### 1

#### Private space appropriation is uniquely key to ensuring ongoing innovation towards space exploration and colonization.

**Cheng 20** [Dean Cheng, 09-16-2020, "Outer Space and Private Property," Heritage Foundation, https://www.heritage.org/space-policy/commentary/outer-space-and-private-property]//DDPT

Fully 53 years after the Outer Space Treaty, however, this has begun to change. The success of SpaceX, Blue Origin, Virgin Galactic, and other private companies has led to what has been termed Space 2.0.

The Obama administration’s decision to rely on commercial space-launch services to resupply the International Space Station opened the door to expanding private enterprise’s role in space.

The innovation exhibited in the various Falcon launches, including the ability to reuse the booster rockets, has seen a significant drop in the cost of placing payloads into orbit. As a result, a real opportunity exists for companies to begin thinking about how to use space not simply to improve terrestrial operations, but to make money from space and its physical resources.

The uncertainty associated with private property rights, however, has had a constraining effect on the ability to exploit space more extensively. Companies are unlikely to be willing to risk capital and assets if they are not sure that they will be able to profit from their investments.

#### The private sector is the key internal link to space exploration and colonization.

**Sharma 9/7** [Maanas Sharma, 9-7-2021, "The Space Review: The privatized frontier: the ethical implications and role of private companies in space exploration," The Space Review, https://www.thespacereview.com/article/4238/1]//DDPT

In recent years, private companies have taken on a larger role in the space exploration system. With lower costs and faster production times, they have displaced some functions of government space agencies. Though many have levied criticism against privatized space exploration, it also allows room for more altruistic actions by government space agencies and the benefits from increased space exploration as a whole. Thus, we should encourage this development, as the process is net ethical in the end. Especially if performed in conjunction with adequate government action on the topic, private space exploration can overcome possible shortcomings in its risky and capitalistic nature and ensure a positive contribution to the general public on Earth.

The implications of commercial space exploration have been thrust into the limelight with the successes and failures of billionaire Elon Musk’s company SpaceX. While private companies are not new to space exploration, their prominence in American space exploration efforts has increased rapidly in recent years, fueled by technological innovations, reductions in cost, and readily available funding from government and private sources.[1] In May 2020, SpaceX brought American astronauts to space from American soil for the first time in almost 10 years.[2] Recognizing the greatly reduced costs of space exploration in private companies, NASA’s budget has shifted to significantly relying on private companies.[3] However, private space companies are unique from government space agencies in the way they experience unique sets of market pressures that influence their decision-making process. Hence, the expansion of private control in the space sector turns into a multifaceted contestation of its ethicality.

The most obvious ethical concern is the loss of human life. Critics contend that companies must answer to their shareholders and justify their profits. This contributes to a larger overall psyche that prioritizes cost and speed above all else, resulting in significantly increased risks.[4] However, the possible increase in mishaps is largely overstated. Companies recognize the need for safety aboard their expeditions themselves.[5] After all, the potential backlash from a mishap could destroy the company’s reputation and significantly harm their prospects. According to Dr. Nayef Al-Rodhan, Head of the Geneva Centre for Security Policy’s Geopolitics and Global Futures Programme, “because there were no alternatives to government space programs, accidents were seen to some degree as par for the course… By comparison, private companies actually have a far more difficult set of issues to face in the case of a mishap. In a worst case scenario, a private company could make an easy scapegoat.” [6]

Another large ethical concern is the prominence capitalism may have in the future of private space exploration and the impacts thereof. The growth of private space companies in recent years has been closely intertwined with capitalism. Companies have largely focused on the most profitable projects, such as space travel and the business of space.[7] Many companies are funded by individual billionaires, such as dearMoon, SpaceX’s upcoming mission to the Moon.[8] Congress has also passed multiple acts for the purpose of reducing regulations on private space companies and securing private access to space. From this, many immediately jump to the conclusion that capitalism in space will recreate the same conditions in outer space that plague Earth today, especially with the increasing push to create a “space-for-space” economy, such as space tourism and new technologies to mine the Moon and asteroids. Critics, such as Jordan Pearson of VICE, believe that promises of “virtually unlimited resources” are only for the rich, and will perpetuate the growing wealth inequality that plagues the world today.[9]

However, others contend that just because private space exploration has some capitalist elements, it is by no means an embodiment of unrestricted capitalism. A healthy balance of restricted capitalism—for example, private space companies working through contracts with government agencies or independently under monitoring and regulation by national and international agreements—will avoid the pitfalls that capitalist colonialism faced down here on Earth. Even those who are generally against excessive government regulation should see the benefits of them in space. Lacking any consensus on definitions and rights in space will create undue competition between corporations as well as governments that will harm everyone rather than helping anyone. To create a conducive environment for new space-for-space exploration, one without confrontation but with protection for corporate astronauts, infrastructure, and other interests, governments must create key policies such as a framework for property rights on asteroids, the Moon, and Mars.[7,10]

Another key matter to note is restricted capitalism in space “could also be our salvation.”[11] Private space exploration could reap increased access to resources and other benefits that can be used to solve the very problems on Earth that critics of capitalism identify. Since governments offset some of their projects to private companies, government agencies can focus on altruistic projects that otherwise would not fit in the budget before and do not have the immediate commercial use that private companies look for. Scott Hubbard, an adjunct professor of aeronautics and astronautics at Stanford University, discusses how “this strategy allows the space agency to continue ‘exploring the fringe where there really is no business case’” but still has important impacts on people down on Earth.[12]

Indeed, this idea is a particularly powerful one when considering the ideal future of private companies in space exploration. Though there is no one set way governments will interact with companies, the consensus is that they must radically reimagine their main purpose as the role of private space exploration continues to grow. As governments utilize services from private space companies, “[i]nstead of being bogged down by the routine application of old research, NASA can prioritize their limited budget to work more on research of other unknowns and development of new long-term space travel technologies.”[13] According to the Council on Foreign Relations, such technologies have far-reaching benefits on Earth as well. Past developments obviously include communications satellites, by themselves a massive benefit to society, but also “refinements in artificial hearts; improved mammograms; and laser eye surgery… thermoelectric coolers for microchips; high-temperature lubricants; and a means for mass-producing carbon nanotubes, a material with significant engineering potential; [and h]ousehold products.”[2] Agencies like NASA are the only actors able to pursue the next game-changing missions, “where the profit motive is not as evident and where the barriers to entry are still too high for the private sector to really make a compelling business case.”[8] These technologies have revolutionized millions, if not billions, of lives, demonstrating the remarkable benefits of space exploration. It follows then that it is net ethical to prioritize these benefits.

This report concludes that the private sector, indeed, has a prominent role to play in the future of space exploration. Further, though private space exploration does bring the potential of increased danger and the colonization of space, these concerns can be effectively mitigated. Namely, strong government frameworks—particularly international ones—will minimize possible sources of ethical violations and ensure an optimal private sector role in space. This also allows government agencies to complete significantly more difficult, innovative projects which have transformative benefits for life on Earth.

#### Space exploration solves extinction and endless resource wars.

Collins 10 [Patrick Collins, professor of economics at Azabu University in Japan, and a Collaborating Researcher with the Institute for Space & Astronautical Science, as well as adviser to a number of companies, Adriano V. Autino is President of the Space Renaissance International; Manager, CEO/CTO, Systems Engineering Consultant / Trainer at Andromeda Systems Engineering LLC; and Supplier of methodological tools and consultancy at Intermarine S.p.A, Acta Astronautica, Volume 66, Issues 11–12, June–July 2010, “What the growth of a space tourism industry could contribute to employment, economic growth, environmental protection, education, culture and world peace”, Pages 1553–1562]

7. World peace and preservation of human civilisation

The major source of social friction, including international friction, has surely always been unequal access to resources. People fight to control the valuable resources on and under the land, and in and under the sea. The natural resources of Earth are limited in quantity, and economically accessible resources even more so. As the population grows, and demand grows for a higher material standard of living, industrial activity grows exponentially. The threat of resources becoming scarce has led to the concept of “Resource Wars”. Having begun long ago with wars to control the gold and diamonds of Africa and South America, and oil in the Middle East, the current phase is at centre stage of world events today [37]. A particular danger of “resource wars” is that, if the general public can be persuaded to support them, they may become impossible to stop as resources become increasingly scarce. Many commentators have noted the similarity of the language of US and UK government advocates of “war on terror” to the language of the novel “1984” which describes a dystopian future of endless, fraudulent war in which citizens are reduced to slaves.

