# 1NC R1

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### 1NC – CP

#### Counterplan Text:

#### --States, except the United States, should ban the appropriation of low earth orbit by private corporations.

#### --The United States should fund the appropriation of low earth orbit for the mining of rare earth metals from asteroids by private entities.

#### --The United States federal government, the Russian Federation, and People’s Republic of China should establish an international fund collected via a fee upon launch starting at 5% and moving upwards pending international agreement that functions as a partial rebate and victims restitution fund by providing partial compensation to countries who create “debris free” launches and implement post-mission disposal mechanisms as well as providing full compensation to countries in the events of collisions with orbital debris.

#### The PIC is key to beat China and protect against Chinese REM gatekeeping

Stavridis 21 [(James, retired US Navy admiral, chief international diplomacy and national security analyst for NBC News, senior fellow at JHU Applied Physics Library, PhD in Law and Diplomacy from Tufts) “U.S. Needs a Strong Defense Against China’s Rare-Earth Weapon,” Bloomberg Opinion, March 4, 2021, <https://www.bloomberg.com/opinion/articles/2021-03-04/u-s-needs-a-strong-defense-against-china-s-rare-earth-weapon>] TDI

You could be forgiven if you are confused about what’s going on with rare-earth elements. On the one hand, news reports indicate that China may increase production quotas of the minerals this quarter as a [goodwill gesture](https://www.scmp.com/news/china/diplomacy/article/3122501/china-raises-rare-earth-quotas-goodwill-trade-signal-us) to the Joe Biden administration. But other sources say that China may ultimately ban the export of the rare earths altogether on “[security concerns](https://www.bloomberg.com/news/articles/2021-02-19/china-may-ban-rare-earth-technology-exports-on-security-concerns?sref=QYxyklwO).” What’s really going on here?

There are 17 elements considered [rare earths](https://www.bloomberg.com/news/articles/2021-02-16/why-rare-earths-are-achilles-heal-for-europe-u-s-quicktake) — lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium, scandium and yttrium — and while many aren’t actually rare in terms of global deposits, extracting them is difficult and expensive. They are used across high-tech manufacturing, including smartphones, fighter aircraft and components in virtually all advanced electronics. Of particular note, they are essential to many of the clean-energy technologies expected to come online in this decade.

I began to focus on rare-earth elements when I commanded the North Atlantic Treaty Organization’s presence in Afghanistan, known as the International Security Assistance Force. While Afghans live in an extremely poor country, [studies](https://thediplomat.com/2020/02/afghanistans-mineral-resources-are-a-lost-opportunity-and-a-threat/) have assessed that they sit atop $1 trillion to $3 trillion in a wide variety of minerals, including rare earths. Some [estimates](https://www.fraserinstitute.org/article/afghanistans-rare-earth-element-bonanza) put the rare-earth levels alone at 1.4 million metric tons.

But every time I tried to visit a mining facility, the answer I got from my security team was, “It’s too dangerous right now, admiral.” Unfortunately, despite a great deal of effort by the U.S. and NATO, those security challenges remain, deterring the large foreign-capital investments necessary to harvest the lodes. Which brings us back to Beijing.

China controls roughly 80% of the rare-earths market, between what it mines itself and processes in raw material from elsewhere. If it decided to wield the weapon of restricting the supply — something it has repeatedly [threatened](https://www.wsj.com/articles/china-trade-fight-raises-specter-of-rare-earth-shortage-11559304000) to do — it would create a significant challenge for manufacturers and a geopolitical predicament for the industrialized world.

It could happen. In 2010, Beijing threatened to cut off exports to Japan over the disputed Senkaku Islands. Two years ago, Beijing was reportedly considering restrictions on exports to the U.S. generally, as well as against specific companies (such as defense giant Lockheed Martin Corp.) that it deemed in violation of its policies against selling advanced weapons to Taiwan.

President Donald Trump’s administration issued an executive order to spur the production of rare earths domestically, and created an [Energy Resource Governance Initiative](https://www.state.gov/wp-content/uploads/2019/06/Energy-Resource-Governance-Initiative-ERGI-Fact-Sheet.pdf) to promote international mining. The European Union and Japan, among others, are also aggressively seeking newer sources of rare earths.

