## **1**

#### **Space commercialization drives tech Innovation in the squo – it provides a unique impetus.**

**Hampson 17** Joshua Hampson 1-25-2017 “The Future of Space Commercialization” <https://republicans-science.house.gov/sites/republicans.science.house.gov/files/documents/TheFutureofSpaceCommercializationFinal.pdf> (Security Studies Fellow at the Niskanen Center)//Elmer

The size of the **space economy** is **far larger** than many may think. In 2015 alone, the global market amounted to $323 billion. **Commercial** infrastructure and **systems** **accounted for 76 percent** of that 9 total, with satellite television the largest subsection at $95 billion. The global space launch market’s 10 11 share of that total came in at $6 billion dollars. It can be hard to disaggregate how space benefits 12 particular national economies, but in 2009 (the last available report), the Federal Aviation Administration (FAA) estimated that commercial space transportation and enabled industries generated $208.3 billion in economic activity in the United States alone. Space is not just about 13 satellite television and global transportation; while not commercial, GPS satellites also underpin personal navigation, such as smartphone GPS use, and timing data used for Internet coordination.14 Without that data, there could be problems for a range of Internet and cloud-based services.15 There is also room for growth. The FAA has noted that while the commercial launch sector has not grown dramatically in the last decade, there are indications that there is latent demand. This 16 demand may catalyze an increase in launches and growth of the wider space economy in the next decade. The Satellite Industry Association’s 2015 report highlighted that their section of the space economy outgrew both the American and global economies. The FAA anticipates that growth to 17 continue, with expectations that small payload launch will be a particular industry driver.18 In the future, **emerging space industries**may contribute even more the American economy. Space tourism and resource recovery—e.g., mining on planets, moons , and asteroids—in particular may become large parts of that industry. Of course, their viability rests on a range of factors, including costs, future regulation, international problems, and assumptions about technological development. However, there is increasing optimism in these areas of economic production. But the space economy is not just about what happens in orbit, or how that alters life on the ground. The growth of this economy can also **contribute to** **new innovations across all walks of life.** Technological Innovation Innovation is generally hard to predict; some new technologies seem to come out of nowhere and others only take off when paired with a new application. It is difficult to predict the future, but it is reasonable to expect that **a growing space economy would open opportunities for technological and organizational innovation**. In terms of technology, **the difficult environment** of outer space helps **incentivize progress along the margins**. Because each object launched into orbit costs a significant amount of money—at the moment between $27,000 and $43,000 per pound, though that will likely drop in the future —each 19 reduction in payload size saves money or means more can be launched. At the same time, the ability to fit more capability into a smaller satellite opens outer space to actors that previously were priced out of the market. This is one of the reasons why **small, affordable satellites** are increasingly pursued by companies or organizations that cannot afford to launch larger traditional satellites. These small 20 satellites also provide non-traditional launchers, such as engineering students or prototypers, the opportunity to learn about satellite production and test new technologies before working on a full-sized satellite. That **expansion of developers, experimenters, and testers**cannot **but help increase innovation opportunities**. Technological developments from outer space have been **applied to terrestrial life** since the earliest days of space exploration. The National Aeronautics and Space Administration (NASA) maintains a website that lists technologies that have spun off from such research projects. Lightweight 21 **nanotubes**, useful in protecting astronauts during space exploration, are now being tested for applications in emergency response gear and electrical insulation. The need for certainty about the resiliency of materials used in space led to the development of an analytics tool useful across a range of industries. **Temper foam,** the material used in memory-foam pillows, was developed for NASA for seat covers. As more companies pursue their own space goals, more innovations will likely come from the commercial sector. Outer space is not just a catalyst for technological development. **Satellite constellations** and their unique line-of-sight vantage point can **provide new perspectives** to old industries. Deploying satellites into low-Earth orbit, as Facebook wants to do, can connect large, previously-unreached swathes of 22 humanity to the Internet. **Remote sensing technology could change how whole industries operate, such as crop monitoring, herd management, crisis response, and land evaluation**, among others. 23 While satellites cannot provide all essential information for some of these industries, they can fill in some useful gaps and work as part of a wider system of tools. Space infrastructure, in helping to change how people connect and perceive Earth, could help spark innovations on the ground as well. These innovations, changes to global networks, and new opportunities could lead to wider economic growth.

#### **Strong innovation solves extinction.**

**Matthews 18** Dylan Matthews 10-26-2018 “How to help people millions of years from now” <https://www.vox.com/future-perfect/2018/10/26/18023366/far-future-effective-altruism-existential-risk-doing-good> (Co-founder of Vox, citing Nick Beckstead @ Rutgers University)//Re-cut by Elmer

If you care about improving human lives, you should overwhelmingly care about those quadrillions of lives rather than the comparatively small number of people alive today. The 7.6 billion people now living, after all, amount to less than 0.003 percent of the population that will live in the **future**. It’s reasonable to suggest that those **quadrillions** of future people have, accordingly, **hundreds of thousands of times** more moral weight than those of us living here **today** do. That’s the basic argument behind Nick Beckstead’s 2013 Rutgers philosophy dissertation, “On the overwhelming importance of shaping the far future.” It’s a glorious mindfuck of a thesis, not least because Beckstead shows very convincingly that this is a conclusion any plausible moral view would reach. It’s not just something that weird utilitarians have to deal with. And Beckstead, to his considerable credit, walks the walk on this. He works at the Open Philanthropy Project on grants relating to the far future and runs a charitable fund for donors who want to prioritize the far future. And arguments from him and others have turned “long-termism” into a very vibrant, important strand of the effective altruism community. But what does prioritizing the far future even mean? The most **literal** thing it could mean is preventing human **extinction**, to ensure that the species persists as long as possible. For the long-term-focused effective altruists I know, that typically means identifying concrete threats to humanity’s continued existence — like unfriendly artificial intelligence, or a pandemic, or global warming/out of control geoengineering — and engaging in activities to prevent that specific eventuality. But in a set of slides he made in 2013, Beckstead makes a compelling case that while that’s certainly **part** of what caring about the far future entails, approaches that address **specific threats** to humanity (which he calls “**targeted**” approaches to the far future) have to **complement** “**broad**” approaches, where instead of trying to **predict** what’s going to kill us all, you just **generally try to keep civilization running as best it can**, so that it is, as a whole, well-equipped to deal with **potential**extinction events in the **future**, not just in 2030 or 2040 but in 3500 or 95000 or even 37 million. In other words, caring about the far future **doesn’t mean just paying attention to low-probability risks of total annihilation**; it also means **acting on pressing needs now**. For example: We’re going to be **better prepared** to prevent extinction from **AI** or a **supervirus** or **global warming** if society as a whole makes **a lot of scientific progress**. And a significant bottleneck there is that the vast majority of humanity doesn’t get high-enough-quality education to engage in scientific research, if they want to, which reduces the **odds that we have enough trained scientists to come up with the breakthroughs** we need as a civilization to survive and thrive. So maybe one of the **best thing**s we can do for the **far future** is to improve school systems — here and now — to harness the group economist Raj Chetty calls “lost Einsteins” (**potential innovators** who are thwarted by poverty and inequality in rich countries) and, more importantly, the hundreds of millions of kids in developing countries dealing with even worse education systems than those in depressed communities in the rich world. What if living ethically for the far future means living ethically now? Beckstead mentions some other broad, or very broad, ideas (these are all his descriptions): Help make computers faster so that people everywhere can work more efficiently Change intellectual property law so that technological innovation can happen more quickly Advocate for open borders so that people from poorly governed countries can move to better-governed countries and be more productive Meta-research: improve **incentives** and**norms** in **academic work** to better advance human knowledge Improve education Advocate for political party X to make future people have values more like political party X ”If you look at these areas (economic growth and technological progress, access to information, individual capability, social coordination, motives) a lot of everyday good works contribute,” Beckstead writes. “An implication of this is that a lot of everyday good works are good from a broad perspective, even though hardly anyone thinks explicitly in terms of far future standards.” Look at those examples again: It’s just a list of what normal altruistically motivated people, not effective altruism folks, generally do. Charities in the US love talking about the lost opportunities for innovation that poverty creates. Lots of smart people who want to make a difference become scientists, or try to work as teachers or on improving education policy, and lord knows there are plenty of people who become political party operatives out of a conviction that the moral consequences of the party’s platform are good. All of which is to say: Maybe effective altruists aren’t that special, or at least maybe we don’t have access to that many specific and weird conclusions about how best to help the world. If the far future is what matters, and generally trying to make the world work better is among the best ways to help the far future, then effective altruism just becomes plain ol’ do-goodery.

