral engagements with China over outer space issues. On the positive side, the United States and China held the **third** U.S.-China Civil Space Dialogue on November 30, 2017.28 Additionally, NASA Administrator James Bridenstine met with Chinese National Space Administrator Zhang Kejian during the International Astronautical Congress in Bremen, Germany on October 1, 2018 to discuss **future bilateral cooperation.**29 However, based on publicly available information, it does not appear the United States and China have continued bilateral Space Security Talks that were established in 2016.

Answer to International Cooperation

Space arms control treaties not enforceable

Henningan 20 [Hennigan, W.J. 07-03-2020. "America Really Does Have a Space Force. We Went Inside to See What It Does," Time Magazine https://time.com/5869987/spaceforce/

Those looking for a less martial alternative point to Cold War treaties that reduced the chances of conflict with the USSR. Despite the advancements of space weapons, there are no enforceable rules for military action in space. The 1967 Outer Space Treaty forbids countries from deploying "nuclear weapons or any other kinds of weapons of mass destruction" in space. But that language is broad, arms–control analysts say, and could not foresee the rapid pace of technology now in development. "**In the absence of any international agreements about protecting satellites and the outer-space environment, more countries are developing weapons that can destroy satellites in orbit,"** says Laura Grego of the Union of Concerned Scientists.

Space treaties are not enforceable

Henningan 20 [Hennigan, W.J. 07-03-2020. "America Really Does Have a Space Force. We Went Inside to See What It Does," Time Magazine https://time.com/5869987/spaceforce/

A treaty for space brings its own challenges. There are ongoing U.S. military and diplomatic discussions about bringing more allies and partners together to ensure space remains safe, but the **White House says it isn't interested in forging new treaties on space-based weaponry. A** U.S. State Department official tells TIME that defining a "space weapon" is difficult and verifying that it isn't a weapon is an even harder problem. "It's not like you can go up there and inspect it—a satellite is going to look like a satellite," the official says. "For all of those reasons, we don't support arms control" in space. Treaty advocates say the problem will get harder as time passes. The U.N. recognizes 90 space-faring nations. In March 2019, India tested its antisatellite system, obliterating its own spacecraft. It proudly proclaimed that it had joined the "elite club of space powers." Other nations such as Iran, North Korea and Pakistan have demonstrated space-weapon capabilities or a desire to expand them.

Answer to Space Militarization

Impact Defense - No space war

Empirically denied- ASAT threat is decades old

Weeden 18 [Weeden, Brian. 11-26-2018, "Real talk and real solutions to real space threats," Space News, https://spacenews.com/op-ed-real-talk-and-real-solutions-to-real-space-threats/]

Yet the public rhetoric and discussion on these threats often leaves out or obscures important details. The existence of counterspace capabilities is **not new**; both the United States and Soviet Union developed, tested and deployed multiple destructive anti-satellite (ASAT) systems throughout the Cold War. The situation in space today is a more a **return** to that historical contested space domain than a uniquely new situation, and the destructive counterspace threats of today are also neither newly hatched nor yet operational. Russian and Chinese ASAT programs have been underway since the early 2000s, and their testing prompted the Obama administration to re-examine U.S. space posture in 2014. In February 2018, Director of National Intelligence Dan Coats testified that Russian and Chinese destructive ASAT weapons probably will reach initial operational capability in the next few years. Counterspace threats are also being conflated with hypersonics, despite the latter being a threat to ground installations and not satellites. Moreover, while destructive ASATs get the most media and political hype, it is non-destructive attacks such as jamming that are actually being used operationally in conflicts today and pose the most likely military threat.

No escalation- dozens of ASAT attacks prove

Mazur, 12 – Northrop Grumman engineering manager

[Jonathan, "Past U.S. Actions: A Source for Foreign Perceptions of U.S. Redlines in Space," Space & Defense, Fall 2012, 6.1, https://www.usafa.edu/app/uploads/Space_and_Defense_6_1.pdf, accessed 7-17-19, language modified]

U.S. Reactions To Foreign Disruption Of U.S. Capabilities

In the 1970s, it was suspected that a U.S. maritime communications satellite was turned off by the Soviets when it was outside of the range of U.S. tracking stations.25 There does not appear to be any documented U.S. reaction, and I suspect there was none. In the mid-1990s, satellite hackers in **Brazil** began hijacking U.S. military communication satellite signals to broadcast their own information, though it took until 2009 for Brazil to crack down on the illegal activity with the support of the DoD.26 In 1998, a U.S.-German satellite known as ROSAT was rendered useless after it turned suddenly toward the sun. NASA investigators later determined the accident was possibly linked to **a cyber-intrusion by Russia**.

The fallout? Though there was an ongoing criminal investigation as of 2008; NASA **security officials** have **seemed determined to publicly minimize the** seriousness of the **threat**.27 In 2003, a signal originating from **Cuba**—later determined to be coming from **Iranian** embassy property— was jamming a U.S. communications satellite that was transmitting Voice of America programming over Iran, which was publicly referred to as an **"act of war"** by a U.S. official. 28 Press reporting indicates the U.S. administration was [frozen]"~~paralyzed~~" about how to cope with the jamming that continued for at least a month, even after

U.S. diplomatic protests to Cuba.29 In 2005, U.S. diplomats protested to the **Libya**n government after two international satellites were illegally jammed disrupting American diplomatic, military, and FBI communicationS.30 In 2006, press reporting indicates that **China** hit a U.S. spy satellite with a ground-based laser. This action was acknowledged by the then director of the NRO, though the DoD remained tight lipped about the incident.31

"We're at a point where the technology's out there, and the capability for people to do things to our satellites is there. I'm focused on it beyond any single event." – Air Force Space Command Commander, General Chilton, 2006 32

In 2009, a U.S. commercial Iridium communications satellite—extensively used by the DoD—was accidently destroyed by a collision with a dead Russian satellite.33 The U.S. company, Iridium, was able to minimize any loss of service by implementing a network solution within a few days.34 As of early 2011, no legal action had been taken by the company either because it is not clear who was at fault or because it might be politically problematic for the United States, which is trying to enter into bi-lateral transparency and confidence-building measures (TCBM) with Russia regarding space activities.35 Since August of 2010, **North Korea** has been intermittently using GPS jamming equipment, which reportedly has been interfering with U.S. and South Korean military operations and civilian use south of the North Korean border.36 Reportedly, only South Korea and the United Nations International Telecommunications Union—at the request of South Korea—have issued letters to Pyongyang demanding the cessation of disruptive communications signals in South Korea.37

It appears that the **only time** the U.S. military has responded with force to a disruption in U.S. space capabilities was in 2003, a few days after the start of the Iraq war.38 According to U.S. officials, Iraq was using multiple GPS jammers—which supposedly did not affect military GPS functionality. However, the U.S. military bombed the jammers anyway after a diplomatic complaint to Russia.39 The use of military force against the GPS jamming threat was possibly because the United States was **already intervening** in Iraq, and **the bombing** probably **would not have occurred if the United States was not at war**.

A foreign actor researching U.S. investments in space and observing that (a) failed U.S. satellites appeared not to be reconstituted immediately, (b) U.S. public reaction to the losses was minimal, and (c) U.S. reactions to foreign disruptions were inconsistent could come to the judgment that there appears to be some redundancy in capability in the U.S. space architecture and/or a **tolerance of loss** within the U.S. Government. The President is still making his phone calls, missiles are still finding their targets, and satellites are still taking pictures of North Korea's nefarious efforts.

No space war- interdependence and deterrence

Bowen, 18 -- University of Leicester international relations lecturer

[Bleddyn, "The Art of Space Deterrence," European Leadership Network, 2-20-18, https://www.europeanleadershipnetwork.org/commentary/the-art-of-space-deterrence/, accessed 7-18-19]

Fourth, the **ubiquity** of space infrastructure and the fragility of the space environment may create a degree of **existential deterrence**. As space is **so useful** to modern economies and military forces, a large-scale disruption of space infrastructure may be so intuitively escalatory to decision-makers that there may be a **natural caution** against a wholesale assault on a state's entire space capabilities because the consequences of doing so approach the mentalities of total war, or **nuclear responses** if a society begins tearing itself apart because of the collapse of optimised energy grids and just-in-time supply chains. In addition, the problem of **space debris** and the political-legal hurdles to conducting debris clean-up operations mean that even a handful of explosive events in space can render a region of Earth orbit **unusable for everyone**. This could **caution a country like China** from excessive kinetic intercept missions because its

own military and economy is increasingly **reliant on** outer **space**, but perhaps not a country like North Korea which does not rely on space. The usefulness, sensitivity, and fragility of space may have some existential deterrent effect. China's catastrophic anti-satellite weapons test in 2007 is a valuable lesson for all on the potentially devastating effect of kinetic warfare in orbit.

Alt cause- drones

Karlik, 19 – US House of Representatives defense fellow

[Evan – Lieutenant commander in US Navy, "US-China Tensions: Unmanned Military Craft Raise Risk of War," 8-12-19, https://www.maritime-executive.com/editorials/us-china-tensions-unmanned-military-craft-raise-risk-of-war, accessed 8-22-19]

US-China Tensions: [**Uncrewed**]~~Unmanned~~ **Military Craft Raise Risk of War**

The immediate danger from militarized artificial intelligence **isn't** hordes of killer robots, nor the exponential pace of **a new arms race**.

As recent events in the Strait of Hormuz indicate, the **bigger risk** is the fact that autonomous military craft make for temping targets - and increase the potential for **miscalc**ulation on and above the high seas.

While less provocative than planes, vehicles, or ships with human crew or troops aboard, unmanned systems are also perceived as relatively expendable. Danger arises when **they lower the threshold for military action**.

It is a development with serious implications in volatile regions far beyond the Gulf - not least the South China Sea, where the U.S. has recently confronted both China and Russia.

If China dispatched a billion-dollar U.S. destroyer and a portion of its crew to the bottom of the Taiwan Strait, a war declaration from Washington and mobilization to the region would undoubtedly follow. But should a Chinese missile suddenly destroy an orbiting, billion-dollar U.S. intelligence satellite, the White House and the U.S. Congress might opt to avoid immediate escalation.

"Satellites have no mothers," quip space policy experts, and the same is true for airborne drones and unmanned ships. Their demise does not call for pallbearers, headstones, or memorial statues.

As autonomous systems **proliferate in the air** and **on the ocean**, military commanders may feel emboldened to strike these platforms, expecting lower repercussions by avoiding the loss of human life.

Consider when Chinese naval personnel in a small boat seized an unmanned American underwater survey glider in the sea approximately 100 kilometers off the Philippines in December 2016. The winged, torpedo-shaped unit was within sight of its handlers aboard the U.S. Navy oceanographic vessel Bowditch, who gaped in astonishment as it was summarily hoisted aboard a Chinese warship less than a kilometer distant. The U.S. responded with a diplomatic demarche and congressional opprobrium, and the glider was returned within the week.

Lately, **both Chinese and Russian** navies in the Western Pacific have shown themselves bolder than ever. Early in June, south of Okinawa, the Russian destroyer Admiral Vinogradov came within tens of meters of the U.S. guided-missile cruiser Chancellorsville.

In September 2018, the American destroyer Decatur conducted a freedom of navigation transit near the disputed Spratly Islands, in the South China Sea; it nearly collided with a Chinese destroyer attempting to 'shoulder' the American vessel off its course through these hotly contested waters.

In coming years, the Chinese military will find increasingly plentiful opportunities to intercept American autonomous systems. The 40-meter prototype trimaran Sea Hunter, an experimental submarine-tracking vessel, recently transited between Hawaii and San Diego without human intervention. It has yet to be used operationally, but it is only a matter of time before such vessels are deployed.

The U.S. Navy's nearly $3 billion 'Ghost Fleet' initiative aims to develop a total of 10, 2,000-ton [uncrewed]~~unmanned~~ warships. Boeing recently edged out Lockheed Martin to begin construction of four extra-large unmanned undersea vehicles, each capable of transiting twelve thousand kilometers autonomously, for $43 million.

China's navy may find intercepting such [uncrewed]~~unmanned~~ and unchaperoned surface vessels or mini-submarines too tantalizing to pass up, especially if Washington's meek retort to the 2016 glider incident is seen as an indication of American permissiveness or timidity.

With a captive vessel, persevering Chinese technicians could attempt to bypass anti-tamper mechanisms, and if successful, proceed to siphon off communication codes or proprietary artificial intelligence software, download navigational data or pre-programmed rules of engagement, or probe for cyber vulnerabilities that could be exploited against similar vehicles.

No doubt Beijing is closely watching how the Trump administration responds to Iran's downing of a Global Hawk surveillance drone on June 20, assessing U.S. willingness to punch back in kind, or to escalate.

Nearly 100,000 ships transit the strategically vital Singapore Strait annually, where more than 75 collisions or groundings occurred last year alone. In such congested international sea lanes, declaring a foreign navy's autonomous vessel wayward or unresponsive would easily serve as convenient rationale for towing it into territorial waters for impoundment, or for boarding it straightaway.

More than 4,000 AI and robotics researchers have joined an open letter advocating a ban on autonomous offensive weapons that function without human supervision, and this past March, the U.N. Secretary-General decried such machines as "politically unacceptable, morally repugnant," and worthy of international prohibition.

Such limits or controls on artificial intelligence would be immensely more difficult to verify when compared to existing inspection regimes for nuclear missiles or centrifuges. In the meantime, urgent action is needed.

A memorandum of understanding signed five years ago by the U.S. Department of Defense and the Chinese defense ministry, as well as the collaborative code of naval conduct created at the 2014 Western Pacific Naval Symposium, should be updated with an expanded right-of-way hierarchy and non-interference standards to clarify how manned ships and aircraft should interact with their autonomous counterparts. Without such guidance, the risk of miscalculation increases.

An incident without any immediate human presence or losses could nonetheless trigger **unexpected escalation** and **spark the next conflict**.

No scenario for space war without prior conflict on Earth- AND no miscalc- Trump and other leaders won't care about satellite loss

Bowen, 18 -- University of Leicester international relations lecturer

[Bleddyn, "The Art of Space Deterrence," European Leadership Network, 2-20-18, https://www.europeanleadershipnetwork.org/commentary/the-art-of-space-deterrence/, accessed 7-18-19]

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.

Alt cause- North Korea and Iran

Zenko 14 – CFR senior fellow

[Micah, Worked at Harvard Kennedy School, Brookings Institution, Congressional Research Service, and State Department's Office of Policy, "Planning Dangerous Space Incidents" Contingency Planning Memorandum No. 21, 4-16-14, Council on Foreign Relations, https://www.cfr.org/report/dangerous-space-incidents, accessed 8-23-19]

China, **North Korea**, **and Iran** could conceivably be involved in dangerous space activities—such as a "direct ascent," or vertical launch, ASAT test from a ground-based missile system—during a crisis with the United States or one of its allies to gain bargaining leverage, to deter potential hostile acts, or for defensive reasons in anticipation of imminent conflict. The intent of these activities could be misinterpreted if they cause unintended harm to U.S. and ally satellites, and could thereby exacerbate or **inadvertently escalate** the crisis.

Status quo solves- resiliency measures deter space attacks

Sankaran, 14 –Harvard Belfer Center for Science and International Affairs postdoctoral fellow

[Jaganath, PhD international security, previously a Stanton Nuclear Security Fellow at the RAND Corporation, "Limits of the Chinese Antisatellite Threat to the United States," Strategic Studies Quarterly, Winter 2014, https://www.cissm.umd.edu/sites/default/files/Limits%20of%20the%20Chinese%20Antisatellite%20Threat%20to%20the%20United%20States.pdf, accessed 7-26-19]

Dissuasion through Technological Innovation

Redundancies and alternate systems give a **large measure** of operational security to US forces, **enabling them to operate** in an environment **with degraded sat**ellite **services**. This can be further improved by developing additional redundancies and alternates. The commander of US Strategic Command, Gen C. Robert Kehler, expounding on one of the goals of "mission assurance" in the 2011 National Security Space Strategy, called for actions to prepare US forces to "fight through" any possible degradations or disruptions to US space capabilities.45 Pursuing such actions will **enhance deterrence** against ASAT attacks by **demonstrating** the **resilience** of US forces and thereby **diminishing the incentive** for an adversary like China to target US space systems.

