**I negate resolution that The appropriation of outer space by private entities is unjust**

## **NC FW**

**My value criteria is maximizing aggregate utility of the general population – For life to be worth living, it is agreed upon that each member of a society must have an equal opportunity to maximize their general happiness and welfare, which are tangible experiences derived from material conditions**

**Default to an aggregate utilitarian calculus – Maximizing aggregate utility for the general population allows for policies that align with each actor’s preference for equal material outcomes.**

**Allen 17** (Daneille Allen, Director of the Edmond J. Safra Center for Ethics at Harvard University and professor in Harvard’s Department of Government and Graduate School of Education, political theorist who has published broadly in democratic theory, political sociology, and the history of political thought, “Political Equality and Empowering Economies-- Toward a New Political Economy” Page 2 – 7 <http://henryfarrell.net/wp/wp-content/uploads/2017/04/Allen_equality.pdf>,)

We were of course surprised not just by Brexit and Trump but also by the recession of 2008. We have therefore been living in a state of intellectual surprise for almost a decade. Why is it that we have been so blind-sided? The answer lies, I suggest, in the dominant liberal policy-making paradigms. The dominant liberal policy paradigm, emerging from places like Harvard’s Kennedy School of Government and operating in Washington think-tanks and policy making-spaces, fuses two things: utilitarian economic welfarism and Rawlsian welfarism. Let me explain**. On the utilitarian model the goal of policy is to maximize happiness or, better, utility, as the economists label it, for society. In its crudest forms, the effort to maximize aggregate utility relies on cost-benefit analyses, linked to preferences typically cast in terms of material goods.** Much modeling of utility maximization in relation to preferences has abstracted away from the contextual, social, psychological, and cultural particularities of individual economic actors. **The pursuit of utilitarian welfare maximization has typically focused on maximizing aggregate growth—in terms of income and wealth--and on using redistributive policies to spread the benefit of that growth**. John Rawls is a philosopher who in 1971 published an important book called Theory of Justice; and one of his main goals was to overturn utilitarianism. He sought to prioritize the right over the good, establishing as the purpose of political order the protection of a framework of right, not the pursuit of any particular good, even utility or happiness. Yet even as, philosophically, he sought to overturn utilitarianism, in many ways Rawlsianism has reinforced its practical applications. In the Rawlsian framework, the goal of a just society is to do two things. The first goal is to protect a set of basic liberties. Those basic liberties include things like the right of association, the right to free expression, and the right to participate politically. The second goal is to pursue social and economic structures, within the constraint of protecting those rights, that are to the benefit of the least well of in society (“the difference principle”) and that secure fair equal opportunity throughout the society. Rawls’ innovative and influential difference principle has anchored the major part of the reception of his work and led to a dominant focus, in philosophical discussions of justice, on the economic questions of distributive justice. These questions have gotten far more attention than his discussion of basic rights. Indeed, in the policy world, Rawlsianism has turned into a basic focus on redistributive taxation as the starting point for building a policy framework. Without intending to, Rawls reinforced the utilitarian paradigm precisely by hiving off consideration of basic rights from his treatment, via the difference principle, of social and economic spheres. **He provided support for the utilitarian focus on growth, so long as it was tethered to redistribution.** **In both utilitarian welfarism and Rawlsian welfarism, as expressed in the policy world, the core question for justice is one of material distribution**. **This is recognizable. When someone invokes the concept of “social justice,” the first thing that comes to mind tends to be matters of economic distribution and welfarist social rights**. Similarly, when a speaker invokes the concept of inequality, the relevant kind of inequality the speaker has in mind is almost invariably economic inequality. That’s what scholars and the general public know how to talk about, thanks to the intellectual support provided by policy paradigms coming out of utilitarian welfarism, on the one hand, and Rawlsian welfarism, on the other. Two features of this fused utilitarian-Rawlsian policy paradigm merit attention. The first is that both the utilitarian paradigm and the Rawlsian paradigm are universalizing. **That is, they both abstract away from the contextual specifics of any given society to develop their overarching policy guidelines (utility maximization, on the one hand; and the difference principle, on the other).** For instance, in Theory of Justice, Rawls seeks the definition of the right by asking us to imagine stepping behind “a veil of ignorance,” where we no longer know anything about our own social situation; from that perspective in the imagination, we are to try to identify the principles that would constitute a just society, **one that we will consider just regardless of whether we turn out to be one of the just society’s wealthier or poorer, male or female, black or white citizens and so forth**. The principles of justice are to be devised without taking into account any underlying demographic features of a society. Moreover, **they are understood to apply universally, to any social context.** In the context of utilitarianism, the move to abstract away from social particularity is less a matter of the intentional design of the theory and more a necessary consequence of its mathematization. In principle, utility is a concept that can embrace not only a given actors preferences for material outcomes but also his or her values and norms. But the project of “maximizing” utility requires that we convert preferences into something arithmetic, and so financial interests are conventionally used as a proxy for utility, thus flattening the particularities of preference that may in fact give meaning and shape to the life of any particular agent. As in the Rawlsian case, the move to treat material gain, money, as a proxy for utility permits universalization. Financial stakes can be translated into a currency and compared across countries and contexts without reference to the underlying demographic facts or situations on the ground in any given country. In other words, one of the things both of these intellectual paradigms do is turn our attention away from the underlying demographic and institutionalarrangements of a society. Our minds are trained away from questions such as: Who has power and on account of what sorts of institutional structures and according to what sorts of allocations of resources and opportunities? We lose the habit of analyzing the demographic and political specificity of any given society to the degree that we embrace and reinforce the habits of using utilitarian and/or Rawlsian welfarism. To give you a concrete example of the kind of abstraction I am trying to pinpoint, think about how the World Bank historically operated throughout the late 20th century. A set of boilerplate requirements for economic liberalization were applied to developing economies as conditions for receiving loans from the bank. The fact the stability of these welfarist policy paradigms has taught us to overlook underlying social and political phenomena flows, I think, from a small philosophical mistake made in the early 19th century, and characterizing most variants of liberalism ever since. The mistake was to draw a distinction between two halves of that set of basic rights protected by liberalism. I introduced the concept of basic rights in describing Rawls’ Theory of Justice, and provided as examples freedom of association, freedom of expression, and the right to participate in politics. With these three examples, I was limning the full spectrum of basic rights, including both halves as distinguished in the early 19th century. What does this mean exactly? An early 19th century French thinker named Benjamin Constant was the first to divide basic rights, basic human rights, into two categories. He called them the rights of the ancients and the rights of the moderns. The rights of the ancients comprised rights to participate in politics, in shaping the collective life of a society. We now call these positive liberties. The rights of the moderns, in contrast, comprise a right to property and the right to be left alone to take your property, which you have a right to, and to engage in commercial transactions in pursuit of your own wellbeing as you see fit. We call these negative liberties. The rights of the ancients were political rights, a right to be a part of a society that was working together to steer itself through collective decision making**. The rights of the moderns, forConstant, were about private autonomy, having the right to steer your own life, and being more or less left alone by any collective decision- making, to the maximum degree possible.** That distinction has worked its way into the philosophical tradition, and was extended by Isaiah Berlin in the early 20th century (who introduced the terms negative and positive liberties). Rawls, in Theory of Justice, argues that he’s putting the two sets of rights back together again and that we need to protect the whole set of basic rights. In fact, however, the political rights become sacrifice-able in his argument, in various technical ways that I won’t go into here (but do detail in Allen, “Difference without Domination”). Over the whole arc of Theory of Justice, we end up primarily focusing our thinking about politics on the conjunction of our private rights (the right to autonomy, property, association, expression, and so forth) with the economic questions associated with those rights-- the wealth associated with property and the need for redistribution that comes from the unequal flow of the gains of productivity across a population. In other words, when you lose sight of the political rights and focus primarily on the private rights or negative liberties, you can easily come to focus exclusively on economic questions and lose sight of political questions. That is what I see as having happened in the policy paradigms that dominated U.S. policy-making in the late 20th century. Another part of the story about the development of a truncated focus on economic questions— without reference to underlying political questions—relates to the transition over the course of the 20th century from the influence of law on public policy to the influence of economics. Sociologist Elizabeth Popp Berman (2014) has written well about the variety of factors— including new capacities for computation—that drove that change, and much more could be said about this transition. But the transition from law to economics also underscores the point I’m making**.** Legal thinking is fundamentally about the institutions of specific societies and about the consequences of particularities of those institutions for specific societies. Even sub-disciplines like comparative law that compare the legal systems in different places must begin by seeing the specificity of the legal institutions in each place under comparison. When law dominated the policy-making universe, universalizing policy approaches that abstracted from demographic and social specificity, were not broadly available. The abstracting, universalizing features of the fused utilitarian/Rawlsian welfarism that dominated policy making of the late 20th century seem to me to have produced the blindspots to society, politics, and political rights, that left us surprised not only by 2008 but also by Brexit and Trump.

## **NC China DA**

#### **Remote-sensing satellites and other innovations put the United States ahead of other adversaries seeking to control space, but Chinese and Russian military doctrines prove a desire to counteract U.S. military capabilities in space**

**Council of Economic Advisers 21** ("Economic Report of the President," Together with The Annual Report of the Council of Economic Advisers January 2021 page 247 – 248 <https://www.whitehouse.gov/wp-content/uploads/2021/07/2021-ERP.pdf>)

Box 8-2. National Security and Space

Space-based capabilities are crucial for the United States’ security. Space has become a primary component of U.S. military operations, including missile warning, geolocation and navigation, target identification, and activities to track adversaries. **Remote-sensing satellites have greatly improved military and intelligence collection capabilities, thereby reducing other countries’ ability to carry out covert military exercises and operations**. **As advancements in the space sector occur, such as technological improvements and lower barriers to entry, foreign governments are developing capabilities that could threaten the United States’ freedom to operate in space**. In a 2020 report, **the Defense Intelligence Agency points out how China and Russia, in particular, are trying to undermine the United States’ advantage in space** (DIA 2019). For example, **Chinese and Russian military doctrines present a view that counterspace capabilities serve as a tool to reduce the effectiveness of U.S. and allied military forces**. Both countries have developed extensive space surveillance networks that enable them to monitor, track, and target American and allied forces. Additionally, both China and Russia are working on their cyberspace and jamming capabilities. The Trump Administration recognizes the importance of establishing and maintaining influence in space and providing space security for U.S. interests and the American people. In March 2018, the White House unveiled a new National Space Strategy that places an emphasis on “peace through strength in the space domain.” **Though adversaries are attempting to use space as a weapon, the United States’ stance is to protect the space domain from conflict and secure the United States’ vital interests in space—namely, the freedom of operation in space to advance security, economic prosperity, and scientific knowledge**. Although peace in the space domain is a top priority, the National Space Strategy affirms that **the United States needs to be vigilant about any harmful interference within the space domain that negatively affects America’s or its allies’ vital interests and must “deter, counter, and defeat” any such threats**. **Space systems are vital to the U.S. economy and national security, and they enable key functions such as global communications; positioning, navigation, and timing; scientific observation; exploration; weather monitoring; and multiple vital national defense applications.** In September 2020, President Trump issued Space Policy Directive (SPD)–5, “Cybersecurity Principles for Space Systems,” which provides guidance on the protection of space assets and supporting infrastructure from evolving cyber threats. The National Space Strategy also emphasizes the importance of better leveraging and supporting the commercial sector to ensure that American companies are leaders in space technology. This is discussed more throughout this chapter. To strengthen the United States’ military position in the space domain, President Trump established the United States Space Force (USSF) as the sixth branch of the U.S. Armed Forces by signing the National Defense Authorization Act for fiscal year 2020. Vice President Pence has stated that the mission of the Space Force is to “develop and implement the unique strategy, doctrine, tactics, techniques and procedures our armed forces need to deter and defeat a new generation of threats in space” (Pence 2019). Its responsibilities include “developing military space professionals, acquiring military space systems, maturing the military doctrine for space power, and organizing space forces to present to our Combatant Commands” (USSF 2020).