Given this tension, it was superficially surprising that China announced it would boost its mining quotas in the first quarter of 2021 by nearly 30%, reflecting a continuation in strong (and rising) demand. But the increase occurs under a shadow of uncertainty, as the Chinese Communist Party is undertaking a “review” of its policies concerning future sales of rare earths. In all probability, the tactics of the increase are temporary, and fit within a larger strategy.

China will go to great lengths to maintain overall control of the global rare-earths supply. This fits neatly within the geo-economic approach of the [One Belt, One Road](https://www.bloomberg.com/opinion/articles/2019-10-30/china-is-determined-to-reshape-the-globe) initiative, which seeks to use a variety of carrots and sticks — economic, trade, diplomatic and security — to create zones of influence globally. In terms of rare earths, the strategy seems to be allowing carefully calibrated access to the elements at a level that makes it economically less attractive for competitors to undertake costly exploration and mining operations. This is similar to the oil-market strategy used by Russia and the Organization of Petroleum Exporting Countries for decades.

Some free-market advocates believe that China will not take aggressive action choking off supply because that could [precipitate retaliation](https://www.bloomberg.com/opinion/articles/2021-02-22/china-weaponizing-rare-earths-technology-will-probably-backfire) or accelerate the search for alternate sources in global markets. What seems more likely is a series of targeted shutdowns directed against specific entities such as U.S. defense companies, Japanese consumer electronics makers, or European industrial concerns that have offended Beijing.

The path to rare-earth independence for the U.S. must include: Ensuring supply chains of rare earths necessary for national security; promoting the exploitation of the elements domestically (and removing barriers to responsibly doing so); mandating that defense contractors and other critical-infrastructure entities wean themselves off Chinese rare earths; sponsoring research and development to find alternative materials, especially for clean energy technology; and creating a substantial stockpile of the elements in case of a Chinese boycott.

This is a bipartisan agenda. The Trump administration’s [strategic assessment](https://www.commerce.gov/news/press-releases/2019/06/department-commerce-releases-report-critical-minerals) of what needs to be done (which goes beyond just 17 rare earths to include a total of 35 critical minerals) is thoughtful, and should serve as a basis for the Biden administration and Congress.

#### “Debris free” incentive solves the case without having to share SSA data.

Prasad and Lochan 7 [(M.Y.S. Prasad, Space Applications Centre, Indian Space Research Organisation, Ahmedabad, India, and Rajeev Lochan Indian Space Research Organisation, Bangalore, India,) “COMMON BUT DIFFERENTIATED RESPONSIBILITY - A PRINCIPLE TO MAINTAIN SPACE ENVIRONMENT WITH RESPECT TO SPACE DEBRIS” ISBN: 9781563479625, Proceedings of the Fiftieth colloquium on the Law of outer space : 24-28 September 2007, Hyderabad, India] TDI

Space debris will be a concern for future for all the countries. Especially the developing countries which have limited Space assets will face serious consequences if any of their satellites is involved with incidents / accidents with Space debris. The manned missions of advanced countries requires absolutely high level of crew safety, and hence Space debris is a serious concern to them also. Even a close approach of the debris to the operational satellites may pose problems if the cloud of debris occupies larger volume. From these considerations, it is definitely essential to evolve strategies to limit the growth of Space debris, and also to evolve debris mitigation measures.

However the analysis of the Space debris presented in section 4 clearly brought out that the debris population is proportional to the number of launches carried out by each country in the past. Hence larger responsibility lies with the countries which carried out a number of launches in the past. So the maintenance of Space environment from the Space debris point of view is a case well suited for “Common but differentiated responsibility” . In this context this principle means that all countries capable of taking actions are responsible to maintain the Space environment relatively clean with respect to Space debris. Also the countries, which are responsible for the present level of the debris population, should take higher responsibility in respect of limiting the future growth of Space debris, and also in providing knowledge and technology in the areas of Space debris monitoring and mitigation to all countries.

In this context various measures can be contemplated for future. One of them had been achieved when UN-COPUOS adopted Space debris mitigation guidelines to be implemented by all countries on voluntary basis through national mechanisms.