7.1. Expansion into near-Earth space is the only alternative to endless “resource wars”

As an alternative to the “resource wars” already devastating many countries today, opening access to the unlimited resources of near-Earth space could clearly facilitate world peace and security. The US National Security Space Office, at the start of its report on the potential of space-based solar power (SSP) published in early 2007, stated: “Expanding human populations and declining natural resources are potential sources of local and strategic conflict in the 21st Century, and many see energy as the foremost threat to national security” [38]. The report ended by encouraging urgent research on the feasibility of SSP: “Considering the timescales that are involved, and the exponential growth of population and resource pressures within that same strategic period, it is imperative that this work for “drilling up” vs. drilling down for energy security begins immediately” [38].

Although the use of extra-terrestrial resources on a substantial scale may still be some decades away, it is important to recognise that simply acknowledging its feasibility using known technology is the surest way of ending the threat of resource wars. That is, if it is assumed that the resources available for human use are limited to those on Earth, then it can be argued that resource wars are inescapable [22] and [37]. If, by contrast, it is assumed that the resources of space are economically accessible, this not only eliminates the need for resource wars, it can also preserve the benefits of civilisation which are being eroded today by “resource war-mongers”, most notably the governments of the “Anglo-Saxon” countries and their “neo-con” advisers. It is also worth noting that the $1 trillion that these have already committed to wars in the Middle-East in the 21st century is orders of magnitude more than the public investment needed to aid companies sufficiently to start the commercial use of space resources.

Industrial and financial groups which profit from monopolistic control of terrestrial supplies of various natural resources, like those which profit from wars, have an economic interest in protecting their profitable situation. However, these groups’ continuing profits are justified neither by capitalism nor by democracy: they could be preserved only by maintaining the pretence that use of space resources is not feasible, and by preventing the development of low-cost space travel. Once the feasibility of low-cost space travel is understood, “resource wars” are clearly foolish as well as tragic. A visiting extra-terrestrial would be pityingly amused at the foolish antics of homo sapiens using long-range rockets to fight each other over dwindling terrestrial resources—rather than using the same rockets to travel in space and have the use of all the resources they need!

7.2. High return in safety from extra-terrestrial settlement

Investment in low-cost orbital access and other space infrastructure will facilitate the establishment of settlements on the Moon, Mars, asteroids and in man[/woman]-made space structures. In the first phase, development of new regulatory infrastructure in various Earth orbits, including property/usufruct rights, real estate, mortgage financing and insurance, traffic management, pilotage, policing and other services will enable the population living in Earth orbits to grow very large. Such activities aimed at making near-Earth space habitable are the logical extension of humans’ historical spread over the surface of the Earth. As trade spreads through near-Earth space, settlements are likely to follow, of which the inhabitants will add to the wealth of different cultures which humans have created in the many different environments in which they live.

Success of such extra-terrestrial settlements will have the additional benefit of reducing the danger of human extinction due to planet-wide or cosmic accidents [27]. These horrors include both man-made disasters such as nuclear war, plagues or growing pollution, and natural disasters such as super-volcanoes or asteroid impact. It is hard to think of any objective that is more important than preserving peace. Weapons developed in recent decades are so destructive, and have such horrific, long-term side-effects that their use should be discouraged as strongly as possible by the international community. Hence, reducing the incentive to use these weapons by rapidly developing the ability to use space-based resources on a large scale is surely equally important [11] and [16]. The achievement of this depends on low space travel costs which, at the present time, appear to be achievable only through the development of a vigorous space tourism industry.

### 2

#### Commercial Space Race favors American Companies that cements space dominance – shift away endangers our lead – losing green-lights Chinese Dominance across the board.

Autry and Kwast 19 Greg Autry and Steve Kwast 8-22-2019 "America Is Losing the Second Space Race to China" (Greg Autry, a clinical professor of space leadership, policy, and business at Arizona State University’s Thunderbird School of Global Management, and Steve Kwast)//Elmer

America Is Losing the Second Space Race to China The private sector can give the United States a much-needed rocket boost. The current U.S. space defense strategy is inadequate and on a path to failure. President Donald Trump’s vision for a Space Force is big enough. As he said on June 18, “It is not enough to merely have an American presence in space. We must have American dominance in space.” But the Air Force is not matching this vision. Instead, the leadership is currently focused on incremental improvements to existing equipment and organizational structures. Dominating the vast and dynamic environment of space will require revolutionary capabilities and resources far deeper than traditional Department of Defense thinking can fund, manage, or even conceive of. Success depends on a much more active partnership with the commercial space industry— and its disruptive capabilities. U.S. military space planners are preparing to repeat a conflict they imagined back in the 1980s, which never actually occurred, against a vanished Soviet empire. Meanwhile, China is executing a winning strategy in the world of today. It is burning hard toward domination of the future space markets that will define the next century. They are planning infrastructure in space that will control 21st-century telecommunications, energy, transportation, and manufacturing. In doing so, they will acquire trillion-dollar revenues as well as the deep capabilities that come from continuous operational experience in space. This will deliver space dominance and global hegemony to China’s authoritarian rulers. Despite the fact that many in the policy and intelligence communities understand exactly what China is doing and have been trying to alert leadership, Air Force leadership has convinced the White House to fund only a slightly better satellite command with the same leadership, while sticking a new label onto their outmoded thinking. A U.S. Space Force or Corps with a satellite command will never fulfill Trump’s call to dominate space. Air Force leadership is demonstrating the same hubris that Gen. George Custer used in convincing Congress, over President Ulysses S. Grant’s better experience intuition, that he could overtake the Black Hills with repeating rifles and artillery. That strategy of technological overconfidence inflamed conflict rather than subduing it, and the 7th Cavalry were wiped out at the Battle of the Little Bighorn. The West was actually won by the settlers, ranchers, miners, and railroad barons who were able to convert the wealth of the territory itself into the means of holding it. They laid the groundwork that made the 20th century the American Century and delivered freedom to millions of people in Europe and Asia. Of course, they also trampled the indigenous people of the American West in their wake—but empty space comes with no such bloody cost. The very emptiness and wealth of this new, if not quite final, frontier, however, means that competition for resources and strategic locations in cislunar space (between the Earth and moon) will be intense over the next two decades. The outcome of this competition will determine the fate of humanity in the next century. China’s impending dominance will neutralize U.S. geopolitical power by allowing Beijing to control global information flows from the high ground of space. Imagine a school in Bolivia or a farmer in Kenya choosing between paying for a U.S. satellite internet or image provider or receiving those services for free as a “gift of the Chinese people.” It will be of little concern to global consumers that the news they receive is slanted or that searches for “free speech” link to articles about corruption in Western democracies. Nor will they care if concentration camps in Tibet and the Uighur areas of western China are obscured, or if U.S. military action is presented as tyranny and Chinese expansion is described as peacekeeping or liberation. China’s aggressive investment in space solar power will allow it to provide cheap, clean power to the world, displacing U.S. energy firms while placing a second yoke around the developing world. Significantly, such orbital power stations have dual use potential and, if properly designed, could serve as powerful offensive weapons platforms. China’s first step in this process is to conquer the growing small space launch market. Beijing is providing nominally commercial firms with government-manufactured, mobile intercontinental ballistic missiles they can use to dump launch services on the market below cost. These start-ups are already undercutting U.S. pricing by 80 percent. Based on its previous success in using dumping to take out U.S. developed industries such as solar power modules and drones, China will quickly move upstream to attack the leading U.S. launch providers and secure a global commercial monopoly. Owning the launch market will give them an unsurmountable advantage against U.S. competitors in satellite internet, imaging, and power. The United States can still build a strategy to win. At this moment, it holds the competitive advantage in every critical space technology and has the finest set of commercial space firms in the world. It has pockets of innovative military thinkers within groups like the Defense Innovation Unit, under Mike Griffin, the Pentagon’s top research and development official. If the United States simply protects the intellectual property its creative minds unleash and defend its truly free markets from strategic mercantilist attack, it will not lose this new space race. The United States has done this before. It beat Germany to the nuclear bomb, it beat the Soviet Union to the nuclear triad, and it won the first space race. None of those victories was achieved by embracing the existing bureaucracy. Each of them depended on the president of the day following the only proven path to victory in a technological domain: establish a small team with a positively disruptive mindset and empower that team to investigate a wide range of new concepts, work with emerging technologies, and test innovative strategies. Today that means giving a dedicated Space Force the freedom to easily partner with commercial firms and leverage the private capital in building sustainable infrastructure that actually reduces the likelihood of conflict while securing a better economic future for the nation and the world.