SHARESHARE

**Space Commercialization is key to Space Deterrence – Commercial Flexibility is key to deterrence by denial.**

**Klein 19**, John J. Understanding space strategy: the art of war in space. Routledge, 2019. (a Senior Fellow and Strategist at Falcon Research, Inc. and Adjunct Professor at George Washington University’s Space Policy Institute)//Elmer

Recent U.S. space policy initiatives underscore **the far-reaching benefits of commercial space activities**. The White House revived the National Space Council to foster closer coordination, cooperation, and exchange of technology and information among the civil, national security, and commercial space sectors.1 National Space Policy Directive 2 seeks to promote economic growth by streamlining U.S. regulations on the commercial use of space.2 While the defense community generally appreciates the value of services and capabilities derived from the commercial space sector—including space launch, Earth observation, and satellite communications—it often overlooks one area of strategic importance: deterrence. To address the current shortcoming in understanding, this paper first describes the concept of deterrence, along with how space mission assurance and resilience fit into the framework. After explaining how **commercial space capabilities may influence the decision calculus of potential adversaries**, this study presents actionable recommendations for the U.S. Department of Defense (DoD) to address current problem areas. Ultimately, DoD—including the soon-to-be reestablished U.S. Space Command and possibly a new U.S. Space Force—should incorporate the benefits and capabilities of the commercial space sector into flexible deterrent options and applicable campaign and contingency plans. Deterrence, Mission Assurance, and Resilience Thomas Schelling, the dean of modern deterrence theory, held that deterrence refers to persuading a potential enemy that it is in its interest to avoid certain courses of activity.3 One component of deterrence theory lies in an understanding that the threat of credible and potentially overwhelming force or other retaliatory action against any would-be adversary is sufficient to deter most potential aggressors from conducting hostile actions. This idea is also referred to as deterrence by punishment.4 **The second salient component of deterrence theory is denial. According to Glenn Snyder’s definition, deterrence by denial is “the capability to deny the other party any gains from the move which is to be deterred.**”5 The 2018 U.S. National Defense Strategy (NDS) highlights deterrence, and specifically deterrence by denial, as a vital component of national security. The NDS notes that the primary objectives of the United States include deterring adversaries from pursuing aggression and preventing hostile actions against vital U.S. interests.6 The strategy also observes that deterring conflict necessitates preparing for war during peacetime.7 **For** the **space** domain, the peacetime **preparedness needed for deterrence by denial** **occurs in** the context of space mission assurance and resilience. **Mission assurance** entails “a **process to protect** or ensure the continued function and **resilience of capabilities and assets**—including personnel, equipment, facilities, networks, information and information systems, infrastructure, and supply chains—critical to the performance of DoD mission essential functions in any operating environment or condition.”8 Similar to mission assurance but with a different focus, **resilience is** an architecture’s **ability to support mission success** with higher probability; shorter periods of reduced capability; and across a wider range of scenarios, conditions, and threats, despite hostile action or adverse conditions.9 Resilience may leverage cross-domain solutions, along with commercial and international capabilities.10 Space mission assurance and resilience can prevent a potential adversary from achieving its objectives or realizing any benefit from its aggressive action. These facets of U.S. preparedness help convey the futility of conducting a hostile act. Consequently, they **enhance deterrence by denial**. Commercial Space Enables Deterrence The **commercial space** sector directly **promotes** **mission assurance and resilience efforts**. This is in part **due to the distributed and diversified nature of commercial space launch and satellites services**. Distribution refers to the use of a number of nodes, working together, to perform the same mission or functions as a single node; diversification describes contributing to the same mission in multiple ways, using different platforms, orbits, or systems and capabilities.11 The 2017 U.S. National Security Strategy, in noting the benefits derived from the commercial space industry, states that DoD partners with the commercial sector’s capabilities to improve the U.S. space architecture’s resilience.12 Although U.S. policy and joint doctrine frequently acknowledge the role of the commercial space sector in space mission assurance and resilience, there is little recognition that day-to-day contributions from the commercial industry assists in deterring would-be adversaries. The commercial space sector contributes to **deterrence by denial through multi-domain solutions** that are **distributed and diversified**. These can **deter** potential **adversaries** **from pursuing offensive actions against space-related systems**. Commercial launch providers enhance deterrence by providing options for getting payloads into orbit. These include diverse space launch capabilities such as small and responsive launch vehicles, along with larger, reusable launch vehicles; launch rideshares for secondary payloads; and government payloads on commercial satellites. Various on-orbit systems also promote deterrence. For exam

ple, if an aggressor damages a commercial remote sensing satellite during hostilities, similar **commercial satellites** in a different orbital regime, or those of the same constellation, may **provide** the **needed imagery. If** **satellite** **communications** are **jammed** or degraded, **commercial service providers can reroute satellite communications** through their own networks, or potentially through the networks of another company using a different portion of the frequency spectrum. Regarding deterrence by punishment efforts, the commercial space sector can play a role, albeit an indirect one, through improved space situational awareness (SSA) and space forensics (including digital forensics and multispectral imagery). The commercial industry may support the attribution process following a hostile or illegal act in space through its increasingly proliferating network of SSA ground telescopes and other terrestrial tracking systems. The DoD may also leverage the commercial space sector’s cyber expertise to support digital forensic efforts to help determine the source of an attack. **By supporting** a **credible** and transparent **attribution** process, **commercial partners may cause a would-be adversary to act differently if** it perceives that its aggressive, illegal, or otherwise nefarious actions will be disclosed. Doing so can help bolster the perceived ability to conduct a legitimate response following a hostile attack, which may **improve deterrence by punishment** efforts. Commercial space capabilities may also facilitate the application of force to punish a potential aggressor. In addition to traditional military space systems, commercial satellite imagery and communication capabilities may be used in cueing and targeting for punitive strikes against an aggressor. Although the commercial space sector is not expected to be involved directly in the use of retaliatory force following a hostile act, commercial partners may help in providing the information used to identify those responsible and to facilitate any consequent targeting efforts.

#### **[Extra] Private sector capabilities, resources, and innovations are essential American Power Projection in Outer Space. The government can’t win the space race without the American Private sector.**

**Puttre 21** (Michael Puttré, writer in New York focusing on defense and space. Formerly, he was editor-in-chief of *The Journal of Electronic Defense* and editor of *Solar Industry* magazine, The China Challenge: Space Race 2.0 China is keeping pace with the U.S. in space launches, but capitalism is already stealing the longest march by making space profitable August 16, 2021 https://www.discoursemagazine.com/politics/2021/08/16/the-china-challenge-space-race-2-0/