#### **Commercial space innovation stops extinction.**

Charles **Beames 18**, Chairman of the SmallSat Alliance, Executive Chairman of York Space Systems, former Principal Director of Space and Intelligence in the Office of the Undersecretary of Defense for Acquisition, Technology, and Logistics (OUSD(AT&L)), Col. (ret.) in the USAF where he served 23 years in space & intelligence leadership positions around the world, 8/8/18, “Op-ed | SmallSat Alliance is on a path toward a new space horizon,” <https://spacenews.com/op-ed-smallsat-alliance-is-on-a-path-toward-a-new-space-horizon/>

We find ourselves still at the dawn of a **new space century**, mindful of the victories and setbacks of our past, eager to pass the torch to the next generation of space visionaries, scientists, engineers, and enthusiasts. We look to the future not just to see how much **bigger**, **faster**, or **higher** we can reach, but also how the **U**nited **S**tates, and specifically the U.S. space community, can again inspire the nations of the world to align with us, as it did in the 20th century. The SmallSat Alliance is an **alliance of companies** **developing**, **producing**, and **operating** in all segments of the **‘next generation’ space economy**; championing renewed **U.S. leadership** in the burgeoning **commercial space economy**, and advocating for the **transformation** of government-led space capabilities. We are experienced space professionals who have chosen to join with others leveraging our decades of hard-won experience, to develop smarter ways to explore space in the 21st century. A wonderful outgrowth of the legacy space program is the **commercial**, **entrepreneurial**, and **job-creating commercial space business** that it bequeathed. These **next-generation enterprises** range from multi-million-dollar startups providing rideshare opportunities or components for small satellites to multi-billion-dollar **space data-analytic platforms** reinventing urban car service and agricultural production. The early returns of this economic revolution are already on our doorstep: **space data capabilities are exponentially growing** elements of the 21st century world economy. Beginning with the dreams and funding by successful tech entrepreneurs, enormous venture investments are already delivering wondrous benefits to the world. Commercial Space – Profit and Non-Profit There are really two major categories in the commercial sector, the profit driven and the non-profit. The classic for-profit companies include not only those designing, building, launching, and operating satellites but also the tech sector that is turning that raw **space data** into **gold** through **machine-learning analytics**. Since for-profit companies are no longer dependent upon the revenues generated by the Cold War space race culture of a bygone era, this new generation of space companies is able to more**efficiently capitalize on Moore’s Law**, the nonstop **exponential growth in chip density**, and the associated networking technology co-evolving with it. This new generation is building **profitable businesses** helping to **clean up** our **oceans of garbage and debris** with satellite surveillance, reconnoitering to assist in enforcing laws that **protect our oceans** from illegal, unregulated, unlicensed fishing, something that is rapidly depleting the world’s most valuable and essential lifeforms. It’s leading in the innovative use of low-cost satellite constellations to produce ubiquitous **remote-sensing data**, enabling small business owners to be more profitable and less wasteful. For example, precise timing signals from space are already **optimizing transportation** of people, goods, and services, with even further gains anticipated with the introduction of **a**rtificial **i**ntelligence to assist drivers, perhaps even someday replacing them entirely. The non-profit sector is the other side of commercial space, concerned more for the **general welfare** of society, but every bit as integral to this new space enterprise. Much like every century before it in human history, ours is not without its unique challenges, some of which have been a consequence of the last, and all of which the space data domain can be leveraged to help solve. **Examples are endless**, but one challenge that this new space community is uniquely well-adapted for is to further inform **worldwide resource allocation** for the 21st century and beyond. These two primary resources are**sustainable water** and the **materials** needed for adequate **housing** for an ever-**increasing human population**. As cities and urbanization continue to expand, governmental planning challenges such as transportation design optimization for goods and services are only the beginning. Additionally, through using inexpensive remote sensing technologies, some members are designing space data analytics to **mitigate human suffering** from **plagues**, contain **outbreaks**, and combating illegal **poaching**. Some are connecting with other non-profits to curtail **human trafficking** for the sex trade or forced labor for migrant debt repayment. Still others are helping non-governmental organizations in their work to expose the use of children as soldiers. Addressing these challenges has little to do with resuscitating dreams conceived by long deceased science-fiction writers and much more to do with turning “swords back into plowshares” to **solve real threats to humanity**. Other non-profit initiatives include pursuing an even more foundational understanding of who we are and how to be the best custodians of our environment. Much as exploring and monitoring the world’s oceans has advanced civilization through a better understanding of human life and the planet, so too does exploring and monitoring from space. Low Earth orbit (LEO) provides aunique vantage point to look back on the planet and understand what is happening, anticipate what might happen and prepare for the future. In addition to **better understanding Earth**, responsible and rapid exploitation of the low Earth orbit domain will enhance the understanding of the **solar system** and the rest of the **universe**. Small satellites already offer low-cost platforms to study and explore what lies beyond the Earth. Other members are pioneering the use of zero-carbon, hydrogen-based reusable propulsion systems to ensure we don’t worsen our atmosphere using kerosene-fueled rockets for the coming tsunami of satellite launches. Finally, a mission ensuring the general welfare and **planet survival** for the next thousand years is finally confronting the **existential threat** that asteroids and comets pose to humanity. These extra-terrestrial, deep-space threats are passing dangerously close to our planet, and today we have no solar map of them and no defense.

### **2**

#### **CP Text: The United States federal government should substantially increase direct military-to-military communication and bilateral and multilateral hotlines with the Russian Federation and the People’s Republic of China.**

**Hotlines and dialogue prevent escalation.**

**Trenin 19** [Dr. Dmitri Vitalyevich Trenin, PhD is the director of the Carnegie Moscow Center, a think tank and regional affiliate of the Carnegie Endowment for International Peace. Strategic Stability in the Changing World. March 2019. https://carnegieendowment.org/files/3-15\_Trenin\_StrategicStability.pdf]

To maintain the minimum degree of strategic **stability**, it’s essential to prevent a direct military collision between the United States and Russia or the United States and China. With that goal in mind, there are already around-the-clock **comm**unication lines between the top military leaderships: ministers of defense, chiefs of general staff, and key U.S./NATO and Russian military personnel. Direct communication lines make it possible to **prevent** or **neutralize** incidents in the air, at sea, or on land that involve Russian and U.S./ NATO armed forces, thus **avoiding** any uncontrollable **escalation**. Communication channels between the leadership of the U.S. armed forces and the top brass of the Chinese **P**eople’s **L**iberation **A**rmy serve a similar purpose. A communication channel between the respective heads of U.S. and Russian intelligence, and between the U.S. and Chinese services, could play an important role as well. Direct contacts at the top political level are also critically important as a means of de-escalation in the most dangerous situations. In addition to constantly functioning lines of communication, **U.S.**, **Russian**, and **Chinese** heads of national security, foreign affairs, and defense should engage in **regular dialogue** on **strategic stability issues**. Such dialogue allows parties to better **understand** each other’s **strategic logic**, the contents of **military doctrines**, and the rationale behind approaches to global and regional security programs. However, broader U.S.-Russian dialogue on strategic issues will likely remain blocked for a long time due to political reasons. Functioning **arms control treaties** are **not** a sine qua non **requirement** for **strategic stability**. It is **highly unlikely** that the **U**nited **S**tates and **China** will **conclude arms control** agreements in the foreseeable future. Preserving **U.S.-Russian arms control** is already difficult enough, with **no prospect** for **improvement** visible on the horizon. But in this atmosphere of growing mistrust and mutual suspicion, discussions about strategic stability that aren’t aimed at negotiating specific agreements will likely be ineffective. The most that can be done diplomatically in the short term— or even the medium term—is to agree on conflict prevention, confidence-building, and transparency measures.