#### Public sector space growth undermines innovation necessary to maintain U.S space dominance.

**Beames 21** [Charles Beames, Charles is currently the Executive Chairman of York Space Systems, a leader in commercial satellite design and manufacturing, as well as Chairman of the SmallSat Alliance. He is also a retired Air Force Colonel, having served 23 years in space & intelligence leadership positions around the world, 9-30-2021, Forbes, "It Is Time Our Government Stops Competing Against The Commercial Space Industry", <https://www.forbes.com/sites/charlesbeames/2021/09/30/it-is-time-our-government-stops-competing-against-the-commercial-space-industry/> accessed on 12-21-2021] Adam

* A2 Public sector fill in
* Also works as a link for the innovation DA

With its fiery engines and impressive reusable rockets, SpaceX is the most visible example of the power of private enterprise in space. Every month, SpaceX makes another great leap further into the stars with another launch and often carrying satellites from other companies. Conservative estimates suggest that tens of thousands more are scheduled to be launched over the next five years to perform missions limited to the providence of major nations only a decade ago.

An outstanding example of an agency leveraging corporate R&D rather than spending its own capital is the Space Development Agency (SDA). When devising its strategy to build the nation’s next-generation missile tracking and communication systems, SDA mandated that the satellites hosting the specialized instruments onboard must be built on an off-the-shelf commodity bus already in rate production. SDA has already awarded four successful companies at a fixed price contract with 10 others deemed competitive, which means we can expect that very little development is required.

Every time the government develops their own version of the same technologies, it inhibits the investment and creative thinking necessary for America’s next big play in space. The boldest and most innovative investors and engineers in the commercial sector shy away from space as a business opportunity when the government insists on staying in the ring, because there are no longer the 10-20X multiples on private investment that commercial opportunities in the tech sector can deliver. Institutional investors do still pour capital into traditional defense companies, especially in times of increasing hostilities. Unfortunately for them, however, the valuation multiples on revenue are far lower – about 2X – and only match the pace of government expansion.

We must rethink the policy incentive structure of last century’s space industrial model to reward unbounded free market economic growth instead of companies whose market cap only grows with more national defense spending. Admittedly, there are instances in which it is still necessary for the government to develop their own satellite, component or rocket, but it is increasingly rare.

The U.S. government once again must transition to become a consumer of commercial space goods and services so that America’s space industry outpaces its adversaries. An organic, commercial space marketplace exists now and must be rewarded, not stifled. We are on a tight schedule, because near-peer competitors like China (and others) are aware of this strategic competition and instead choose to [leverage their nascent technologies to outpace us](https://www.forbes.com/sites/charlesbeames/2020/10/14/the-dragon-is-breathing-down-our-neck-action-is-americas-best-weapon/?sh=67a437724cb5).

The role for the government is larger and more strategic than ever before, but it is our capital markets that are our biggest advantage in Great Power competition. We must maximize this strength by encouraging private investments in the new space economy, promoting competition among commercial providers, and not competing against the very technologies we hope to leverage to secure America’s promising future in space.

#### Hegemony solves Extinction.

Ikenberry 20 John Ikenberry 6-9-2020 “The Next Liberal Order: The Age of Contagion Demands More Internationalism, Not Less” <https://www.foreignaffairs.com/articles/united-states/2020-06-09/next-liberal-order> (Albert G. Milbank Professor of Politics and International Affairs at Princeton University and Global Eminence Scholar at Kyung Hee University, in South Korea)//Elmer

The rivalry between the United States and China will preoccupy the world for decades, and the problems of anarchy cannot be wished away. But for the United States and its partners, a far greater challenge lies in what might be called “the problems of modernity”: the deep, worldwide transformations unleashed by the forces of science, technology, and industrialism, or what the sociologist Ernest Gellner once described as a “tidal wave” pushing and pulling modern societies into an increasingly complex and interconnected world system. Washington and its partners are threatened less by rival great powers than by emergent, interconnected, and cascading transnational dangers. Climate change, pandemic diseases, financial crises, failed states, nuclear proliferation—all reverberate far beyond any individual country. So do the effects of automation and global production chains on capitalist societies, the dangers of the coming revolution in artificial intelligence, and other, as-yet-unimagined upheavals. The coronavirus is the poster child of these transnational dangers: it does not respect borders, and one cannot hide from it or defeat it in war. Countries facing a global outbreak are only as safe as the least safe among them. For better or worse, the United States and the rest of the world are in it together. Past American leaders understood that the global problems of modernity called for a global solution and set about building a worldwide network of alliances and multilateral institutions. But for many observers, the result of these efforts—the liberal international order—has been a failure. For some, it is tied to the neoliberal policies that produced financial crises and rising economic inequality; for others, it evokes disastrous military interventions and endless wars. The bet that China would integrate as a “responsible stakeholder” into a U.S.-led liberal order is widely seen to have failed, too. Little wonder that the liberal vision has lost its appeal. Liberal internationalists need to acknowledge these missteps and failures. Under the auspices of the liberal international order, the United States has intervened too much, regulated too little, and delivered less than it promised. But what do its detractors have to offer? Despite its faults, no other organizing principle currently under debate comes close to liberal internationalism in making the case for a decent and cooperative world order that encourages the enlightened pursuit of national interests. Ironically, the critics’ complaints make sense only within a system that embraces self-determination, individual rights, economic security, and the rule of law—the very cornerstones of liberal internationalism. The current order may not have realized these principles across the board, but flaws and failures are inherent in all political orders. What is unique about the postwar liberal order is its capacity for self-correction. Even a deeply flawed liberal system provides the institutions through which it can be brought closer to its founding ideals. However serious the liberal order’s shortcomings may be, they pale in comparison to its achievements. Over seven decades, it has lifted more boats—manifest in economic growth and rising incomes—than any other order in world history. It provided a framework for struggling industrial societies in Europe and elsewhere to transform themselves into modern social democracies. Japan and West Germany were integrated into a common security community and went on to fashion distinctive national identities as peaceful great powers. Western Europe subdued old hatreds and launched a grand project of union. European colonial rule in Africa and Asia largely came to an end. The G-7 system of cooperation among Japan, Europe, and North America fostered growth and managed a sequence of trade and financial crises. Beginning in the 1980s, countries across East Asia, Latin America, and eastern Europe opened up their political and economic systems and joined the broader order. The United States experienced its greatest successes as a world power, culminating in the peaceful end to the Cold War, and countries around the globe wanted more, not less, U.S. leadership. This is not an order that one should eagerly escort off the stage. Any alternative is worse and causes great power war. The major alternatives to a modernized world order supported by the United States appear unlikely, unappealing, or both. A Chinese-led order, for example, would be an illiberal one, characterized by authoritarian domestic political systems and statist economies that place a premium on maintaining domestic stability. There would be a return to spheres of influence, with China attempting to domi-nate its region, likely resulting in clashes with other regional powers, such as India, Japan, and Vietnam, which would probably build up their conventional or even nuclear forces. A new democratic, rules-based order fashioned and led by medium powers in Europe and Asia, as well as Canada, however attractive a concept, would simply lack the military capacity and domestic political will to get very far. A more likely alternative is a world with little order—a world of deeper disarray. Protectionism, nationalism, and populism would gain, and democracy would lose. Conflict within and across borders would become more common, and rivalry between great powers would increase. Cooperation on global challenges would be all but precluded. If this picture sounds familiar, that is because it increasingly corresponds to the world of today. The deterioration of a world order can set in motion trends that spell catastrophe. World War I broke out some 60 years after the Concert of Europe had for all intents and purposes broken down in Crimea. What we are seeing today resembles the mid-nineteenth century in important ways: the post– World War II, post–Cold War order cannot be restored, but the world is not yet on the edge of a systemic crisis. Now is the time to make sure one never materializes, be it from a breakdown in U.S.-Chinese relations, a clash with Russia, a conflagration in the Middle East, or the cumulative effects of climate change. The good news is that it is far from inevitable that the world will eventually arrive at a catastrophe; the bad news is that it is far from certain that it will not.