The People’s Republic of China (PRC) has powerful Long March booster rockets that it is counting on to propel its ambitions in a new space race with the United States. It has successfully deployed a moon rover, a Mars rover and a new space station—right over our heads. As in the days of Sputnik, the cry arises, “Are we losing the space race?” Today, there are many space races. Earth orbit is now open to commercial, scientific and, increasingly, military use by an ever-expanding roster of countries. The competition is hot for available slots, particularly in the desirable and economically promising low-Earth orbit (LEO) arena. Similarly, the number of objects in the solar system to receive visits from one probe or another continues to grow, with more missions planned from a more select—but still widening—group of participants. The most exclusive race, however, is the one to establish a persistent manned presence in orbit, on the moon and elsewhere in the solar system—a race in which both the U.S. (through the International Space Station) and China (through its new Tiangong Space Station) have gained significant ground. Despite China’s recent achievements in space, the U.S. has been there, done that. It is on the cusp of handing the baton over to space entrepreneurs just when China is tuning up to play. **America is conducting space law as China is figuring out the opening notes.** However, will China’s energy, resources, central planning and political will enable it to muscle past an evolving U.S. approach driven by free enterprise? Robert Zimmerman, author, analyst and proprietor of the space and technology website [Behind the Black](https://behindtheblack.com/), says the PRC’s emphasis on space is reflected in its current crop of important political figures, many of whom [have come up through the space program](https://www.scmp.com/news/china/policies-politics/article/2092940/how-leaders-chinas-space-programme-entered-political). “The PRC is picking people to run their government that have proven themselves to be very good managers in a field where error costs a lot,” Zimmerman says. “Other bureaucracies can get away with doing something stupid; no one will care. But in space, if you don’t run it right, things fail, and they do it very publicly. Space also produces people who have to innovate and be smart.” According to Zimmerman, promoting space managers into high levels of the Chinese government not only guarantees a continued commitment to space by that government, it also [raises the quality of that government](https://findchina.info/china-space-agency-chief-leaves-post-to-become-acting-governor-for-fujian-province?cat=chinas-space-program). This fact should not be taken lightly: “The Chinese government is thus now filled with people who came from that space program, which explains the acceleration in the program in recent years.” Despite China’s renewed focus on space policy, however, the U.S. continues to maintain its competitive edge in the final frontier. **Sitting in a Tin Can** NASA and its partners in Russia, Europe, Japan and Canada have built and maintained the International Space Station (ISS), which has been continuously occupied by crews and visitors of many nations for more than 20 years. The modular complex is the largest man-made object in space and represents an evolution from earlier Soviet and American orbital station projects from the Cold War, such as Mir and Skylab. Capable of supporting a vast array of scientific experiments and observations, the ISS has weathered technical challenges, budget-conscious critics and worldly political conflict to become a symbol of international cooperation and achievement. Conspicuous by its absence among the ISS partners is the PRC. A U.S. law passed in 2011 essentially [barred NASA from cooperating with China](https://www.thespacereview.com/article/3725/1) because of technology transfer concerns and worries over the theft of intellectual property. This did not stop the China National Space Administration (CNSA) from moving forward with its increasingly ambitious space program using licensed Russian and home-grown technology (and perhaps tech [pilfered from the West](https://nationalinterest.org/blog/buzz/will-china-steal-its-way-space-race-victory-184574)). Earlier this year, the CNSA established the base Tianhe module of its [Tiangong Space Station](https://www.nasaspaceflight.com/2021/06/shenzhou-12-new-chinese-station/), which it plans to crew for the next 10 years. “There is no question that much of China’s new space infrastructure, including their space station and the spacecraft, are upgraded designs of the Soviet Union’s Mir station and its Soyuz capsule,” Zimmerman says. “**There’s also no doubt that the Chinese government has used its hackers to aggressively steal blueprints and plans made by American companies and NASA’s Jet Propulsion Laboratory, as documented by one inspector general report**. For example, their rover on Mars is almost certainly an upgrade of the Spirit and Opportunity rovers we launched a decade and a half ago. At the same time**, China is also improving on others’ engineering, and their work so far has been impeccable. They have not failed. They have done it well.”** The Tiangong program builds on the success of the CNSA’s two previous manned orbiting laboratories. The Tianhe module is scheduled to be joined by two science modules by the end of 2022. The three Chinese astronauts, called taikonauts, fitting out the core module now are due to return to Earth in September. Future launches will bring successive crews to the station. While the Tiangong will be only a fraction of the size of the ISS, alarmists see its advent as a [direct challenge to the United States](https://freebeacon.com/national-security/chinese-space-station-a-looming-threat-to-us-experts-say/). The line between Chinese scientific and military development is blurred, and some analysts express concern that the station could host dual-use technology research with military applications. Of course, this is essentially true for any technology for space, from rocket boosters to Earth observation sensors to space-rendezvous capabilities. For this reason, many critics of the so-called [Wolf Amendment](https://www.forbes.com/sites/williampentland/2011/05/07/congress-bans-scientific-collaboration-with-china-cites-high-espionage-risks/?sh=548fc1b84562) (named after China critic Rep. Frank Wolf (R-Va.), now retired), which limits NASA cooperation with China, would like to see the amendment [removed in future legislation](https://www.thespacereview.com/article/3725/1). However exaggerated concerns may be about Tiangong’s danger as a platform for dominating the United States, the program does have the potential for swinging international support for space exploration China’s way. In June, officials at Russia’s Roscosmos said the space agency was in [talks to send its cosmonauts](https://www.space.com/russia-cosmonauts-may-visit-china-space-station) to the Chinese station. Russia has been making noise about leaving the ISS project for years, bristling at Western criticism of its incursions into Ukraine and its annexation of Crimea. A shiny new Chinese space station is an attractive lure, particularly if access comes sans criticism of Russia’s foreign policy. Moreover, the European Space Agency (ESA) and the CNSA have an [existing agreement](https://www.esa.int/Science_Exploration/Human_and_Robotic_Exploration/Astronauts/ESA_and_Chinese_astronauts_train_together) for joint training and technical cooperation in preparation for European crews to visit Tiangong after its completion. While there is no prospect for the ESA (or Roscosmos, for that matter) to have any sort of partnership role on China’s space station on par with what they have with the ISS, China is clearly extending an open hand to spacefaring nations that historically have partnered with NASA. It is also likely that China will make opportunities available for countries that do not have their own space programs to send visitors to Tiangong and thereby expand its influence. Russia does seem to have gotten over its recent fit of pique and has committed itself to the ISS program, at least into 2025. In late July, Roscosmos successfully—if shakily—[delivered its long-awaited Nauka](https://www.nasaspaceflight.com/2021/07/nauka-docking/#more-79335) Multipurpose Laboratory Module to the station. Russia is slated to launch its Prichal spacecraft support module to the ISS later this year. At the same time, Roscosmos officials have declared that the agency is planning to [build its new Russian Orbital Service Station (ROSS)](https://www.nasaspaceflight.com/2021/04/roscosmos-future-for-mid-2020s/) and place it into a polar orbit, with the first module scheduled to go up in 2025. The ROSS is an ambitious project with the goal of being able to resupply and service satellites and spacecraft in orbit, greatly extending their operational lives and capabilities—maybe too ambitious for Russian resources alone. In any event, Roscosmos says it wants its presence on the ISS and eventual operational capacity of the ROSS to overlap, which might keep Russia around for a while longer if schedules slip, as they are wont to do. (Nauka originally was supposed to be delivered to the ISS in 2007.) But if Russia’s own resources are insufficient to launch the ROSS, the country may turn to China’s coffers for help. **Big Money Goes Around the World** For its part, NASA says it would like to keep the ISS operational through 2030, when the oldest sections will be reaching the end of their designed lifespans. **Rather than seeking to launch a replacement, the U.S. space agency says it wants to** [**support private enterprise in building space stations**](https://www.upi.com/Science_News/2021/07/12/NASA-next-commercial-space-station/7611625859006/) **of their own in LEO.** **The** [**Commercial LEO Destinations project**](https://www.nasa.gov/leo-economy/commercial-destinations/) **is seeking proposals from companies leading to the deployment of new private space stations that meet the needs of customers, including NASA.** Thus, contract winners will own and operate the facilities as commercial enterprises. This approach is very different from China’s, which sees space exploration and development as a government prerogative. As sort of an interim step, **NASA has awarded Axiom Space a** [**$140 million contract**](https://www.nasa.gov/press-release/nasa-selects-first-commercial-destination-module-for-international-space-station) **to build a private module for the ISS that could transition into a core module for an independent private station after the venerable station is retired.** If “LEO Destinations” sounds like an upscale suburban mall, that’s sort of the point. Presumably, space station operators will be able to drum up business from private, public and educational entities. NASA says it will be evaluating proposals based on the capabilities on offer. The usual suspects of [legacy and new-wave aerospace companies](https://www.thejournaldaily.com/nasa-commercial-leo-destinations-project-for-private-space-stations/) are expected to compete for a share of the $400 million contract. At least one prospective bidder, Sierra Nevada Corp., says it also wants to design and deploy private space stations to its own specifications, independent of NASA awards. It is also developing its Dream Chaser space plane to serve as a shuttle to orbital destinations. Though not as famous as SpaceX’s Elon Musk, Virgin’s Richard Branson and Blue Origin’s Jeff Bezos, the billionaire husband-and-wife owners of Sierra Nevada, Turkish immigrants Fatih and Eren Ozmen, share the others’ [visions of private space entrepreneurship](https://www.cnbc.com/2021/04/14/billionaire-owned-sierra-nevada-corp-creating-new-space-company-to-bet-on-a-low-earth-orbit-economy.html) backed by deep pockets. If the Ozmens have heretofore flown under the radar, it is only because they have not yet gotten off the ground (although Sierra Nevada, a major defense contractor, does build satellites for the military). The other private space program billionaires have come in for [some criticism and even scorn](https://www.theatlantic.com/science/archive/2021/07/space-billionaires-jeff-bezos-richard-branson/619383/) for squandering their earthly fortunes on allegedly vanity rocket projects and not using their money for worldly philanthropic concerns. Putting aside demonstrable charitable outreach (e.g., Musk’s $100M sponsorship of an XPrize for carbon capture, Branson’s Virgin Unite Foundation and Bezos’ buying The Washington Post), they have taken vastly different approaches to reaching orbit. These efforts have done much to advance humanity’s access to space. While Musk’s SpaceX has stridden a workmanlike path of marching into orbit with increasingly more powerful booster rockets and better capsule designs, Branson and Bezos have taken the detour into space tourism. Likewise, Sierra Nevada sees its prospective space habitats as tourist destinations served by a fleet of reusable space taxis. The focus on tourism may seem like a frivolous use of orbital access, but the very capabilities that enable a (reasonably) safe adventure for rich people willing to pay for it will make a space-based economy possible in LEO and beyond. All these companies have perceived that reusability of launchers is a key aspect of making space access routine and economical. SpaceX has put its efforts to overcome the technical hurdles of recovering boosters front and center for all the world to see, failures and all. Blue Origin has been less profligate in its approach to the same problem and has achieved limited success doing so. Virgin Galactic is demonstrating an air-launch approach that, while bringing people to the edge of space, is also a viable strategy for launching payloads into orbit (Virgin Orbit and others are already launching payloads into space from conventional aircraft). Sierra Nevada is poised to test its reusable Dream Chaser space plane next year and has a contract to deliver payloads to the ISS with these planes in 2024. The space billionaires have used government contracts to launch payloads, to supply and send crews to the ISS, to provide boosters for upcoming moon and space exploration missions, and, through the Commercial LEO Destinations program, to bid for new orbital stations—all as rungs on a ladder to the high frontier. Some are also using the willingness of tourists to pay for the privilege of having a look at the frontier for themselves. This is low-hanging fruit. **These U.S. space investors all have ambitions of being in on the ground floor of a** [**robust space-based economy**](https://www.discoursemagazine.com/economics/2021/01/22/the-solar-system-is-open-for-business/) **and profess a willingness to use such contracts, and their own deep pockets, to make this happen**. But while the U.S. is busily trying to open a path to space for the private sector, China remains focused on a territorial, government-centric strategy. **Wish You Were Here** Government-centric space programs are constrained by government-centric imagination, budgets and deciders. NASA, thankfully, has reasoned this out. The PRC has no hope of matching Western entrepreneurship, even with its world-class resources and demonstrable ability to keep a schedule. Therefore, it is falling back on the tried-and-true Chinese Communist Party (CCP) strategy of outrageous rhetoric to inspire its people and bluff would-be competitors. A senior official with the CNSA’s lunar program has been [reported by the Daily Beast](https://www.thedailybeast.com/chinas-looming-land-grab-in-outer-space) as saying the moon and Mars (and presumably myriad other rocks out there) are the equivalent of the islands in strategic locations in the Indo-Pacific region that China contests with Japan and other countries: The universe is an ocean, the moon is the Diaoyu Islands, Mars is Huangyan Island. If we don’t go there now even though we’re capable of doing so, then we will be blamed by our descendants. If others go there, then they will take over, and you won’t be able to go even if you want to. This is reason enough. The fact the CCP views real estate in the solar system the same way as real estate on Earth is both instructive and amusing. There are clearly practical benefits to establishing the ability to exist in space and on celestial bodies in the solar system. Presidents Obama and Trump (perhaps incongruously) both set the stage for the [Artemis Accords](https://www.nasa.gov/specials/artemis-accords/index.html), which encourage signatory nations to legalize the use of space resources to further their space projects. So, you can use stuff you dig up and refine for fuel and manufacturing. And if it’s valuable, you can sell it. Of course, both China and Russia denounced the Artemis Accords. Yet China now apparently says such locations are analogous to islands off its coasts that it claims to own. Better get up there and plant some rovers or bases—even though a serious spacefaring power, not to mention a space-based economy, would need to use space resources to sustain itself. **“I see limited evidence of the Chinese government’s desire to patiently work with others in the long term,”** says Behind the Black’s Zimmerman. “They want dominance.” **He adds that the legal framework for exploiting space resources needs updating. The Outer Space Treaty of 1967** **stipulates that no nation may claim sovereignty over bodies in space.** The Artemis Accords are an attempt to get around that stipulation so as to allow some demarcation of property rights in space. In this context, Zimmerman has recently published a new history, “[Conscious Choice](https://behindtheblack.com/conscious-choicethe-origins-of-slavery-in-america-and-why-it-matters-today-and-for-our-future-in-outer-space/),” that explores the failures and successes of the British colonies in North America, a history which he then uses to illustrate what we should and should not do when we build our new colonies in space. “The Outer Space Treaty had good intentions, and you know where that leads to,” he says. “Its good intentions—like the desire to leave space to all humanity—are actually encouraging military conflict because there is no legal way for nations to work things out.” Japan recently [passed a law](https://spacewatch.global/2021/06/japan-fourth-country-in-the-world-to-pass-space-resources-law/) on the use of space resources along the lines of that suggested by the Artemis Accords. Japan will be an enthusiastic partner in the Western model for the development of space. One can understand China’s concern. China and Russia have declared a plan to [jointly establish a base on the moon](https://behindtheblack.com/behind-the-black/points-of-information/china-and-russia-outline-long-term-plans-for-building-joint-lunar-base/) by 2036. We’ll see. In the meantime, NASA has the luxury of considering which woman and/or person of color to put on the moon as part of its [Artemis program](https://www.nasa.gov/specials/artemis/). (I’m pulling for [Jasmine Moghbeli](https://www.nasa.gov/specials/artemis-team/) of Baldwin, N.Y. Go Long Island!). NASA [selected SpaceX](https://www.nasa.gov/press-release/as-artemis-moves-forward-nasa-picks-spacex-to-land-next-americans-on-moon) to provide the lander for the Artemis program (which gave its name to the accords), scheduled for a first crewed landing in 2024, although that target may slip due to concerns over [spacesuit availability](https://thehill.com/policy/technology/567239-elon-musk-on-reported-nasa-space-suit-delays-spacex-could-do-it). SpaceX has also been contracted to launch into lunar orbit the first modules of NASA’s planned [Gateway space station](https://www.nasa.gov/gateway/overview) “no earlier” than late 2024. Again, we’ll see. What’s interesting is that Blue Origin threw a flag on the lander award and claimed it could do better. A judge [dismissed the suit](https://www.nytimes.com/2021/07/30/science/nasa-bezos-lunar-lander-contract.html), but the attempt stands as a demonstration that multiple American companies are competing to put people into space. It’s an important dynamic missing from CNSA’s committee-driven program. The PRC’s approach to space exploration looks very much like a follow-the-leader affair, with its space station, moon rover and Mars rover, even if it is a competently managed one. Wait until China sees the power of a fully operational capitalist economy in space. Fortunately, there is plenty of room for everybody. Failing that, it’s a [good thing we have a Space Force](https://www.discoursemagazine.com/politics/2020/10/02/securing-the-high-frontier/).