### **3**

#### **Chinese Asteroid Mining key to sustaining Rare Earth Minerals.**

**Cohen 21** Ariel Cohen 10-26-2021 "China’s Space Mining Industry Is Prepping For Launch – But What About The US?" <https://www.forbes.com/sites/arielcohen/2021/10/26/chinas-space-mining-industry-is-prepping-for-launch--but-what-about-the-us/?sh=6b8bea862ae0> (I am a Senior Fellow at the Atlantic Council and the Founding Principal of International Market Analysis, a Washington, D.C.-based global risk advisory boutique.)//Elmer

Exploration of space-based natural resources are on the Chinese policy makers’ mind. The question is, what Joe Biden thinks? In April of this year, **China’s**Shenzen **Origin Space Technology Co.** Ltd. **launched** the NEO-1, the first **commercial spacecraft dedicated to the mining of space resources** – from asteroids to the lunar surface. Falling costs of space launches and spacecraft technology alongside existing infrastructure provides a unique opportunity to explore extraterrestrial resource extraction. Current technologies are equipped to analyze and categorize asteroids within our solar system with a limited degree of certainty. One of the accompanying payloads to the NEO-1 was the Yuanwang-1, or “little hubble” satellite, which searches the stars for possible asteroid mining targets. The NEO-1 launch marks another milestone in private satellite development, adding a new player to space based companies which include Japan’s Astroscale. Private asteroid identification via the Sentinel Space Telescope was supported by NASA until 2015. As private investment in space grows, the end goal is to be capable of harvesting resources to bring to Earth. “Through the development and launch of the spacecraft, Origin Space is able to carry out low-Earth orbit space junk cleanup and prototype technology verification for space resource acquisition, and at the same time demonstrate future asteroid defense related technologies.” In the end, it will come down to progressively lowering the cost of launched unit of weight and booster rocket reliability – before fundamentally new engines may drive the launch costs even further down. The April launch demonstrates that **China is already succeeding** while the West is spinning its wheels. The much touted Planetary Resources and Deep Space Industries (DSI) DSI -1% were supposed to be the vanguard of extra-terrestrial resource acquisition with major backers including Google’s GOOG -1.4% Larry Page. But both have since been acquired, the former by block chain company ConsenSys and the latter by Bradford Space, neither of which are prioritizing asteroid mining. This is too bad, **given** that that **supply chain crunches** **here on Earth** – coupled with the global green energy transition – are **spiking demand for strategic minerals that are increasingly hard to come by** on our environmentally stressed planet. And here **China** currently **holds** a **monopoly on** rare earth element (**REE) extraction** and processing to the tune of 90%. REE’s 17 minerals essential for modern computing and manufacturing technologies for everything from solar panels to semi-conductors. Resource-hungry China also has major involvement in global critical mineral supply chains, which include cobalt, tungsten, and lithium. As I’ve written before, the Chinese hold of upstream and downstream markets is staggering. Possessing 30% of the global mined ore, 80% of the global processing facilities, and an ever increasing list of high dollar investments around the world, China boasts over $36 billion invested in mining projects in Africa alone. **Beijing’s space program clearly indicates that the Chinese would also like to tighten their grip on space-based resources** as well. According to research, it is estimated that **a small asteroid** roughly 200 meters in length that is ric**h in platinum could be worth up to $300 million.** Merrill Lynch predicts the space industry — including extraterrestrial mining industry – to value $2.7 trillion in the next three decades. **REEs are fairly common in the solar system**, but to what degree remains unknown. The most sought after are M-type asteroids which are mostly metal and hundreds of cubic meters. While these are not the most common, the 27,115 Near Earth asteroids are bound to contain a few. This – and military applications – are no doubt **a driving factor of China’s ever increasing space ambitions.**

#### **China terrestrial mining slipping.**

**CPT 21** China Power Team. "Does China Pose a Threat to Global Rare Earth Supply Chains?" China Power. July 17, 2020. Updated May 12, 2021. Accessed December 19, 2021. <https://chinapower.csis.org/china-rare-earths/> //Elmer

Growing Global Competition While China maintains a commanding presence within the global rare earth industry, **Beijing’s capacity to unilaterally disrupt supply chains is likely to be eroded** in the coming years. A **number of initiatives** are **underway** that may prove successful **at establishing new rare earth suppliers** outside of China. Shifting market dynamics are likely to aid these efforts. There are already signs that other players have started to chip away at China’s dominance in certain areas. **Mining** of raw rare earth materials **outside** of **China has ramped up significantly in recent years** as the US’ Mountain Pass mine, and other mines around the world, have increased their output. **China’s share of global mining production has slipped as a result**, from a high of 97.7 percent in 2010 to 62.9 percent in 2019 – the lowest point since 1995. China’s **share of global rare earth reserves has likewise fallen from 50 percent to 36.7 percent** over the same period.3 China’s status as the preeminent supplier of oxides, metals, and permanent magnets has not been similarly diminished – but it may be in the coming years. In the US, the company MP Materials is working to bring online facilities at Mountain Pass that would allow it to process its mined minerals, instead of sending them to China for processing. The company aims to accomplish this in 2021 and to establish the ability to refine and separate rare earth metals in the coming years. International efforts are also underway. In April 2020, the US DoD green-lit initial funding for a joint venture between Australia’s Lynas Corporation and US-based Blue Line Corporation to construct a processing facility in Texas. If successful, it would allow Lynas to ship rare earth materials from its processing facility in Malaysia to the US for final processing – rather than to China. The Japanese government (through JOGMEC) is looking to invest in US and Australian initiatives, likely including the new facility in Texas. These steps are part of Tokyo’s announced goal of further reducing Japan’s reliance on Chinese rare earth imports to less than 50 percent by 2025. Due to growing demand for rare earths, these ventures will likely be more successful than previous attempts to establish rare earth suppliers outside of China. Much of this new demand is being driven by rapid growth of the renewable energy and electric vehicle industries, which utilize large quantities of rare earth permanent magnets. From 2007 to 2017, China’s production of renewable and nuclear energy more than tripled, accounting for roughly 51 percent of the global increase in production over this period. China’s electric vehicle market is growing even faster. Between 2014 and 2019, the number of electric vehicles in China swelled from approximately 90,000 to nearly 3.4 million.

#### **REMs dominance solves the economy.**

**GH 14** [Greenovation Hub, conducts research on China-relevant issues in climate, energy and sustainable finance with a global perspective, “China’s Mining Industry at Home and Overseas: Development, Impacts and Regulation,” 2014, https://www.ghub.org/cfc\_en/wp-content/uploads/sites/2/2014/11/China-Mining-at-Home-and-Overseas\_Main-report2\_EN.pdf, EA]

Economic Development and Employment Opportunities The rapid growth China has experienced over the last three decades has been **fuelled** in part **by its mining and metals industries.** The industrialization of the country and extensive infrastructure development would not have been possible without high outputs of steel and other construction materials. Likewise, without China’s huge coal industry, there would have been insufficient electricity to power the factories and industries that propelled China to its current position as the world’s second largest economy. Mining and metal production generates **large** **revenues**, which constitutes a **significant** **portion** of the country’s **GDP**. According to the National Bureau of Statistics, in 2010 mining directly contributed around 5.2% of China’s total GDP. This figure is **significantly** **higher** if **downstream** **industries** and **revenues** are taken into account. According to the International Council on Mining and Metals (ICMM), in 2010 the total production value of mining in China was **over US$69.2 billion**, which is an increase of over 555% since 2000. As well as generating revenue through taxation, royalties and sale of resources, mining also supports secondary industries such as those supplying machinery and other services to mining companies. Products of the mining industry can be **traded on international markets**, further **adding to China’s foreign currency reserves.**