Different countries have evolved their own national Space debris mitigation standards and regulations to be implemented by the companies involved in aerospace activities in their countries. Still many countries feel that an appropriate legal regime at a global level is essential to tackle the Space debris issue. This is where the models evolved in the Kyoto Protocol can be considered to be tailored and used with appropriate modifications for Space debris legal regime.

Some of the new mechanisms which can be derived from the principles of Kyoto Protocol are:

• To limit the future Space debris generation, launch quota caps for each Space-faring country can be evolved linked to their past generation of the Space debris.

• The countries can be rewarded with “debris credits” in case they implement Space debris mitigation measures in their missions.

• Some advanced Space-faring nations may have pressing commitments to carry out larger number of launches. They can be enabled to carry out such missions through purchase of “debris credits” from the other countries, who have earned “debris credits” through application of Space debris mitigation measures.

• The countries which do not have any Space activity for the present, but who have plans to develop either Space transportation or deploy satellites in orbit can be given fixed quota of “debris credits”. These credits can lapse after a certain period if they do not realize their Space missions. These countries can also be enabled to market their “debris credits” to the other countries, and benefit by acquiring Space technologies.

• A Trust Fund can be created to compensate the victims involved in the accidents with Space debris, to which the contributions can be linked to the debris generated in the past by different countries. This can be a part of larger aspect of Space debris damage liability regime.

• Special treatment can be considered for the countries willing to share their knowledge and technology in the area of Space debris with other countries, to take up the research and development to a higher level. Such cooperative ventures can be given special treatment as Joint Implementation Mechanisms to earn “Debris credits”.

These are some of the ideas which are derived from the Kyoto Protocol with application to Space debris area. They are not exhaustive but only indicative for friture legal experts to examine while developing Space debris legal regime.

6. CONCLUSIONS

This paper describes various multi-lateral initiatives in the area of analysis, and mitigation of Space debris. The specific features related to type of debris and the level of launches and other activities of Space-faring nations are detailed. The innovative mechanisms evolved in the Kyoto Protocol of UN FCCC are described and their applicability for Space debris case is argued. Possible measures which can be fashioned after the Kyoto Protocol are suggested to deal with the Space debris and maintenance of Outer Space environment. All the analysis is based on the conviction that ‘Common but Differentiated Responsibility’ is very well suited for the present Space debris scenario.

#### REM access key to military primacy and tech advancement – alternatives fail.

Trigaux 12 (David, University Honors Program University of South Florida St. Petersburg) “The US, China and Rare Earth Metals: The Future Of Green Technology, Military Tech, and a Potential Achilles‟ Heel to American Hegemony,” USF St. Petersberg, May 2, 2012, <https://digital.stpetersburg.usf.edu/cgi/viewcontent.cgi?article=1132&context=honorstheses>] TDI

The implications of a rare earth shortage aren’t strictly related to the environment, and energy dependence, but have distinct military implications as well that could threaten the position of the United States world’s strongest military. The United States place in the world was assured by powerful and decisive deployments in World War One and World War Two. Our military expansion was built upon a large, powerful industrial base that created more, better weapons of war for our soldiers. During the World Wars, a well-organized draft that sent millions of men into battle in a short amount of time proved decisive, but as the war ended, and soldiers drafted into service returned to civilian life, the U.S. technological superiority over its opponents provided it with sustained dominance over its enemies, even as the numerical size of the army declined. New technologies, such as the use of the airplane in combat, rocket launched missiles, radar systems, and later, GPS, precision guided missiles, missile defense systems, high tech tanks, lasers, and other technologies now make the difference between victory and defeat.

The United States military now serves many important functions, deterring threats across the world. The United States projects its power internationally, through a network of bases and allied nations. Thus, the United States is a powerful player in all regions of the world, and often serves as a buffer against conflict in these regions. US military presence serves as a buffer against Chinese military modernization in Eastern Asia, against an increasingly nationalist Russia in Europe, and smaller regional actors, such as Venezuela in South America and Iran in the Middle East. The U.S. Navy is deployed all over the world, as the guarantor of international maritime trade routes. The US Navy leads action against challenges to its maritime sovereignty on the other side of the globe, such as current action against Somali piracy. Presence in regions across the world prevents escalation of potential crisis. These could result in either a larger power fighting a smaller nation or nations (Russia and Georgia, Taiwan and China), religious opponents (Israel and Iran), or traditional foes (Ethiopia and Eretria, Venezuela and Colombia, India and Pakistan). US projection is also key deterring emerging threats such as terrorism and nuclear proliferation. While not direct challenges to US primacy, both terrorism and nuclear proliferation can kill thousands.