#### **U.S. Defensive Space strategy is essential to deterring aggressive Chinese Expansion and preventing conflict**

**Grossman and Langeland 21** (Derek Grossman***,*** *senior defense analyst at the* RAND Corporation focused on a range of national security policy and Indo-Pacific security issues, KRISTA LANGELAND, received her PhD in Materials Science in 2012. She is currently an Associate Physical Scientist at RAND Corporation, "Tailoring Deterrence for China in Space*" CHAPTER FIVE Implications for the United States* Page 37 – 42 <https://www.rand.org/content/dam/rand/pubs/research_reports/RRA900/RRA943-1/RAND_RRA943-1.pdf>)

A deterrence strategy tailored to the space domain will need to consider capabilities, actions, and retaliatory responses in other domains and use this to shape China’s perception of the costs and gains of interfering in space. **From our analysis here, several initial observations on how the United States could best shape China’s perception of cost and gains become apparent**. First, given that Beijing clearly believes that space deterrence is part and parcel of undermining the overall will and capabilities of an adversary to resist in armed conflict, Washington might need to rethink how it responds to the Chinese escalation ladder. For example, if Beijing escalates from military space exercises to space force deployments, as described by Jiang and Wang above, then Washington should seek to convey to Beijing that its space deterrence strategy is not working. **This would entail the United States demonstrating resolve to fight on in the confrontation, and might require meeting Chinese space escalation with countervailing U.S. responses in the space domain, other domains, or both.** **Doing so would reinforce the message that Beijing is failing to achieve the desired end state.** **Communicating the United States’ ability and intent to respond in other domains is important for this tailored deterrence strategy.** From this perspective, it is concerning that official U.S. space strategy still generally conceptualizes American space deterrence efforts as confined to the space domain. According to the Pentagon’s Defense Space Strategy Summary, published in June 2020, **Washington seeks “to deter and defeat adversary hostile use of space” in order to “maintain space superiority” as well as “deter aggression inspace” to “ensure space stability**.”1 The strategy does not address how Washington would effectively prevent Chinese actions in space from undermining terrestrial-based U.S. joint military operations in all other domains. In the first USSF Chief of Space Operations’ planning guidance of November 2020, however, the United States approaches doing so by stating that “**we will support a position of strategic stability, United States advantage in space, and a space warfighting posture that deters aggression and ensures Joint and Coalition warfighters can employ forces in the time, place, manner, and domain of our choosing.”**2 Further, the United States Space Command, while previously focused on providing capabilities that support other military operations, such as communication satellites and missile warning, has shifted to a new paradigm that recognizes that, should U.S. space capabilities be targeted, the United States Space Command would need to be supported by other combatant commands.3 These recent shifts that recognize the supporting and supported role of the space domain are positive moves toward a multidomain approach to space deterrence. The bottom line is that the United States’ public statements should avoid space-to-space calculations and encompass deterring China’s plans to impact the entirety of the United States’ war effort through activities in space. Doing so could convince Beijing that such a plan would not work, or at least that it would be less effective than previously thought. Second, the United States might seek ways of demonstrating that it is not as highly dependent on satellite-enabled warfare as Beijing has come to believe in recent years. As discussed above, China assesses that U.S. satellites were an essential enabler of Washington’s successful joint military operations against Iraq. In order to modify Chinese perceptions that the United States is heavily reliant on space and therefore reduce Beijing’s focus on space deterrence, Washington could publicly reveal new capabilities outside of the space domain, such as advancedsurveillance remote piloted vehicles or new communications systems, which demonstrate redundancy of its space-based capabilities. Developing and messaging the existence of this redundancy could encourage China to reconsider the value of taking escalatory steps in space. From this perspective, the establishment of USSF is counterproductive because the new service implies that Beijing is correct—that is, that the United States does highly value outer space and must defend it at all costs to avoid vulnerabilities on Earth. USSF Chief of Space Operations’ guidance says as much: “Space is a vital national interest. Activities on land, at sea, in the air, through cyberspace, and in the electromagnetic spectrum all depend on space superiority. The nation established the United States Space Force to ensure freedom of action for the United States in, from, and to space.”4 Chinese observers have also accurately identified the rationale behind the establishment of USSF, with one noting that “the U.S. military believes that entering, utilizing and controlling space is of great strategic significance for maintaining national defense security. The United States military has been committed to innovating tactics and strategies to control space power, strengthening the support of space organization system to ensure the technical advantages of space equipment.”5 This is not to say, however, that the establishment of USSF is an error or is somehow misguided. But the fact of USSF’s existence does perhaps unavoidably show just how important defending space is for the United States and thereby confirms the Chinese approach. Third, the United States would probably benefit from encouraging China to question its own ability to leverage the space domain in support of the PLA’s system-of-systems concept of modern warfare and terrestrial-based joint operations. This might be accomplished via a demonstration of capabilities that would compromise PLA space systems, perhaps through enhanced U.S. cyberhacking, spoofing, jamming, or other dazzling capabilities against China, but could also include kinetic options as well. **If Beijing believes** **its ability to leverage space for terrestrial-based joint operations is no longer reliable, or lessreliable than previously assessed, then it might have to look elsewhere to achieve these capabilities. In this scenario, the United States may observe a reduction in China’s emphasis on achieving space supremacy and its corresponding deterrence activities in space. Beijing might be compelled to cede gains toward space superiority in favor of gains in more advantageous domains. In this regard, the establishment of USSF serves the very important purpose of keeping pressure on China in space. From a Chinese perspective, it is worrying that the United States Defense Space Strategy calls for “build[ing] a comprehensive military advantage in space” by “building capabilities to counter hostile uses of space.” The strategy further states that “DoD [will develop an agile space enterprise that can take advantage of emerging technological and commercial innovation in order to continually outpace adversary threats.”**6 Beijing is undoubtedly concerned about USSF’s long-term plans. **There is the possibility that the United States eventually outcompetes China in space, which would ultimately prompt China to back down.** Threats to outspend Moscow during the Cold War and how this strategy contributed to the Soviet Union’s demise is an intriguing and relatively recent historical analogy. However, one Chinese article also highlights the destabilizing effect of USSF, noting that “the United States’ increased space deterrence not only directly poses a clear threat to its opponents, but also causes international space security to increasingly slip into an arms race and security dilemma. This change at the level of the international system caused by the United States’ pursuit of space hegemony has in turn shaped the current space security relationship, prompting other countries to make complex responses including counter-deterrence under system pressure.”7 Thus, USSF deterrence activities may have to be carefully calibrated to mitigate concern about its role. Messaging about USSF could emphasize its role in maintaining equitable access to space or resilience and reconstitution capabilities that deny PLA successes in space rather than simply ramping up punitive capabilities that can be mirrored on the other side. Fourth, and finally, the United States might want to consider the nature of its deterrence messaging to China in space. **As mentioned above, Washington would likely benefit from increased clarity in its warnings and intentions, signaling to Beijing that the United States will not “submit to the deterrer’s volition” as China moves up its spacedeterrence escalation ladder. There is a move in the space community away from technical warnings based on easily measurable metrics such as vicinity constraints in favor of behavior-based warnings, and messaging to China would benefit from following this shift. For example, the United Nations General Assembly recently passed a resolution drafted by the United Kingdom that focuses on such a behavior-based approach rather than an object-based approach.8 The resolution, “Reducing Space Threats Through Norms, Rules, and Principles of Responsible Behaviors,” gives states the flexibility to assess threats from their own national security perspective rather than presenting a unilateral assessment of threat based on an object itself.** The focus of this resolution on building norms and establishing an international code of conduct is in contrast to an object-based approach that would seek a treaty that bans specific kinds of ASAT tests. This shift toward a focus on behavioral norms is a positive step toward building a deterrence strategy with effective redlines.9 It is also the current position of the U.S. Department of State that behaviors should be the driver of deterrence messaging rather than technology and technical limits on its use.10 The implication would be that if China does not follow acceptable behavioral norms, then negative consequences could follow. This approach could accomplish two things. First, Beijing might be less likely to place counterspace assets just beyond Washington’s minimum standoff distance from the United States, thereby providing the United States with more reaction time in the event of attacks. And second, it would put the onuson China to be a more responsible power in space. Heeding Marquez’s advice to shift away from vicinity-based warnings in favor of behaviorbased warnings could make space force deployments, the third rung on the Chinese space escalation ladder, fraught with greater risk to China. At present, China seems to have more of an appreciation for vicinitybased messaging, as in the U.S. delineation of specific locations as redlines, as it typically loiters in the standoff threshold. Beijing typically disregards behavior-based messaging. The shift in the international space community toward establishing norms of behavior, coupled with a shift in Washington toward behavior-based messaging, may serve to increase the perceived importance of behavior-based messaging in Beijing’s mind by presenting them with increased costs should they violate these norms. Additionally, by placing the onus on China to act responsibly in space through threat of punishment or denial, this behavior-based messaging would in effect challenge Beijing’s objective to “seize the initiative” early to win in space. The United States has noted China’s inconsistency in its words and deeds in space, and this inconsistency is facilitated by the absence of behavioral-based norms in space.11 China routinely advocates the peaceful use of space and use of military force for defensive purposes only, yet continues the development and testing of counterspace weapons. Widespread adoption of international norms of behavior may resonate in China and, hopefully, keep Beijing true to its words (not deeds) and compel it to change its behavior going forward.12

#### **The failure of U.S. Space deterrence spurs Chinese Space Weaponization and makes a space war inevitable. A space war would have detrimental effects on society through destroying logistics, communications, navigation systems, supply chains, and health care.**

**Erwin 21** (Sandra Erwin, covers the military and national security beat as a Senior Staff Writer at SpaceNews, "U.S. generals planning for a space war they see as all but inevitable" September 17, 2021 https://spacenews.com/u-s-generals-planning-for-a-space-war-they-see-as-all-but-inevitable/)