#### **Chinese economic decline leads to all-out war – specifically over Taiwan.**

**Joske 18** Stephen Joske 10-23-2018 “China’s Coming Financial Crisis And The National Security Connection” <https://warontherocks.com/2018/10/chinas-coming-financial-crisis-and-the-national-security-connection/> (senior adviser to the Australian Treasurer during the 1997–98 Asian crisis)//re-cut by Elmer

The biggest **national security issues**, however, **arise from** the unpredictable **political impact of a recession in China**. We learned this, or should have, during the 1997 to 1998 Asian crisis. China may have had a disguised recession or near recession in 1998, but it was in a much smaller economy. Apart from that one episode there is no collective memory of recession and how to deal with it. As such, **China** is now **psychologically unprepared** to deal with the challenges of a recession. China’s coming recession will be accompanied by a large uncontrolled devaluation of the RMB as foreign exchange reserves evaporate, so it will be impossible to conceal this time. All asset prices, including housing prices, will be hit. **Combine** the **shock** of an unexpected economic setback **with tensions** in a one party state where a single individual has been calling the shots, and **political instability could set in.** While Xi’s anti-corruption campaign has not eliminated corruption, it has created many enemies who are biding their time. Minxin Pei has documented the activities of China’s powerful corruption networks. These networks, not a debilitated civil society, represent the alternative government of China. Competition between them could easily be destabilizing in a winner-take-all political environment. While our understanding of elite politics in China is poor, a recession would likely discredit the existing leadership and **set off intense competition between corrupt factions** for control of China. Bo Xilai, a former Chongqing party chief and Politburo member, was purged in 2012 but his son appears to still be interested in politics. While the outcome is impossible to predict, we can **see** the conditions in place for destabilizing events ranging from **military adventurism** to **civil war**. Alternatively, the regime could reassert its stability through increased repression, which would make China harder to deal with and would spill over into the Chinese diaspora. China’s Belt and Road Initiative has never had a real economic base. It is all about power projection (such as the Gwadar port) and would quickly be dropped by Beijing as a post-crisis China becomes focused on domestic political and economic stability. **Any Chinese military adventurism is likely to be focused on Taiwan.** China’s military is currently poorly equipped for an invasion of Taiwan, which has difficult geography and a substantial military, making an invasion of Taiwan unlikely to succeed. However, it is possible the Chinese **leadership would miscalculate** the risks, leaving it in a limited war with no clear resolution that would quickly **draw in Japan and the U**nited **S**tates. China has spent most of its history disunited, reflecting its geography. It has a number of widely dispersed economic centers. It was in outright civil war as recently as the 1960s. If competition between political factions remains unresolved, a civil war could develop, leaving China as a battleground where Russia, Japan, and the United States seek to influence the outcome. This scenario would stall or even end China’s rise as a global military and political power.

#### **Taiwan goes nuclear.**

**Talmadge 18** [Caitlin, Associate Professor of Security Studies at the Edmund A. Walsh School of Foreign Service at Georgetown University, “Beijing’s Nuclear Option: Why a U.S.-China War Could Spiral Out of Control,” accessible online at <https://www.foreignaffairs.com/articles/china/2018-10-15/beijings-nuclear-option>, published Nov/Dec 2018]//re-cut by Elmer