The United States should also study and improve its ability to use measures like satellite sensor shielding and collision avoidance maneuvers for satellites. These would dilute an adversary's ASAT operation and **increase** the apparent **uncertainty of the consequences** of an ASAT attack.46 Monitoring mechanisms—both technical and nontechnical—that provide long warning times and the ability to definitively identify an attacker in real time should also be a priority. The US Air Force has started to invest in such capabilities on a small scale. Gen William Shelton, head of Air Force Space Command, announced on 21 February 2014 the upcoming launch of the geosynchronous space situational awareness (SSA) system designed to "have a clear, unobstructed and distinct vantage point for viewing resident space objects."47 Such systems will help in attributing an ASAT attack. Similarly, the ground-based Rapid Attack, Identification, Detection, and Reporting System (RAIDRS) is a valuable US asset to identify, characterize, and geolocate attacks against US satellites.48

Negative Arguments

Arms Race

Space Force increases the risk of war

Henningan 20 [Hennigan, W.J. 07-03-2020. "America Really Does Have a Space Force. We Went Inside to See What It Does," Time Magazine https://time.com/5869987/spaceforce/

Regardless of the seemingly contradictory Russian positions, some U.S. critics and arms–control analysts say the creation of Space Force makes conflict more likely. A **new orbital arms race has turned space into a "war-fighting domain," like air, land and sea, and will funnel billions of dollars to newfangled technology that increases the possibility of war**, both up there and down here. A separate branch of the armed forces for space, these critics fear, risks militarizing U.S. space policy and promoting weapons in space. On June 17, the Pentagon unveiled a Defense Space Strategy that made clear the U.S. will counter Russian and Chinese space weapons, coordinate with allies and prepare for war in space.

Creation of Space Force triggers an arms race internationally as other countries will not want to be left behind.

Xuanzhun 20 [Xuanzhun, Liu. 05-20-2020, "U.S. Space Force development risks new arms race in outer space," Global Times, https://www.globaltimes.cn/content/1188977.shtml]

The flag, very much resembling the logo of China's state-owned space industry giant China Aerospace Science and Technology Corporation, received scornful comments from Chinese netizens. Was the design a coincidence? Or was it indicating the newly established force has China in mind? Nevertheless, **the US space force's establishment and development could trigger new arms race in the outer space.** It will bring space militarization that will threaten the whole world. In early May, the US Space Force revealed its first recruitment video. Reports said more than 2,000 airmen have applied in just two weeks. Social network reactions show that the US Space Force has garnered a considerable attention. Many of them grew up watching Hollywood movies that portray Americans fighting in space, even against aliens. From these science fiction films, many fantasized the US Space Force could boost space technology development and contribute to humanity's exploration of space. This, however, will not likely become true. During the Cold War, the US and Soviet Union's arms race expanded to space exploration. This indeed accelerated space technology development and exploration of space. But the US slowed down the process following the collapse of the Soviet Union. Any country's attempt to militarize space will result in changes in the international strategic balance. Other major countries will not stand by and watch. In modern warfare, information is key to victory, and **space is one of the most important places to gather and transfer information**. Why? Because technologies like satellite navigation, ground observation and information transmission have become integrated parts of combat systems of major military powers. This includes nuclear-armed intercontinental ballistic missiles and new hypersonic weapons that can also fly in outer space. No major military power will accept facing threats that their navigation systems could fail, communications may become jammed, or command systems go blind and deaf, and nuclear deterrence could run amok. But the **US Space Force is becoming a reality. Countries will face huge strategic pressures and be forced to respond. They** will naturally want to develop space forces of their own as a direct solution. Following the US, Japan recently also announced the establishment of its Space Operations Squadron. It aims to track suspicious satellites and space debris to protect Japanese satellites. It also plans to cooperate with the US. If this trend continues, **other countries with technological or**

economic strength will be tempted or forced to follow. This will result in a large scale space arms race.

Continuing on a hostile path will lead to the continued development of ASAT weapons

Smith 08 [Smith, Andrew K. 4-12-2008, "The Next Space Race: Impact of Anti-Satellite Weapons on International Relations and Peaceful Space Programs," American Public University System, https://www.apus.edu/content/dam/online-library/student-papers/smith-2008.pdf]

ASAT weapons will reduce international cooperation by creating a hostile and competitive environment between nations attempting to achieve sole freedom from attack. **Any attempts by a nation to accelerate anti-satellite offensive or defensive capability will be met by other nations. Regional conflicts could conceivably result from the perceived threat of anti-satellite employment**. Prior to the U.S. engaging US 193, Russia and China both proposed talks to ban arms in space and the threat of force against space objects. The same movement towards peace talks evident regarding anti-ballistic missile defenses on former Soviet property, as the prospect of allowing a rival nation to achieve exclusive freedom from attack is unacceptable to any nation. This fact will provide significant drive to the arms race since defensive systems are still in their infancy**, satellites are extremely fragile, and current policy of the China and the U.S. both require dominance of space**. The current policies of the U.S. and China will be a major factor in expediting proliferation of space weapons. The current U.S. policy on space authorized 31 August 2006 was heavily influenced by the U.S. Air Force's Offensive Counterspace Operations Doctrine (Krepon and Katz-Hyman 2005, 324). This doctrine treated space as a venue much like the skies over the Earth to be used by the U.S. to protect allies and attack enemies. The current policy threatens to "deny, if necessary, adversaries the use of space capabilities hostile to U.S. national interests," (U.S. President 2006, 2) and sends a message to the rest of the world that space is not off-limits in war, and will be used at any and all phases of a conflict in the best interests of the U.S. China's response came only five months later with the destruction of Feng Yun 1-C, but can be further clarified by Bao Shixiu, senior fellow at the Academy of Military Studies of the Chinese PLA: China cannot accept the monopolization of outer space by another country. For that reason, **the U.S. administration's penchant for "exceptionalism" in space policy poses a serious threat to Chin**a both in terms of jeopardizing its national defense as well as obstructing its justified right to exploit space for civilian and commercial purposes. (Shixiu 2007, 4-5) His comments make clear that neither China nor the United States can accept a rival nation's space policy that demands exclusive freedom of action. He further explains that any nation's activities in space will never be exclusively peaceful due to the preponderance of dual-use satellite technology and that "**without some kind of mutual understanding on controlling arms in space, suspicion will dominate relations between China and the United States"** (Shixiu 2007, 5). The ultimate outcome of this inherent suspicion will be reduced international cooperation between two of the most prominent space-faring nations. **As long as U.S. and Chinese policy**

remain unchecked by a treaty clearly outlining legitimacy of war in space, escalation in anti-satellite weapons will continue.

ASATs arms race could lead to a space security dilemma.

Grego 10 [Grego, Laura; Wright David. November 2010. "Securing the Skies Ten Steps the United States Should Take to Improve the Security and Sustainability of Space," Union of Concerned Scientists, http://www.ucsusa.org/sites/default/files/legacy/assets/documents/nwgs/securing-the-skies-full-report-1.pdf]

Risks Are Growing The **growing population of satellites and resultant accumulation of debris, as well as the greater importance of satellites, are leading to greater risks.** First, the crowding of space increasingly poses collision hazards. The high speeds of objects in orbit render debris even the size of a marble capable of damaging or destroying a satellite. Three active satellites are known to have been hit by debris in the past 15 years, and it is estimated that under current conditions a collision between an active satellite and a piece of debris larger than a marble will occur every two to three years (Wright 2009). The possibility of unintentional interference between satellites—not just physical collisions between satellites but also electromagnetic interference—is also increasing, given that the crowding of space has not been accompanied by a commensurate improvement in coordination or "space traffic management." While satellite positions and frequencies in the distant geostationary orbit (GEO) are managed by the International Telecommunication Union (ITU),4 no comparable coordination effort exists in closer orbits, even though collisions at these lower altitudes would be at higher speeds and pose greater debris risks. Second, the innate vulnerability and growing value of satellites may render them increasingly attractive targets in a conflict. **Satellites are susceptible to deliberate attack because they follow predictable orbits, have limited protections, are widely visible from the ground, and represent a long-term loss of capability**—at present, repair is unlikely and replacement is costly and time-consuming. And **with time, more countries will acquire the technical abilities to attack and interfere with satellites.** This is particularly likely in that a number of emerging technologies, such as hit-to-kill missile defense interceptors and a spacecraft's ability to rendezvous with another without its cooperation, are "dual-use"—applicable to peaceful and aggressive uses alike. While a satellite owner would certainly protest the deliberate or careless interference with its asset, satellites do not currently have clearly elaborated legal protections nor is there a systematic process for addressing grievances. Third, threats to satellites can amplify the risks of other undesirable outcomes, such as the creation or escalation of terrestrial crises. The **development of ASAT capabilities by one country could create enough suspicion and tension to spur the development of ASAT weapons by others**. Because so much of satellite and space-launch technology is dual-use, **development of space systems would increase the chances of dangerous misinterpretations**, especially in the absence of clearly stated policies and meaningful communication between countries. Moreover, if ASAT weapons are being developed and tested, the loss of an important satellite during a time of political tension could be interpreted—rightly or wrongly—as an attack. Quickly determining the reason for the satellite's disruption might be difficult or impossible, and this incomplete information together with the absence of reliable channels for communication between countries that are not close allies could exacerbate the crisis even further, possibly leading to its escalation. Recent "war game" conflict simulations confirm that such a satellite loss could have very serious consequences.6

Space attacks quickly escalate to nuclear (☢) use on Earth, drawing in global powers. Satellites key to solving every other war impact.

Broder 16 [Broder, Jonathan. 05-04-2016, "Why the next Pearl Harbor could happen in space," Newsweek Magazine, http://www.newsweek.com/2016/05/13/china-us-space-wars-455284.html]

In their techno-thriller Ghost Fleet, authors Peter Singer and August Cole describe a cataclysmic world war that begins with a Chinese sneak attack against the U.S. in space. First, soldiers at China's Cyber Command Headquarters in Shanghai hack into the Pentagon's network of GPS satellites and scramble their signals. The cyberattack sows chaos among U.S. forces, which can no longer navigate accurately, track targets or hit them with precision munitions.Then, from a space station orbiting 200 miles above Earth, Chinese astronauts train a laser gun on three dozen U.S. satellites the military relies upon for virtually all of its communications and critical surveillance. By the time the Chinese are done, America's technological edge on this new, 21st-century battlefield has been reduced to the predigital levels of World War II.Such scenarios may read like science fiction, but the threat of what military experts call a "**space Pearl Harbor"—a** sneak attack on U.S. satellites that cripples American forces before a shot has been fired—**has Pentagon planners seriously worried.** Space is the ultimate high ground for today's warriors, and no military has dominated those strategic heights as successfully as **America's**. But its constellations of **GPS, surveillance and communications satellites are largely undefended,** a vulnerability that hasn't escaped notice in China and Russia. The result: a new three-way space race—the first since the end of the Cold War, and one that now includes the development of weapons to knock out the other side's space assets. Try Newsweek for only $1.25 per week "The U.S., China, Russia are all working on not just using space but also taking it away from the other side," Singer, a military strategist at the New America Foundation, a Washington, D.C., think tank, tells Newsweek.Chinese President Xi Jinping paid a high-profile visit last month to air force headquarters in Beijing, where he ordered his generals to sharpen the country's defensive and offensive capabilities in space in preparation for what many Chinese military analysts believe is an inevitable war in space with the U.S. Like the U.S. and Russia, China has sent astronauts into space and landed a spacecraft on the moon, and it is developing its own space station. The Pentagon also notes that Beijing continues to ramp up its military capabilities in space, launching 142 satellites to provide intelligence, navigation, communications and weather forecasting that can "limit or prevent the use of space-based assets by adversaries during times of crisis or conflict."A **war in space would have staggering implications. If conflict were to erupt, say, over China's territorial claims to the South China Sea or Russia's aggression in Eastern Europe, America's military satellites wouldn't be the only space assets at risk.** Fighting would also likely cripple the civilian satellites that control so much of modern life, from cellphone networks to ATMs and personal GPS units. And although such a conflict might start in space, experts say it could easily turn into full-scale war on Earth. "If war does extend into space someday—and I hope it never does—the first [nuclear] response is not going to be in space," warns General John Hyten, head of the U.S. Air Force Space Command.This year, the Pentagon will spend $2 billion on measures to counter threats to its national security satellites. That amount is expected to soar as part of the $22 billion set aside to maintain U.S. superiority in space in 2017. Senior U.S. officials explain such large investments reflect the Pentagon's recognition of a major shift in U.S., Chinese and Russian capabilities. For the first 25 years after the Cold War's end, they note, America's conventional forces were unmatched, thanks largely to the advantages their satellites gave them on the battlefield. Making their debut in the 1991 Persian Gulf war, satellites have guided American precision munitions, provided U.S. commanders with worldwide communications and helped American forces navigate the globe ever since.But over the past 15 years, a period in which U.S. defense dollars were diverted to pay for the wars in the Middle East, China and Russia have developed advanced weapons that "challenge our advantages...especially in cyber,