#### Specifically, solves Nuclear War – shift causes Transition Wars.

Khalizad 16 Zalmay Khalizad 3-23-2016 “4 Lessons about America's Role in the World” http://nationalinterest.org/feature/4-lessons-about-americas-role-the-world-15574?page=show (former U.S. ambassador to the United Nations, counselor at the CSIS)//Elmer

Ultimately, however, we concluded that the United States has a strong interest in precluding the emergence of another bipolar world—as in the Cold War—or a world of many great powers, as existed before the two world wars. Multipolarity led to two world wars and bipolarity resulted in a protracted worldwide struggle with the risk of nuclear annihilation. To avoid a return such circumstances, Secretary of Defense Dick Cheney ultimately agreed that our objective must be to prevent a hostile power to dominate a “critical region,” which would give it the resources, industrial capabilities and population to pose a global challenge. This insight has guided U.S. defense policy throughout the post–Cold War era. Giving major powers the green light to establish spheres of influence would produce a multipolar world and risk the return of war between the major powers. Without a stabilizing U.S. presence in the Persian Gulf and U.S. relationships with Jordan and the Gulf States, Iran could shut down oil shipments in its supposed sphere of influence. A similar scenario in fact played out during the 1987 “tanker war” of the Iran-Iraq war, which eventually escalated into a direct military conflict between the United States and Iran. Iran’s nuclear program makes these scenarios even more dangerous. The United States can manage the rise and resurgence of great powers like China, Russia and Iran at an acceptable cost without ceding entire spheres of influence. The key is to focus on normalizing the geopolitics of the Middle East, Europe and the Asia-Pacific, which the United States can do by strengthening its transatlantic and transpacific alliances and adapting them to the new, dangerous circumstances on the horizon. The United States should promote a balance of power in key regions while seeking opportunities to reconcile differences among major actors.

### 3

#### Loss of sats leads to ecoonomic collapse

Graff 18 (Garrett M., former editor of Politico Magazine, editor-in-chief of Washingtonian magazine in Washington, D.C., and instructor at Georgetown University in the Masters in Professional Studies Journalism and Public Relations program, WIRED contributing editor, “The New Arms Race Threatening to Explode in Space,” WIRED, August 26, 2018, <https://www.wired.com/story/new-arms-race-threatening-to-explode-in-space>) | Recut MU