As China’s power has grown in recent years, so, too, has the risk of war with the United States. Under President Xi Jinping, China has increased its political and economic pressure on Taiwan and built military installations on coral reefs in the South China Sea, fueling Washington’s fears that Chinese expansionism will threaten U.S. allies and influence in the region. U.S. destroyers have transited the Taiwan Strait, to loud protests from Beijing. American policymakers have wondered aloud whether they should send an aircraft carrier through the strait as well. Chinese fighter jets have intercepted U.S. aircraft in the skies above the South China Sea. Meanwhile, U.S. President Donald Trump has brought long-simmering economic disputes to a rolling boil. A war between the two countries remains unlikely, but the prospect of a **military confrontation**—resulting, for example, **from a Chinese campaign against Taiwan**—**no longer seems** as **implausible** as it once did. And the odds of such a confrontation going nuclear are higher than most policymakers and analysts think. Members of China’s strategic community tend to dismiss such concerns. Likewise, U.S. studies of a potential war with China often exclude nuclear weapons from the analysis entirely, treating them as basically irrelevant to the course of a conflict. Asked about the issue in 2015, Dennis Blair, the former commander of U.S. forces in the Indo-Pacific, estimated the likelihood of a U.S.-Chinese nuclear crisis as “somewhere between nil and zero.” This assurance is misguided. If deployed against China, the Pentagon’s preferred style of conventional warfare would be a potential recipe for nuclear escalation. Since the end of the Cold War, the United States’ signature approach to war has been simple: punch deep into enemy territory in order to rapidly knock out the opponent’s key military assets at minimal cost. But the Pentagon developed this formula in wars against Afghanistan, Iraq, Libya, and Serbia, none of which was a nuclear power. **China**, by contrast, not only has **nuclear weapons**; it has also **intermingled** them **with its conventional** military **forces**, **making it difficult to attack one without attacking the other**. This means that a major U.S. military campaign targeting China’s conventional forces would likely also threaten its nuclear arsenal. Faced with such a threat, Chinese leaders could decide to use their nuclear weapons while they were still able to. As U.S. and Chinese leaders navigate a relationship fraught with mutual suspicion, they must come to grips with the fact that a conventional war could skid into a nuclear confrontation. Although this risk is not high in absolute terms, its consequences for the region and the world would be devastating. As long as the United States and China continue to pursue their current grand strategies, the risk is likely to endure. This means that leaders on both sides should dispense with the illusion that they can easily fight a limited war. They should focus instead on managing or resolving the political, economic, and military tensions that might lead to a conflict in the first place. A NEW KIND OF THREAT There are some reasons for optimism. For one, China has long stood out for its nonaggressive nuclear doctrine. After its first nuclear test, in 1964, China largely avoided the Cold War arms race, building a much smaller and simpler nuclear arsenal than its resources would have allowed. Chinese leaders have consistently characterized nuclear weapons as useful only for deterring nuclear aggression and coercion. Historically, this narrow purpose required only a handful of nuclear weapons that could ensure Chinese retaliation in the event of an attack. To this day, China maintains a “no first use” pledge, promising that it will never be the first to use nuclear weapons. The prospect of a nuclear conflict can also seem like a relic of the Cold War. Back then, the United States and its allies lived in fear of a Warsaw Pact offensive rapidly overrunning Europe. NATO stood ready to use nuclear weapons first to stalemate such an attack. Both Washington and Moscow also consistently worried that their nuclear forces could be taken out in a bolt-from-the-blue nuclear strike by the other side. This mutual fear increased the risk that one superpower might rush to launch in the erroneous belief that it was already under attack. Initially, the danger of unauthorized strikes also loomed large. In the 1950s, lax safety procedures for U.S. nuclear weapons stationed on NATO soil, as well as minimal civilian oversight of U.S. military commanders, raised a serious risk that nuclear escalation could have occurred without explicit orders from the U.S. president. The good news is that these Cold War worries have little bearing on U.S.-Chinese relations today. Neither country could rapidly overrun the other’s territory in a conventional war. Neither seems worried about a nuclear bolt from the blue. And civilian political control of nuclear weapons is relatively strong in both countries. What remains, in theory, is the comforting logic of mutual deterrence: in a war between two nuclear powers, neither side will launch a nuclear strike for fear that its enemy will respond in kind. The bad news is that one other trigger remains: a conventional war that threatens China’s nuclear arsenal. **Conventional forces** can threaten nuclear forces in ways that **generate pressures to escalate**—especially when ever more capable U.S. conventional forces face adversaries with relatively small and fragile nuclear arsenals, such as China. **If U.S. operations endangered** or damaged China’s **nuclear forces,** Chinese leaders might come to think that Washington had aims beyond winning the conventional war—that it might be seeking to disable or destroy China’s nuclear arsenal outright, perhaps as a prelude to regime change. In the fog of war, **Beijing might**reluctantly **conclude** that limited **nuclear escalation**—an initial strike small enough that it could avoid full-scale U.S. retaliation—**was** a **viable** option to defend itself. STRAIT SHOOTERS The **most worrisome flash point** for a U.S.-Chinese war **is Taiwan**. Beijing’s long-term objective of reunifying the island with mainland China is clearly in conflict with Washington’s longstanding desire to maintain the status quo in the strait. It is not difficult to imagine how this might lead to war. For example, China could decide that the political or military window for regaining control over the island was closing and launch an attack, using air and naval forces to blockade Taiwanese harbors or bombard the island. Although U.S. law does not require Washington to intervene in such a scenario, the Taiwan Relations Act states that the United States will “consider any effort to determine the future of Taiwan by other than peaceful means, including by boycotts or embargoes, a threat to the peace and security of the Western Pacific area and of grave concern to the United States.” Were Washington to intervene on Taipei’s behalf, the world’s sole superpower and its rising competitor would find themselves in the first great-power war of the twenty-first century. In the course of such a war, U.S. conventional military operations would likely threaten, disable, or outright eliminate some Chinese nuclear capabilities—whether doing so was Washington’s stated objective or not. In fact, if the United States engaged in the style of warfare it has practiced over the last 30 years, this outcome would be all but guaranteed. Consider submarine warfare. China could use its conventionally armed attack submarines to blockade Taiwanese harbors or bomb the island, or to attack U.S. and allied forces in the region. If that happened, the U.S. Navy would almost certainly undertake an antisubmarine campaign, which would likely threaten China’s “boomers,” the four nuclear-armed ballistic missile submarines that form its naval nuclear deterrent. China’s conventionally armed and nuclear-armed submarines share the same shore-based communications system; a U.S. attack on these transmitters would thus not only disrupt the activities of China’s attack submarine force but also cut off its boomers from contact with Beijing, leaving Chinese leaders unsure of the fate of their naval nuclear force. In addition, nuclear ballistic missile submarines depend on attack submarines for protection, just as lumbering bomber aircraft rely on nimble fighter jets. If the United States started sinking Chinese attack submarines, it would be sinking the very force that protects China’s ballistic missile submarines, leaving the latter dramatically more vulnerable. Even more dangerous, U.S. forces hunting Chinese attack submarines could inadvertently sink a Chinese boomer instead. After all, at least some Chinese attack submarines might be escorting ballistic missile submarines, especially in wartime, when China might flush its boomers from their ports and try to send them within range of the continental United States. Since correctly identifying targets remains one of the trickiest challenges of undersea warfare, a U.S. submarine crew might come within shooting range of a Chinese submarine without being sure of its type, especially in a crowded, noisy environment like the Taiwan Strait. Platitudes about caution are easy in peacetime. In wartime, when Chinese attack submarines might already have launched deadly strikes, the U.S. crew might decide to shoot first and ask questions later. Adding to China’s sense of vulnerability, the small size of its nuclear-armed submarine force means that just two such incidents would eliminate half of its sea-based deterrent. Meanwhile, any Chinese boomers that escaped this fate would likely be cut off from communication with onshore commanders, left without an escort force, and unable to return to destroyed ports. If that happened, China would essentially have no naval nuclear deterrent. The situation is similar onshore, where any U.S. military campaign would have to contend with China’s growing land-based conventional ballistic missile force. Much of this force is within range of Taiwan, ready to launch ballistic missiles against the island or at any allies coming to its aid. Once again, U.S. victory would hinge on the ability to degrade this conventional ballistic missile force. And once again, it would be virtually impossible to do so while leaving China’s nuclear ballistic missile force unscathed. Chinese conventional and nuclear ballistic missiles are often attached to the same base headquarters, meaning that they likely share transportation and supply networks, patrol routes, and other supporting infrastructure. It is also possible that they share some command-and-control networks, or that the United States would be unable to distinguish between the conventional and nuclear networks even if they were physically separate. To add to the challenge, some of China’s ballistic missiles can carry either a conventional or a nuclear warhead, and the two versions are virtually indistinguishable to U.S. aerial surveillance. In a war, targeting the conventional variants would likely mean destroying some nuclear ones in the process. Furthermore, sending manned aircraft to attack Chinese missile launch sites and bases would require at least partial control of the airspace over China, which in turn would require weakening Chinese air defenses. But degrading China’s coastal air defense network in order to fight a conventional war would also leave much of its nuclear force without protection. Once China was under attack, its leaders might come to fear that even intercontinental ballistic missiles located deep in the country’s interior were vulnerable. For years, observers have pointed to the U.S. military’s failed attempts to locate and destroy Iraqi Scud missiles during the 1990–91 Gulf War as evidence that mobile missiles are virtually impervious to attack. Therefore, the thinking goes, China could retain a nuclear deterrent no matter what harm U.S. forces inflicted on its coastal areas. Yet recent research suggests otherwise. Chinese intercontinental ballistic missiles are larger and less mobile than the Iraqi Scuds were, and they are harder to move without detection. The United States is also likely to have been tracking them much more closely in peacetime. As a result, China is unlikely to view a failed Scud hunt in Iraq nearly 30 years ago as reassurance that its residual nuclear force is safe today, especially during an ongoing, high-intensity conventional war. China’s vehement criticism of a U.S. regional missile defense system designed to guard against a potential North Korean attack already reflects these latent fears. Beijing’s worry is that this system could help Washington block the handful of missiles China might launch in the aftermath of a U.S. attack on its arsenal. That sort of campaign might seem much more plausible in Beijing’s eyes if a conventional war had already begun to seriously undermine other parts of China’s nuclear deterrent. It does not help that China’s real-time awareness of the state of its forces would probably be limited, since blinding the adversary is a standard part of the U.S. military playbook. Put simply, the favored **U.S. strategy** to ensure a conventional victory **would** likely **endanger** much of China’s **nuclear arsenal** in the process, at sea and on land. Whether the United States actually intended to target all of China’s nuclear weapons would be incidental. All that would matter is that Chinese leaders would consider them threatened. LESSONS FROM THE PAST At that point, the question becomes, How will China react? Will it practice restraint and uphold the “no first use” pledge once its nuclear forces appear to be under attack? Or will it use those weapons while it still can, gambling that limited escalation will either halt the U.S. campaign or intimidate Washington into backing down? Chinese writings and statements remain deliberately ambiguous on this point. It is unclear which exact set of capabilities China considers part of its core nuclear deterrent and which it considers less crucial. For example, if China already recognizes that its sea-based nuclear deterrent is relatively small and weak, then losing some of its ballistic missile submarines in a war might not prompt any radical discontinuity in its calculus. The danger lies in **wartime developments** that could **shift** **China’s assumptions about U.S. intentions.** If Beijing interprets the erosion of its sea- and land-based nuclear forces as a deliberate effort to destroy its nuclear deterrent, or perhaps even as a prelude to a nuclear attack, it might see limited nuclear escalation as a way to force an end to the conflict. For example, China could use nuclear weapons to instantaneously destroy the U.S. air bases that posed the biggest threat to its arsenal. It could also launch a nuclear strike with no direct military purpose—on an unpopulated area or at sea—as a way to signal that the United States had crossed a redline. If such escalation appears far-fetched, China’s history suggests otherwise. In 1969, similar dynamics brought China to the brink of nuclear war with the Soviet Union. In early March of that year, Chinese troops ambushed Soviet guards amid rising tensions over a disputed border area. Less than two weeks later, the two countries were fighting an undeclared border war with heavy artillery and aircraft. The conflict quickly escalated beyond what Chinese leaders had expected, and before the end of March, Moscow was making thinly veiled nuclear threats to pressure China to back down. Chinese leaders initially dismissed these warnings, only to radically upgrade their threat assessment once they learned that the Soviets had privately discussed nuclear attack plans with other countries. Moscow never intended to follow through on its nuclear threat, archives would later reveal, but Chinese leaders believed otherwise. On three separate occasions, they were convinced that a Soviet nuclear attack was imminent. Once, when Moscow sent representatives to talks in Beijing, China suspected that the plane transporting the delegation was in fact carrying nuclear weapons. Increasingly fearful, China test-fired a thermonuclear weapon in the Lop Nur desert and put its rudimentary nuclear forces on alert—a dangerous step in itself, as it increased the risk of an unauthorized or accidental launch. Only after numerous preparations for Soviet nuclear attacks that never came did Beijing finally agree to negotiations. China is a different country today than it was in the time of Mao Zedong, but the 1969 conflict offers important lessons. China started a war in which it believed nuclear weapons would be irrelevant, even though the Soviet arsenal was several orders of magnitude larger than China’s, just as the U.S. arsenal dwarfs China’s today. Once the conventional war did not go as planned, the Chinese reversed their assessment of the possibility of a nuclear attack to a degree bordering on paranoia. Most worrying, China signaled that it was actually considering using its nuclear weapons, even though it had to expect devastating retaliation. Ambiguous wartime information and worst-case thinking led it to take nuclear risks it would have considered unthinkable only months earlier. This pattern could unfold again today.