electronic warfare and space," says Deputy Defense Secretary Robert Work. "As a result, our margin of technological superiority is slowly eroding."Today, Beijing and Moscow can no longer be ignored. With their ability to deny, disrupt and degrade America's hard-to-defend satellites, warns Lieutenant General David Buck, commander of the 14th Air Force, "there isn't a single aspect of our space architecture that isn't at risk."Missiles, Lasers and Space BotsLast December, the U.S. Air Force Space Command in Colorado Springs held a large-scale war game set in outer space in 2025. Some 200 U.S. military and civilian experts, as well as representatives from Britain, Canada, Australia and New Zealand, took part. The details remain highly classified, as does the U.S. military's arsenal of space weapons. But the Space Command said the exercise "included full-spectrum threats across diverse operating environments." Translation: The participants had to deal with all the known dangers to U.S. satellites, plus a few that are suspected to exist.The known threats include Chinese ballistic missiles that can hit U.S. satellites in low Earth orbit about 500 miles up and possibly those in high geostationary orbits some 22,000 miles above the Earth. China and Russia also have ground-based lasers that can blind the camera on a reconnaissance satellite or burn up the spacecraft altogether, and experts say spacecraft-mounted lasers are just a few years away. Moscow and Beijing are also believed to be developing satellites that can disable, bump off course or destroy other satellites.Any combat in space also would involve cyberattacks like the one in 2011, when a Romanian hacker gained access to NASA's confidential satellite data. Three years later, U.S. officials say, China hacked the satellite network of the National Oceanographic and Atmospheric Administration, the nation's weather forecaster, forcing it to shut down for two days. The penetration exposed a dangerous vulnerability: In a scenario similar to the one Singer and Cole describe in their novel, hackers could reprogram a U.S. satellite to send false weather reports, coordinates and other disinformation to American and allied forces, throwing off planning, navigation and targeting. Singer, who serves as a consultant to the Air Force Space Command and the U.S. intelligence community, says satellite hackers could even redirect a U.S. missile to strike its own forces or alter the course of the satellite.This isn't the first time that military planners have worried about the threat of war in space. In the years following the Soviet Union's 1957 launch of Sputnik, the first man-made satellite, the U.S., fearing a Soviet nuclear attack from space, began exploring ways to shoot down satellites. The U.S. military also conducted a series of nuclear tests in space. One, carried out some 250 miles above the South Pacific in 1962 , generated an electromagnetic pulse so powerful that it fried the electronics of five U.S. satellites and caused power, telephone and radio blackouts thousands of miles away. The tests were stopped in 1967 under the U.N.'s Outer Space Treaty, which banned placing weapons of mass destruction in space. For the remainder of the Cold War, powerful surveillance satellites became the key component in U.S. and Soviet early-warning systems to detect preparations for a nuclear test or a missile launch. But that didn't stop the rival superpowers from figuring out ways to grab an advantage in space. The Soviets developed the space equivalent of a suicide car bomb—an unmanned vehicle that could sidle up to an orbiting U.S. satellite and then blow up beside it. In the 1980s, President Ronald Reagan launched his multibillion-dollar Strategic Defense Initiative, derisively nicknamed Star Wars, which called for a combination of ground-based interceptors and space-based lasers to shield the United States from a Soviet nuclear ballistic missile attack. In 1985, Reagan demonstrated U.S. prowess when an Air Force F-15 fighter flying at 38,000 feet launched a missile that destroyed a faltering U.S. satellite.Yet the U.S. and Soviet Union never fought in space. That's because each side knew the other regarded its early-warning satellites as a critical component of its nuclear arsenal, U.S. officials say. Any strike against the other's satellites would be seen as the opening shot in a nuclear attack, triggering immediate nuclear retaliation. "Both we and the Soviets understood the red lines in terms of attacks on space systems that we dared not cross," says Work, the deputy defense secretary.But after the end of the Cold War, in 1991, the situation in space grew far more complicated. Some 60 other countries eventually joined the U.S. and Russia in space, contributing to a wreath of an estimated 1,100 satellites circling the globe. Meanwhile, U.S. forces became ever more dependent on their satellites—not only for nuclear early warning but also for conventional military requirements such as communications, weather reports and navigation. The Pentagon, however, spent little time thinking about how to protect them. The military leaders of the world's sole superpower came to regard space as an American sanctuary, and both personnel and budgets were shifted to other priorities. "Our adversaries noticed all that," says Singer.Surviving an AttackSuspicions that China was developing anti-satellite weapons arose in January 2007, when Beijing fired a missile that hit one of its own aging weather satellites in low Earth orbit. Then, in 2013, China tested a missile that climbed to 18,000 miles—high enough to take out U.S. GPS satellites and nearly reaching the military's early-warning satellites that hang in geostationary orbit 22,000 miles above the Earth. China is believed to have conducted similar tests in 2010, 2014 and 2015, leading Pentagon planners to conclude it will deploy these missiles, placing U.S. space systems under constant

threat. “You don’t have a seven-year development plan if you’re not going to make it operational,” Hyten, the Air Force Space Command chief, said last year.Meanwhile, lingering suspicions about Russia’s newest space weapons center on its launch of four military satellites in 2013 and 2014. According to Brian Weeden, a former Air Force captain specializing in space surveillance, three of the satellites have changed orbit several times. They moved close to a Russian spacecraft and even collided with it. The fourth satellite maneuvered close to several newly launched Russian satellites and came very close to two Intelsat commercial communications satellites. “The technology could be used for ASATs,” Weeden tells Newsweek, using the military abreviation for anti-satellite weapons. But he adds it's not clear that the Russians were conducting ASAT tests.U.S. military planners are now debating how to protect the country’s military satellites and maintain the flow of information from space if some of those satellites are taken out in a conflict. The Pentagon is stressing the idea of resiliency, broadening the use of defenses already on some of the military’s latest satellites. They range from adding a thick shutter to a spy satellite’s camera for protection against a laser attack to boosting a satellite’s signals to prevent jamming. Other methods include frequency hopping, which enables satellites to transmit data on alternative frequencies if some are jammed. The military also has diversified its information sources by acquiring data from neutral countries and commercial satellites.Military officials are now seeking alternatives to GPS navigation. They’re also taking a hard look at two multibillion-dollar programs for satellites that are critical for the country’s strategic nuclear defenses but also sport conventional communications and surveillance capabilities. Such add-ons became commonplace back when space was uncontested and the military’s main concern was getting the most bang for its buck with each expensive satellite launch. But with these multitasking satellites presenting such juicy targets to U.S. adversaries, Pentagon officials say, it might make more sense to spread their capabilities around on smaller, less expensive satellites—an approach they call disaggregation.“The changing nature of the threats in space, namely anti-satellite weapons and jammers being developed by countries such as China and Russia, are driving some of the thinking,” Frank Kendall, the Pentagon’s top weapons buyer, told a Washington gathering of space businesspeople in February.As the Pentagon explores new ways to protect its satellites, America’s fallback policy remains deterrence by threat of retaliation. Depending on which satellites are attacked, the U.S. could confine itself to taking out the enemy’s equivalent satellites. But if China or Russia destroyed the Pentagon’s nuclear early-warning and strategic communications satellites, military strategists say, it’s unlikely the U.S. response would stay in space.“We would interpret such an attack as going to war against us,” says Singer. Under this scenario, commercial satellites, along with the Earth’s space-based civilian infrastructure, would probably be destroyed. “War in space would very quickly involve the civilian world,” he says.Such scenes play out in Ghost Fleet, which is now required reading for military planners in the U.S. Space Command, as well as in the Army, Navy, Marines and CIA. Singer recently testified before Congress and briefed White House National Security Council staff on the real-world lessons of his thriller, which contains 400 footnotes based on the space weaponry and battle plans of the United States, China and Russia. “It’s a novel, but it’s a realistic look at how a war might play out when we lose the opening battle in space,” Singer says, adding: “Let’s hope it stays in the realm of fiction.”

Corruption

Space Force creates unneeded complexity and risks corruption

W.J. Hennigan July 3, 2020, Time,. America Really Does Have a Space Force. We Went Inside to See What It Does, https://time.com/5869987/spaceforce/

The prospect of Space Force has stimulated the enthusiasm of the aerospace industry, which relies on big-ticket defense contracts, and high-tech research institutions and think tanks, which depend on government funding to lend expertise. That in turn creates opportunities for traditional forms of Pentagon waste, fraud and abuse. The **U.S. Government Accountability Office (GAO)**, Congress's watchdog, has **warned the creation of Space Force risks exacerbating fragmentation and ineffective management and complicating oversight when it comes to buying new satellite systems**. That's a **big concern considering space projects are routinely billions of dollars over budget and years behind schedule,** the GAO said. Deborah Lee James, Air Force Secretary under President Obama, concluded when she was at the Pentagon that Space Force made little sense. "Inherent in all reorganization is bureaucratic thrashing," she says. "To me, this is just an extra thing out there that's going to take away time and attention and money." Convincing Americans otherwise is proving difficult.

Space Militarization

US Space force is inherently aggressive and risks conflict escalation

Faith 20 [Faith, Ryan. (Ryan Faith is a space policy consultant who previously served as a professional staff member supporting the House Subcommittee on Space and Aeronautics) 10-16-2020, "U.S. Space Force: Built for War?" Real Clear Defense, https://www.realcleardefense.com/articles/2020/10/16/us_space_force_built_for_war_580985.html]

The culture of the Space Force might still be unformed and changing; it does bear at least a family resemblance to its sister services in at least one significant respect. In the services, the purveyors of kinetic mayhem — the shooters and the killers — tend to be culturally dominant within their respective services. The Space Force has been no exception to this. **Whether or not the Space Force shooters want to or not, they present a louder, more muscular, aggressive face of the Space Force**. Conversely, non-kinetic approaches to space dominance get little discussion indeed. Between the relative boldness of the kinetic space warfare community and the comparative silence of the non-kinetic warfare practitioners, the overall message suggests a Space Force with a strong bias towards kinetic warfare. Compounding this problem, the USSF does not speak a lot about the activities of its potential foes. In public discussion, there's little to suggest that U.S. opponents are hostile and aggressive and that need a muscular response. Keeping malicious actions secret makes the cultural bias towards kinetic action appear spontaneous — that it is not a response to unfortunate real-life conditions, but more of an itchy trigger finger. s space conflict planners know, kinetic action in space comes with an immense risk associated with orbital debris. An anti-satellite weapon, like the Chinese weapon demonstrated in 2007, can generate huge amounts of debris. The Chinese test itself created more than 3,000 bits of space shrapnel. Keep in mind that orbital speeds are immense, so an impact by even a small bit of debris can have a devastating effect producing vast clouds of junk. Those bits of debris themselves become unguided, uncontrolled, kinetic anti-satellite weapons of their own. Should the debris get thick enough, collisions can create a sort of feedback effect, called the Kessler Syndrome, where each bit of space shrapnel hits and annihilates additional satellites, creating more debris and so on. Thus, at the very far end of kinetic space conflicts, we may see some echoes of strategic deterrent thinking about nuclear warfare in decades past. An orbital debris chain-reaction starts to take on at least a passing resemblance to the more familiar idea of Mutually Assured Destruction. Without getting into the entire history of the nuclear deterrent, the fundamental problems should be familiar to people thinking about space conflict everywhere: Difficulties with escalation control, issues with massive retaliation as a doctrine, deterrent credibility, and so on. Prompt Global Strike (PGS) dependent on space cabiabilities

Establishment of Space Force will prompt a space arms race—creating bureaucratic incentives to hype the space weapon threat and build new weapons

Knight 21 [Knight, Sam. 02-09-2021. "With Biden's Backing, Space Force Threatens to Accelerate the Arms Race," Truthout, https://truthout.org/articles/with-bidens-backing-space-force-threatens-to-accelerate-the-arms-race/]

The push to militarize space started under the Bush administration in response to the Chinese military testing anti-satellite weaponry in 2007. In the years leading up to the test, however, the U.S.government repeatedly voted against U.N. General Assembly resolutions proposed by Russian diplomats, which sought to affirm that outer space should only be used for "peaceful purposes." In 2005 and 2006, the resolutions "enjoyed support from an overwhelming majority, with only Israel abstaining and the United States objecting," as the Nuclear Threat Initiative noted. Three years before the first resolution, Russia and China had released a paper entitled: "Possible Elements for a Future International Legal Agreement on the Prevention of the Deployment of Weapons in Outer Space, the Threat or Use of Force Against Outer Space Objects." But **with Democrats and Republicans now both firmly behind Space Force, it seems there is no going back.** In December 2019, days before Congress first advanced legislation to create the branch, Russian President Vladimir Putin said the U.S. military's new focus on outer space would force the Russian government "to pay increased attention to strengthening the orbital group, as well as the rocket and space industry as a whole." The call from Putin reinforced warnings from critics of the Space Force worried about the proliferation of weapons in the thermosphere and beyond. Laura Grego, a physicist with the Union of Concerned Scientists, said the **establishment of the U.S. military branch "would prompt a space arms race that would threaten U.S. military and civilian satellites, not protect them**." "Creating a **new military service** focused on space **will create bureaucratic incentives to hype the space weapons threat and build new weapons,"** Grego added.

Risk of miscalculation in space is higher than ever and guarantees existential escalation –

Dallon 18 [Adams, Dallon. 05-01-2018. "Weaponized Satellites and the Cold War in Space," Digital Trends, https://www.digitaltrends.com/cool-tech/weaponized-satellites-and-the-cold-war-in-space/]

High stakes On October 27, 1962, a nuclear-armed Soviet submarine had been spotted patrolling near the U.S. blockade line around Cuba, kicking off the Cuban Missile Crisis. In an attempt to bring the submarine to the surface, a U.S. destroyer began dropping non-lethal depth charges. The captain of the submarine mistakenly believed these charges were an attack and ordered his crew to arm the nuclear-tipped torpedo for launch. If this launch occurred, the U.S. would have presumably retaliated with a barrage of nukes launched at predetermined locations across the USSR. Per Soviet protocols, all three of the Russian submarine's commanding officers needed to agree unanimously on the decision to launch the warhead. The second in command, Vasili Arkhipov, refused to consent to a launch. The commanding officers eventually brought the submarine to the surface and returned to Russia without incident. In essence, one man's last-minute decision prevented what could easily have been the beginning of **World War III.** This is perhaps as close the world has ever come to a doomsday scenario, and it's chilling to think a **moment of indeterminacy would have meant instant annihilation for millions**. But unfortunately, the **potential for a grave accident due to misinterpretation is dreadfully ripe in the space-age Cold War** we're currently entrenched in. "In regards to indeterminacy of an attack: Bingo! Attribution is tremendously difficult," says Samson. "If a satellite stops working in orbit, it's not always apparent why. It could be because of faulty parts, solar flares, or deliberate interference." Let's say, for instance, a U.S. intelligence satellite is taken out by a solar flare or fleck of debris while a Chinese or Russian satellite with suspected ASAT potential floats haphazardly nearby. **The U.S. would have every reason to believe this was a**

possible preemptive strike to diminish U.S. GPS capacity before a larger attack. **Would defense officials wait calmly** with such crucial satellite assets potentially in the crosshairs**? Probably not.** While there is currently tremendous potential for a military battle to begin in space, the ensuing war would extend to earth soon thereafter. This unnerving warning was echoed by General John Hyten, head of the U.S. Air Force Space Command. "If war does extend into space someday — and I hope it never does — the first response is not going to be in space," he warned. All things considered, it could easily be argued that **the risk of an existential threat on this pale blue dot has never been higher**. It's incredible that a nuclear weapon hasn't been used on civilians in more than 70 years, but most military experts would agree **it is a matter of when, not if.** Without meaningful legislation to prevent such a disaster, **life on this planet could disappear as quickly as a blip on a radar screen, with only the artificial halo of orbiting trash left to tell the tale.**

Space conflicts go nuclear

Grego 15 [GREGO, LAURA is a physicist in the Global Security program at UCS. She is an expert in space weapons and security; ballistic missile proliferation; and ballistic missile defense. "Preventing Space War." https://allthingsnuclear.org/lgrego/preventing-space-war]

So says a very good New York Times editorial "Preventing a Space War" this week. Sounds right, if X-Wing fighters come to mind when you think space conflict. But in reality conflict in space is both more likely than one would think and less likely to be so photogenic. Space as a locus of conflict The Pentagon has known that space could be a flash point at least since the late 1990s when it began including satellites and space weapons in earnest as part of its wargames. The early games revealed some surprises. For example, attacking an adversary's ground-based anti-satellite weapons before they were used could be the "trip wire" that starts a war: in the one of the first war games, an attack on an enemy's ground-based lasers was meant to defuse a potential conflict and protect space assets, but instead was interpreted as an act of war and initiated hostilities. The games also revealed that disrupting space-based communication and information flow or "blinding" could rapidly escalate a war, eventually leading to nuclear weapon exchange. The war games have continued over the years with increased sophistication, but continue to find that **conflicts can rapidly escalate and become global when space weapons are involved, and that even minor opponents can create big problems**. The report back from the 2012 game, which included NATO partners, said these insights have become "virtually axiomatic." Participants in the most recent Schriever war games **found that when space weapons were introduced in a regional crisis, it escalated quickly and was difficult to stop from spreading.** The compressed timelines, the global as well as dual-use nature of space assets, the difficulty of attribution and seeing what is happening, and the inherent vulnerability of satellites all contribute to this problem. Satellite vulnerability & solutions Satellites are valuable but, at least on an individual basis, physically vulnerable. Vulnerable in that they are relatively fragile, as launch mass is at a premium and so protective armor is too expensive, and a large number of low-earth-orbiting satellites are no farther from the earth's surface than the distance from Boston to Washington, DC.