A ship in the Pacific Ocean carrying a high-power laser takes aim at a U.S. spy satellite, blinding its sensors and denying the United States critical eyes in the sky. This is one scenario that military officials and civilian leaders fear could lead to escalation and wider conflict as rival nations like China and Russia step up development and deployments of anti-satellite weapons. If a satellite came under attack, depending on the circumstances, “the appropriate measures can be taken,” said Lt. Gen. John Shaw, deputy commander of U.S. Space Command. The space battlefield is not science fiction and anti-satellite weapons are going to be a reality in future armed conflicts, Shaw said at the recent 36th Space Symposium in Colorado Springs. U.S. Space Command is responsible for military operations in the space domain, which starts at the Kármán line, some 100 kilometers (62 miles) above the Earth’s surface. This puts Space Command in charge of protecting U.S. satellites from attacks and figuring out how to respond if hostile acts do occur. Military space assets like satellites and ground systems typically have been considered “support” equipment that provide valuable services such as communications, navigation data and early warning of missile launches. But as the Pentagon has grown increasingly dependent on space, satellites are becoming strategic assets and coveted targets for adversaries. “It is impossible to overstate the importance of space-based systems to national security,” Air Force Secretary Frank Kendall said in a keynote speech at the symposium. Shaw noted that Gen. John Hyten, the vice chairman of the Joint Chiefs of Staff, “likes to talk about satellites as being ‘big fat juicy targets.’” “I agree with that,” said Shaw. “But how do we change that? How do we make it more difficult for a potential adversary to think they could succeed in depriving us of our space capabilities?” Those questions are now being debated as Space Command develops what Shaw describes as “space warfighting doctrine.” A laser blinding a satellite is just an example of the types of attacks the U.S. has to prepare for, said Shaw. If that happened, the Defense Department would have to decide how to respond to that threat. Conceivably, naval or aerial forces would be called upon to take retaliatory action. “[W]e are only starting to grapple with… what space warfighting really means,” Shaw said. U.S. in a ‘long-term strategic competition’ A competition for space dominance between the United States and rival powers China and Russia prompted the Trump administration and Congress in 2019 to re-establish U.S. Space Command — which had been deactivated since 2002 — and create the U.S. Space Force as an independent service branch. Kendall, who was sworn in late July as the civilian leader of the Air Force and the Space Force, said **the United States is in a “long-term strategic competition” with China. The implications for space are significant, he said, as “China has moved aggressively to weaponize space.” The Space Force will invest in new capabilities to deter and win if deterrence fails,** Kendall said. **Any type of escalation can result in miscalculations and human errors which is why a space war is a “conflict that no one wants,” he said. The U.S. military’s space weapons that presumably would deter China from firing the first shot against a satellite are classified.** In a rare disclosure, the Space Force last year said it deployed an advanced ground-based communications jammer made by L3Harris that could be used as an “offensive weapon” to disrupt enemies’ satellite transmissions. Chris Kubasik, L3Harris vice chairman and CEO, said **there should be more awareness of the risks of an attack against a satellite precipitating a broader conflict.** “**I think it’s the biggest threat facing our nation,”** Kubasik said at the Space Symposium. **A war in space would be “detrimental to society” because satellites play such a central role in everyday life for most people. “If you think of the impact of a war in space and how it impacts something as simple as our cellphones, navigation, supply chain, logistics, healthcare. I think it is a serious issue. And I think we have to continue to talk about it**.” Public awareness and education about the nation’s dependence on space are needed to help DoD “get the funding to make sure that we deter or defeat our adversaries in space,” he said. Unlike conflicts on Earth, a space war is not easy to visualize. “I call it an invisible war with invisible hardware that people can’t see, it’s a little different than being here on the ground,” said Kubasik. First shot could be against satcom The military’s reliance on commercial satellites for communications makes these systems one of the most likely targets of enemy jammers and cyber disruptions, said Travis Langster, vice president and general manager of Comspoc, a company that monitors space traffic and tracks orbital activities. “Given the plethora of commercial space, based on the observations and activities we’ve seen at Comspoc, the target of that first shot is likely to be a commercial satellite,” Langster said during a Space Symposium panel discussion. By launching an electronic or cyberattack against a commercial satellite that is used by DoD for military operations, an enemy would be “trying to send a very specific message” that it does not draw a line between commercial and military space assets. The most likely scenario is a “reversible attack,” meaning some temporary loss of a space-based service, said Langster. “In this day and age, the first shot will likely be a cyberattack.” Carey Smith, CEO of defense and cybersecurity contractor Parsons, said space-based networks already are under attack. “Jamming is occurring today; there’s obviously cyber attacks that are occurring across the infrastructure,” she said. And there have been many documented attempts to interfere with communications signals in war zones where U.S. forces operate. But the question is whether these activities will escalate and lead to broader conflict. “I think the path to war in space is really based upon a space arms race, and we’ve been fortunate that we’ve been able to delay it up until this point, but it is perhaps imminent,” she added. A key reason why the space race is accelerating is that technology is advancing so rapidly, Smith said. A second reason is the absence of “binding commitments on what the operating norms are going to be in space,” she said. “And without that, we’re very likely to have a space war.” The only foundation of international space law that currently exists, the 1967 Outer Space Treaty, is outdated and doesn’t address most space security issues that could set off a war, Smith noted. The treaty bans the stationing of weapons of mass destruction in outer space, prohibits military activities on celestial bodies and contains legally binding rules governing the peaceful exploration and use of space. But a new set of rules is needed for the current space age, Smith said. “We really haven’t addressed some of the very difficult questions. Can a nation tailgate another nation’s satellite? Is preemptive self defense going to be permissible? Are we going to ban any form of weapons in space?” Frank Backes, senior vice president of space and defense contractor Kratos, echoed that sentiment. “We’ve seen very intentional interference within regional conflicts to take military systems offline,” he said. Of particular concern to the Pentagon are disruptions to satellite communications networks that are used to operate unmanned surveillance aircraft. Drones rely on GPS and satellite communications systems to track and strike targets. “Those types of reversible effects have already entered into the space layer, but I agree with Carrie Smith. It is the space race that is turning space into a warfighting domain,” said Backes. “What that looks like going forward definitely could be devastating to our commercial and international use of space.” DoD wants resilient space architecture Experts point out that there are increasingly more ways to permanently or temporarily damage satellites so it would be virtually impossible for DoD to defend against a multitude of weapons. China and Russia, for example, have direct-ascent weapons that are launched on a sub-orbital trajectory to strike a satellite in orbit. They also have co-orbital weapons that are placed into orbit and then later maneuvered toward their intended target. Additionally, China and Russia are deploying non-kinetic space weapons, according to the Center for Strategic and International Studies. These include lasers that can be used to temporarily dazzle or permanently blind sensors on satellites, and jamming devices that interfere with the communications to or from satellites by generating noise in the same radio frequencies. In the face of these threats, the United States aims to make space networks more resilient by using a diversity of satellites in different orbits,complicating an adversary’s ability to launch an effective attack. Kendall said resiliency “isn’t just about the individual satellite, it’s about the architecture.” DoD’s Space Development Agency is looking to demonstrate what it hopes will be a more resilient space architecture. The agency is working to deploy a proliferated constellation of small satellites in low Earth orbit as an alternative to the traditional large, expensive spacecraft that DoD has traditionally flown in higher orbits but much smaller numbers. “We’re getting away from ‘juicy targets’,” said SDA Director Derek Tournear. The idea of a proliferated architecture is to have enough satellites in orbit that “we can handle some attrition.”

#### **If a conflict were to happen China would not back down – statements from Chinese military and political officials prove**

**Klein 19** (John J. Klein, Senior Fellow and Strategist at Falcon Research, USA; and serves as an adjunct professor at the George Washington University’s Space Policy Institute, "Understanding Space Strategy: The Art of War in Space" 2019 Page 96 – 99 **5** **Space Strategy for Great Powers)**

Historical experience illustrates that states will compete in space, and this competition includes an assessment of fear, honor, and interest. When considering the space strategies for states, the categories of great, medium, and emerging powers are useful for discerning relevant considerations for strategy’s formulation. Even though the concepts and principles described in Chapter 2 stand on their own, the strategies for states and actors with varying degrees of power and capabilities will likely be different by necessity. Strategy involves balancing desired ends with available means, and the available means will be predicated, in part, on space-related capabilities commensurate with each category of space power. Because of the expected strategy preferences among the different types of space powers, the next three chapters consider those areas likely to be most germane for great, medium, and emerging space powers. That said, just because a concept is described in one category of power does not mean that it cannot be thoughtfully considered and implemented in another. Every competition or conflict between states is different, and therefore, the concepts discussed here are not meant to be prescriptive but only illustrative of those areas where thoughtful deliberations should occur. Deganit Paikowsky has provided an insightful arrangement for those considered to be in the “space club,” which can be used to differentiate between the levels of emerging, medium, and great space powers.1 Using Paikowsky’s framework, emerging space powers include the numerous states that indigenously can develop, maintain and control satellites but that are unable to launch them through indigenous means. There are many countries within the group, but examples include Canada and Saudi Arabia. Medium space powers include those states with the indigenous capability to launch, develop, and control satellites.2 The contenders presently for the label of medium space power include the European Space Agency (ESA), the European member states of ESA that support ESA’s space launch capabilities, Japan, India, Israel, Ukraine (which inherited its launch capability through the former Soviet Union), and Iran. In contrast, great space powers are defined as those having the aforementioned medium space power capabilities but also having the indigenous capability of human spaceflight, which includes China, Russia, and the United States. Even though the United States has not had indigenous human spaceflight capability since the2011 retirement of the Space Shuttle, it is still considered a great space power because of its legacy of such capability. Of the various categories of space powers, it is perhaps great space power that is understood best because we have decades of historical experience to draw upon. This chapter will examine great power competition in space—namely the more recent activities of China, Russia, and the United States—to highlight potential challenges and opportunities for international cooperation. After gleaning any lessons or worthwhile considerations from history, topics for the practical implementation of space strategy will be discussed. While the ideas presented here will be in line with the general concepts and principles discussed previously, the ideas and topics in this chapter are thought to be especially salient for great space powers. China China’s meteoric rise as a space power has been striking. With its manned space program starting in 2003, its anti-satellite testing in 2007, 2010, and 2013, and its plan for a large space station by 2020, the achievements illustrate how rapidly China has matured as a space power.3 In October 2003, China independently launched and recovered its first taikonaut—or astronaut— becoming just the third member of an elite spacefaring club with Russia and the United States. In January 2007, China successfully tested a direct ascent anti-satellite weapon in low Earth orbit, thereby again joining Russia and the United States as one of only three states known to have demonstrated this capability.4 Regrettably, this test created over 3,000 pieces of trackable space debris.5 Three years later, China reportedly conducted a test with two microsatellites performing proximity operations and apparently intentionally “bumping” each other, a capability which only a few countries have at present.6 It is assessed that this test helped improve Chinese anti-satellite systems. In May 2013, China conducted a self-described “high-altitude science mission,” which was assessed by the U.S. Defense Department to be a counterspace test designed to reach satellites in geostationary orbit.7 **Concerning military operations in space, the intent of the Chinese leadership is difficult to discern. It has been suggested, however, that China understands that to conduct war effectively it must be a space power**. Joan Johnson-Freese writes that **Beijing understands that it cannot control space all the time, nor does it believe it has to control it**. It needs only to buy the time it needs to accomplish its goals by interfering with its opponent’s capabilities.8 Similarly, **Chinese military doctrine states that a “soft kill” against an opponent’s space system can be achieved by interfering with information systems and ground stations, electromagnetic pulses, camouflage, flare, and deception.**9 **Chinese political and military leadership have concluded that information operations and space capabilities are required to fight and win in future conflicts**. Recent Chinese efforts to both exploit and deny space and cyber domains are central to the People’s Liberation Army (PLA) focus on fighting and winningfuture “informationized local wars,” of which dominance of outer space, cyber space, maritime, and nuclear domains will play a part.10 It is generally understood that the capabilities of the PLA are steadily expanding in every facet. A 2017 Report to the