The US Air Force has a commanding lead over the rest of the world, in terms of both numbers and capabilities. American ground forces have few peers, and are unmatched in their ability to deploy to anywhere in the world at an equally unmatched pace.

The only perceived challenge to the United States militarily comes from the People’s Republic of China.76 While the United States outspends all other nations in the world put together in terms of military spending, China follows as a close second, and has begun an extensive modernization program to boot.77 The Chinese military however, is several decades behind the United States in air power and nuclear capabilities.78 To compensate, China has begun the construction of access-denial technology, preventing the US from exercising its dominance in China’s sphere of influence.79 Chinese modernization efforts have a serious long-term advantage over the United States; access to rare earth metals, and a large concentration of rare earth chemists doing research.80 This advantage, coupled with the U.S. losing access to rare earth metals, will even the odds much quicker than policymakers had previously anticipated. 81

The largest example is US airpower. With every successive generation of military aircraft, the U.S. Air Force becomes more and more dependent on Rare Earth Metals.82 As planes get faster and faster, they have to get lighter and lighter, while adding weight from extra computers and other features on board.83 To lighten the weight of the plane, scandium is used to produce lightweight aluminum alloys for the body of the plane. Rare Earth metals are also useful in fighter jet engines, and fuel cells.84 For example, rare earths are required to producing miniaturized fins, and samarium is required to build the motors for the F-35 fighter jet.85 F-35 jets are the next generation fighter jet that works together to form the dual plane combination that cements U.S. dominance in air power over the Russian PAK FA.86

Rare earth shortages don’t just affect air power, also compromising the navigation system of Abrams Tanks, which need samarium cobalt magnets. The Abrams Tank is the primary offensive mechanized vehicle in the U.S. arsenal. The Aegis Spy 1 Radar also uses samarium.87 Many naval ships require neodymium. Hell Fire missiles, satellites, night vision goggles, avionics, and precision guided munitions all require rare earth metals. 88

American military superiority is based on technological advancement that outstrips the rest of the world. Command and control technology allows the U.S. to fight multiple wars at once and maintain readiness for other issues, as well as have overwhelming force against rising challengers. This technology helps the U.S. know who, where, and what is going to attack them, and respond effectively, regardless of the source of the threat.

Rare Earth Elements make this technological superiority possible.

To make matters worse, the defense industrial base is often a single market industry, dependent on government contracts for its business. If China tightens the export quotas further, major US defense contractors will be in trouble.89 Every sector of the defense industrial base is dependent on rare earth metals. Without rare earths, these contractors can’t build anything, which collapses the industry.90

Rare Earth shortages are actually already affecting our military, with shortages of lanthanum, cerium, europium and gadolinium happening in the status quo. This prevents us not only from building the next generation of high tech weaponry, but also from constructing more of the weapons and munitions that are needed in the status quo. As current weapon systems age and they can’t be replaced, the US primacy will be undermined. Of special concern is that U.S. domestic mining doesn’t produce “heavy” rare earth metals that are needed for many advanced components of military technologies. Given the nature of many military applications, substitutions aren’t possible. 91

#### Climate solutions rely on REMs.

Arrobas et al 17 [(Daniele La Porta Arrobas is a senior mining specialist with the World Bank based in Washington DC and has degrees in Geoscience and Environmental Management, Kirsten Hund is a senior mining specialist with the Energy and Extractives Global Practice of the World Bank and holds a Master’s in IR from the University of Groningen in the Netherlands, Michael Stephen McCormick, Jagabanta Ningthoujam has an MA in international economics and international development from JHU and a BS in MechE from Natl University of Singapore, John Drexhage also works at the Intl Institute for Sustainable Development) “The Growing Role of Minerals and Metals for a Low Carbon Future,” World Bank, June 30, 2017, <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/207371500386458722/the-growing-role-of-minerals-and-metals-for-a-low-carbon-future>] TDI