Blocks to Affirmative Arguments

Answer to Debris

Unilateral debris removal fails---the plan resolves outstanding legal uncertainty and facilitates international buy-in

Knipfer 17 [Knipfer, Cody (GWU Space Policy Institute, Technology & Cybersecurity Fellow at Young Professionals in Foreign Policy) 2017. "It's Time the United States Actively Pursued Space Debris Removal," *Next Gen*, http://www.ewinextgen.com/north-america/2017/6/28/its-time-the-united-states-became-active-on-space-debris-removal]

Discarded hardware, defunct and derelict satellites, spent rocket stages. The refuse of the space age—space debris—is increasingly pervasive in the orbits that many of the world's valuable space assets occupy. Traveling at incredible velocities, even the smallest loose screw or speck of paint can have a catastrophic effect on collision with other objects in space. Debris poses an increasingly unacceptable threat to the safe operation of our satellites that is not going away; rather, it's proliferating in trajectories that will take decades, if not centuries, to fall back to Earth. Yet, space debris is an addressable problem—a cooperative **international** debris removal mission could be a **sound first step** toward a lasting solution. There are ways to remove debris from space, but complicated and unresolved legal and policy issues, in tandem with significant political and financial risks, impede progress and raise many complex questions. What debris should be prioritized for removal? How can removal be transparently monitored and verified to address its "dual-use" military applicability? How can the intellectual property of a defunct satellite's owner be protected? The answers **need international buy-in** if space debris removal, a transnational issue, is to begin in earnest. Until then, the continued growth of space debris risks a "tragedy of the commons" scenario developing in Earth's orbit. As a primary space debris "polluter" and a leading spacefaring nation, the United States is in a unique position to guide international efforts toward a solution because it is among those with the most to gain from a "cleaned" space environment. With China and Japan actively developing space debris removal technologies, the European Space Agency considering plans of its own, and the commercial sector eying the business case for debris removal, the window of opportunity to resolve these outstanding issues is opening. To that end: building confidence and transparency in space debris mitigation and removal are important first steps for setting mutually agreed norms. The United Nations' 2008 set of voluntary debris mitigation guidelines and 2010 Beijing Orbital Debris Mitigation Workshop, for example, established a dialogue on international cooperation regarding the problem. But many conferences and meetings on this issue have been exclusive to non-governmental organizations and academia—failing to foster active state-to-state cooperation. Responsible actors in the United States government, such as the State Department and NASA, should redouble their efforts to engage with foreign counterparts on possible legal, policy, and technical solutions to space debris. NASA already participates in international organizations such as the Inter-Agency Space Debris Coordination Committee, which could potentially be a forum on the issue. A more productive step, however, is an international mission to demonstrate debris removal technology by nations' respective space agencies. Without practical experience in the technical processes and challenges in debris removal, the outstanding legal questions and their policy solutions will remain hypothetical—as will their proposed solutions. An actual cooperative mission, on the other hand, would necessitate international agreement on how to operationally handle legal and policy challenges. Such agreements, borne out of active technical cooperation instead of policy dialogue alone, would **lay a more solid foundation** for future debris removal guidelines—whether multilateral, unilateral, or commercial—than those that exist today. An international mission could benefit the space

environment beyond practical cleanup. **Involving space "adversaries" such as China and Russia**, whom the United States perceives as increasingly threatening to its space assets, in a potential mission would be a useful step toward **constructive engagement**, **consistent communication**, and **mutual understanding** on space issues.

Unilateral clean-up is impossible

Weeden 11 [Weeden, Brian. February 2011, "Overview of the legal and policy challenges of orbital debris removal," Secure World Foundation, Montreal, Canada Space Policy Volume 27, Issue 1, February 2011, Pages 38-43 Space Policy https://www.sciencedirect.com/science/article/pii/S0265964610001268]

Thus these two treaties stipulate that a space object is under the jurisdiction and control of the Launching State in perpetuity, leading to the conclusion that any attempt by a third party to remove that object could be seen as a breach of sovereignty. Roughly **one-third of the space debris currently in orbit is owned by the USA, one-third by** the Commonwealth of Independent States (**Russia**), **and one-third** by the People's Republic of **China**. Thus, under international law, unilateral ADR activities by any one of these states would only be able to remove **a portion** of the orbital debris threat. It is possible that, with proper prior consultation, a third party could obtain permission from the Launching State to remove a debris object. However, a protocol for doing so does not currently exist and would need to be developed.

Answer to Power Projection

Turn. Miscalculation. Space is offense dominant which structurally increases first strike and use or lose pressures

Grego 18 [Grego, Laura. 03-19-2018. "Space and Crisis Stability," Union of Concerned Scientists, https://www.law.upenn.edu/live/files/7804-grego-space-and-crisis-stabilitypdf]

Why crisis stability? For the foreseeable future, military tensions between the United States, China, and Russia are likely to remain high, as are those between China and India. Even absent intentional confrontation, regional problems, such as those in the Baltics and East and South Asia, have the potential to draw these actors into conflict. Thus, it is imperative to pay attention to any pathways that could lead an actor considering crossing the nuclear threshold, or approaching it very closely. The United States and Russia continue to retain large nuclear arsenals on high alert1 . Each are developing new strategic weapons, including hypersonic conventional prompt global strike systems with a suggestion mission of holding ground-based anti-satellite weapons at risk.2 Russia has declared the existence of novel nuclear delivery systems as a response to US missile defense systems,3 weapons which complicate the management of crises. China is reportedly considering increasing the size, capacity and alert status of its nuclear weapons delivery systems4 and is also developing new kinds of strategic weapons. China is also developing hypersonic weapons,5 and the ingredients for an arms race around these technologies is in place. India continues to increase the sophistication of its strategic posture. And India, China, Russia and the United States have or are pursuing missile defense technologies that are important both in the nuclear realm but in space issues, since missile defenses present demonstrated or inherent antisatellite capabilities. Thus it is critical to ensure that in times of tension, no actor escalates the crisis inadvertently or against their better judgment, and that misperception does not play an important role in the initiation or progress of the crisis. And that hostilities, if initiated, resolve as quickly as possible. Thomas Schelling's encapsulated an aspect of this idea in his landmark work this way: This is the problem of surprise attack. If surprise carries an advantage, it is worth while [sic] to avert it by striking first. Fear that the other may be about to strike in the mistaken belief that we are about to strike gives us a motive for striking, and so justifies the other's motive. But if the gains from even successful surprise are less desired than no war at all, there is no ―fundamentall basis for an attack by each side. Nevertheless, it look as though a modest temptation on each side to sneak in the first place — a temptation too small by itself to motivate an attack — might become compounded through a process of interacting expectations, with additional motive for attack being produced by successive cycles of ―He thinks we think he thinks we think … he think we think he'll attack; so he thinks we will; so he will; so we must.6 This suggests that it is important to **make the advantage of surprise attack negligible and the disadvantages as great as possible**, to **make sure** that **all actors understand** this, and to **make sure that actors have** as **clear** an **understanding of each other's motivations** as possible to avoid miscalculation. In the last twenty years, space assets have become important not only for strategic missions but also increasingly underpin conventional military force for modern militaries, and especially those with expeditionary forces, such as the United States. They are essential not only for militaries, but are a critical provider of essential civilian, commercial, and scientific services. Not only do satellites perform many more missions than they have in the past, there are many more spacefaring nations. While most satellites belong to the United States, Russia, and China, more than sixty countries own satellites or a large stake in one.7 At the same time, the technologies that are useful for holding satellites at risk have grown significantly in sophistication and capacity even in the last decade, and have become more widely available. This is particularly problematic because attacks on satellites can create or escalate terrestrial crises in potentially difficult to predict ways. The world is drifting towards a space regime that faces an ever more prevalent and more sophisticated anti-satellite technology and greater numbers and types of targets in space, with very little mutual understanding about how actions in space are perceived. While space's foundational legal document, the 1967 Outer Space Treaty, sets out the principles by which space is used and provides a number of useful, most recognize that more is needed to secure lasting peace on earth and the long-term health of the space environment. Different stakeholders are tackling space security issues from different angles. Under the aegis of the United Nations Conference on Disarmament's (UNCD) Prevention of an Arms Race in Space (PAROS) agenda item, Russia and China have invested in the Treaty for the Prevention of the Placement of Weapons in Outer Space, a comprehensive ban on the deployment of space-based weapons and on threats of any kind against satellites.8 The United States has stated that it sees little value in this treaty, but has not proposed revisions that would make it more acceptable nor suggested its own preferred legally-binding treaty. And the UNCD has struggled to extricate itself from a deadlock that has kept it from moving forward on discussions on this (and all other) topics. Others have suggested a ban on destructive anti-satellite weapons development and testing,9 and limits on counterspheric missile defense tests.10 These efforts have not yet produced any appreciable progress. Others prefer the approach of starting with confidence-building and transparency measures that are politically binding rather than legally binding. The European Union moved forward a Code of Conduct for Outer Space Activities, 11 which would set out rules of the road for space, creating transparency and building confidence. It did not address directly core security issues, and the gestures it made in this direction (the requirement by the United States that it include a specific reference to the right of self-defense) created disagreements serious enough to not be easily addressed in this format. The process has a said in 2015. A United Nations Group of Governmental Experts, convened to consider TCBMs for space, produced a consensus document,12 though for a number of reasons, little progress has been made on implementing them.13 Perhaps the greatest progress in creating new guidelines has come under the aegis of protecting the long-term sustainability of space. (While the long-term sustainability of space does imply that core security questions are solved enough to not threaten the space environment, work on this topic does not take the issue head-on.) The United Nations Committee on the Peaceful Uses of Outer Space has drafted a set of such guidelines which will be referred to the General Assembly in 2018.14 For its part, the United States, currently the most heavily invested in space in sheer capacity and in posture, is investing significant intellectual energy in creating a deterrence strategy to protect its military interests in space. While this is closely related to crisis stability, this work is distinctly from a US point of view. Each of these approaches have something distinct to offer. The aim of this paper, however, is to look at the issue differently and to use crisis stability (rather than, e.g., preventing an arms race, preserving the space environment) as an organizing principle or lens to help identify which facets of space activities are particularly dangerous, and to prioritize the existing initiatives, as well as to offer other unilateral and collaborative actions that can help reduce the pathways to confrontation between nuclear powers. Why space is a particular problem for crisis

stability For a number of reasons, space poses particular challenges in preventing a crisis from starting or from being managed well. Some of these are to do with the physical nature of space, such as the short timelines and difficulty of attribution inherent in space operations. Some are due to the way space is used, such as the entanglement of strategic and tactical missions and the prevalence of dual-use technologies. Some are due to the history of space, such the absence of a shared understanding of appropriate behaviors and consequences, and a dearth of stabilizing personal and institutional relationships. While some of these have terrestrial equivalents, taken together, they present a special challenge. The vulnerability of satellites and first strike incentives Satellites are inherently fragile and difficult to protect; in the language of strategic planners, space is an —**offense-dominant‖ regime**. This can lead to a number of pressures to strike first that don't exist for other, better-protected domains. Satellites travel on predictable orbits, and many pass repeatedly over all of the earth's nations. Low-earth orbiting satellites are reachable by missiles much less capable than those needed to launch satellites into orbit, as well as by directed energy which can interfere with sensors or with communications channels. Because launch mass is at a premium, satellite armor is impractical. Maneuvers on orbit need costly amounts of fuel, which has to be brought along on launch, limiting satellites' ability to move away from threats. And so, these very valuable **satellites are** also **inherently vulnerable and may present as attractive targets.** Thus, **an actor with substantial dependence on space has an incentive to strike first if hostilities look probable**, to ensure these valuable assets are not lost. Even if both (or all) sides in a conflict prefer not to engage in war, this weakness may provide an incentive to approach it closely anyway. A RAND Corporation monograph commissioned by the Air Force15 described the issue this way: First-strike stability is a concept that Glenn Kent and David Thaler developed in 1989 to examine the structural dynamics of mutual deterrence between two or more nuclear states.16 It is similar to crisis stability, which Charles Glaser described as —a measure of the countries' incentives not to preempt in a crisis, that is, not to attack first in order to beat the attack of the enemy,‖17 except that it does not delve into the psychological factors present in specific crises. Rather, first strike stability focuses on each side's force posture and the balance of capabilities and vulnerabilities that could make a crisis unstable should a confrontation occur. For example, in the case of the United States, the fact **that** conventional **weapons are** so **heavily dependent on vulnerable satellites may create incentives for the US to strike first terrestrially** in the lead up to a confrontation, before its space-derived advantages are eroded by anti-satellite attacks.18 Indeed, any actor for which satellites or space-based weapons are an important part of its military posture, whether for support missions or on-orbit weapons, will feel **—use it or lose it‖ pressure** because of the inherent vulnerability of satellites. Short timelines and difficulty of attribution The compressed timelines characteristic of crises combine with these —use it or lose it‖ pressures to shrink timelines. This dynamic couples dangerously with the inherent difficulty of determining the causes of satellite degradation, whether malicious or from natural causes, in a timely way. Space is a difficult environment in which to operate. Satellites orbit amidst increasing amounts of debris. A collision with a debris object the size of a marble could be catastrophic for a satellite, but objects of that size cannot be reliably tracked. So **a failure due to a collision** with a small piece of untracked debris **may be left open to other interpretations**. Satellite electronics are also subject to high levels of damaging radiation. Because of their remoteness, satellites as a rule cannot be repaired or maintained. While on-board diagnostics and space surveillance can help the user understand what went wrong, it is difficult to have a complete picture on short timescales. Satellite failure on-orbit is a regular occurrence19 (indeed, many satellites are kept in service long past their intended lifetimes). In the past, when fewer actors had access to satellite-disrupting technologies, satellite failures were usually ascribed to —natural‖ causes. But increasingly, **even during times of peace operators may assume malicious intent**. More to the point, **in a crisis** when the costs of inaction may be perceived to be costly, **there is an incentive to choose the worst-case interpretation** of events even if the information is incomplete or inconclusive. Entanglement of strategic and tactical missions During the Cold War, nuclear and conventional arms were well separated, and escalation pathways were relatively clear. While space-based assets performed critical strategic missions, including early warning of ballistic missile launch and secure communications in a crisis, there was a relatively clear sense that these targets were off limits, as attacks could undermine nuclear deterrence. In the Strategic Arms Limitation Treaty, the US and Soviet Union pledged not to interfere with each other's —national technical means‖ of verifying compliance with the agreement, yet another recognition that attacking strategically important satellites could be destabilizing.20 There was also restraint in building the hardware that could hold these assets at risk. However, where the lines between strategic satellite missions and other missions are blurred, these norms can be weakened. For example, the satellites that provide early warning of ballistic missile launch are associated with nuclear deterrent posture, but also are critical sensors for missile defenses. Strategic surveillance and missile warning satellites also support efforts to locate and destroy mobile conventional missile