U.S. Congress states: The PLA is acquiring a range of technologies to improve China’s counterspace capabilities. In addition to the research and possible development of directed-energy weapons and satellite jammers, China is also developing anti-satellite capabilities and probably has made progress on the antisatellite missile system that it tested in July 2014. China is employing more sophisticated satellite operations and probably is testing dual-use technologies in space that could be applied to counterspace missions.11 Moreover, China has concluded that space warfare will be an integral part of future wartime operations.12 Waging “local war under modern, high-tech conditions” would necessitate space capabilities.13 **In Chinese strategy, space is thought to be important for the advantage it confers when collecting, transmitting, and exploiting information, rather than for space’s own sake.14 Chinese analysis concluded that future joint operations will involve multiple services operating together across significant distances**. Victory in future conflicts will not only require unfettered access to space for one’s own forces but also the denial of the same ability to the adversary.15 In the 2013 edition of the Chinese journal The Science of Military Strategy, space is said to be the “high ground in wars under informationized conditions,” while being tied to the struggles in the future battlegrounds of network space and the electromagnetic spectrum.16 Chinese space strategy embraces what would be called joint or multi-domain in Western militaries. Dean Cheng writes that the Chinese embrace an “all aspects unified,” thereby viewing the land, sea, air, electromagnetic spectrum, and space in a joint fashion, with operations in each domain contributing to, and receiving support from, the other domains.17 All operations in these domains are considered to be aimed ultimately at predetermined political ends.18 Based upon PLA analysts, Chinese military space operations are likely to entail five broad “styles” or mission areas: space deterrence, space blockades, space strike operations, space defense operations, and space information support.19 China’s growing power and space emphasis may become manifest in mostly peaceful and cooperative ways, or its expanding capabilities may lead to increased competition. Peter Hays has noted, “**China presents the global community with both the greatest opportunities and the most difficult challenges for space cooperation.”**20 **Many security analysts believe that if the United States and others can successfully engage China in effective space cooperation and confidence-building activities, this may help reduce the risks associated with increasing competition**. Furthermore, state leaders must avoid the mistake of treating China like the Soviet Union or seeing this relationship through the lens of the Cold War.21 Brad Roberts has suggested that a potentially more useful historical lens is the interwar period between World Wars I and II, because thatperiod was exemplified by a multipolar world of state competition.**22 If Roberts is correct, historical experience of that period teaches that fear, distrust, miscalculation, and ambiguity should be addressed directly to help avoid any future global conflict.**

## **Case**

#### **Disregard their arguments in favor government managing the appropriation of outer space because they are informed by a pro state bias. The reality is that government is prone to corruption and compulsion which causes government to mismanage enterprises and drives up costs. Each wasteful expenditure of the state adds another hindrance to the long - suffering taxpayer.**

**Block and Nelson 18** (Walter E. Block, Harold E. Wirth Endowed Chair and Professor of Economics, College of Business, Loyola University New Orleans, and senior fellow at the Mises Institute. He earned his PhD in economics at Columbia University in 1972. He has taught at Rutgers, SUNY Stony Brook, Baruch CUNY, Holy Cross, and the University of Central Arkansas. He is the author of more than 500 refereed articles in professional journals, two dozen books, and thousands of op eds. He lectures widely on college campuses, delivers seminars around the world, and appears regularly on television and radio shows. He is the Schlarbaum Laureate, Mises Institute (2011), has won the Loyola University Research Award (2005, 2008), the Mises Institute’s Rothbard Medal of Freedom (2005), and the Dux Academicus award, Loyola University (2007). Peter Lothian Nelson, master’s degrees in engineering and divinity. He has over 40 years of experience in civil engineering and is the retired president of PL Nelson Engineering Inc. He is, along with Walter Block, the co-author of Water Capitalism: The Case for Privatizing Oceans, Rivers, Lakes, and Aquifers. He has served as an expert witness and has written reports regarding the standard of care for professional engineering on two dozen cases including depositions by dozens of attorneys and responding to rebuttal reports. He has presented several papers at engineering symposia and was granted the outstanding project awards for his work on the Florida   
”Space Capitalism How Humans will Colonize Planets, Moons, and Asteroids” Page 1 – 5 http://d.zaix.ru/iYG3.pdf)

We argue two things in this book. One, space travel is vital and beneficial to human well-being. Two, it should be done privately; the state should be kept as far from this initiative as possible, ideally, totally.1 These two principles inspire this book. We believe that an overwhelming majority of citizens will wonder if we have gone completely bonkers. Our critics will tend to dismiss both propositions out of hand. So, what persuades us to favor these themes? Our main motivation for the first is love for human beings.2Why space—it is so … well, “OUT THERE.” As Star Trek would have it, explorers are driven “to go where no man3 has gone before.” That, alone, suffices. Then, there are the more practical considerations. Moving into space will be profitable. We will learn new technologies which will endow the remaining earthlings with electrifying spillover advantages. For example, will near or actual weightlessness cure diseases? Will resources be discovered in the heavenly bodies (apart from the Moon’s green cheese) that will open new horizons? We find our second theme, that efforts in this regard be undertaken by market participants, not crony capitalists supported via compulsory tax payments, similarly compelling. **Real entrepreneurs throw the dice with their own funds, or those voluntarily entrusted to them. They coerce no one**. Why this limitation? Would not our first goal, space exploration, be better served by government itself, given its taxing power or, at the very least, via a partnership between the state and private interests? Absolutely not! Says Rothbard (2015): **The myth has arisen that government research is made necessary by our technological age, because only planned, directed, large-scale ‘team’ research can produce important inventions or develop them properly.** **The day of the individual or small-scale inventor is supposedly over and done with. And the strong inference is that government, as potentially the ‘largest-scale’ operator, must play a leading role in even non-militaryscientific research**. This common myth has been completely exploded by the researches of John Jewkes, David Sawers, and Richard Stillerman in their highly important recent work.4 Pretty **much anything touched by government comes with fatal flaws starting with corruption and compulsion. Eliminating state involvement in space frees people rather than limits them.** Besides, **the ruling powers notoriously mismanage all enterprises.5 It becomes a self-fulfilling prophecy, because that very incompetence makes the venture appear far more expensive than it really needs to be**. The record of “picking winners” on the part of governing establishments6 does not engender much confidence in government’s capacity to promote this goal. **Nor is “contracting out” to private interests likely to provide efficiency in this context. If government cannot do the job itself, there is no reason to believe it will be effective in choosing and funding collaborators.** In addition, we believe that even **if the state could be effective in promoting such tasks, it would still be improper for it to do so, since its funds are mulcted, unwillingly, from their rightful owners, the long-suffering taxpayers** (Rothbard, M. 1998). In addition to the two primary themes, in a third we note that our species, while admirable in many ways such as the need to explore, is also often quite silly and even more destructive. We have developed weapons of mass destruction, and one despicable government apparatus, venerated by many worldwide, even used them, twice, in 1945.7 But we do notneed to resort to such high technology to murder our fellow creatures. We are fully capable of doing so on a massive scale, without such sophistication. Estimates are that governments have done away with almost 200 million of their citizens in the twentieth century, and this is apart from wars8 and traffic fatalities on public highways.9 In support of this contention, much in the following pages details the violent nature and destructive results of states. The same applies to wouldbe governments like ISIS and others that go around shooting police officers. In recent days and months, the evening news (of whichever source the reader consults) has been filled with graphical depictions of bombings and shootings.10 These are being done by those who do not so much disapprove of government per-se but who do not like this state and wish to substitute their own. In addition to being anarchists, we do not approve of would-be states either. As Shaw (1903) said: “He who slays a king and he who dies for him are alike idolaters.” We concur completely that one who ambushes or kills or purposely injures policemen simply lowers himself to the level of these idolaters. To be libertarian requires adoption of the Non-Aggression Principle. That in turn does not admit of murder, assault, or aggression in any way whatsoever against even those of whom we most strongly disapprove. How will space travel help alleviate mankind’s tendency to kill us? Simple. If we can establish colonies starting with the Moon, Venus, and Mars, and then later, as improved technology will permit, on other planets and moons,11 the odds will improve that if people blow up any one home of the human race, there will still be others, so that our species will still “live long and prosper.” There are of course other ways of raising the odds that our fellow creatures will survive their base instincts. There is psychology; perhaps we can eradicate our malevolent impulses through talk therapy. There is biology; maybe human beings can be engineered so that we are not so given to mass murder. Who knows? Maybe we can hypnotize ourselves so that we are more likely to continue to live. But those are topics for other books. The present one assumes away these elegant possibilities for changing the human element.12 We probe, instead, the inelegant scenario of leaving members of our species exactly as they are in terms of viciousness, and instead keeping us apart from each other,13 so that at least some branch of homo sapiens can continue forever.14 This is but one result that could naturally follow from space exploration. The point is, we desperately want to save (remnants?) of the human race, but, we impose upon ourselves one essential constraint: we obligate ourselves to the non-aggression principle (NAP).15 Why? Because in our view, violations of the rights of men constitute a significant danger justifying departure from Earth in the first place.16

#### **Debris**

#### **Turn it – Their evidence also concedes that the risk from debris would only arise if the US were engaged in heavy ASAT activity; this is only likely to happen in our negative world.**

**Lewis, 4** – Post doctorate Fellow in the Advanced Methods of Cooperative Security Program, (Jeffery, July "What if Space Were Weaponized? Possible Consequences for Conflict Scenarios" Center for Defense Information, http://www.cdi.org/PDFs/scenarios.pdf)

Assessing the likelihood of these sorts of coincidences **is difficult** because Russia has never provided data about the frequency or duration of false alarms; nor indicated how seriously early warning data is taken by Russian leaders. Moreover, **there is no reliable estimate of the debris risk for Russian satellites** in highly elliptical orbits.52 **The important point**, however, is that such a **coincidence** would **only appear suspicious** if the United States were in the business of disabling satellites – in other words, there is much less risk if Washington does not develop ASATs.