For decades, America’s satellites had circled Earth at a largely safe remove from the vicissitudes of geopolitics. An informal global moratorium on the testing of anti-satellite weapons had held since 1985; the intervening decades had been a period of post–Cold War peace—and unquestioned American supremacy—high overhead. During those decades, satellites had become linchpins of the American military apparatus and the global economy. By 2007, ships at sea and warplanes in the air had grown reliant on instant satellite communications with ground stations thousands of miles away. Government forecasters relied on weather satellites; intelligence analysts relied on high-­resolution imagery to anticipate and track adversaries the world over. GPS had become perhaps the single most indispensable global system ever designed by humans—the infrastructure upon which the rest of the world’s infrastructure is based. (Fourteen of the 16 infrastructure sectors designated as critical by the Department of Homeland Security, like energy and financial services, rely on GPS for their operation.) Now, Shelton feared, all those satellites overhead had become so many huge, unarmored, billion-dollar sitting ducks. In the decade since China’s first successful anti-satellite missile test, Shelton’s premonition has largely come true: Everything has changed in space. A secretive, pitched arms race has opened up between the US, China, Russia, and, to a lesser extent, North Korea. The object of the race: to devise more and better ways to quickly cripple your adversary’s satellites. After decades of uncontested US supremacy, multinational cooperation, and a diplomatic consensus on reserving space for peaceful uses, military officials have begun referring to Earth’s orbit as a new “warfighting domain.” On the ground, the military is starting to retrain pilots, ship captains, and ground troops in fail-safe forms of navigation that don’t rely on GPS—like celestial navigation. The US military must relearn how to fight “unwired” and defend itself in space. “We knew how to do that, and somehow we forgot,” General John E. Hyten, the head of US Strategic Command, said in 2015. When former director of national intelligence James Clapper left office at the end of the Obama administration, he told me that the increasing sophistication of America’s adversaries in space was one of the top three strategic threats he worried about. Clapper’s successor, Dan Coats, warned last spring that “Russia and China remain committed to developing capabilities to challenge perceived adversaries in space, especially the United States.” Since he took office, President Trump has dropped numerous hints of the warnings he’s evidently getting from military and intelligence leaders. During a spring livestream with astronauts aboard the International Space Station, he alluded, obliquely and without context, to the “tremendous military applications in space.” And he has repeatedly floated the idea of creating a new branch of the armed forces specifically for celestial combat—culminating last week with a speech out-and-out ordering the Joint Chiefs of Staff to begin developing plans for a new “Space Force.” But if space is indeed becoming a war-­fighting domain, it’s important to understand the stakes, not just for America’s strategic standing but for the species. A Russo-Sino-American space war could very well end with a [destroyed] crippled global economy, inoperable infrastructure, and a planet shrouded by the orbiting fragments of pulverized satellites—which, by the way, could hinder us all on Earth until we figured out a way of cleaning them up. In the aftermath of such a conflict, it might be years before we could restore new constellations of satellites to orbit. Preparing for orbital war has fast become a priority of the US military, but the more urgent priority is figuring out how to prevent it. Growing up in Oklahoma City, William Shelton dreamed of becoming a pilot. He got as far as the Air Force Academy before he discovered his eyes weren’t good enough. So instead he became an astronomical engineer. In 1976 he began serving as a launch facility manager at Vandenberg Air Force Base, the military’s oldest space and missile launch base, perched on the California coast north of Santa Barbara. He arrived just as the Air Force was beginning to understand how crucial space would be to its future: The nation’s first early-warning satellites had been put in orbit with the intention of tracking Soviet missile launches, and satellite imagery was becoming increasingly critical to intelligence gathering. Shelton’s poor eyesight, it turned out, had led him to the center of the Air Force’s new frontier. In August 1990, Shelton, then a young lieutenant colonel, took command of the 2nd Space Operations Squadron in Colorado. When he arrived at his post, the Air Force was busy building a new constellation of satellites—launching new ones from Cape Canaveral in Florida every few months to help fill out what he was told would ultimately be a global system aimed at helping the US improve its navigation and increase the precision of its bombs and missiles. This was the new Global Positioning System, and one of Shelton’s first duties at “2Sops” was to build support and enthusiasm for the new effort. To impress visitors (including the brass), he carried around a demo GPS unit that weighed 10 pounds, cost $3,000, and could tell America’s soldiers, sailors, airmen, and Marines exactly where they were on the surface of the planet. The power of the new system that 2Sops ran was proven faster than anyone imagined. The Gulf War caused a rush of final preparations to get GPS ready for battle. Around 2:30 am on January 17, 1991, GPS-equipped helicopters snuck into Iraq, using the technology to guide themselves through the darkened desert and knock out air defense radars. The first bombing campaign of the war had begun. Reporters marveled at precision-­guided bombs zeroing in on their targets and cruise missiles appearing to turn street corners to hit the right buildings. Shelton had a front-row seat to this transformation. As the technology has improved, so has the precision of GPS. The system originally provided accuracy to within 17 yards; with it, you could pinpoint a specific copse of pine trees. Today, if you’re using a smartphone, it can generally locate an object to within five yards—a resolution fine enough to locate a pair of pine trees within that copse. Soon it could be able to zero in on a pine cone: Research from UC Riverside has demonstrated that the latest tech is reliable to within an inch. And research has shown that 1-millimeter accuracy might be eventually possible—which means that the system could locate an individual seed inside that pine cone. Today, troops on the ground use GPS to navigate foreign streets; drone pilots can program a flight plan from thousands of miles away. And because GPS satellites also house America’s detection system for nuclear detonations, we rely on them to tell us if North Korea launches a nuclear weapon, and to tell our missiles and bombs where to find their targets. “When you look at our American way of war, the strategy is largely underpinned by space assets—navigation, early warning, timing,” Shelton says. And that’s just the military. The creators of GPS probably never intended for the system to become the backbone of daily life, but it has. I visited Colorado while reporting this story and tried to keep tabs on everything I did that relied on GPS. There were the obvious navigational moments—my Uber ride to the airport, my American Airlines flight to Denver, my own Google Maps–guided drive in a rental car to Schriever Air Force Base, outside Colorado Springs. But there were also less obvious instances, like the phone calls I made along the way (cellular networks rely on GPS data to keep their stations synchronized), my stop at the ATM (banks use GPS to track deposits and withdrawals), and the fill-up at the gas station (the credit card system also relies on GPS). Moreover, GPS is no longer the world’s sole geolocating mechanism. Russia, China, and the European Union have now all either deployed or begun working on their own full constellations of navigation satellites, ensuring that they won’t have to rely on the US system. It also means that, in the early moments of a war, it’s a fair bet that satellites—the other guy’s satellites—could be among the first targets. During the Cold War, a US army mountain outpost in the Fulda Gap, the shortest route between East and West Germany, served as an early warning trip wire for a Soviet invasion of Europe. If Russian tanks ever made a surprise attack, NATO planners knew that the soldiers there would likely be the first to find out. Today, the members of 2Sops play a similar role. Deep inside the squat, beige, windowless Building 400 at Schriever Air Force Base—the destination I had plugged into Google Maps during my trip to Colorado—10 people at a time remotely operate the heavenly constellation of GPS satellites that guide Tomahawk cruise missiles to their targets, deliver Lyft passengers to their destinations, and help farmers cultivate their crops. They also watch out for any shocks or attacks on the system. The average GPS operators are in their mid-twenties. During one recent shift, the entire Global Positioning System was being operated by two 19-year-old airmen (who, the Air Force emphasizes, are rigorously trained). Their commander, US Air Force lieutenant colonel Peter Norsky, is in his mid-thirties. Together, they watch over the roughly three dozen GPS satellites, troubleshooting the geolocation system and minding the quirks of each orbiting craft—this one’s damaged solar panels, that one’s balky communications links—as if they were remotely tending a stable full of temperamental horses. As integral as GPS is to daily life, the way it actually works is little understood by most people outside of Schriever Air Force Base. Fundamentally, the function of GPS is to provide the globe with a shared clock. GPS satellites allow phone companies to keep their systems in sync, battleships to chart open waters, and ATMs to time-stamp their transactions by triangulating signals from overhead and measuring how long it takes those signals from different satellites to reach a GPS receiver. The system works by making daily calculations, employing Newtonian physics and Einsteinian relativity, to minutely tweak the time broadcast from each GPS satellite as it moves through space—the high-tech version of tuning your grandfather clock to within 100-­billionths of a second. Time is, after all, relative; as of January, the time in space was 18 seconds ahead of Earth’s “Coordinated Universal Time,” since space doesn’t recognize the leap seconds that scientists add to terrestrial time to account for the planet’s slowing rotation. Additionally, the time-keeping device on each satellite gives a subtly different reading, the result of variations in their atomic clocks, which tell time by measuring the precise oscillations of an atom. (Some GPS satellites use rubidium atoms, which are highly accurate day to day; some use cesium, which is more accurate over long stretches.) Any malfunction in the GPS system threatens to plunge the global economy into chaos. Fortunately those glitches are rare, but they’re not unheard of. On January 25, 2016, one of 2Sops’ flight commanders, Captain Aaron Blain, was awoken by a call from work in the middle of the night. User reports from around the country suggested that the system’s precision had “wobbled,” making measurements increasingly inaccurate. Blain raced to Schriever in his Ford pickup and found that the constellation’s timing was off by about 13 microseconds. It was an infinitesimal number—over 25,000 times shorter than the blink of an eye—but for the finely tuned GPS it was a yawning crevice. Left uncorrected, the glitch could have ricocheted through the global economy, corrupting not just driving directions but stock trades too. Alongside the rest of his team, Blain worked through the night, chugging Mountain Dew. It took about six hours to locate the problem—a single corrupted measurement—and then individually reset the affected satellites. (Russia’s GPS equivalent, known as Glonass, has suffered even more serious issues. In 2014 it went down for 10 hours, but many Glonass receivers can also use GPS as a backup, so the systemic chaos was limited.) 