launchers. Interfering with an early warning sensor satellite might be intended to dissuade an adversary from using nuclear weapons first by degrading their missile defenses and thus hindering their first-strike posture. However, for a state that uses early warning satellites to enable a ―hair trigger‖ or launch-on-attack posture, the interference with such a satellite might instead be interpreted as a precursor to a nuclear attack. It may accelerate the use of nuclear weapons rather than inhibit it. Misperception and dual-use technologies Some space technologies and activities can be used both for relatively benign purposes but also for hostile ones. It may be difficult for an actor to understand the intent behind the development, testing, use, and stockpiling of these technologies, and see threats where there are none. (Or miss a threat until it is too late.) This may start a **cycle of action and reaction based on misperception**. For example, relatively low-mass **satellites can now maneuver autonomously and closely approach other satellites** without their cooperation; this may be for peaceful purposes such as satellite maintenance or the building of complex space structures, or for more controversial reasons such as intelligence-gathering or anti-satellite attacks. Ground-based lasers can be used to dazzle the sensors of an adversary‘s remote sensing satellites, and with sufficient power, they may damage those sensors. The power needed to dazzle a satellite is low, achievable with commercially available lasers coupled to a mirror which can track the satellite. Laser ranging networks use low-powered lasers to track satellites and to monitor precisely the Earth‘s shape and gravitational field, and use similar technologies. 21 Higher-powered lasers coupled with satellite-tracking optics have fewer legitimate uses. Because midcourse missile defense systems are intended to destroy long-range ballistic missile warheads, which travel at speeds and altitudes comparable to those of satellites, such defense systems also have inherent ASAT capabilities. In fact, while the technologies being developed for long-range missile defenses might not prove very effective against ballistic missiles—for example, because of the countermeasure problems associated with midcourse missile defense— they could be far more effective against satellites. This capacity is not just theoretical. In 2007, China demonstrated a direct-ascent anti-satellite capability which could be used both in an ASAT and missile defense role, and in 2009, the United States used a ship-based missile defense interceptor to destroy a satellite, as well. US plans indicated a projected inventory of missile defense interceptors with capability to reach all low earth orbiting satellites in the dozens in the 2020s, and in the hundreds by 2030.22 Discrimination The consequences of interfering with a satellite may be vastly different depending on who is affected and how, and whether the satellite represents a legitimate military objective. However, it will not always be clear who the owners and operators of a satellite are, and users of a satellite‘s services may be numerous and not public. Registration of satellites is incomplete23 and current ownership is not necessarily updated in a readily available repository. The identification of a satellite as military or civilian may be deliberately obscured. Or its value as a military asset may change over time; for example, the share of capacity of a commercial satellite used by military customers may wax and wane. A potential adversary‘s satellite may have different or additional missions that are more vital to that adversary than an outsider may perceive. An ASAT attack that creates persistent debris could result in significant collateral damage to a wide range of other actors; unlike terrestrial attacks, these consequences are not limited geographically, and could harm other users unpredictably. In 2015, the Pentagon‘s annual wargame, or simulated conflict, involving space assets focused on a future regional conflict. The official report out24 warned that it was hard to keep the conflict contained geographically when using anti-satellite weapons: As the wargame unfolded, a regional crisis quickly escalated, partly because of the interconnectedness of a multi-domain fight involving a capable adversary. The wargame participants emphasized the challenges in containing horizontal escalation once space control capabilities are employed to achieve limited national objectives. Lack of shared understanding of consequences/proportionality States have fairly similar understandings of the implications of military actions on the ground, in the air, and at sea, built over decades of experience. The United States and the Soviet Union/Russia have built some shared understanding of each other‘s strategic thinking on nuclear weapons, though this is less true for other states with nuclear weapons. But in the context of nuclear weapons, there is an arguable understanding about the crisis escalation based on the type of weapon (strategic or tactical) and the target (counterforce—against other nuclear targets, or countervalue—against civilian targets). **Because of a lack of experience in hostilities that target space**-based capabilities, **it is not entirely clear what the proper response** to a space activity **is and where** the escalation thresholds or **―red lines‖ lie**. Exacerbating this is the asymmetry in space investments; not all actors will assign the same value to a given target or same escalatory nature to different weapons. For example, the United States is the country most heavily dependent on military space assets. Its proportionally higher commitment to expeditionary forces make this likely to be true well into the future. So while the United States seeks to create a deterrence framework, punishment-based deterrence would not likely target its adversary‘s space assets. But then there is difficulty finding target on the ground that would be credible but also not unpredictably escalate a crisis. If an American military satellite were attacked but without attendant human casualties (_satellites have no mothers‘), retaliation on an adversary‘s ground-based target is likely to escalate the conflict, perhaps justifying the adversary‘s subsequent claim to self-defense, even if the initial satellite attack didn‘t support such a claim. Little

experience in engaging substantively in these issues Related to this issue is that there is relatively little experience among the major space actors in handling a crisis with the others. The United States and the Soviet Union, then Russia, have had a long history of strategic discussions and negotiations. This built up a shared understanding of each other's point of view, developed relationships between those conducting those discussions, and created bureaucracies and expertise to support those discussions. This experience and these relationships are important to interpreting events and to resolving disputes before they turn into a crisis, and to managing one once it begins. There is nothing like this level of engagement around space issues between these two states, and much less between the US and China. One of the participants in a 2010 US space war game, a diplomatic veteran, imagined25 how things would play out if one or more militarily important US satellites failed amidst a crisis with an adversary known to have sophisticated offensive cyber and space capabilities: The good news is that there has never been a destructive conflict waged in either the space or cyber domains. The bad news is that no one around the situation room table can cite any history from previous wars, or common bilateral understandings with the adversary, relating to space and cyber conflict as a guide to what the incoming reports mean, and what may or may not happen next. This is the big difference between the space-cyber domains, and the nuclear domain. **There is,** in this future scenario, **no credible basis** for anyone around the president **to attribute restraint to the adversary**, no track record from which to interpret the actions by the adversary. **There is no crisis management history**: the president has no bilateral understandings or guidelines from past diplomatic discussions, and no operational protocols from previous incidents where space and cyber moves and counter-moves created precedents. Perhaps the adversary intended to make a point with one series of limited attacks, and hoped for talks with Washington and a compromise; but for all the president knows, sitting in the situation room, the hostile actions taken against America's space assets and information systems are nothing less than early stages of an all-out assault on US interests. Where to start? How to prioritize efforts Using this lens, what does this say about where efforts around space security should be focused? Start a substantive, high-level arms control discussion Starting a credible high-level discussion will require countries to identify key domestic stakeholders, assemble teams of experts on relevant issues, and develop detailed policy positions. The resulting informed dialogue will increase understanding between countries, identify important areas of agreement and disagreement, clarify intentions, and establish better channels of communication. The easiest path seems to be a resumption of the discussion of the European Union's Code of Conduct. This also would serve to establish important norms of acceptable behavior in space and supports predictability, very useful in avoiding misperceptions. However, it does have some drawbacks. Because the Code is not a binding treaty, the stakes are lower. This may make it easier to get started, but that may also serve to not get states to engage at the deepest levels. There's a significant difference in the level of preparation and buy-in that states require when participating in a UNCD negotiation than in a voluntary Code. While the PPWT has little support from the US, through the lens of crisis stability, it may be quite a good place to start. While one of the US objections to the Russian-Chinese PPWT is that it does nothing to prevent the development of ground-based ASAT weapons, space-based weapons are especially dangerous from a stability point of view, more so than ground-based equivalents. Additionally, because the PPWT does not explicitly limit ground-based ASAT weapons, this may allow leaving for later the issue of limiting ground-based missile defenses, which have significant ASAT capability and which the US fields the greatest number of. And which is a particularly politically sensitive topic. Reduce the incentives to "use it or lose it" or to strike first Unilateral and cooperative measures can be implemented to reduce the attractiveness of a surprise or first strike attack. One unilateral approach is to improve the resiliency of one's space assets. The vulnerability of satellites can be reduced by hardening them to attack; this is analogous to moving nuclear armed missiles into hardened silos or onto mobile platforms that are hard to locate. Or one can reduce the value of each target by distributing the mission over a constellation of satellites, roughly analogous to distributing nuclear assets over different platforms or de-MIRVing nuclear missiles. (This analogy has weaknesses. While each additional nuclear weapon delivery system may increase the risk of catastrophic use, breaking a large satellite into a constellation of smaller ones does not similarly increase risk.) These are just a few aspects of a resiliency approach. While a resilient posture can reduce one's own incentives to ―use it or lose it,‖ the effective communication of this resiliency can reduce one's potential adversary from attempting to strike them first because they will not reap the benefits they seek, i.e., ―deterrence by denial.‖ Additionally, states should resist locating weapons in space, particularly if objectives could be met with terrestrial alternatives. While space is well-suited to many missions that involve observing the earth or universe, or relaying or broadcasting information, it is poorly suited to missions that require rapid transfer of mass, such as ground-attack weapons or ballistic missile defenses,26 and little would be lost by foregoing them. Reducing first strike incentives can also be pursued via cooperative agreements. In the nuclear realm, the powers took steps that improved stability such as limiting the numbers and types of weapons and defenses, ensuring robust crisis communications channels, and exchanging information about forces and policies. Again, the processes of negotiating these cooperative agreements provided each side with institutional experience and working relationships with each other. More capable situational awareness While the strategy is helpful in that it helps satellites become less likely targets, services are more robust

and resilient, it does present the problem that failures may be more likely. If space postures do indeed move toward more distributed capabilities and hence larger constellations of lower quality assets, satellites may fail more. Satellites may also be built to be less robust as launch becomes cheaper. Even if a relatively unimportant satellite's failure does not present a crippling of capability, it might send a signal that must be interpreted—is this the onset of a bigger attack? Additionally, current trends indicate there will be many more small satellites on orbit, scores or hundreds. Many are not designed to be controlled from the ground. Some will lose control because of failure. If they are not trackable, they may present collision hazards, and more problematic, the collisions may not be predictable or attributable. Additionally, the credibility of retaliation can be undermined if the attacker has a reasonable expectation of being anonymous or that the attribution will be unclear. This incentive works against stability. Thus, it is critical to build systems that provide accurate information about the health of satellites to their operators, as well as where the satellites are and will be. This could be enhanced if all satellites meet a minimum trackability standard and ability to transmit telemetry. While improved space situational awareness is critical for each space actor, some of this information would necessarily be kept secret. So there is a real role for a civil society or civil/government partnership entity that could provide robust, trustable, impartial data about the on-orbit behavior of satellites. Such an entity could identify potentially aberrant or abnormal onorbit behavior, and verify compliance with norms and agreements. The ASTRIA project at University of Texas is building an experimental version of such a system. **Example of a cooperative agreement that could alleviate misperception: keep out zones** Closely approaching a satellite that is unable (or unwilling) to cooperate is a broadly useful technology. It may facilitate the repair or refueling of a satellite in orbit, or to begin to build large or complex structures in orbit. It also may be used for less benign purposes; for example, if a satellite can closely approach an adversary's satellite without the cooperation of the adversary, then an attack may be mounted using relatively unsophisticated technologies that can disrupt or destroy the target satellite. This may be an especially attractive technology, because it may permit disabling an adversary's satellite without creating a large amount of debris. The United States has developed this technology both through its civilian space agency NASA (DART)27 and its military research arms (XSS-11,28 MiTeX29) and presently fields two Geosynchronous Space Situational Awareness Program (GSSAP)30 satellites in GEO orbit which plan to closely approach and survey 600 satellites. China has tested rendezvous technologies with its BX-1 satellite31 and Russia has, as well.32 A **satellite owner** who detects a satellite closely approaching without having asked permission or given notice **may legitimately feel threatened** and take actions on that basis. For example, in an environment without norms of behavior, valuable satellites could host defensive weapons on board or have a defensive escort. **Without clarity around intentions and expected behaviors, the followed satellite may** use defensive weapons to **pre-empt an attack** by the follower, whether or not the follower had ill intent. As an arms control measure, the idea of keep out zones, which would establish protected areas around satellites, was generally held to perhaps be modestly useful but unworthy of significant amounts of high-level time to negotiate. 33 But it may look different if the organizing principle is stability. A common argument against keep out zones is that the protection they provide is limited and won't stop a determined adversary. The hostile satellite could loiter outside the keep out zone indefinitely and then be poised to interfere with the satellite when the timing was right. Although the keep out zones could be devised based on contemporary threat assessments, the adversary satellite could be equipped with an ASAT technology that was developed specifically to hold satellites at risk from the distance indicated by the keep out zone. It could use lasers, highpowered microwaves, or projectiles, for example. The other way to look at it though, would be to view a **keep out zone as providing not protection, but accountability and transparency**. While **a country** may have legitimate reasons to occasionally come near a keep out zone, it **would have no reason to loiter at its periphery**. The restraint or the absence of it could deliberately signal the intentions of the potential adversary. How might such an arrangement be verified and how would responsibility be set? Some of the responsibility can be assigned to operators of highly maneuverable satellites. Such satellites could be required to amplify their trackability with technological aids that are already in use, such as highly radar reflective coatings, optical retroreflectors, or signaling beacons. Because the economics of satellite repair, on-orbit structure building, and active debris removal are becoming more realistic (or at least being perceived as such, so that investments are being made), norms are being established already for the close approach of satellites for peaceful purposes. The technical requirements to monitor declared maneuverable satellites are relatively low, since the satellites are trying to be tracked. However, to ensure that no undeclared maneuvering satellites enter protected zones, those zones must be monitored. While it would not be possible today to monitor keep out zones for every object, it would be feasible to do so for a subset of more important satellites. Satellite capability scales with mass, and

generally, the more massive a satellite, the more capable and valuable it is. Large satellites are clearly visible from the ground and all of them can be tracked. Additionally, particularly critical satellites may carry their own sensors that monitor the space around them.

Turn. Creation of the space force risks further containment of China and Russia. Containment backfires and causes war

Krickovic 18 — Andrej Krickovic (Faculty of World Economy and International Affairs Higher School of Economics at Moscow), October 2018, "Policy Memos Russia's Challenge: A Declining Power's Quest for Status," PONARS Eurasia, http://www.ponarseurasia.org/memo/russia-challenge-declining-power-quest-status, [accessed: 8/17/19]

How should the United States and its Western allies deal with a declining challenger such as Russia? One seemingly rational policy might be to ignore Russia for the time being and to postpone the day of reckoning to the future, when Russia will be weaker. This was the approach largely followed by the Obama administration. However, it provokes Russia into engaging in even more reckless and destabilizing behavior in order for it to have its voice heard—as Obama soon found out in Ukraine and Syria. Containment, the policy now favored by many Russia hawks in Washington, risks **dangerous confrontation** with a country that, despite its weaknesses, is still a **nuclear superpower with a formidable military**. What's more, **containment is unnecessary**. Russia's leaders are **well aware of the limits of their country's power** and **are not looking to overtake the U**nited **S**tates **as the global hegemon** or to take over management of the international system. Accommodating Russia's status aspirations **will not embolden it** to pursue more radical revisionism. Instead of ignoring or containing Russia, Western leaders must try to find ways to channel its status-seeking behavior in constructive ways that contribute to **global peace**, **stability**, and **development**. Russia's efforts toward economic reintegration of the post-Soviet space may have been such an opportunity. From the very start, Russian leaders made it clear that these efforts were not aimed at creating a closed neo-Soviet trade block, but were designed to strengthen Russia's position in the larger process of pan-European integration with the EU. Eurasian economic integration could have contributed to the economic development and stability of a problematic and dangerous region while also allowing Russia to improve its international status through peaceful and constructive means. Instead of engaging with Russia's regional integration efforts, the United States and the EU pushed back against them, threatening Moscow with further status losses and provoking (what should have been) a predictable backlash. Other opportunities to engage Russia's status seeking in a constructive way will present themselves in Syria, Ukraine, and in the geopolitical realignments that China's rise will generate. They will confront Western policy makers with difficult choices that will force them to find a balance between their beliefs and values and the harsh realities of power politics. In making these choices, they must understand just how important status concerns are for Russia and realize that the bigger dangers come not from empowering a declining Russia through accommodation, but from ignoring its status aspirations

Turn. The space force introduces bureaucracy that slows the United States down in times of crisis

Spirtas 20 [Spirtas, Michael. 03-13-2020, "New Space Force Will Need Resources, Clear Definition of Warfighting Mission," RAND Corporation, https://www.rand.org/news/press/2020/03/13.html

"The transfer of these functions will likely create new 'seams' between the Space Force and the other services and the organizations it supports," said Yool Kim, an author of the report and senior engineer at RAND. "For example, **some of these 'seams' could potentially slow operations in a kill chain that relies on sensors or communication assets in space to support kinetic attacks, reducing the capabilities of the joint force."** The Space Force will need personnel with skills in space operations, space intelligence, space acquisition, mathematics, and other science, technology and engineering specialties. Although some Space Force career fields will be organic to the new service, many career fields will be manned by Air Force officers who are on assignment to the Space Force. Some Air Force career fields will need to develop a "space track" to ensure the additional training and development that will be necessary for the Air Force officers who will serve in the Space Force. The Space Force—with an initial estimated size of 16,000

personnel—will likely need to draw many of its general officers from the Air Force or other services.