#### **[After 2019] Collision is unlikely – all countries receive collision warnings THREE days ahead AND their evidence doesn’t assume new technology.**

**Mosher ’19** [Dave; September 3rd; Journalist with more than a decade of experience reporting and writing stories about space, science, and technology; Business Insider, “Satellite collisions may trigger a space-junk disaster that could end human access to orbit. Here’s How,” <https://www.usafa.edu/app/uploads/Space_and_Defense_2_3.pdf>; GR]//ww pbj

The **Kessler syndrome** plays center-stage in the movie "Gravity," in which an accidental **space collision** endangers a crew aboard a large space station. But Gossner said that type of a runaway **space-junk catastrophe** is **unlikely**. "Right now I don't think we're **close to that**," he said. "I'm not saying we couldn't get there, and I'm not saying we don't need to be smart and manage the problem. But I don't see it **ever** becoming, anytime soon, an unmanageable problem." There is no current system to remove old satellites or sweep up bits of debris in order to prevent a Kessler event. Instead, space debris is monitored from Earth, and new rules require satellites in low-Earth orbit be deorbited after 25 years so they don't wind up adding more space junk. "Our current plan is to manage the problem and not let it get that far," Gossner said. "I don't think that we're even close to needing to **actively remove** stuff. There's lots of research being done on that, and maybe some day that will happen, but I think that — at this point, and in my humble opinion — an unnecessary expense." A major part of the effort to prevent a Kessler event is the **S**pace **S**urveillance **N**etwork (SSN). The project, led by the **US military**, uses **30** different systems around the **world** to **identify**, **track**, and share **info**rmation about **objects** in space. Many objects are tracked **day and night** via a networkof radar observatories around the globe. Optical telescopes on the ground also keep an eye out, but they aren't always run by the government. "The commercial sector is actually putting up lots and lots of telescopes," Gossner said. The government pays for their debris-tracking services. Gossner said one major debris-tracking company is called **Exoanalytic**. It uses about 150 small telescopes set up around the globe to **detect**, **track**, and **report** space debris to the SSN. Telescopes in space track debris, too. Far less is known about them because they're likely top-secret military satellites. Objects detected by the government and companies get added to a **catalog** of space debris and **checked** against the orbits of other known bits of **space junk**. New orbits are calculated with **supercomputers** to see if there's a **chance** of **any collisions**. Diana McKissock, a flight lead with the US Air Force's 18th Space Control Squadron, helps track space debris for the SSN. She said the surveillance network issues warnings to NASA, satellite companies, and other groups with spacecraft, based on two levels of emergency: basic and advanced. The SSN issues a basic emergency report to the **public three days ahead** of a 1-in-10,000 chance of a **collision**. It then provides **multiple updates** per day until the risk of a collision **passes**. To qualify for such reporting, a rogue object must come within a certain distance of another object. In low-Earth orbit, that distance must be less than 1 kilometer (0.62 mile); farther out in deep space, where the precision of orbits is less reliable, the distance is less than 5 kilometers (3.1 miles). Advanced emergency reports help satellite providers see possible collisions much more than **three days ahead**. "In **2017**, we provided **data** for **308,984 events**, of which only **655** were **emergency**-reportable," McKissock told Business Insider in an email. Of those, 579 events were in low-Earth orbit (where it's relatively crowded with satellites).

#### **No debris impact at every layer of space**

**Fange 17** (Daniel von Fange. Web Application Engineer. “Kessler Syndrome is Over Hyped,” *Braino*, 5/21/17, <http://braino.org/essays/kessler_syndrome_is_over_hyped/>) dwc 19)

**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.

#### **Even full-scale Anti-Satellite Weapon war can’t trigger Kessler – modelling**

**Drmola** and Hubik **18** [Jakub Drmola, Division of Security and Strategic Studies, Department of Political Science at the Faculty of Social Sciences of Masaryk University. Tomas Hubik, Department of Theoretical Computer Science and Mathematical Logic, Faculty of Mathematics and Physics, Charles University. Kessler Syndrome: System Dynamics Model. Space Policy Volumes 44–45, August 2018, Pages 29-39. https://www.sciencedirect.com/science/article/pii/S0265964617300966?via%3Dihub]

The **probabilities** and **rates** of **collisions** of objects from different groups were **calculated** using a **coefficient** converting the **rate of collisions** between **objects from one group** to the **rate of collisions** between **objects from another group**. The initial **base rate** was estimated using **iterative simulations** and **comparison** of the resulting **runs** with **real data** and **outputs** from **other models**. **Detailed model** built by a group of **researchers** from the **Lawrence** Livermore **National Laboratory** was used as a **base** for the **calibration** [see 9]. As the major factor influencing collision probability is size, the probability increases with square of the diameter representing bigger area for possible impact. Speed would be another factor influencing the probability of impacts, but the speed depends on the distance from the Earth and is not influenced by debris size. It means that it will not vary between different debris groups and thus will not influence the collision probability conversion parameters in our model. One the most important limitations and simplifications of the model is the uncertainty of size, structure, and composition of the satellites—i.e. what debris the satellite will disintegrate into in case of a collision. Perhaps even more crucially, the rate of orbital decay changes significantly with the altitude and eccentricity of the trajectory. The lower the orbital altitude is or the more eccentric it is, the more drag the object experiences as it passes through the last vestiges of our atmosphere. Therefore, objects in the lower or more eccentric orbit will decay significantly faster. Thus, the actual lifetime of a piece of debris can easily vary from days to centuries. It also needs to be noted that while it may take many decades for a satellite to decay (especially from the popular orbits between 500 km and 800 km), we cannot assume the same about debris. That is because while satellite orbits typically have very low eccentricity, collisions result in fragments with velocities and trajectories that vary and differ from the original intact satellite (i.e. are more eccentric and decay faster). This makes estimating rate of orbital decay of debris quite difficult, especially when combined with the ongoing laudable efforts by Inter-Agency Space Debris Coordination Committee (IADC) to shorten the lifetime of satellites after they cease planned operations [14], [15]. Therefore, both the orbital and structural parameters used here are (and must be) overall averages designed to represent a “general LEO satellite” and are based on previous fragmentations, of which there are but few. Furthermore, this is getting increasingly more difficult as satellites are getting progressively more diverse, especially with the ongoing boom of the miniaturized CubeSats [16]. This leads to a relatively wide and heterogeneous population of real satellites being represented by a single, homogenized stock of simulated satellites in the model. It is also uncertain and difficult to predict how exactly is this going to evolve in the far future, what proportion of launched satellites will be of which size, and into which orbit they will be placed. Lacking precise information, we simply extrapolate current and expected trends. 5. Scenarios and simulation results 5.1. Business as usual and beyond The baseline scenario represents a continuation of the current trends, which are simply extended into the future. An average 1% growth rate of yearly launches of new satellites (starting at 89) is assumed, together with constant success rate in satellites’ ability to actively avoid collisions with debris and other satellites, constant lifetime, and failure rate. This basic model lacks any sudden events or major policy changes that would markedly influence the debris propagation. However, it serves both as a foundation for all the following scenarios and as a basis of comparison to see what the impact would be. Given high uncertainty regarding future state of the satellite industry (how many satellites will be launched per year, of what type and size, etc.), we elected to limit our simulations to 50 years. The model can certainly continue beyond this point, but the associated unknowns make the simulations progressively less useful. Running this model for its full 50 years (2016–2066) yields the expected result of perpetually growing amount of debris in the LEO. One can observe nearly 2-fold increase in the large debris (over 10 cm) and 3-fold increase in small debris (less than 1 cm) quantities (Fig. 5). The oscillations visible in the graph are caused by the aforementioned solar cycles which influence the rate of reentry for all simulated populations except the still active (i.e. powered) satellites. Also please note that throughout the article, the graphs use quite different scales for debris populations because of the considerable variations between scenarios. Using any single scale for all graphs would render some of them unintelligible. We can see that this increase in numbers still does not result in realization of the Kessler syndrome as most of the satellites being launched remain intact for their full expected service life. However, it comes with a considerable increase in risk to satellites, which is manifested by their higher yearly losses, making satellites operations riskier and more expensive for governments and private companies alike. This increased amount of debris in LEO combined with the larger number of active satellites makes it approximately twice as likely that an active satellite will suffer a disabling hit or a total disintegration during its lifetime. It should be noted that this risk might possibly be offset by future improvements in satellite reliability, debris tracking, and navigation [17]. This negative development of increasingly risky and costly operation of satellites can also be highlighted and visualized in a graph by comparing the number of satellites launched to the number of satellites lost (to collisions as well as malfunctions) in each given year (Fig. 6). This ratio shows diminishing efficiency of the system, where number of losses per launch increases. After fully acknowledging limitations stemming from inherent uncertainties, we can also try to “make things expectedly worse” by doubling the growth rate of yearly launches (to what it perhaps might end up being because of the boom in satellites industry because of increasing privatization of space, growing demand for communication satellites, etc.) and also extending the simulation timeframe to 200 years (Fig. 7). It must be stressed that the model was not designed with such long outlooks in mind, and many of the assumptions will certainly not hold over the next 200 years (such as static launch rate growth, size, and structure of the satellites, their lifetime, evasion rates, lack of mitigation, and many others). But in the overwhelmingly unlikely case that these assumptions stay true, the simulated outcome seems to suggest a collapse of sorts around the year 2163. However, it does not look like a suddenly triggered chain reaction leading to widespread fragmentation of the entire LEO but rather like a gradually reached point at which LEO is so full of debris, and the rate of active satellite fragmentation is so high (almost one every day) that the launches cannot keep up anymore. This is consistent with the findings reported by LaFleur and Finkelman, who found the debris system to be unconditionally stable [18], [19], [27]. 5.2. Antisatellite weapon system scenario Apart from the usual collisional risks that satellites face in the LEO, there has been growing concern regarding the development of antisatellite weapon systems (ASATs) by several world powers (namely China, Russian Federation, and the United States). These weapons are designed to intercept and destroy orbiting satellites and are, for the most part, descended from the antiballistic missile defense systems. While there are some alternative designs under development, the current generation mostly takes form of a boosted missile with a kinetic kill vehicle. This method of destruction (a collision of a missile with a satellite) leads to extensive fragmentation and creation of large debris clouds. A prime example of this was the Chinese 2007 ASAT test which destroyed China's own decommissioned weather satellite FengYun-1C. This hypervelocity collision created around 3000 pieces of medium to large debris and tens of thousands of smaller pieces, most of which will remain in orbit for decades, thus considerably contributing to overall risk of future orbital collisions [20]. As much as occasional tests of ASATs are increasing the amount of debris in the LEO, a greater danger by far is the possibility of a **large-scale ASAT deployment** during an **armed conflict** between two or more **major**, technologically advanced **powers**. Given the reliance of modern militaries on satellites for intelligence, communication, and navigation, it is generally presumed that the initial phase of any such conflict would involve **mutual destruction** of each other's **satellites** to blind the enemy and hinder their offensive operations [21], [22]. Such opening salvos could involve **immediate destruction** of **dozens of satellites**, thus creating **massive clouds of debris** threatening the remaining satellites and possibly leading to cascading disintegration across the entire orbit. This kind of hypothetical event is **simulated** in the second scenario, where an imaginary **major** military **conflict** erupts in the year 2040, during which roughly half of all military satellites are destroyed by **intentional** kinetic **impacts** using antisatellite weapons. With military and dual-use satellites generally representing a little over one-third of all satellites [23] (depending on criteria and the operating country), this results in some **200 satellites destroyed** by ASATs in 2040 (Fig. 8). **However**, **even this sudden event** is **not enough** to **trigger** a **chain reaction** of **sat**ellite**s** **disintegrating** in LEO, at least according to this model. Nevertheless, the number of collisions with active satellites ends up nearly twice as high at the end of the simulation (i.e. 25 years after the conflict and ASAT strikes) when compared to the previous run. This shows that the damage would be long-term and would negatively affect satellite operations (including commercial and scientific ones) for many years after any conflict involving ASATs.