## **Case**

### SPACE WAR

#### **Space commercialization is a strong constraint on conflict – solves space war adv 1 and 2**

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

By the end of the twentieth century, scholars zeroed in on the democratic peace theory which attempts to explain why democracies do not go to war with other democracies and why, in some analyses, they seem to be more prone to peace in general than non-democracies. Similar to the golden arches, what is it about democracy that seems to induce such peacefulness? Academics have proposed everything from the nature of mediating institutions to the restraint of public opinion, to trade relations. While these variations will be explored further in Chapter 3, of interest here are the versions that focus explicitly on trade, commercial ties, and capitalism. Along these lines, Erik Gartzke argues, "peace ensues when states lack differences worthy of costly conflict."31 **If the costs of conflict are too high**, then **states should be more unlikely to engage in it**. To this end, economic globalization can provide the means through which costs are raised. “The integration of world markets not only facilitates commerce, but also creates new interests inimical to war. Financial interdependence ensures that damage inflicted on one economy travels through the global system, **afflicting** even **aggressors**."32 Focusing his analysis primarily on the influence of capitalism, Gartzke's findings suggest that states with markets more closely tied to the global economy are far less likely to experience a militarized dispute. In thinking about the space environment today, there are obvious principles of capitalism at work. However, China, a major spacefaring state that has been making capitalist reforms, arguably remains far from a true capitalist country. This is especially true in their space industry which is heavily subsidized by the state and almost wholly integrated with China's military.34 Many other states continue to subsidize space activities heavily as well. A better approach through which to examine conflict in space is presented by an offshoot of the capitalist peace which is termed the commercial peace. The commercial peace thesis emphasizes the role of trade and the connections made through it to explain a lack of conflict. Han Dorussen and Hugh Ward write: Trade is important not only because it creates an economic interest in peace but also because trade generates 'connections' between people that promote communication and understanding.... Based on these ideas, the flow of goods between countries creates a network of ties and communication links. If two countries are more embedded in this network, their relations should be more peaceful 35 Given the interconnectedness of the global economy to space-based assets, a version of the commercial peace thesis can be used to argue that the chance of conflict in space is less than is commonly understood or recognized precisely because of the extent to which **the global economy has become dependent on space-based assets.** To understand this argument, consider a scenario in which Russia, in preparation for a new assault on Eastern Europe, attacks a key US military satellite with the purpose of disrupting and disabling military communications in Europe. This action would conceivably enable the Russians to undertake their attack under more favorable conditions and prevent a quicker response from America and its allies. However, if the satellite was attacked via an ASAT that kinetically destroyed the US satellite, the debris cloud created from the attack could have disastrous consequences beyond military communications Much like the movie Gravity, the debris cloud could cause a chain reaction, hitting and ~~disabling~~ dismantling other satellites that would in turn disrupt civilian communications, business transactions, and perhaps even Russian military satellites. The economic effects of lost satellites would not be restricted to one country alone; the global economic consequences in terms of lost property (satellites), lost transactions, and financial havoc would echo throughout the world, including in Russia itself. Finally, the attack on one satellite could even ultimately endanger the ISS and its inhabitants, several of which are Russians. Destruction of the ISS would negate billions of dollars in investment from not just Russia, but other countries that have participated in it including Japan, Italy, and Canada. Therefore, an attack on a US military satellite would not just be an attack on one but an attack on all. While the previous scenario highlights several reasons why it would not be in Russia's best interest to attack a US satellite, this book argues that the economic argument is both the strongest and the most restraining especially as space becomes more congested, competitive, contested, and commercialized. The emergence of private space companies enhances this argument. "In the commercial sector, companies need reliability and legal enforcement mechanisms if they are going to operate profitably in a shared environment."36 In order to foster the growing area of space commercialization, companies must be assured that the activities they undertake in space will be protected in some way or, at a minimum, allowed to proceed to the extent where they can reap the profit. This could be done through international organizations that would provide some sort of space traffic control, but **the likelihood of a major international breakthrough on rules regarding space is unlikely in the near term**. Therefore, **actors must rely on** the**protections afforded them by an increasingly globalized economy that is ever more dependent on space-based assets**.

#### **No resource wars.**

### **Allouche 11—Research Fellow at the Institute of Development Studies and a PhD in International Relations from the Graduate Institute of International Studies (Geneva) [Jeremy, “The sustainability and resilience of global water and food systems: Political analysis of the interplay between security, resource scarcity, political systems and global trade,” *Food Policy*, Vol. 36, p. 53, Emory Libraries]**

### **The question of resource scarcity has led to many debates on whether scarcity (whether of food or water) will lead to conflict and war. The underlining reasoning behind most of these discourses over food and water wars comes from the Malthusian belief that there is an imbalance between the economic availability of natural resources and population growth since while food production grows linearly, population increases exponentially. Following this reasoning, neo-Malthusians claim that finite natural resources place a strict limit on the growth of human population and aggregate consumption; if these limits are exceeded, social breakdown, conflict and wars result. Nonetheless, it seems that most empirical studies do not support any of these neo-Malthusian arguments. Technological change and greater inputs of capital have dramatically increasedlabour productivity in agriculture. More generally, the neo-Malthusian view has suffered because during the last two centuries humankind has breached many resource barriers that seemed unchallengeable. Lessons from history: alarmist scenarios, resource wars and international relations In a so-called age of uncertainty, a number of alarmist scenarios have linked the increasing use of water resources and food insecurity with wars. The idea of water wars (perhaps more than food wars) is a dominant discourse in the media (see for example Smith, 2009), NGOs (International Alert, 2007) and within international organizations (UNEP, 2007). In 2007, UN Secretary General Ban Ki-moon declared that ‘water scarcity threatens economic and social gains and is a potent fuel for wars and conflict’ (Lewis, 2007). Of course, this type of discourse has an instrumental purpose; security and conflict are here used for raising water/food as key policy priorities at the international level. In the Middle East, presidents, prime ministers and foreign ministers have also used this bellicose rhetoric. Boutrous Boutros-Gali said; ‘the next war in the Middle East will be over water, not politics’ (Boutros Boutros-Gali in Butts, 1997, p. 65). The question is not whether the sharing of transboundary water sparks political tension and alarmist declaration, but rather to what extent water has been a principal factor in international conflicts. The evidence seems quite weak. Whether by president Sadat in Egypt or King Hussein in Jordan, none of these declarations have been followed up by military action. The governance of transboundary water has gained increased attention these last decades. This has a direct impact on the global food system as water allocation agreements determine the amount of water that can used for irrigated agriculture. The likelihood of conflicts over water is an important parameter to consider in assessing the stability, sustainability and resilience of global food systems. None of the various and extensive databases on the causes of war show water as a casus belli. Using the International Crisis Behavior (ICB) data set and supplementary data from the University of Alabama on water conflicts, Hewitt, Wolf and Hammer found only seven disputes where water seems to have been at least a partial cause for conflict (Wolf, 1998, p. 251). In fact, about 80% of the incidents relating to water were limited purely to governmental rhetoric intended for the electorate (Otchet, 2001, p. 18). As shown in The Basins At Risk (BAR) water event database, more than two-thirds of over 1800 water-related ‘events’ fall on the ‘cooperative’ scale (Yoffe et al., 2003). Indeed, if one takes into account a much longer period, the following figures clearly demonstrate this argument. According to studies by the United Nations Food and Agriculture Organization (FAO), organized political bodies signed between the year 805 and 1984 more than 3600 water-related treaties, and approximately 300 treaties dealing with water management or allocations in international basins have been negotiated since 1945 (FAO, 1978, 1984). The fear around water wars have been driven by a Malthusian outlook which equates scarcity with violence, conflict and war. There is however nodirect correlation between water scarcity and transboundary conflict. Most specialists now tend to agree that the major issue is not scarcity per se but rather the allocation of water resources between the different riparian states (see for example Allouche, 2005, 2007; Rouyer, 2000). Water rich countries have been involved in a number of disputes with other relatively water rich countries (see for example India/Pakistan or Brazil/ Argentina). The perception of each state’s estimated water needs really constitutes the core issue in transboundary water relations. Indeed, whether this scarcity exists or not in reality, perceptions of the amount of available water shapes people’s attitude towards the environment (Ohlsson, 1999). In fact, some water experts have argued that scarcity drives the process of co-operation among riparians (Dinar and Dinar, 2005; Brochmann and Gleditsch, 2006)**