Answer to Satellite Protection

Sats key to precision warfare and autonomous systems

Barnes 18 [Barnes, Paul (Paul, current Army Visiting Fellow at the Royal United Services Institute, and Alexandra Stickings). 11-27-2018, "The Death of Precision in Warfare?" War on the Rocks, https://warontherocks.com/2018/11/the-death-of-precision-in-warfare/]

As an example of the fragility of precision, consider the congested environment of near earth orbit and specifically the vulnerability of orbiting satellites, particularly those providing vital navigational information to platforms and weapon systems in all three domains of war. The enablement of precision took a step forward with the Global Positioning System (GPS) constellation of satellites, the first of which was launched into orbit in 1989. GPS, operated and maintained by the U.S. Air Force, was the first global navigation satellite system, the others being Russia's GLONASS, Europe's Galileo and China's Beidou (initially a regional system now being expanded to provide global coverage). GPS built on previous U.S. military satellite-based navigation systems, such as Transit, highlighting that the recognition of the potential in this area goes back earlier than is commonly acknowledged. It is generally agreed that the Gulf War of 1991 was the first conflict in which GPS played a significant role, the success of which led to further integration of the technology into military systems. As a result, global navigation satellite systems have become the **most important component** of precision.

These satellite constellations provide precision position, navigation, and timing signals, which militaries use for a range of capabilities, including maritime navigation, missile targeting, and autonomous systems. Using atomic clocks aboard each satellite, the constellations can be used to pinpoint locations on the ground to within a few meters, a level of accuracy which has exponentially improved since the launch of the initial systems. These signals have become so embedded in daily military and civilian operations that even the most mundane domestic task is reliant on them.

That lowers the threshold for war- leads to interventionism

Cortright 12 [Cortright, David. 01-09-2012. "License to Kill," CATO Institute, https://www.cato-unbound.org/2012/01/09/david-cortright/license-kill]

More War? The rise of drone warfare has stirred strong passions and sparked a vigorous debate about the morality of unmanned weapons systems. The first and most important question is whether drone technology makes war more likely. Are decisionmakers more prone to employ military force if they have accurate weapons that are easier to use and do not risk the lives of their service members? The use of these weapons creates the false impression that war can be fought cheaply and at lower risk. They transform the very meaning of war from an act of national sacrifice and mobilization to a distant, almost unnoticeable process of robotic strikes against a secretive "kill list." Do these factors lower the political threshold for going to war? On the surface the question seems naïve. Political scientists argue that decisions about going to war are made on the basis of strategic necessity and perceived threats to security. The act of war is not determined by the type of weapon available. As the eminent political theorist Hans Morgenthau famously said, referring to nuclear weapons, people "do not fight because they have arms. They have arms because they deem it necessary to fight."[5] On the other hand, the availability of a particular class of weaponry can influence judgments on the likely costs and viability of military action. U.S. political leaders are able to imagine intervening militarily in other

countries because they have advanced weapons systems designed for that purpose.[6] The possession of drone technology increases the temptation to intervene because it removes the risks associated with putting boots on the ground or bombing indiscriminately from the air. Drone systems are "seductive," writes law professor Mary Ellen O'Connell, because they lower the political and psychological barriers to killing.[7] They induce a false faith in the efficacy and morality of armed attack that could create a greater readiness to use force. A March 2011 report from the Development, Concepts and Doctrine Centre of the U.K. Ministry of Defence concluded that the availability of drone weapons was indeed a factor in the decision of British leaders to participate in military operations in Pakistan and Yemen. In its study the Center found that manned aircraft and commando raids could have been used for the selected missions but were rejected as too risky. The decision to use force was "totally a function of the existence of an unmanned capability—it is unlikely that a similar scale of force would be used if this capability were not available." The report urged "removing some of the horror" of these weapons so that "we do not risk losing our controlling humanity and make war more likely."[8] A greater readiness to use force may also result from the physical and psychological distance that separates the launching of a strike from its bloody impact. Robotic technology removes the person from the emotional equation of war, reducing human targets to images on a computer screen. This has stretched to the maximum what writer P.W. Singer describes as the disconnection between war and society.[9] Scholar Mary Dudziak agrees, "Drones are a technological step that further isolates the American people from military action, undermining political checks."[10] U.N. Special Rapporteur Philip Alston warns against "a 'PlayStation' mentality to killing" that may induce public callousness and susceptibility to claims about costless warfare.[11] Any development that makes war appear to be easier or cheaper is deeply troubling. It reduces the political inhibitions against the use of deadly violence. It threatens to weaken the moral presumption against the use of force that is at the heart of the just war doctrine.

Impact Defense

AT ASAT (Anti-Satellite)

No escalation- dozens of ASAT attacks prove

Mazur 12 [Mazur, Jonathan. Fall 2012, "Past U.S. Actions: A Source for Foreign Perceptions of U.S. Redlines in Space," Space & Defense, https://www.usafa.edu/app/uploads/Space_and_Defense_6_1.pdf]

U.S. Reactions To Foreign Disruption Of U.S. Capabilities

In the 1970s, it was suspected that a U.S. maritime communications satellite was turned off by the Soviets when it was outside of the range of U.S. tracking stations.25 There does not appear to be any documented U.S. reaction, and I suspect there was none. In the mid-1990s, satellite hackers in **Brazil** began hijacking U.S. military communication satellite signals to broadcast their own information, though it took until 2009 for Brazil to crack down on the illegal activity with the support of the DoD.26 In 1998, a U.S.-German satellite known as ROSAT was rendered useless after it turned suddenly toward the sun. NASA investigators later determined the accident was possibly linked to **a cyber-intrusion by Russia**.

The fallout? Though there was an ongoing criminal investigation as of 2008; NASA **security officials** have **seemed determined to publicly minimize the** seriousness of the **threat**.27 In 2003, a signal originating from **Cuba**—later determined to be coming from **Iranian** embassy property— was jamming a U.S. communications satellite that was transmitting Voice of America programming over Iran, which was publicly referred to as an **"act of war"** by a U.S. official. 28 Press reporting indicates the U.S. administration was [frozen]"~~paralyzed~~" about how to cope with the jamming that continued for at least a month, even after U.S. diplomatic protests to Cuba.29 In 2005, U.S. diplomats protested to the **Libya**n government after two international satellites were illegally jammed disrupting American diplomatic, military, and FBI communicationS.30 In 2006, press reporting indicates that **China** hit a U.S. spy satellite with a ground-based laser. This action was acknowledged by the then director of the NRO, though the DoD remained tight lipped about the incident.31

"We're at a point where the technology's out there, and the capability for people to do things to our satellites is there. I'm focused on it beyond any single event." – Air Force Space Command Commander, General Chilton, 2006 32

In 2009, a U.S. commercial Iridium communications satellite—extensively used by the DoD—was accidently destroyed by a collision with a dead Russian satellite.33 The U.S. company, Iridium, was able to minimize any loss of service by implementing a network solution within a few days.34 As of early 2011, no legal action had been taken by the company either because it is not clear who was at fault or because it might be politically problematic for the United States, which is trying to enter into bi-lateral transparency and confidence-building measures (TCBM) with Russia regarding space activities.35 Since August of 2010, **North Korea** has been intermittently using GPS jamming equipment, which reportedly has been interfering with U.S. and South Korean military operations and civilian use south of the North Korean border.36 Reportedly, only South Korea and the United Nations International Telecommunications Union—at the request of South Korea—have issued letters to Pyongyang demanding the cessation of disruptive communications signals in South Korea.37

It appears that the **only time** the U.S. military has responded with force to a disruption in U.S. space capabilities was in 2003, a few days after the start of the Iraq war.38 According to U.S. officials, Iraq was using multiple GPS jammers—which supposedly did not affect military GPS functionality. However, the U.S. military bombed the jammers anyway after a diplomatic complaint to Russia.39 The use of military force against the GPS jamming threat was possibly because the United States was **already intervening** in Iraq, and **the bombing** probably **would not have occurred if the United States was not at war**.

A foreign actor researching U.S. investments in space and observing that (a) failed U.S. satellites appeared not to be reconstituted immediately, (b) U.S. public reaction to the losses was minimal, and (c) U.S. reactions to foreign disruptions were inconsistent could come to the judgment that there appears to be some redundancy in capability in the U.S. space architecture and/or a **tolerance of loss** within the U.S. Government. The President is still making his phone calls, missiles are still finding their targets, and satellites are still taking pictures of North Korea's nefarious efforts.

AT Asteroids

Nothing is hitting us – 100% sure

Taylor 19 [Taylor, Denny (professor of literacy studies in the Teaching, Literacy and Leadership program at Hofstra University). 07-29-2019, "The Peculiar Case of Asteroids and Elephants", https://www.dennytaylor.com/news/2019/the-peculiar-case-of-asteroids-and-elephants]

Don't worry about asteroids[1]. Fictional emergency response scenarios are taking place to ensure millions of people are not annihilated if an asteroid is detected on a collision course with the planet. An impact scenario has been playing out at the May 2019 International Planetary Defense Conference in College Park, Maryland. This scenario created by NASA and FEMA is designed to help key decision makers practice for a real asteroid impact. But here's a caveat. There is no known asteroid or comet with a significant probability of impacting Earth in the next century. We know this for a fact from advancements in planetary defense astronautics. NASA and its international partners are continually scanning the skies for NEOs (near Earth objects) -- which are asteroids and comets that orbit the Sun and come within 30 million miles (50 million kilometers) of Earth's orbit. International groups, such as NASA's Planetary Defense Coordination Office (PDCO), the European Space Agency's Space Situational Awareness-NEO Segment, and the International Asteroid Warning Network (IAWN) have made better communication of the hazards posed by NEOs a top priority.

We can deflect anything now

Asmelah 19 [Asmelah, Leah. 08-20-2019, "Despite Elon Musk's alarmist tweet about an asteroid hitting Earth, NASA says there is no known threat," CNN, https://www.cnn.com/2019/08/20/us/nasa-elon-musk-big-rock-tweet-scn-trnd/index.html]

NASA's website, though, clearly says, "**No known asteroid poses a significant risk of impact with Earth over the next 100 years**." Lindley Johnson, of NASA's Planetary Defense Coordination Office, reiterated that stance in a statement. "While no known asteroid larger than 140 meters in size has a significant chance of hitting Earth for the next 100 years, NASA and its partners are studying several different methodologies for deflecting a hazardous asteroid," he said. Basically, **even if an asteroid were hurtling toward Earth, scientists believe they will have the technology to deflect it off course and prevent collision.** NASA also has a designated department that finds undetected asteroids and tracks their orbits, so they have data on where exactly an asteroid will be up to hundreds of years in the future. Even if an undetected asteroid slipped through, Johnson said in a previous interview with CNN, that impact is extremely rare -- occurring only once every two or three centuries.

More than 90% of all large asteroids have been tracked.

IAA 17 [International Academy of Astronautics; 2017; "IAA Planetary Defense Conference: Conference Summary and Recommendations," iaaweb.org/iaa/Scientific Activity/report2017pdc.pdf]

Estimates of the population of large (>1 km) NEOs have been revised to correct around-off error, reducing the estimated population from ~990 to ~934 and bringing the estimated survey completion of these objects up from ~88% to ~93%

AT China is Peaceful Actor

China is revisionist---new Xi doctrine enshrines expansionist agenda---accommodation only emboldens them more. Deterrence key to containing China

Thayer & Han 19 [Thayer, Bradley A. (Political Science Professor at UT San Antonio); Han, Lianchao (Visiting fellow at Hudson Institute). 06-12-2019. "The 'Xi Doctrine': Proclaiming and Rationalizing China's Aggression," *The National Interest*, https://nationalinterest.org/feature/%E2%80%98xi-doctrine%E2%80%99-proclaiming-and-rationalizing-china%E2%80%99s-aggression-62402]

Using the occasion of the Shangri-La Dialogue in Singapore this month, Chinese Minister of National Defense and State Councilor Gen. Wei Fenghe, delivered a sharp message to the United States, which may be termed the "Xi Doctrine" on China's use of force, after Chinese premier Xi Jinping. Wei declaring both China's resolve to aggress to advance its interests and a rationalization for the use of force. Wei's de facto threat of war should not be lost in his nuances, deliberate ambiguity, or in translation. His remarks were so bellicose that the world has noticed, as was certainly **intended** by the leadership of the Chinese Communist Party (CCP). Empirical evidence of China's aggression is increasingly common, from its attempt to **dominate the S**outh **C**hina **S**ea, the **neo-imperialist effort** to gain control of states through the Belt and Road Initiative, to its technological imperialism to control 5G and **a**rtificial **i**ntelligence technologies. What is rather less frequent are statements from **high-level** Chinese **officials** proclaiming the country's **intent to be aggressive** and offering an attempted legitimizing principle **justifying that aggression**. While much of the content of Wei's remarks were in keeping with the gossamer pronouncements on China's peaceful intentions, as well as a paean to Xi Jinping's leadership, they still conveyed that China is ready and willing to resort to war if the United States stands in its way of global expansion; and they made clear that China must go to war, or even a **nuclear war**, to occupy Taiwan. Specifically, there are four elements that comprise the Xi Doctrine and are indications of China's signaling its willingness to use force. The first component is a new and alarming proclamation of the undisguised threats to use force or wage an unlimited war. China is becoming bolder as its military power grows. This is evidenced in Wei's muscular remarks on the People's Republic of China's approach against Taiwan, his explicit statement that China does not renounce the use of force against Taiwan, and his effort to deter the United States and its allies from intervention should an attack occur. Wei forcefully stated: "If anyone dares to separate Taiwan from China, the Chinese military has no choice but must go to war, and must fight for the reunification of the motherland at all costs." "At all cost" means that China **will not hesitate to use nuc**lear weapon**s** or **launching another Pearl Harbor** to take over Taiwan. This is a clear warning of an invasion. Second, the Xi Doctrine legitimizes territorial expansion. Through his remarks, Wei sought to convince the rest of the world that China's seizure of most of the South China Sea is an accomplished fact that cannot be overturned. He made bogus accusations, which included blaming the United States for "raking in profits by stirring up troubles" in the region. He insisted that only ASEAN and China must resolve the issue. He claimed that China's militarization on South China Sea islands and reefs were an act of self-defense. Should this be allowed to stand, then **the Xi Doctrine will set a perilous precedent of successful territorial expansion**, **which will further entice China and jeopardize** the **peace** of the region. Third, the doctrine targets the United States as a cause of the world's major problems and **envisions a powerful China evicting the U**nited **S**tates **from the region**. Wei obliquely identified the United States as the cause wars, conflicts, and unrest, and sought to convey that the United States will abandon the states of the South China Sea (SCS) when it is confronted by Chinese power, a typical divide and conquer strategy used by the CCP regime. The Xi Doctrine's fourth element is the mendacity regarding China's historical use of force and current actions. While the distortions of history were numerous, there were three major lies that should be alarming for the states of the region and the global community. First, Wei said that China had never invaded another country, which is a claim so transparently false it can only be a measure of the contempt he held for the audience. China has a **long history of aggression**,

including against the Tibetans and Vietnamese, and perhaps soon against the Taiwanese. Second, Wei argued that hegemony does not conform to China's values when, in fact, China proudly was Asia's hegemon for most of the last two thousand years. Lastly, he claimed that the situation in the SCS is moving toward stability—from China's perspective this stability is caused by its successful seizure of territory. In fact, the SCS is far less stable as a result of China's actions. Efforts to counter this grab are denounced by Wei as destabilizing, which is a bit like a thief accusing you of a crime for wanting your property returned. Wei's belligerent rhetoric is an indication that the CCP regime faces deep external and internal crises. Externally, the Trump administration has shocked the CCP with the three major steps it has taken. First, it has shifted the focus of the U.S. national-security strategy and now identifies China explicitly as its primary rival—abandoning the far more muted policies of previous administrations. Second, Trump has acted on this peer competitive threat by advancing tangible measures, such as arms sales to allies and the ban of Huawei. Third, the administration has made credible commitments to assure partners and allies to counter China's aggression and bullying. These have unbalanced the CCP regime, and its natural reaction is to bully its way out. Additionally, the CCP regime has perceived that the world today has begun to consider the negative implications of China's rise, and the United States is determined to prevent what heretofore had been considered China's unstoppable rise. From the perspective of CCP, conflict is increasingly seen as inevitable and perhaps even imminent. Wei's bellicosity should be seen in this light, and the PLA is tasked with fighting and winning the war. Internally, Xi's anti-corruption campaign that selectively targets his political rivalries, and his abandoning the established rules such as term limited of presidency, have introduced deep cleavages into the unity of the regime unity. China's economic slowdown, made worse by the U.S. trade war, is a fundamental challenge to the regime's legitimacy. Xi's repression and suppression of the Chinese people, particularly human-rights defenders, Christians, Kazakhs, Uighurs, and other minorities, have miscarried. Drawing from the pages of unfortunate history, in a classic social-imperialist move, the regime wants to direct these internal tensions outward. At the same time, the **nationalistic fervor** advanced by the CCP's propaganda and by the rapid military modernization have made many young militant **officers** in the PLA overconfident. This is infrequently noticed in the West. They can hardly wait to fight an ultimate war to defeat the arch-enemy. This plainly dangerous mentality echoes the **Japanese military's beliefs before Pearl Harbor.** The bellicosity evinced in Wei's speech is serious and is not bluster intended to deter. The United States cannot meet China's threat with **half-measures**, which **are likely to further encourage China's aggressive behavior**. The United States must respond to China's belligerence with greater strength, **adamantine determination**, and more vigorous diplomatic and military measures. With the Xi Doctrine, China has proclaimed and **rationalized its aggression**. A Trump Doctrine forged in response has to reveal to all global audiences, most importantly the CCP leadership, the recklessness of the Xi Doctrine and the supreme folly of aggression.