2Sops averted a benign catastrophe that night, but it seems increasingly worried about what China and Russia are doing up in the heavens, out of sight. It recently doubled the number of airmen who oversee the satellites, so one team can run the GPS constellation while another trains to face worst-case scenarios—what the Pentagon refers to as “a contested, degraded, and ­operationally limited environment.” That is, a space war. The New Satellite Arms Race Threatening to Explode in Space In one respect, space is already like a war zone: It’s increasingly shot through with flying shrapnel. By some estimates, there are more than 100 million pieces of debris zipping around in Earth’s orbit. China’s 2007 anti-satellite test is estimated to have created some 150,000 new ones, many too small to be tracked. In 2013, some of those fragments hit a Russian satellite—threatening to add still more debris to the orbital mix. And as commercial ventures like SpaceX and Blue Origin ramp up their space tourism plans, Earth’s orbit is about to get even more crowded with both junk and spacecraft. Scientists say there could be a point at which the density of objects spinning around the planet reaches a threshold—called the Kessler effect—that triggers a runaway cascade of collisions: an entire orbit, in other words, set to Blend. Another tricky thing about space debris is that sometimes it isn’t just debris. A US military program called the Space Surveillance Network carefully tracks and monitors every piece of space junk that’s larger than a softball. That currently amounts to some 20,000 objects—everything from old satellite parts to discarded rocket boosters to a pair of pliers lost during an astronaut’s spacewalk. In 2014, a piece of presumptive space junk known to the US military as Object 2014-28E began to behave strangely. The object, known to be of Russian origin, started to perform complicated maneuvers. “That’s concerning—when you see something that appears to be debris come to life,” Shelton says. Object 2014-28E was, in fact, an autonomous spacecraft capable of veering off course and sidling up to other objects, including American commercial communications satellites. In the years since, Object 2014-28E has been joined by similar space objects of Russian provenance. Analysts fear that they might mark the revival of a Russian program known as Satellite Killer, which was shut down after the Cold War. But it’s difficult, even for US government analysts, to know for certain whether that fear is warranted. The secrecy that surrounds nearly everything space-related makes it hard to assess any adversary’s capabilities. Discerning intentions is especially difficult. “If I wanted to build a satellite that looked very different from its actual mission, that’s not hard to do,” Shelton says. A satellite that maneuvers close to another could be doing a repair job or squaring up for an attack—and it might use the same tools for both. “Small satellites with small grappling arms—they have both military and nonmilitary uses,” says Dean Cheng, who studies China’s military capabilities at the Heritage Foundation. “If I manipulate a satellite’s bits and pieces, I can also rip something out.” The US has also been secretive in developing what may or may not be weapons in space. Last May, the Air Force announced that an unmanned space-shuttle-like vehicle that appears to be classified had completed 718 days orbiting Earth, doing who knows what. As of this May, another OTV was circling the globe, more than 200 days into its mostly classified mission. Todd Harrison, director of the Aerospace Security Project at the Center for Strategic and International Studies in Washington, explains that there are effectively four categories of space weapons: kinetic (aimed at destroying a satellite), nonkinetic (aimed at disabling a satellite without touching it), electromagnetic (aimed at interfering with a satellite’s signals), and cyber (aimed at corrupting the data sent to a satellite). The US tested its own anti-satellite missile in 2008, shooting down an errant spy satellite as it was falling out of orbit. Russia has repeatedly flight-tested a so-called direct ascent weapon, the PL-19 Nudol ballistic missile, which could strike objects in orbit, although it hasn’t conducted a live attack on an orbiting satellite. And in the decade since China shot down its weather satellite in 2007, Beijing has launched multiple ballistic missile tests that extended into orbit. In addition, a trio of Chinese satellites have practiced “close-proximity operations,” similar to those performed by the Russian Object 2014-28E. Anti-satellite weapons form just one part of what China calls shashoujian, or “assassin’s mace” systems, which can be used at the start of an attack to achieve a surprise, decisive advantage over a technologically superior foe. There’s also the growing challenge of cyberattacks on satellites: Chinese hackers have reportedly infiltrated the US weather satellite system, and a Romanian hacker announced that he had accessed the server of one of NASA’s space flight centers. In the past decade, at least two nonmilitary US satellite systems have experienced brief, unattributed glitches tied to hacking attacks. Some actors have begun to exploit the fragility not of satellites themselves, but of the signals they broadcast. By the time the radio signals from a GPS satellite reach Earth from thousands of miles up, they can be easily overridden by a stronger signal broadcast on the same frequency. Simple GPS jammers sell online for $119, but they have a short reach. Militaries appear to be acquiring much more powerful jamming technologies. In 2016, roughly 1,000 planes and 700 vessels at sea reportedly experienced problems with their GPS signals near North Korea, which is believed to have purchased Russian jammers that can be mounted on trucks. Those devices have an effective radius of 30 to 60 miles. The US seems to possess similar technology; a test that went awry near a Navy base in San Diego in 2007 knocked out GPS signals to cell phone network operators for at least two hours. More troubling than simple jamming, though, is the rise of “spoofing,” which overrides correct GPS data with a more powerful localized signal that delivers false information to a receiver. In 2013 a team of researchers from the University of Texas at Austin successfully led astray an $80 million yacht in the Mediterranean, overpowering its GPS receivers and sending it onto a new course. The dirty truth about spoofing is that secure channels are no defense against it. “Even our encrypted military GPS receivers can be spoofed,” Harrison says. Shelton, who retired in 2014 after 38 years in the Air Force, lives not far from 2Sops in Colorado; these days he chairs an educational and advocacy nonprofit called the Space Foundation. He still expends a lot of energy worrying about what is happening in the heavens. “We as a nation have been too slow to respond to this threat,” he says. He’s particularly troubled by the failure of the US to procure new space systems. Some GPS satellites are older than the people running them. “Our systems are archaic,” Shelton says. “Because space assets are so expensive, we deploy ‘just enough’; there’s no backup or excess capability.” (The Air Force noted that the GPS constellation consists of more than 30 satellites, which provides some redundancy.) China, by contrast, is investing heavily in its space program, seeing it as a symbol of its growing prominence. As soon as this year, it could land a craft on the never-before-touched far side of the moon. And China’s global navigation satellite system, known as BeiDou, has some capabilities that outmatch even the United States’ GPS. In 2015, China created a new space-­focused military service, known as the People’s Liberation Army Strategic Support Force. Meanwhile, the US relies entirely on Russian rockets to get its astronauts to the Space Station (although NASA has awarded contracts to Boeing and SpaceX to fix that). As Cheng says, “Today China is one of two countries that can put a person into space—and the other country isn’t the United States.” Many of America’s space warriors, as they call themselves, share Shelton’s sense that the US isn’t responding nearly quickly enough to the threat of orbital war. “We needed to be marching faster,” says Deborah Lee James, who served as President Obama’s secretary of the Air Force. “Why aren’t there more space and cyber officers at the top of the Air Force?” Addressing these issues, as James’ question suggests, is not just about throwing money at the space-industrial complex. It involves organizational changes too. The Air Force is building what it calls the nation’s first Space Mission Force, made up of airmen trained to respond to the demands of an orbital war. On the same base as the 2Sops command center, the military has established the National Space Defense Center, which puts representatives from various military and intelligence offices focused on space under a single roof. And the defense authorization bill is full of upgrades to the Air Force’s space-­fighting capabilities, including the creation of an additional Air Force unit responsible for space warfighting operations. Not content to tinker with the Air Force, a growing number of people in Washington—including the commander in chief—have to come to favor creating an entire new military branch dedicated to space operations. In May, during a ceremony honoring West Point’s football team, President Trump told his audience, “We’re getting very big in space, both militarily and for other reasons, and we are seriously thinking of the Space Force.” The comment sounded to many listeners like yet another oddball Trumpian tangent. But then, after reportedly meeting resistance from the Air Force, Trump escalated. At a mid-June meeting of the newly constituted US Space Council, he announced—much to the surprise of his own advisors and the military itself—that he was ordering the Pentagon to move forward. As he said, “I’m hereby directing the Department of Defense and Pentagon to immediately begin the process necessary to establish a Space Force as the sixth branch of the Armed Forces. That’s a big statement. We are going to have the Air Force and we are going to have the Space Force—separate but equal. It’s going to be something.” The Space Force is, of course, not a fait accompli. Any military reorganization has to be approved by Congress—which is not necessarily an easy path. (Last year, a bill that included the creation of just such a new branch of the military passed the US House of Representatives, but that provision was taken out of the Senate version.) And the establishment of a new branch of the military involves a vast set of logistical and structural questions. Yet Trump’s push may speed up a natural evolution toward an independent space branch by years, if not a decade. Space, the president said, was “going to be important monetarily and militarily. We don’t want China and Russia and other countries leading us. We’ve always led.” But where—and to what—are we leading? Part of the challenge in figuring out how to think about space conflict is the sheer complexity of the orbital environment—an arena that has long belonged to nation-states, but that is increasingly becoming a domain of commerce and tourism. How do countries protect their interests up above—and down here? Right now, countries appear to be racing to build their military capabilities—but an arms race isn’t the only answer. The last time an arms race appeared poised to overtake space, the world’s superpowers banded together to sign the 1967 Outer Space Treaty, which banned weapons of mass destruction in space and held that “the moon and other celestial bodies” should be reserved for peaceful purposes. The Outer Space Treaty is still in force, but it is by now full of holes. Legal scholars had a hard time proving that China’s 2007 anti-­satellite test, for instance, violated the agreement. That’s because the missile that China fired was not technically addressed in the 50-year-old treaty. Part of what makes space such volatile terrain right now is that it’s hard even to apply the existing laws of war to it. No country can claim sovereignty in orbit, and it’s impossible to occupy territory there. So what counts as an act of territorial aggression? What qualifies as a proportional response? It’s even difficult to say, with certainty, what the physics of war in space will look like. We don’t well understand, for instance, how a kinetic attack on a satellite constellation might spill over into a spiraling Kessler effect. Humans have “millennia of experience in blowing up things on land,” says Laurie Blank, a law professor at Emory University and a specialist in the laws of armed conflict. “We’re still learning the consequences of all these things in space.”