* Full report - https://documents1.worldbank.org/curated/en/207371500386458722/pdf/117581-WP-P159838-PUBLIC-ClimateSmartMiningJuly.pdf

Climate and greenhouse gas (GHG) scenarios have typically paid scant attention to the metal implications necessary to realize a low/zero carbon future. The 2015 Paris Agreement on Climate Change indicates a global resolve to embark on development patterns that would significantly be less GHG intensive. One might assume that nonrenewable resource development and use will also need to decline in a carbon-constrained future. This report tests that assumption, identifies those commodities implicated in such a scenario and explores ramifications for relevant resource-rich developing countries. Using wind, solar, and energy storage batteries as proxies, the study examines which metals will likely rise in demand to be able to deliver on a carbon-constrained future. Metals which could see a growing market include aluminum (including its key constituent, bauxite), cobalt, copper, iron ore, lead, lithium, nickel, manganese, the platinum group of metals, rare earth metals including cadmium, molybdenum, neodymium, and indium—silver, steel, titanium and zinc. The report then maps production and reserve levels of relevant metals globally, focusing on implications for resource-rich developing countries. It concludes by identifying critical research gaps and suggestions for future work.

#### Heg solves arms races, land grabs, rogue states, and great power war.

Brands 18 [Hal, Henry Kissinger Distinguished Professor at Johns Hopkins University's School of Advanced International Studies and a senior fellow at the Center for Strategic and Budgetary Assessments." American Grand Strategy in the Age of Trump." Page 129-133]

Since World War II, the United States has had a military second to none. Since the Cold War, America has committed to having overwhelming military primacy. The idea, as George W. Bush declared in 2002, that America must possess “strengths beyond challenge” has featured in every major U.S. strategy document for a quarter century; it has also been reflected in concrete terms.6

From the early 1990s, for example, the United States consistently accounted for around 35 to 45 percent of world defense spending and maintained peerless global power-projection capabilities.7 Perhaps more important, U.S. primacy was also unrivaled in key overseas strategic regions—Europe, East Asia, the Middle East. From thrashing Saddam Hussein’s million-man Iraqi military during Operation Desert Storm, to deploying—with impunity—two carrier strike groups off Taiwan during the China-Taiwan crisis of 1995– 96, Washington has been able to project military power superior to anything a regional rival could employ even on its own geopolitical doorstep.

This military dominance has constituted the hard-power backbone of an ambitious global strategy. After the Cold War, U.S. policymakers committed to averting a return to the unstable multipolarity of earlier eras, and to perpetuating the more favorable unipolar order. They committed to building on the successes of the postwar era by further advancing liberal political values and an open international economy, and to suppressing international scourges such as rogue states, nuclear proliferation, and catastrophic terrorism. And because they recognized that military force remained the ultima ratio regum, they understood the centrality of military preponderance.

Washington would need the military power necessary to underwrite worldwide alliance commitments. It would have to preserve substantial overmatch versus any potential great-power rival. It must be able to answer the sharpest challenges to the international system, such as Saddam’s invasion of Kuwait in 1990 or jihadist extremism after 9/11. Finally, because prevailing global norms generally reflect hard-power realities, America would need the superiority to assure that its own values remained ascendant. It was impolitic to say that U.S. strategy and the international order required “strengths beyond challenge,” but it was not at all inaccurate.

American primacy, moreover, was eminently affordable. At the height of the Cold War, the United States spent over 12 percent of GDP on defense. Since the mid-1990s, the number has usually been between 3 and 4 percent.8 In a historically favorable international environment, Washington could enjoy primacy—and its geopolitical fruits—on the cheap.