Chinese strategy utilizes offensive measures defensively, making a pre-emptive strike possible.

Pollpeter et. al 15 – Kevin Pollpeter, is a senior research analyst at Defense Group, Inc. (DGI), in Washington, DC. From 2013 to 2015, Pollpeter was deputy director of IGCC's project on the Study of Innovation and Technology in China (SITC). Prior to working at IGCC, Pollpeter was the deputy director of the East Asia program at DGI, where he managed a group of more than 20 China analysts. Before DGI, he was a researcher at RAND. He is widely published on China national security issues, with a focus on China's space program and information warfare issues. A Chinese linguist, he holds an MA in international policy studies from the Monterey Institute of International Studies. Eric Anderson, is a national security consultant. As a long-standing member of the U.S. intelligence community, he has written over 600 articles for the National Intelligence Council, International Security Advisory Board and the Department of Defense. In addition, he is a leading scholar on the rise of sovereign wealth funds. His book, Take the Money and Run: Sovereign Wealth Funds and the Demise of American Prosperity was published in March 2009. His focus on events in Asia is reflected in a forthcoming text, China Restored: The Middle Kingdom Looks Forward to 2020. Prior to assuming his current position, Mr. Anderson served as a senior intelligence officer at the Defense Intelligence Agency. In addition, he has been a senior intelligence analyst for the Multi National Forces-Iraq in Baghdad and at the U.S. Pacific Command in Hawaii. From 1990-2000, Mr. Anderson was an active duty intelligence officer in the United States Air Force—with assignments in Japan, Korea and Saudi Arabia. He remains on duty as an Air Force reserve officer, teaching at the National Defense Intelligence College. He has also taught for the University of Missouri, University of Maryland, and the Air Force Academy. Mr. Anderson has a PhD in political science from the University of Missouri, a MA from Bowling Green State University in Ohio, and a BA from Illinois Wesleyan University. A long-time Harley rider, Mr. Anderson claims to have put over 200,000 miles on motorcycles during the last 15 years. Jordan Wilson, currently works as a Research Fellow in the Security and Foreign Affairs division at the U.S.-China Economic and Security Review Commission, where he writes on issues relating to China's military development and science and technology progress and their implications for U.S. policy. Prior to joining the Commission, Wilson worked at the Institute on Global Conflict and Cooperation from 2013-2014 as a research assistant with the Study of Innovation and Technology in China (SITC) project. There, his responsibilities included research, analysis, and writing work for projects on the development of China's high performance computing industry, the nature and influence of China's defense industry, the role of China's science and engineering leaders in defense science and technology, and the Institute's 2013 Defense Transparency Index. Wilson completed a Master's degree in Pacific International Affairs from the School of International Relations and Pacific Studies (IR/PS) at the University of California, San Diego in 2013, focusing on international politics and China in particular and also studying Mandarin Chinese. His experience also includes a 2011 internship at United States Southern Command in Doral, FL, and a six-month teaching position in Taiwan from 2008-2009. He has a Bachelor's degree in Business

Administration from Thomas Edison State College in Trenton, NJ. Fan Yang, 5-2-2015 ("CHINA DREAM, SPACE DREAM: CHINA'S PROGRESS IN SPACE TECHNOLOGIES AND IMPLICATIONS FOR THE UNITED STATES," U.S.-China Economic and Security Review Commission, Available Online at http://origin.www.uscc.gov/sites/default/files/Research/China%20Dream%20Space%20Dream_Report.pdf, Accessed 6-22-2016, RJS)

Chinese Military Concept of Operations A second factor that affects PLA space operations is its concept of operations. Chinese writings place a heavy emphasis on gaining the initiative at the outset of a conflict, including during the U.S. military's deployment stage. The PLA, like most militaries, would prefer to fight a "quick war with a quick resolution" (速战速决). Based on the their study of war since the 1982 Falklands War, PLA analysts assess that the relatively quick conclusion of modern wars places an emphasis on seizing the initiative at the outset of a campaign. Looking at the 1991 Gulf War, and the initial invasions of Afghanistan in 2001 and Iraq in 2003, Chinese military analysts assess that the PLA cannot allow the U.S. military to become fully prepared lest they cede victory. In carrying out this concept of operations, the Chinese government states that its national defense policy is "purely defensive in nature" and that it "places the protection of national sovereignty, security, territorial integrity, safeguarding of the interests of national development, and the interests of the Chinese people above all else." 47 In doing so, China follows a military strategy of active defense (积极防 御), which was been described by Mao Zedong as "offensive defense or defense through decisive engagements…for the purpose of counter-attacking and taking the offensive." 48 At face value, an adherence to a defensive national defense policy would seem to be counter to the goal of fighting a quick war with a quick resolution and the need to take the initiative at the beginning of an operation. In fact, there is little operational difference between China's active defense strategy and an offensive military strategy. Chinese analysts assert that, within the context of protecting China's national interests, the full range of offensive actions are possible. As a result, active defense is best thought of as a politically defensive but operationally offensive strategy in which China will maintain a rhetorically defensive posture up until the time that war appears imminent. **Thus, any U.S. military support or deployment that is deemed a precursor to U.S. action could be grounds for a preemptive strike**. In this case, the United States would be considered to have taken a "first shot" at the strategic level that would allow China to conduct first strikes at the operational and tactical levels. Chinese thinking on active defense can be seen in writings on space operations. A 2013 textbook on space operations, for example, argues that China's space strategy is defensive in nature and thus it will "do all it can at the strategic level to avoid firing the first shot" (emphasis added).49 In other places, however, the authors recommend conducting first strikes at the operational and tactical levels, writing that one should "strive to attack first at the campaign and tactical levels in order to maintain the space battlefield initiative" 50 and argue that fighting a quick war with a quick resolution is one of the "special characteristics of space operations" and that a military should "conceal the concentration of its forces and make a decisive large-scale first strike." 51

AT Space Debris

Space Debris will not cause a miscalculated war –advanced sensors, safeguards, and human operators check

Tertrais 17 [Tertrais, Bruno. Summer 2017. "'On The Brink'—Really? Revisiting Nuclear Close Calls Since 1945", THE WASHINGTON QUARTERLY ▪ SUMMER 2017, https://www.frstrategie.org/web/documents/publications/autres/2017/2017-tertrais-twq-on-the-brink.pdf]

At least a dozen real incidents took place in the United States in the 1960s, 1970s, and 1980s. (Even though there is little or no evidence that as many happened in other countries, one should assume that some also occurred in the Soviet Union or elsewhere.)10 In these cases, alert levels were elevated due to a false alarm, generally caused by the malfunction of a technical system. For instance, in 1960 a U.S. early warning radar in Greenland confused the moonrise with a missile launch.11 In 1961, a dysfunctional transmitter made the Strategic Air Command (SAC) believe that its lines of communication had been cut off.12 In 1962, a cascade of minor incidents and misinterpretation led to bombers being put on alert.13 The same year, a rare conjunction of events led a U.S. radar station to believe that a Soviet missile attack was underway.14 Something similar occurred in 1967, when a solar storm jammed three early warning radars.15 In 1980, two incidents caused by faulty computer chips led U.S. authorities to mistakenly believe that a Soviet attack could be underway.16 In the Soviet Union, a well-known 1983 incident of the same sort was recently publicized through a documentary entitled The Man Who Saved The World (2014), according to which "millions of lives were hanging by a thread," and no less than "the end of our civilization" was at stake.17 A more sobering account of the incident casts serious doubts on whether this was actually the case. When the alarm sounded in the Soviet nuclear command center because of a U.S. missile launch, the officer in charge suspected that it was a mistake and requested visual confirmation. Such confirmation never came, and the command thus stood down.18 Some incidents involve direct human errors. This was the case for the infamous magnetic tape mistake of 1979, which went up the chain of command to the U.S. presidency. Woken up by a phone call announcing that 200 missiles were coming in the direction of U.S. territory, National Security Advisor Zbigniew Brzezinski requested a confirmation.19 He was informed a couple of minutes later that ten times that number of missiles had now been detected. The cause was the insertion of a tape used for training and exercises in SAC computers. Nobody knows what President Jimmy Carter would have done had Brzezinski told him that he only had a few minutes to decide, but can one seriously believe that he would have launched a massive counter-strike in the absence of any confirmation that an attack was underway? In a few of these incidents, a real launch caused confusion. In 1980, for instance, the Soviet Union launched four submarine-launched ballistic missiles (SLBMs) as part of an exercise, and a U.S. early warning radar wrongly judged that one of them was going in the direction of the United States. This evaluation was quickly corrected.20 The Norwegian rocket launch of 1995 belongs in the same category and has become another poster child for nuclear dangers. However, the episode should rather be taken as a testimony to Russian cool-headedness. Norwegian and American scientists launched a new type of rocket, the Black Brant XII, in order to study weather data; they had sent word of the launch to Moscow, but the information had not reached the appropriate authorities. Since Black Brant XII was new, large, and with a high-altitude trajectory, its launch was interpreted as a possible missile strike. Some in the general staff raised the hypothesis of a highaltitude electro-magnetic pulse (EMP) detonation. Yeltsin considered an interception, but it soon became clear that Russia was not a target. "After the rocket emerged onto a ballistic curve, the direction of the flight became clear, and we could see that it would in no way touch on Russian territory, but land in the Spitsbergen region—we calmed down and took no serious measures … "21 Generals Vladimir Dvorkin, a well-known Russian expert, and Eugene Habiger, former head of STRATCOM, denied that the incident had any character of gravity.22 The System Worked Based on the above examples, one must wonder: is luck a necessary hypothesis to explain why none of these events led to nuclear war? Is it not at least equally possible that since 1945, people in charge of nuclear weapons "have taken greater care [of them] than is taken in any other situation involving human agents and complex mechanical systems"? 23 Nuclear-armed countries have set up mechanisms designed to ensure that nuclear weapons will not be used by mistake. This includes fail-safe procedures (where non-use remains the default condition up until the last possible moment) as well as dual phenomenology (the need to confirm the attack by two independent means relying on different physical principles). When The Man Who Saved The World was shown in New York City, the Russian mission to the United Nations issued a communiqué that stated: "Under no circumstances a decision to use nuclear weapons could be made or even considered in the Soviet Union (Russia) or in the United States on the basis of data from a single source or a system. For this to happen, a confirmation is necessary from several systems: ground-based radars, early-warning satellites, intelligence reports, etc." 24 In all the incidents mentioned above, safety mechanisms worked, even in the early 1960s when they were still rudimentary. Furthermore, is it credible to imagine that the head of a State or government would order a nuclear strike without being certain that a major military attack was underway? U.S. nuclear expert Jeffrey G. Lewis rightly argues that he cannot imagine that an American president would embark in nuclear reprisals if there was the slightest doubt on the reality of the attack.25 Retired Russian General Vladimir Dvorkin thinks similarly, claiming that "No president, no matter what president it is, will ever make a decision about launch-onwarning based on information about one rocket or missile or even … two or three missiles." 26 From the point of view of logic and complex systems analysis, it remains possible that a combination of incidents can lead to the failure of all safety mechanisms designed to prevent accidental nuclear war. Such a thesis is embodied by the classic work of Scott D. Sagan, The Limits of Safety. It would thus only be "a matter of time" due to cumulative probabilities.27 In a recent documentary about nuclear risks, author Eric Schlosser reiterates the point: "it's also due to luck, pure luck, and the problem with luck is that eventually it runs out … Every machine ever invented eventually goes wrong." 28 But the probability of failure increases markedly with time only if conditions do not change—and conditions do change**. Safety mechanisms have been perfected** (without necessarily becoming more complex) and lessons of past incidents are being learned. Sagan claimed in 1993 that the Yom Kippur war (see below), as well as the 1979 and 1980 incidents (see above), are proof that organizations fail to learn from experience. But if that was the case, why would the number of known incidents have

significantly declined since 1983? We only know of one significant incident in nearly 35 years: the Black Brant XII episode. Charles Perrow, the father of "normal accidents" theory (those resulting from the complexity and interconnection of systems), wrote: "with regard to firing [nuclear weapons] after a false warning we reach a surprising conclusion, one I was not prepared for: because of the safety systems involved in a launchon-warning scenario, it is virtually impossible for wellintended actions to bring about an accidental attack." 29

No collisions

Albrecht 16 [Abrecht, Mark. "Op-ed | Congested space is a serious problem solved by hard work, not hysteria", SpaceNews, May 9th 2016, https://spacenews.com/op-ed-congested-space-is-a-serious-problem-solved-by-hard-work-not-hysteria/]

Popular culture has embraced the risks of collisions in space in films like Gravity. Some participants have dramatized the issue by producing graphics of Earth and its satellites, which make our planet look like a fuzzy marble, almost obscured by a dense cloud of white pellets meant to conceptualize space congestion. Unfortunately, for the sake of a good visual, satellites are depicted as if they were hundreds of miles wide, like the state of Pennsylvania (for the record, there are no space objects the size of Pennsylvania in orbit). Unfortunately, this is the rule, not the exception, and almost all of these articles, movies, graphics, and simulations are exaggerated and misleading. **Space debris and collision risk is real, but it certainly is not a crisis.** So what are the facts? On the positive side, space is empty and it is vast. At the altitude of the International Space Station, one half a degree of Earth longitude is almost 40 miles long. That same one half a degree at geostationary orbit, some 22,000 miles up is over 230 miles long. Generally, we don't intentionally put satellites closer together than one-half degree. That means at geostationary orbit, they are no closer than 11 times as far as the eye can see on flat ground or on the sea: That's the horizon over the horizon 10 times over. In addition, other than minute forces like solar winds and sparse bits of atmosphere that still exist 500 miles up, nothing gets in the way of orbiting objects and they behave quite predictably. The location of the smallest spacecraft can be predicated within a 1,000 feet, 24 hours in advance. Since we first started placing objects into space there have been [eleven] known low Earth orbit collisions, and three known collisions at geostationary orbit. Think of it: 135 space shuttle flights, all of the Apollo, Gemini and Mercury flights, hundreds of telecommunications satellites, [thirteen hundred] functioning satellites on orbit today, half a million total objects in space larger than a marble, and fewer than 15 known collisions. Why do people worry?