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### **Space Debris**

#### **Squo solves debris — ADR, debris tracking, and maneuverability improvements will mitigate the impact far before we reach Kessler.**

**Kurt 15** (Joseph; Juris Doctor candidate, William & Mary School of Law, 2016; B.A. Marquette University, 2000; *Triumph of the Space Commons: Addressing the Impending Space Debris Crisis Without an International Treaty*; William & Mary Environmental Law and Policy Review; <https://pdfs.semanticscholar.org/0bd4/c4059d5a5ad2faa42ce5977548d900df8f8c.pdf>; accessed 10/4/19; MSCOTT)

III. **REASONS FOR HOPE: WHY INTERNATIONAL ACTORS WILL AVOID A TRAGEDY OF THE SPACE COMMONS WITHOUT A COMPREHENSIVE TREATY** A binding international regime—i.e., a comprehensive treaty— governing space debris might well be the most prudent international response to the issue.89 But for all the reasons discussed above, anything approaching a comprehensive agreement is nowhere in sight.90 If the need for such a regime is as dire as many commentators suggest,91 perhaps panic is in order. However, this Part argues that in addition to the significant obstacles to achieving a comprehensive treaty to deal with space debris, there is perhaps an even more compelling reason why there has been almost no progress in this direction: the **space debris problem can be effectively addressed without a binding treaty**. This claim flies in the face of common underlying assumptions about solving tragedies of the commons.92 Nevertheless, Part III of this Note will examine the space debris problem through three (overlapping) lenses that each suggest that nations with interests in space will cooperate to avoid a catastrophe in Earth’s orbit. Section A will demonstrate that realistic solutions to the problem are entirely feasible—and on the horizon. Section B, using the issue of global climate change as a point of comparison, will argue that political cooperation can be achieved without the force of international law. And Section C, informed by the practical and political considerations of the first two sections, will apply economic theories that also suggest that future international cooperation is highly likely to resolve the issue of space debris. A. Practical Considerations: Feasible Solutions to the Space Debris Problem Are **on Their Way** One key question in assessing whether an international treaty is a requisite for solving the space debris problem is just how difficult it will be to fashion a remedy. The more complex and costly are feasible solutions, the more likely it is that a comprehensive regime is necessary to bind the various actors together.93 A good place to begin is to determine just how imminent is the onset of the cascade of exponentially more frequent debris-creating collisions, known as the Kessler Syndrome.94 To be certain, no one can be sure—this phenomenon being subject to highly complex probabilities.95 Indeed, experts’ estimates of when such a cascade will become irreversible **vary widely**.96 The National Research Council produced a report in 2011 that suggested that “space might be just 10 or 20 years away from severe problems.”97 In fact, the cascading effect has already begun, albeit at a modest pace.98 However, Donald **Kessler**, who first described the eponymous effect in 1978, has significantly **recalibrated his own outlook over the years**.99 Originally, Kessler predicted that catastrophe would result by the year 2000.100 That date long passed, Kessler now speaks of a **century-long process that “we have time to deal with.”**101 Nevertheless, few would disagree with Cristophe Bonnal of the Centre National d’Études Spatiales (“CNES”), the French space agency, who says that it is “not yet clear” how much time we have to act.102 None of this is to say that interested parties should not act with great dispatch to address the space debris problem. Even if catastrophe is not on the immediate horizon—as some have suggested—Heiner Klinkrad, the European Space Agency’s leading authority on space debris points out that “[t]he longer you wait, the more difficult and far more expensive” any solution will be.103 The additional slack in plausible timelines is **cause for optimism** when one considers the **progress being made towards remediating the problem of space debris**. Such remediation entails a three-pronged approach: **preventive measures to reduce the creation of new debris**,104 space **debris tracking technologies**,105 and active debris removal (“**ADR**”).106 In an effort to address the first prong, the United Nations General Assembly in 2007 endorsed the COPUOS Space Debris Mitigation Guidelines.107 The recommended measures include design changes which would avoid the previously common practice of releasing debris during standard operations, **refraining from intentional destruction** of space objects, and **limiting the risk of collisions through avoidance maneuvers** and delaying launch times.108 As the COPUOS document points out, many of these practices had **already**been **adopted by spacefaring nations**.109 Compliance with the COPUOS Mitigation Guidelines is voluntary and has not been universal;110 however, many nations do take steps beyond those called for in the Mitigation Guidelines, recognizing the importance of redressing the issue.111 That said, even if no nation ever again launched a single object into outer space, the operation of the Kessler Syndrome would ensure that, over time, continuing collisions amongst already present objects would result in Earth’s orbit being rendered unusable.112 Improvements in space **debris tracking technology** are another partial solution that promises to help actors avoid collisions by identifying orbital debris in the path of satellites or spacecraft.113 There are limits on the effectiveness of such tracking, however, including the inability of some optical systems to track objects at night.114 Moreover, commonly employed systems cannot continually track objects smaller than thirty centimeters in diameter.115 **New systems are being developed**, however, that will use lasers that can track the location of objects as small as a softball— sometimes to within one meter.116 Such technology is still at the planning stage for NASA,117 but Lockheed Martin is teaming up with an Australianbased company on a laser-tracking project already in the works.118 Another promising development comes from scientists at the Massachusetts Institute of Technology, who are working on soccer-ball-sized robots designed to travel alongside the ISS, investigating potentially harmful space debris along the way.119