#### **Public Commons**

**1. Non-Unique – space is already a global commons, its in the OST**

**2. Turn – the term global commons leads to the exploitation of whatever is supposedly being protected**

**Clancy 98** (The Tragedy of the Global Commons, Spring 1998,<https://www.repository.law.indiana.edu/cgi/viewcontent.cgi?article=1136&context=ijgls> pecial Assistant to the Deputy Secretary of State, US Department of State, Indiana Journal of global legal studies)

**The inherent problem in this communal property is** the idea put forth byGarrett Hardin in his 1968 article entitled The Tragedy of the Commons." Hardin theorized **that in communal property systems, each individual enjoys the benefit of exploiting the resource to its maximum, while the cost of this increased utilization is spread out over all users. Consequently, there is incentive for individual over exploitation**. Applying this theory to global expanses shows that "the disadvantage inherent in this doctrine is that nations are free to make maximum use of resources because no outside mechanism exists to force their acceptance of external costs, either the cost of resource degradation or the cost of resourc

e depletion."'" Much like the herding commons depicted in Hardin's essay, **global commons are susceptible to overuse**. 19 This problem is indeed a serious one. **Global commons become, in effect, a target for over exploitation.** Moreover, critics have addressed the problems of free riders and the Prisoner's Dilemma in dealing with commons.2 " **The end result is the same, however. These global commons fall victim to the predatory interest of individual exploiting nations.**

**3. Circumvention – countries like the US, Russia, and China are too power-hungry to agree to an equal sharing international agreement.**

· **Silverstein flows neg – the fact that a minimal number of states agree to the most limited type of this mechanism proves that it is massively unpopular and impossible**

#### **Space Col Good**

**It’s sustainable – data proves we’re entering the golden age**

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**The past 30 years have seen immense progress in improving the quality of life for much of humanity. Extreme poverty — the number of people living on less than $1.90 per day — has fallen by nearly two-thirds, from 1.9 billion to around 650 million. Life expectancy has risen in most of the world, along with literacy and access to education, while infant mortality has fallen. Despite perceptions to the contrary, the average person born today is likely to have access to more opportunities and have a better quality of life than at any other point in human history. Much of this increase in human wellbeing has been propelled by rapid economic growth driven largely by state-led industrial policy, particularly in poor-to-middle income countries. However, this growth has come at a cost: between 1990 and 2019, global emissions of CO2 increased by 56%. Historically, economic growth has been closely linked to increased energy consumption — and increased CO2 emissions in particular — leading some to argue that a more prosperous world is one that necessarily has more impacts on our natural environment and climate. There is a lively academic debate about our ability to “absolutely decouple” emissions and growth — that is, the extent to which the adoption of clean energy technology can allow emissions to decline while economic growth continues. Over the past 15 years, however, something has begun to change. Rather than a 21st century dominated by coal that energy modelers foresaw, global coal use peaked in 2013 and is now in structural decline. We have succeeded in making clean energy cheap, with solar power and battery storage costs falling 10-fold since 2009. The world produced more electricity from clean energy — solar, wind, hydro, and nuclear — than from coal over the past two years. And, according to some major oil companies, peak oil is upon us — not because we have run out of cheap oil to produce, but because demand is falling and companies expect further decline as consumers**

**increasingly shift to electric vehicles. The world has long been experiencing a relative decoupling between economic growth and CO2 emissions, with the emissions per unit of GDP falling for the past 60 years. This is the case even in countries like India and China that have been undergoing rapid economic growth. But relative decoupling alone is inadequate in a world where global CO2 emissions need to peak and decline in the next decade to give us any chance at limiting warming to well below 2℃, in line with Paris Agreement targets. Thankfully, there is increasing evidence that the world is on track to absolutely decouple CO2 emissions and economic growth — with global CO2 emissions potentially having peaked in 2019 and unlikely to increase substantially in the coming decade. While an emissions peak is just the first and easiest step towards eventually reaching the net-zero emissions required to stop the world from continuing to warm, it demonstrates that linkages between emissions and economic activity are not an immutable law, but rather simply a result of our current means of energy production. In recent years we have seen more and more examples of absolute decoupling — economic growth accompanied by falling CO2 emissions. Since 2005, 32 countries with a population of at least one million people have absolutely decoupled emissions from economic growth, both for terrestrial emissions (those within national borders) and consumption emissions (emissions embodied in the goods consumed in a country). This includes the United States, Japan, Mexico, Germany, United Kingdom, France, Spain, Poland, Romania, Netherlands, Belgium, Portugal, Sweden, Hungary, Belarus, Austria, Bulgaria, El Salvador, Singapore, Denmark, Finland, Slovakia, Norway, Ireland, New Zealand, Croatia, Jamaica, Lithuania, Slovenia, Latvia, Estonia, and Cyprus. Figure 1, below, shows the declines in territorial emissions (blue) and increases in GDP (red). To qualify as having experienced absolute decoupling, we require countries included in this analysis to pass four separate filters: a population of at least one million (to focus the analysis on more representative cases), declining territorial emissions over the 2005-2019 period (based on a linear regression), declining consumption emissions, and increasing real GDP (on a purchasing power parity basis, using constant 2017 international $USD). We chose not to include 2020 in this analysis because it is not particularly representative of longer-term trends, and consumption and territorial emissions estimates are not yet available for many countries. There is a wide range of rates of economic growth between 2005-2019 among countries experiencing absolute decoupling. Somewhat counterintuitively, there is no significant relationship between the rate of economic growth and the magnitude of emissions reductions within the group. While it is unlikely that there is not at least some linkage between the two factors, there are plenty of examples of countries (e.g., Singapore, Romania, and Ireland) experiencing both extremely rapid economic growth and large reductions in CO2 emissions. One of the primary criticisms of some prior analyses of absolute decoupling is that they ignore leakage. Specifically, the offshoring of manufacturing from high-income countries over the past three decades to countries like China has led to “illusory” drops in emissions, where the emissions associated with high-income country consumption are simply shipped overseas and no longer show up in territorial emissions accounting. There is some truth in this critique, as there was a large increase in emissions embodied in imports from developing countries between 1990 and 2005. After 2005, however, structural changes in China and a growing domestic market led to a reversal of these trends; the amount of emissions “exported” from developed countries to developing countries has actually declined over the past 15 years. This means that, for many countries, both territorial emissions and consumption emissions (which include any emissions “exported” to other countries) have jointly declined. In fact, on average, consumption emissions have been declining slightly faster than territorial emissions since 2005 in the 32 countries we identify as experiencing absolute decoupling. Figure 2, below, shows the change in consumption emissions (teal) and GDP (red) between 2005 and 2019. There is a pretty wide variation in the extent to which these countries have reduced their territorial and consumption emissions since 2005. Some countries — such as the UK, Denmark, Finland, and Singapore – have seen territorial emissions fall faster than consumption emissions, while the US, Japan, Germany, and Spain (among others) have seen consumption emissions fall faster. Figure 3 shows reductions in consumption and territorial emissions for each country, with the size of the dot representing the size of the population in 2019. Absolute decoupling is possible. There is no physical law requiring economic growth — and broader increases in human wellbeing — to necessarily be linked to CO2 emissions. All of the services that we rely on today that emit fossil fuels — electricity, transportation, heating, food — can in principle be replaced by near-zero carbon alternatives, though these are more mature in some sectors (electricity, transportation, buildings) than in others (industrial processes, agriculture).**

**Cap is key to space exploration and development**

**Blundell 4 [John, director general of the Institute of Economic Affairs, “Mission to Mars must go private to succeed”, Feb 2,** [**http://news.scotsman.com/marsexploration/Mission-to-Mars-must-go.2499794.jp**](http://news.scotsman.com/marsexploration/Mission-to-Mars-must-go.2499794.jp)**]**

**Bush is not finding the billions himself. Rather the tab will be picked up by US taxpayers in perhaps 20 years’ time. What arrests me is the unchallenged assumption that space exploration must be a nationalised industry. The Soviet effort may be stalled but the Chinese seem committed to joining the race. The European Space Agency is a strange combination of nationalised bodies. NASA is a pure old-fashioned nationalised entity. I argue we should relinquish the expectationthat space has to be limited to vast quangos. The mindset we all share is an echo of the rivalry between the evaporated USSR and the still dynamic US. The first bleeps of the Sputnik galvanised the US into accelerating its space effort. What we need is capitalists in space. Capitalism needs property rights, enforcement of contracts and the rule of law. The ideological tussle does not cease once we are beyond the ionosphere. With the exception of Arthur C Clarke, none of us imagined the entertainment potential from satellites. Geostationary lumps of electronic gadgetry beam us our BSkyB television pictures. I remain in awe that Rupert Murdoch can place a device in the skies above Brazil that sends a signal to every home in each hemisphere. Who could have foreseen that mobile phones could keep us chattering without any wiring, or that global position techniques could plot where we all are to within a metre? These are business applications. Business is already in space. Markets detect and apply opportunities that are not envisaged by even the most accomplished technicians. I’m not saying Murdoch has special competences. I imagine he is as baffled by digital miracles as I am. The point is that companies define and refine what public bodies cannot achieve. Lift the veil of course and all those satellite firms are an intricate web of experts supplying ideas and services. We have an infant space market. What use will the Moon be? Is there value on Mars other than the TV rights? The answer is nobody can know. We can only make some guesses. The Spanish ships that set off for the US thought they would get to India. The Portuguese knew they’d reach China. The English followed them westwards seeking gold. In fact, they got tobacco. Events always confound expectations. The arguments for putting men on Mars are expressly vague from President Bush. Perhaps he was really bidding for votes. From my reading the best results may be medical. Zero, or low, gravity te**

**chniques may allow therapies of which we are ignorant. It seems facetious to suggest tourism may be a big part of space opportunity but as both the North and South poles are over-populated and there is a queue at the top of Mount Everest, a trip to the Sea of Tranquility may prove a magnet for the wealthy. Instead of NASA’s grotesque bureaucracy it may be Thomas Cook will be a greater force for exploration. NASA could be a procurement body. It need not design and run all space ventures. It could sub-contract far more extensively. Without specialised engineering expertise it is not easy to criticise projects such as the shuttle. It seems to be excessively costly and far too fragile. There are private space entrepreneurs already. They are tiddlers up against the mighty NASA. Yet Dan Goldin, the NASA leader, says he favours the privatisation of space: "We can’t afford to do solar system exploration until we turn these activities over to the cutting edge private sector**

#### **Case analytics**

#### **No repercussions – Theres no reason for the government to care since they aren’t a private company. They can simply extract more money from the Treasury even if they mess up. If Elon Musk did something carelessly, he would definitely lose stock and investor confidence and there would be severe repercussions. This boosts efficiency and higher quality in space exploration through private companies.**

#### **Profit-based incentives – If private companies do well, they make a lot of money. But the government doesn’t really get anything. If the government runs out of money, they can just be like: “Oh let’s raise some taxes!!!” That’s the Block and Nelson evidence.**

#### **Tax increase – Judge if you think that the government’s appropriation of space is good you can vote aff, but they really are terrible. Do you want to pay taxes and give your hard earned money to the government so they can screw up in space exploration? An increase in private sector space appropriation would mean less government screw ups, and less unncessscary taxes. Governments have done everything wrong in the context of space. Extra taxes would have better use in hands of education, infrastructure, and environmental protection.**

#### **Solvency deficit – Countries such as China and Russia won’t listen to your government action to enforce your plan. In fact, they will do everything they can to go against western policies to compete. You can’t just make believe that these countries comply. We can see that sanctions don’t work, and current day Russia and its invasion Ukraine proves. You think they will listen to your plan? You talk about how private companies are unjust but you have no viable way to enforce it, which means you can never solve. The aff is basically a rule without a referee to enforce it. Fiat does not mean you get to think the aff solves. Fiat is that a piece of legislation happens.**

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