#### Economic crash leads to diversionary global nuclear war.

**Tønnesson 15** (Stein, research professor at Peace Research Institute Oslo, leader of East Asia Peace program at Uppsala University, “Deterrence, interdependence and Sino–US peace,” *International Area Studies Review*, Vol. 18, No. 3, 2015, p. 297-311)

Several recent works on China and Sino–US relations have made substantial contributions to the current understanding of how and under what circumstances a combination of nuclear deterrence and economic interdependence may reduce the risk of war between major powers. At least four conclusions can be drawn from the review above: first, those who say that interdependence may **both inhibit and drive conflict** are right. Interdependence raises the cost of conflict for all sides but asymmetrical or unbalanced dependencies and negative trade expectations may generate tensions leading to trade wars among inter-dependent states that in turn increase the risk of military conflict (Copeland, 2015: 1, 14, 437; Roach, 2014). The risk may increase if one of the interdependent countries is governed by an inward-looking socio-economic coalition (Solingen, 2015); second, the risk of war between China and the US should not just be analysed bilaterally but include their allies and partners. Third party countries could drag China or the US into confrontation; third, in this context it is of some comfort that the three main economic powers in Northeast Asia (China, Japan and South Korea) are all deeply integrated economically through production networks within a global system of trade and finance (Ravenhill, 2014; Yoshimatsu, 2014: 576); and fourth, decisions for war and peace are taken by very few people, who act on the basis of their future expectations. International relations theory must be supplemented by foreign policy analysis in order to assess the value attributed by national decision-makers to economic development and their assessments of risks and opportunities. If leaders on either side of the Atlantic begin to seriously **fear or** anticipate **their own nation’s** decline then they may blame this on external dependence, appeal to anti-foreign sentiments, contemplate the use of force to gain respect or credibility, adopt protectionist policies, and ultimately refuse to be deterred **by** either nuclear arms or prospects of socioeconomic calamities. Such a dangerous shift could happen abruptly, i.e. under the instigation of actions by a third party – or against a third party. Yet as long as there is both nuclear deterrence and interdependence, the tensions in East Asia are unlikely to escalate to war. As Chan (2013) says, all states in the region are aware that they cannot count on support from either China or the US if they make provocative moves. The greatest risk is **not** that **a territorial dispute** leads to war under present circumstances but that changes in the world economy alter those circumstances in ways that render inter-state peace more precarious. If China and the US fail to rebalance their financial and trading relations (Roach, 2014) then a trade war could result, interrupting transnational production networks, provoking social distress, and exacerbating nationalist emotions. This could have unforeseen consequences in the field of security, with nuclear deterrence remaining the only factor to **protect the world from** Armageddon, and **unreliably so**. Deterrence could lose **its** credibility: one of the two great powers might gamble that the other yield in a cyber-war or conventional limited war, or third party countries might engage in conflict with each other, with a view to obliging Washington or Beijing to intervene. Yet as long as there is both nuclear deterrence and interdependence, the tensions in East Asia are unlikely to escalate to war. As Chan (2013) says, all states in the region are aware that they cannot count on support from either China or the US if they make provocative moves. The greatest risk is **not** that **a territorial dispute** leads to war under present circumstances but that changes in the world economy alter those circumstances in ways that render inter-state peace more precarious. If China and the US fail to rebalance their financial and trading relations (Roach, 2014) then a trade war could result, interrupting transnational production networks, provoking social distress, and exacerbating nationalist emotions. This could have unforeseen consequences in the field of security, with nuclear deterrence remaining the only factor to **protect the world from** Armageddon, and **unreliably so**. Deterrence could lose **its** credibility: one of the two great powers might gamble that the other yield in a cyber-war or conventional limited war, or third party countries might engage in conflict with each other, with a view to obliging Washington or Beijing to intervene.

### Collisions

#### Squo debris thumps

**Wall 21** [Mike Wall, Michael Wall is a Senior Space Writer with [Space.com](http://space.com/) and joined the team in 2010. He primarily covers exoplanets, spaceflight and military space. He has a Ph.D. in evolutionary biology from the University of Sydney, Australia, a bachelor's degree from the University of Arizona, and a graduate certificate in science writing from the University of California, Santa Cruz. 11/15/21, "Kessler Syndrome and the space debris problem," Space, [https://www.space.com/kessler-syndrome-space-debris accessed 12/10/21](https://www.space.com/kessler-syndrome-space-debris%20accessed%2012/10/21)] Adam

Earth orbit is getting more and more crowded as the years go by. Humanity has launched about 12,170 satellites since the dawn of the space age in 1957, [according to the European Space Agency](https://www.esa.int/Safety_Security/Space_Debris/Space_debris_by_the_numbers) (ESA), and 7,630 of them remain in orbit today — but only about 4,700 are still operational. That means there are nearly 3,000 defunct spacecraft zooming around Earth at tremendous speeds, along with other big, dangerous pieces of debris like upper-stage rocket bodies. For example, orbital velocity at 250 miles (400 kilometers) up, the altitude at which the ISS flies, is about 17,100 mph (27,500 kph). At such speeds, even a tiny shard of debris can do serious damage to a spacecraft — and there are huge numbers of such fragmentary bullets zipping around our planet. ESA estimates that Earth orbit harbors at least 36,500 debris objects that are more than 4 inches (10 centimeters) wide, 1 million between 0.4 inches and 4 inches (1 to 10 cm) across, and a staggering 330 million that are smaller than 0.4 inches (1 cm) but bigger than 0.04 inches (1 millimeter). These objects pose more than just a hypothetical threat. From 1999 to May 2021, for example, the ISS conducted 29 debris-avoiding maneuvers, including three in 2020 alone, [according to NASA officials](https://www.nasa.gov/mission_pages/station/news/orbital_debris.html). And that number continues to grow; the station performed [another such move in November 2021](https://www.space.com/space-station-dodging-chinese-space-junk-spacex-crew-3), for example. Many of the smaller pieces of space junk were spawned by the explosion of spent rocket bodies in orbit, but others were more actively emplaced. In January 2007, for instance, China intentionally destroyed one of its defunct weather satellites in a much-criticized test of anti-satellite technology that generated [more than 3,000 tracked debris objects](https://swfound.org/media/9550/chinese_asat_fact_sheet_updated_2012.pdf) and perhaps 32,000 others too small to be detected. The vast majority of that junk remains in orbit today, experts say. Spacecraft have also collided with each other on orbit. The most famous such incident occurred in February 2009, when Russia's defunct Kosmos 2251 satellite slammed into the operational communications craft Iridium 33, producing [nearly 2,000 pieces of debris](https://swfound.org/media/6575/swf_iridium_cosmos_collision_fact_sheet_updated_2012.pdf) bigger than a softball. That 2009 smashup might be evidence that the Kessler Syndrome is already upon us, though a cataclysm of "Gravity" proportions is still a long way off. "The cascade process can be more accurately thought of as continuous and as already started, where each collision or explosion in orbit slowly results in an increase in the frequency of future collisions," [Kessler told Space Safety Magazine in 2012](http://www.spacesafetymagazine.com/space-debris/kessler-syndrome/don-kessler-envisat-kessler-syndrome/).

#### No debris cascades, but even a worst case is confined to low LEO with no impact

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

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

What is Kessler Syndrome?

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

It is a dark picture.

Is Kessler Syndrome likely to happen?

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

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

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

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

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

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

How bad could Kessler Syndrome in High LEO be?

Let’s imagine a worst case scenario.

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

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

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

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

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

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

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

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

#### Collision risk is tiny

Wein 9 [Lawrence M. Wein, Professor & Senior Fellow at Stanford’s Center for International Security and Cooperation Jeffrey S. Skoll Professor of Management Science at Stanford University and Senior Fellow at Stanford’s Center for International Security and Cooperation, former DEC Leaders for Manufacturing Professor of Management Science at MIT, and Andrew M. Bradley, PhD-Institute for Computational and Mathematical Engineering at Stanford University, Space debris: Assessing risk and responsibility, Advances in Space Research 43 (2009) 1372–1390]

More importantly, while our numerical results mimic earlier results (Liou and Johnson, 2005; Walker and Martin, 2004) that stressed the importance of postmission deorbiting, we do not necessarily agree with the claim that the only way to prevent future problems is to remove existing large intacts from space (Liou and Johnson, 2006, 2008). The divergence between our views and those in Liou and Johnson (2006, 2008) is perhaps due to the different performance metrics used. The root causes for alarm in Liou and Johnson (2006, 2008) appear to be the growth rate of fragments and the small increase in the rate of catastrophic collisions over the next 200 years (Liou and Johnson, 2008, Fig. 2). However, the great majority of catastrophic collisions in the SOI do not involve operational spacecraft, and are hazardous only in the sense that the fragments generated from such a collision could subsequently damage or destroy operational spacecraft. Therefore, we introduced the notion of the lifetime risk of an operational spacecraft as the primary performance metric. Our model predicts that the lifetime risk is <5x10^-4 [less than .0005%] over the next two centuries, and always stays <10^-3 [less than .001%] than if there is very high (>98%) spacecraft deorbiting compliance. These risks appear to be low relative to the immense cost and considerable technological uncertainty involved in removing large objects from space, are dwarfed by the ~20% historical mission-impacting (but not necessarily mission-ending) failure rate of spacecraft (Frost and Sullivan, 2004), and could be overestimated if improved traffic management techniques lower future collision risks (Johnson, 2004). Hence, the need to bring large objects down from space does not appear to be as clear cut as suggested in Liou and Johnson (2006, 2008). Nonetheless, our model does not incorporate the possibility of intentional catastrophic collisions (ASAT tests, space wars) that could conceivably occur in the future. In addition, Fig. 5 considers only catastrophic collisions, whereas noncatastrophic intact-fragment collisions could easily disable an operational spacecraft. If the operational lifetime risk is modified to include noncatastrophic collisions with fragments >= 10cm, then the sustainable risk rises by ~50%: it increases from 2.19x10^-2 [.0219%] to 3.09x10^-2 in the base case, and increases from 4.91x10^-4 [.000491%] to 7.94x10^-4 in the full compliance case. Moreover, if fragments >= 1 cm (rather than >= 10 cm) are harmful to spacecraft (Johnson, 2004), then we (as well as other researchers) could be underestimating the risk.