International Treaties and regulations solves any problem for space debris

Wall 19 [Mike Wall, Ph.D, Space.com Senior Space Writer, "Space Junk Menace: New Guidelines Urged to Help Fight Orbital Debris Threat", Space.com, Oct 15th 2019, https://www.space.com/space-junk-threat-satellites-guidelines-reduce-orbital-debris.html]

But we can stave off the Kessler syndrome — or at least minimize the odds that it happens anytime soon — if spacecraft builders and operators follow a few simple rules, according to the Space Safety Coalition (SSC). The SSC, a newly established group of space-industry stakeholders, laid out those proposed voluntary guidelines last month in a document called "Best Practices for the Sustainability of Space Operations." There are space-junk mitigation guidelines on the books already, which were drawn up by the Inter-Agency Space Debris Coordination Committee and the United Nations Committee on the Peaceful Uses of Outer Space. But those guidelines were last revised in 2007, the SSC noted. "Plans to increase our space population with more cubesats and other small satellites, as well as new, large constellations of satellites, were not envisioned when the above-mentioned guidelines and standards were established," the new "best practices" document states. "These new planned

spacecraft and constellations, coupled with improvements in space situational awareness, space operations and spacecraft design, all **provide an opportunity to expand upon established space operations and orbital debris mitigation** guidelines and best practices." One of the key new recommendations is that all spacecraft that operate at an altitude above 250 miles (400 kilometers) should feature a propulsion system that allows them to maneuver their way out of potential collisions. That's a natural dividing line, Scott said; the International Space Station circles at about that altitude, and nobody wants out-of-control satellites falling back to Earth through the orbiting lab's path. Also, below 250 miles, there's enough atmosphere to create significant drag on spacecraft, causing them to deorbit relatively quickly when their operational lives are over. (The space community could designate the below-250-mile region an "experimental zone," Scott wrote in a recent blog post. Such a move would keep space "affordable for operators of the growing number of inexpensive, experimental or educational cubesats," he wrote.) The SSC also recommends that satellite designers consider building encryption into their command and control systems, so that spacecraft cannot be hijacked by hackers intent on causing havoc in orbit. And the best practices include anti-littering guidelines. For example, the handlers of satellites that operate in low-Earth orbit should include in their launch contracts a requirement that rocket upper stages be disposed of promptly, via a controlled reentry into Earth's atmosphere. As of today (Oct. 15), 31 space-industry stak**eholders have endorsed the new guidelines. And there are some big names in that group, including Maxar** (the parent company of satellite operator DigitalGlobe and the spacecraft manufacturer SSL, among other subsidiaries), On**eWeb, Rocket Lab, Iridium, SES and Intelsat.** "You don't want to wait for a disaster before you take action," Scott said. "It really is time, and you're seeing operators like Maxar and OneWeb being proactive."

No debris risk to military satellites; Comm Sats are in GEO --- Safe from collisions

Burns 13 [Burns, Corrinne. November 2013, “Space junk apocalypse: just like Gravity?” The Guardian, https://www.theguardian.com/science/blog/2013/nov/15/space-junk-apocalypse-gravity]

Fortunately, communications satellites are, in the main, situated high up in geosynchronous orbit (GEO), whereas the risk of collisions lies mainly in the much lower, and more crowded, low Earth orbit (LEO).

AT Miscalculation/Space War

No space war--- interdependence and deterrence check.

Bragg et. al 18 [Bragg, Allison et. al. July 2018, "Contested Space Operations, Space Defense, Deterrence, and Warfighting: Summary Findings and Integration Report," NSI, https://nsiteam.com/social/wp-content/uploads/2018/11/Space-SMA-Integration-Report-Space-FINAL.pdf]

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

No space war

Zarybnisky 18 [Zarybnisky, Eric J., MA in National Security Studies from the Naval War College, PhD in Operations Research from the MIT Sloan School of Management, Lt Col, USAF, "Celestial Deterrence: Deterring Aggression in the Global Commons of Space", 3-28, https://apps.dtic.mil/dtic/tr/fulltext/u2/1062004.pdf]

PREVENTING AGGRESSION IN SPACE While deterrence and the Cold War are strongly linked in the public's mind through the nuclear standoff between the United States and the Soviet Union, the fundamentals of deterrence date back millennia and deterrence remains relevant. Thucydides alludes to the concept of deterrence in his telling of the Peloponnesian War when he describes rivals seeking advantages, such as recruiting allies, to dissuade an adversary from starting or expanding a conflict.6F6 Aggression in space was successfully avoided during the Cold War because both sides viewed an attack on military satellites as highly escalatory, and such an action would likely result in general nuclear war.7F7 In today's more nuanced world, **attacking satellites, including military satellites, does not necessarily result in nuclear war**. For instance, foreign countries have used high-powered lasers against American intelligence-gathering satellites8F8 and the United States has been reluctant to respond, let alone retaliate with nuclear weapons. This

shift in policy is a result of the broader use of gray zone operations, to which countries struggle to respond while limiting escalation. Beginning with the fundamentals of deterrence illuminates how it applies to prevention of aggression in space.

No miscalculation—safety systems, caution, and ground radars check

Tertrais 17 [Tertrais, Bruno. Summer 2017. "'On The Brink'—Really? Revisiting Nuclear Close Calls Since 1945", THE WASHINGTON QUARTERLY ▪ SUMMER 2017, https://www.frstrategie.org/web/documents/publications/autres/2017/2017-tertrais-twq-on-the-brink.pdf]

At least a dozen real incidents took place in the United States in the 1960s, 1970s, and 1980s. (Even though there is little or no evidence that as many happened in other countries, one should assume that some also occurred in the Soviet Union or elsewhere.)10 In these cases, alert levels were elevated due to a false alarm, generally caused by the malfunction of a technical system. For instance, in 1960 a U.S. early warning radar in Greenland confused the moonrise with a missile launch.11 In 1961, a dysfunctional transmitter made the Strategic Air Command (SAC) believe that its lines of communication had been cut off.12 In 1962, a cascade of minor incidents and misinterpretation led to bombers being put on alert.13 The same year, a rare conjunction of events led a U.S. radar station to believe that a Soviet missile attack was underway.14 Something similar occurred in 1967, when a solar storm jammed three early warning radars.15 In 1980, two incidents caused by faulty computer chips led U.S. authorities to mistakenly believe that a Soviet attack could be underway.16 In the Soviet Union, a well-known 1983 incident of the same sort was recently publicized through a documentary entitled The Man Who Saved The World (2014), according to which "millions of lives were hanging by a thread," and no less than "the end of our civilization" was at stake.17 A more sobering account of the incident casts serious doubts on whether this was actually the case. When the alarm sounded in the Soviet nuclear command center because of a U.S. missile launch, the officer in charge suspected that it was a mistake and requested visual confirmation. Such confirmation never came, and the command thus stood down.18 Some incidents involve direct human errors. This was the case for the infamous magnetic tape mistake of 1979, which went up the chain of command to the U.S. presidency. Woken up by a phone call announcing that 200 missiles were coming in the direction of U.S. territory, National Security Advisor Zbigniew Brzezinski requested a confirmation.19 He was informed a couple of minutes later that ten times that number of missiles had now been detected. The cause was the insertion of a tape used for training and exercises in SAC computers. Nobody knows what President Jimmy Carter would have done had Brzezinski told him that he only had a few minutes to decide, but can one seriously believe that he would have launched a massive counter-strike in the absence of any confirmation that an attack was underway? In a few of these incidents, a real launch caused confusion. In 1980, for instance, the Soviet Union launched four submarine-launched ballistic missiles (SLBMs) as part of an exercise, and a U.S. early warning radar wrongly judged that one of them was going in the direction of the United States. This evaluation was quickly corrected.20 The Norwegian rocket launch of 1995 belongs in the same category and has become another poster child for nuclear dangers. However, the episode should rather be taken as a testimony to Russian cool-headedness. Norwegian and American scientists launched a new type of rocket, the Black Brant XII, in order to study weather data; they had sent word of the launch to Moscow, but the information had not reached the appropriate authorities. Since Black Brant XII was new, large, and with a high-altitude trajectory, its launch was interpreted as a possible missile strike. Some in the general staff raised the hypothesis of a highaltitude electro-magnetic pulse (EMP) detonation. Yeltsin considered an interception, but it soon became clear that Russia was not a target. "After the rocket emerged onto a ballistic curve, the direction of the flight became clear, and we could see that it would in no way touch on Russian territory, but land in the Spitsbergen region—we calmed down and took no serious measures … "21 Generals Vladimir Dvorkin, a well-known Russian expert, and Eugene Habiger, former head of STRATCOM, denied that the incident had any character of gravity.22 The System Worked Based on the above examples, one must wonder: is luck a necessary hypothesis to explain why none of these events led to nuclear war? Is it not at least equally possible that since 1945, people in charge of nuclear weapons "have taken greater care [of them] than is taken in any other situation involving human agents and complex mechanical systems"? 23 Nuclear-armed countries have set up mechanisms designed to ensure that nuclear weapons will not be used by mistake. This includes fail-safe procedures (where non-use remains the default condition up until the last possible moment) as well as dual phenomenology (the need to confirm the attack by two independent means relying on different physical principles). When The Man Who Saved The World was shown in New York City, the Russian mission to the United Nations issued a communiqué that stated: "Under no circumstances a decision to use nuclear weapons could be made or even considered in the Soviet Union (Russia) or in the United States on the basis of data from a single source or a system. For this to happen, a **confirmation is necessary from several systems: ground-based radars, early-warning satellites, intelligence reports, etc." 24 In all the incidents mentioned above, safety mechanisms worked**, even in the early 1960s when they were still rudimentary. Furthermore, is it credible to imagine that the head of a State or government would order a nuclear strike without being certain that a major military attack was underway? U.S. nuclear expert Jeffrey G. Lewis

rightly argues that he cannot imagine that an American president would embark in nuclear reprisals if there was the slightest doubt on the reality of the attack.25 Retired Russian General Vladimir Dvorkin thinks similarly, claiming that "No president, no matter what president it is, will ever make a decision about launch-onwarning based on information about one rocket or missile or even … two or three missiles." 26 From the point of view of logic and complex systems analysis, it remains possible that a combination of incidents can lead to the failure of all safety mechanisms designed to prevent accidental nuclear war. Such a thesis is embodied by the classic work of Scott D. Sagan, The Limits of Safety. It would thus only be "a matter of time" due to cumulative probabilities.27 In a recent documentary about nuclear risks, author Eric Schlosser reiterates the point: "it's also due to luck, pure luck, and the problem with luck is that eventually it runs out … Every machine ever invented eventually goes wrong." 28 But the probability of failure increases markedly with time only if conditions do not change—and conditions do change. Safety mechanisms have been perfected (without necessarily becoming more complex) and lessons of past incidents are being learned. Sagan claimed in 1993 that the Yom Kippur war (see below), as well as the 1979 and 1980 incidents (see above), are proof that organizations fail to learn from experience. But if that was the case, why would the number of known incidents have significantly declined since 1983? We only know of one significant incident in nearly 35 years: the Black Brant XII episode. Charles Perrow, the father of "normal accidents" theory (those resulting from the complexity and interconnection of systems), wrote: "with regard to firing [nuclear weapons] after a false warning we reach a surprising conclusion, one I was not prepared for: **because of the safety systems involved in a launchon-warning scenario, it is virtually impossible for wellintended actions to bring about an accidental attack." 29**

AT Radiation

No impact to plutonium radiation

Zielinski 14 [Zielinski, Sarah. 01-07-2014, "Plutonium From Nuclear Tests Lingers in the Atmosphere" Smithsonian, https://www.smithsonianmag.com/science-nature/plutonium-from-nuclear-tests-lingers-in-the-atmosphere-180948081/]

Particles of radioactive plutonium from nuclear testing have remained high in the stratosphere for more than 50 years, and volcanic eruptions such as Iceland's Eyjafjallajökull in 2010 can bring those particles into the lower atmosphere, researchers report January 7 in Nature Communications. They caution, however, that the concentrations of particles in the lower atmosphere are small and do not threaten human health. Between 1945 and 1998, nations around the world tested nuclear weapons underground, underwater and high in the atmosphere. The atmospheric tests, conducted in the 1950s, 1960s and 1970s—along with the burn-up of a plutonium-powered SNAP-9A satellite in 1964—created radioactive debris that became attached to particles in the air, called aerosols. In the troposphere—the lowest part of the atmosphere extending from the ground to about 17 to 20 kilometers up—these particles washed out within weeks to months. But a combination of factors, such as the barrier-like tropopause, keep the particles in the stratosphere (the next layer up, extending to about 50 kilometers) for longer. But how long? Studies done in the 1960s and 1970s, in which aerosols were sampled with aircraft and balloons, showed that most radioactive particles lingered in the stratosphere for about one to four years. Larger particles, those in the range of one to 10 micrometers settled even faster, last only weeks to months in the stratosphere. (The particles didn't just disappear; they moved down into the troposphere during interruptions in the tropopause that allow mixing between the troposphere and stratosphere, events that happen most often in spring.) Because nuclear tests were conducted so long ago, all these radioactive stratospheric particles should mostly be gone by now, scientists had concluded. The 2010 eruption of Eyjafjallajökull started scientists to think that those conclusions might be wrong. When the volcano erupted, researchers in Switzerland began taking aerosol samples from the troposphere, and they found elevated concentrations of radioactive particles. Levels of plutonium and cesium (another byproduct of nuclear testing) were up to three orders of magnitude higher than levels found in aerosols at ground level. These measurements contradicted the earlier aerosol studies, which had found low levels throughout the troposphere; something was up. José Corcho Alvarado of Lausanne University Hospital and colleagues gathered aerosol data that had been collected by military aircraft over Switzerland for most years starting in the 1970s until 2004 along with similar data collected as the ash plume from Eyjafjallajökull traveled over the country in 2010. They then used this data to create a model of the distribution of radioactive particles in the atmosphere over Switzerland from 1970 to the present. The majority of the plutonium in the stratosphere, they calculated based on concentrations and decay rates, must have been deposited there between 1964 and 1982. That's consistent with the assumption that nuclear testing and the satellite breakup are the biggest sources of radioactive particles in the atmosphere. The plutonium remains in the stratosphere for an average of 2.5 to 5 years, their model revealed, but a small amount remains circulating in the stratosphere. "Our results show that significant fractions of radioactive aerosols…remain in the stratosphere for timescales of the order of several decades," the researchers write. As for how the radioactive plutonium likely ended up in the volcano's ash plume, here's what the researchers propose: The eruption caused thousands of tons of molten rock to come into contact with ice. That interaction created a huge explosion that threw steam and particles into the air, pushing fine-grained ash and gases such as sulfur dioxide into the lower regions of the stratosphere. The ash and sulfur particles picked up plutonium and cesium from the stratosphere and brought the radioactive elements down into the troposphere. "The strong volcanic eruption of the Eyjafjallajökull volcano has redistributed anthropogenic radionuclides [radioactive particles from human activities] in the lower atmosphere," the researchers write. It's not enough radioactivity for people to worry about—someone born after the tests were done isn't going to get cancer from plutonium particles in the stratosphere. But it may be enough to help scientists who study the movement of particles through the atmosphere because the radioactive particles act like markers of how air circulates.