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

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

Kessler Syndrome is **overhyped**. A **chorus of online commenters** great any news of upcoming low earth orbit satellites with worry that humanity will to lose access to space. I now think they are **wrong**. What is Kessler Syndrome? Here’s the popular view on Kessler Syndrome. Every once in a while, a piece of junk in space hits a satellite. This single impact destroys the satellite, and breaks off several thousand additional pieces. These new pieces now fly around space looking for other satellites to hit, and so exponentially multiply themselves over time, like a nuclear reaction, until a sphere of man-made debris surrounds the earth, and humanity no longer has access to space nor the benefits of satellites. It is a dark picture. Is Kessler Syndrome likely to happen? I had to stop everything and spend an afternoon doing back-of-the-napkin math to know how big the threat is. To estimate, we need to know where the stuff in space is, how much mass is there, and how long it would take to deorbit. The orbital area around earth can be broken down into four regions. **Low LEO** - Up to about 400km. Things that orbit here burn up in the earth’s atmosphere quickly - between a few months to two years. The space station operates at the high end of this range. It loses about a kilometer of altitude a month and if not pushed higher every few months, would soon burn up. For all practical purposes, Low LEO **doesn’t matter** for Kessler Syndrome. If Low LEO was ever full of space junk, we’d just wait a year and a half, and the problem would be over. **High LEO** - 400km to 2000km. This where most heavy satellites and most space junk orbits. The air is thin enough here that satellites only go down slowly, and they have a much farther distance to fall. It can take 50 years for stuff here to get down. This is where Kessler Syndrome could be an issue. **Mid Orbit** - **GPS** satellites and other navigation satellites travel here in lonely, long lives. The **volume of space is so huge**, and the **number of satellites so few**, that we **don’t need to worry** about Kessler **here**. **GEO** - If you put a satellite far enough out from earth, the speed that the satellite travels around the earth will match the speed of the surface of the earth rotating under it. From the ground, the satellite will appear to hang motionless. Usually the geostationary orbit is used by big weather satellites and big TV broadcasting satellites. (This apparent motionlessness is why satellite TV dishes can be mounted pointing in a fixed direction. You can find approximate south just by looking around at the dishes in your northern hemisphere neighborhood.) For Kessler purposes, GEO orbit is roughly a ring 384,400 km around. However, all the satellites here are moving the same direction at the same speed - debris doesn’t get free velocity from the speed of the satellites. Also, it’s quite expensive to get a satellite here, and so there aren’t many, only about **one satellite per 1000km** of the ring. Kessler is **not a problem** here. How bad could Kessler Syndrome in High LEO be? Let’s imagine a **worst case** scenario. An evil alien intelligence chops up everything in High LEO, turning it into 1cm cubes of death orbiting at 1000km, spread as evenly across the surface of this sphere as orbital mechanics would allow. Is humanity cut off from space? I’m guessing the world has launched about 10,000 tons of satellites total. For guessing purposes, I’ll assume 2,500 tons of satellites and junk currently in High LEO. If satellites are made of aluminum, with a density of 2.70 g/cm3, then that’s **839,985,870 1cm cubes**. A sphere for an orbit of 1,000km has a surface area of 682,752,000 square KM. So there would be one cube of junk per .81 square KM. If a rockettraveled 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 19**90’s** are required to include a plan to get rid of the satellite at the end of its useful life (usually by deorbiting)

### **1NC – Solvency**

**Violations are inevitable globally, but there’s no impact because i-law’s toothless.**

**Hiken 12** (Luke - JD, Attorney Who Has Engaged in the Practice of Criminal, Military, Immigration, and Appellate Law, and Marti Hiken, Former Associate Director of the Institute for Public Accuracy and Former Chair of the National Lawyers Guild Military Law Task Force, “The Impotence of International Law”, Foreign Policy in Focus, 7/17/2012, <https://fpif.org/the_impotence_of_international_law/>)

Whenever a lawyer or historian describes how a particular action “violates international law” many people stop listening or reading further. It is a bit alienating to hear the words “this action constitutes a violation of international law” time and time again – and especially at the end of a debate when a speaker has no other arguments available. The statement is inevitably followed by: “…and it is a war crime and it denies people their human rights.” A **plethora** of international law violations are perpetrated by **every major power** in the world **each day**, and thus, the **empty invocation** of **i**nternational law **does nothing** but reinforce our own sense of impotence and helplessness in the face of international lawlessness. The **U**nited **S**tates, alone, and on a **daily basis** violates **every principle of international law ever envisioned**: unprovoked **wars of aggression**; unmanned **drone attacks**; **tortures** and **renditions**; **assassinations** of our alleged “enemies”; **sales of nuclear weapons**; **destabilization of unfriendly governments**; creating the **largest prison population** in the world – the list is **virtually endless**. Obviously one would wish that there existed a body of international law that could put an end to these abuses, but such laws exist in **theory**, not in **practice**. Each time a legal scholar points out the particular treaties being **ignored by the superpowers (and everyone else)** the only appropriate response is **“so what!”** or “they always say that.” If there is **no enforcement mechanism** to prevent the violations, and **no military force** with the power to intervene on behalf of those victimized by the violations, **what possible good does it do** to invoke principles of “truth and justice” that **border on fantasy**? The assumption is that by invoking human rights principles, legal scholars hope to reinforce the importance of and need for such a body of law. Yet, in reality, the invocation means nothing at the present time, and **goes nowhere**. In the real world, it would be nice to focus on suggestions that are enforceable, and have some potential to prevent the atrocities taking place around the globe. Scholars who invoke international law principles would do well to add to their analysis, some form of action or conduct at the present time that might prevent such violations from happening. Alternatively, **praying for rain** sounds as effective and rational as citing international legal principles to a **lawless president**, and his **ruthless military**.

**Space norms fail and the plan doesn’t establish consensus, it just adds a conflicting interpretation to an already fractured set of ideas about space**

**Lambakis 18** (Dr. Steven - Director of Space Studies and Senior Defense Analyst at the National Institute for Public Policy, Ph.D. at Catholic University, and Managing Editor of Comparative Strategy, “Foreign Space Capabilities: Implications for U.S. National Security”, Comparative Strategy, Volume 37, Issue 2, p. 135)

A recent unclassified national security space strategy report provides no indication that the Obama Administration was preparing to actively counter the space capabilities of adversaries; rather, the Obama Administration apparently was attempting to balance its highly idealistic language with the potential realities of conflict. Yet it must be pointed out that U.S. leadership in the world today is predicated heavily on its **military might**. Leading by **example without strength** to bear against those who would transgress U.S. interests would most likely lead the nation to **retreat**from the defense of its interests. Moreover, such a **display of weakness** could **lead to attacks** on the **U**nited **S**tates. **History** does **not** tell us that merely leading by example through living responsibly and peacefully is the best way to defend the nation. Why would we expect this tactic to work in space? Today, counter-space operations against U.S. assets are getting attention, but there seems to be no attention given to providing the United States with capabilities to counter the hostile space activities of other nations. There is significant discussion in official circles today about bolstering behavioral norms in space. But to **whose “norms”** will nations adhere? As the U.S. Deputy Assistant Secretary of Defense for Space, Doug Loverro put it, “we don’t want people shooting at satellites, we don’t believe that’s a good thing for mankind.”280 It has also been said that the establishment of norms “serves as a reminder that any battle for control over the use of space to support military operations begins well before forces begin to mobilize on Earth.”281 We **cannot assume**, however, that the normswhich other states adopt will be **those norms we deem appropriate** to ensure peaceful actions and safe behavior in space. The last decade is **replete** with examples of other countries, some of which are potential adversaries of the United States, practicing direct ascent ASAT maneuvers; one of these was destructive, demonstrating co-orbital ASAT operations, and practicing reversible interference through jamming of radio signals or dazzling infrared sensors. The norm of **self-serving behavior** that **advances national goals** is **the norm** that has been **most obvious** in international relations for centuries. And, this norm has been **reflected in space** over the past 10 years. Are efforts to create benign “rules of the road” likely to **replace** this norm?While possible in principle, it seems **extremely unlikely**, and would be highly imprudent to assume as a basis for defense planning. Another norm that characterizes the current age and should inform our thinking about space is invasion of sovereign nations. In February 2014, Russia’s president Vladimir Putin invaded Ukraine, starting with the annexation of Crimea (part of Ukraine). Since the invasion, more than 10,000 Ukrainians have been killed. This has happened **despite** international norms, treaties, and agreements that condemn such aggressive behavior and consider it to be politically shameful; indeed, international agreements and shaming speeches have been **entirely ineffectual**. The Ukrainians either did not consider that such a transgression could occur, or believed that the world would rally to their side to push back the invasion. Neither belief, of course, was based in reality. All that matters today are the facts on the ground—i.e., the nature of the regimes confronting us and the strategies they are pursuing. There are broad national security implications of not having access to space. On land, at sea, and in the air, the United States customarily strives for peaceful, safe, and responsible behavior to avoid accidents, ensure international tensions do not flare up, and essentially collaborate with other states to ensure a stable, predictable environment—but it does so armed all the same, prepared to defend interests in each of those environments. Why? Because **history is replete** with **violations** of **broken** conventions and international **agreements**, and because **peace does not last**.