#### Mining internal link is wrong – no uq for amount of debris caused by mining which is small compared to exploration and sats cuz its barely happening, there ev says it would take till 2033 for debris to reach earth and the last line says it’s a small risk.

#### Warming internal link just says sats collect data – we already have data on how to prevent climate change the problem is complacency.

#### Asteroid deflection isn’t happening and even if it does we have asteroid deflection capabilities. Also they get rid of private sats and telescopes which makes it way harder to find incoming ones.

### Escalation

#### This advantage says nothing – the Jamasmie ev just says China and Russia are collaborating on appropriation. That doesn’t mean that they are gonna start an intentional nuke war against the US. It also thumps because it means Russia and China are already working together.

#### Turn – space wars are more likely when governments are the only ones with vested interest in space, because they’re the ones with military interests.

#### No space wars --- dependence on space creates a de facto taboo

Triezenberg, 17

Bonnie Triezenberg, Senior engineer at RAND. Previously, she was the senior technical fellow at the Boeing Company, specializing in agile systems and software development. “Deterring Space War: An Exploratory Analysis Incorporating Prospect Theory into a Game Theoretic Model of Space Warfare,” RAND Corporation. 2017. <https://www.rand.org/pubs/rgs_dissertations/RGSD400.html>

The above discussion suggests that a likely means to achieve deterrence of acts of war in outer space is to increase civilian dependence on space to support day-to-day life—if everyone on earth is equally dependent on space, no one has an incentive to destroy space. Largely by accident, this dependence appears to have, in fact, occurred. The space age was born in an age of affluence and rapid economic expansion; space quickly became a domain of international commerce as well as a domain of national military use. Space assets and the systems they enable have transformed social, infrastructure and information uses perhaps more visibly than they have transformed military uses. In fact, in the current satellite database published by the Union of Concerned Scientists, of the 1461 satellites in orbit 40% support purely commercial ventures, while only 16% have a strictly military use.46 The first commercial broadcast by a satellite in geo-synchronous orbit was of international news between Europe and the United States.47 The first telephony uniting the far flung islands of Indonesia was enabled by satellite48. Those of us who are old enough remember the 1960s “magic” of intercontinental phone calls and international “breaking news” delivered by satellite. Today, most social and infrastructure uses of space are taken for granted – even in remote locales of Africa, people expect to be able to monitor the weather, communicate seamlessly with colleagues and to find their way to new and unfamiliar locations using the GPS in their phones. All of us use space every day.49 These unrestricted economic and social uses of space may be the best deterrent, making everyone on all sides of combat equally dependent on space and heightening the taboo against weaponizing space or threatening space assets with weapons.

#### Transparency inevitable ---Nothing slips by in space

--Surprise attacks either fail bc they’re ragged, or are detected bc the enemy has to load a ton of stuff into space

--Launch capacity is international – would have to ask to do it

--Monitoring satellites is easy – as early as 50s elementary school classes saw stuff – remote sensing means we see everything in space or on the ground

--International nonproliferation agreements democratized site monitoring – we can see states interior regions

--Even if no guarantee, uncertainy means no state would risk it

Handberg, 17 – Faculty and Research, School of Politics, Security, and International Affairs, UCF

Roger Handberg, “Is space war imminent? Exploring the possibility,” Comparative Strategy. 2017. <https://www.tandfonline.com/doi/pdf/10.1080/01495933.2017.1379832?needAccess=true>

Second, surprise requires that sufficient offensive space assets be placed in orbit without triggering a response by other states—the scale of such technology deployment is in itself possibly self-defeating given high costs and a likely lack of launch capacity. In addition, much launch capacity is now international rather than national, so maintaining secrecy becomes even more difficult. Space as an operational environment suffers from excessive transparency, meaning any launches can be monitored and tracked by others with strong evidence as to what is being deployed. One must remember that the original satellite launches in the 1950s were accurately tracked by a British grade-school class as a science project. In addition, at least since the early 1960s, remote sensing has increased exponentially the global capability to detect buildup of military assets of differing types, whether in space or on the ground. Commercial remote-sensing capabilities further enhance the capacity to detect militarily relevant actions. For example, commercial imagery is accessed by private parties to monitor the North Korean missile and nuclear weapons programs, in effect expanding the capacity of the world to look in on various states’ interior regions, scanning for relevant information, including weapons buildup and launch capabilities. Even construction of physical facilities for production of space assets or for other weaponry can be monitored, making surprise more difficult but not impossible, as demonstrated in earlier monitoring of North Korea and, in 1998, the nuclear tests by both Pakistan and India. That means if the ASAT weapons come from ground locations, there is a high probability that they can be detected but no guarantee exists that detection will in fact occur. The uncertainty will impact calculations of attack success.

#### Space Wars are not that dangerous—they’ll be robotized and end as soon as communication satellites are taken out. Corporations are specifically key to this peaceful outcome

--space wars have no terrorist groups or failed states

--mostly robotized means few lives lost

--brief because destroying communication satellites ends conflict, also incentivizes states to innovate in a way that reduces casualties

Szoic et al 17-- Szocik, Konrad [Department of Philosophy and Cognitive Science, University of Information Technology and Management in Rzeszow], Tomasz Wójtowicz [Institute of Security and Civic Education, Pedagogical University in Cracow, Podchorążych 2 Street, 30-084 Kraków, Poland], and Leszek Baran [Chair of Internal Security, University of Information Technology and Management in Rzeszow, Poland]. "War or peace? The possible scenarios of colonising Mars." Space Policy 42 (2017): 31-36. <https://doi.org/10.1016/j.spacepol.2017.10.002>. (AG DebateDrills)

Contrary to fourth and fifth generation warfare, space wars will be dominated by nation states and international corporations. Elon Musk, Managing Director of SpaceX, a company dealing with the manufacture of jet engines, carrier rockets, and spaceships, claimed that within the nearest 40–100 years over 1 million people might be sent to Mars. He estimated the cost of one person's reaching the Red Planet at USD 200 million [16]. According to the authors of the Mars one initiative, a sum of USD 6 billion will be needed to send the first four astronauts to Mars [6]. The need to secure such exorbitant funds virtually excludes any entities other than states and international corporations (terrorist groups, criminal organisations or failed states) from participating in space wars. It should be expected that the future space wars will entail an advanced process of conflict robotisation and dehumanisation. The prospective Mars colonisation war may proceed by means of robots – unmanned aerial vehicles. Ender's Game, an American science fiction film dating back to 2013, based on a novel by Orson Scott Card pub- lished under the same title, features scenes presenting such kind of a conflict. The film is set in 2070. The main hero, ten-year-old Andrew Wiggin, is elected leader of the invading fleet, intended to destroy the native world of a foreign life form threatening the Earth. Andrew Wiggin, believing that he is taking part in training, leads the invading fleet and defeats the enemy. The invading forces comprise only un- manned space drones controlled from a secure place [11]. The pro- gressing robotisation and dehumanisation of war will also be influenced by the strategic culture of western countries (the United States) whose societies show limited tolerance to human loss during military conflicts. As stressed by Adrian Lewis in his book The American Culture of War, abolishing the obligatory military service was the most significant change introduced in the 20th century to the U.S. war-fighting model. It triggered the professionalization of armed forces, with a mass army being replaced by mobile troops limited in numbers [14]. Along with the robotisation and dehumanisation, the future space wars should also be expected to be brief. Unless the dispute escalating between the global powers evolves into military activities located in the Earth, the conflict may end soon after the communication satellites of one of the parties are destroyed, or its space station is damaged. Considering the above, the technological arms race between the competing States, aimed at designing, as fast as possible, a weapon which will enable defeating the enemy in the first attack, without any possibility of re- taliation, will prove crucial.