Yet U.S. strategy also heeded, at least until recently, the fact that there was a limit to how cheaply that primacy could be had. The American military did shrink significantly during the 1990s, but U.S. officials understood that if Washington cut back too far, its primacy would erode to a point where it ceased to deliver its geopolitical benefits. Alliances would lose credibility; the stability of key regions would be eroded; rivals would be emboldened; international crises would go unaddressed. American primacy was thus like a reasonably priced insurance policy. It required nontrivial expenditures, but protected against far costlier outcomes.9 Washington paid its insurance premiums for two decades after the Cold War. But more recently American primacy and strategic solvency have been imperiled.

THE DARKENING HORIZON For most of the post–Cold War era, the international system was— by historical standards—remarkably benign. Dangers existed, and as the terrorist attacks of September 11, 2001, demonstrated, they could manifest with horrific effect. But for two decades after the Soviet collapse, the world was characterized by remarkably low levels of great-power competition, high levels of security in key theaters such as Europe and East Asia, and the comparative weakness of those “rogue” actors—Iran, Iraq, North Korea, al-Qaeda—who most aggressively challenged American power. During the 1990s, some observers even spoke of a “strategic pause,” the idea being that the end of the Cold War had afforded the United States a respite from normal levels of geopolitical danger and competition. Now, however, the strategic horizon is darkening, due to four factors.

First, great-power military competition is back. The world’s two leading authoritarian powers—China and Russia—are seeking regional hegemony, contesting global norms such as nonaggression and freedom of navigation, and developing the military punch to underwrite these ambitions. Notwithstanding severe economic and demographic problems, Russia has conducted a major military modernization emphasizing nuclear weapons, high-end conventional capabilities, and rapid-deployment and special operations forces— and utilized many of these capabilities in conflicts in Ukraine and Syria.10 China, meanwhile, has carried out a buildup of historic proportions, with constant-dollar defense outlays rising from US$26 billion in 1995 to US$226 billion in 2016.11 Ominously, these expenditures have funded development of power-projection and antiaccess/area denial (A2/AD) tools necessary to threaten China’s neighbors and complicate U.S. intervention on their behalf. Washington has grown accustomed to having a generational military lead; Russian and Chinese modernization efforts are now creating a far more competitive environment.

### 1NC – DA

#### We’ll colonize space within 15 years

Pettit 21 [(Harry, Senior Digital Technology and Science Reporter, a science and technology reporter at MailOnline, Harry Pettit joined The Sun in December 2018. He holds an undergrad degree in Physiology from the University of Manchester and a Master’s degree in Science Communication from Imperial College London.), “Humans could move to ‘floating asteroid belt colony’ within 15 years,” NYPost, 1/20/2021, <https://nypost.com/2021/01/20/humans-could-move-to-floating-asteroid-belt-colony-within-15-years/>] TDI

Humans could live on giant orbs floating in the asteroid belt between Mars and Jupiter within the next 15 years.

That’s the bonkers claim made by top scientist Dr. Pekka Janhunen, who says millions of people could inhabit a megacity in space by 2026.

Janhunen, an astrophysicist at the Finnish Meteorological Institute in Helsinki, described his vision in a research paper published this month.

He laid out the blueprint for floating “mega-satellites” around the dwarf planet Ceres, which lies roughly 325 million miles from Earth.

“The motivation is to have a settlement with artificial gravity that allows growth beyond Earth’s living area,” Janhunen wrote.

The vast majority of plots to settle distant worlds revolve around the moon or Mars. This is largely due to their proximity to Earth.

Janhunen’s proposal, on the other hand, looks a little farther afield.

His disk-shaped habitat would boast thousands of cylindrical structures, each home to more than 50,000 people.

Those pods would be linked by powerful magnets and generate artificial gravity by slowly rotating.

Residents would mine resources from Ceres 600 miles below the settlement and haul them back up using “space elevators,” Janhunen said.

“Lifting the materials from Ceres is energetically cheap compared to processing them into habitats, if a space elevator is used,” he wrote.

“Because Ceres has low gravity and rotates relatively fast, the space elevator is feasible.”

Ceres — the largest object in the asteroid belt — is the best destination for off-world settlements due to its nitrogen-rich atmosphere, Janhunen added.

This would allow settlers to more easily create Earth-like conditions than those colonizing the harsher, carbon dioxide-rich environment of Mars.

That doesn’t solve the threats of rogue asteroids or space radiation, though Janhunen, who worked with a number of Finnish researchers on the paper, has thought of that, too.

He proposed that giant, cylindrical mirrors placed around the mega-satellite could protect it from bombardment of all kinds.

Those mirrors would also focus sunlight onto the habitat for the growth of crops and other plant life.

#### Space col happens

Kennedy 19 Fred, 12-18, (I am currently the President of Momentus, a space transportation company located in the San Francisco Bay Area, a member of multiple space company advisory boards, and a member of the Guiding Coalition for the American Institute of Aeronautics and Astronautics ASCEND event. I served as the inaugural Director of the Defense Department’s Space Development Agency during 2019, and led the Defense Advanced Research Projects Agency’s Tactical Technology Office from 2017 to 2019. I served as a senior advisor for space and aviation in the White House Office of Science and Technology Policy in 2016. I retired from the Air Force as a colonel after a 23-year career in space and airborne system engineering and acquisition. I received my Ph.D. from the University of Surrey for work on small satellite propulsion systems. Following my departure from the government, I worked as an executive at Astra, a small rocket company in Alameda, California. At Forbes, my interest areas include the accelerating pace of technological change, the impact of the private sector’s primacy in technology investment, and how civil, defense, and commercial interests will increasingly work together over the coming decades to build new ecosystems on earth and in space) "To Colonize Space Or Not To Colonize: That Is The Question (For All Of Us)," Forbes, https://www.forbes.com/sites/fredkennedy/2019/12/18/to-colonize-or-not-to-colonize--that-is-the-question-for-all-of-us/?sh=3118b432367f

The good news: Critical technologies such as propulsion and power generation systems will improve over time. Transit durations between celestial destinations will shorten (in the same way sailing vessels gave way to steam ships and then to airliners and perhaps, one day, to point-to-point ballistic reusable rockets). Methods for obtaining critical resources on other planets will be refined and enhanced. Genetic engineering may be used to better adapt humans, their crops and other biota to life in space or on other planetary surfaces – to withstand the effects of low or micro-gravity, radiation, and the psychological effects of long-duration spaceflight.

As nation after nation lands their inaugural exploratory vessels on our Earth’s moon, and as billionaire space enthusiasts race to launch passengers, satellites and other cargo into orbit, it’s clearly time for us to sit down as a species and debate whether our future will be one highlighted primarily by growth and discovery, opening the solar system to settlement and economic development, or one that eschews outward expansion for conservation and preservation. Doing so would allow us to focus our attentions on this planet, leaving the solar system in its natural state, a celestial Antarctica stretching beyond Neptune.

#### Private sector space col is k2 broad space colonization.

Diakovska & Aliieva 20 [Halyna Diakovska and Olga Aliieva, Ph.D.s in Philosophy, Associate Professors, Donbass State Pedagogical University, “Consequentialism and Commercial Space Exploration,” 2020, *Philosophy and Cosmology*, Vol. 24, pp. 5-24, https://doi.org/10.29202/phil-cosm/24/1, EA]

The experience of the USA showed that leadership in space exploration, which is maintained solely through public funding, could be erroneous. Since 1984, the share of public funding has gradually decreased in space telecommunications, commercial space transportation, remote sensing, etc., while the share of participation of non-state enterprises has increased rapidly. A legal and regulatory framework has been modified to stimulate space commercialization. The stages of space law development are discussed in the research of Valentyn Halunko (Halunko, 2019), Larysa Soroka (Soroka & Kurkova, 2019), etc. Larysa Soroka and Kseniia Kurkova explored the specifics of the legal regulation of the use and development of artificial intelligence for the space area (Soroka & Kurkova, 2019).

As a result of changing the legal framework and attracting private investors to the space market, the US did not lose its leadership in space exploration, but rather secured it. Private investment along with government funding have significantly reduced the risk of business projects in the space industry. The quality and effectiveness of space exploration programs have increased.

In 2018, Springer published an eloquent book The Rise of Private Actors in the Space Sector. Alessandra Vernile, the author of the book, explores a broad set of topics that reveal the role of private actors in space exploration (Vernile, 2018). The book covers the following topics: “Innovative Public Procurement and Support Schemes,” “New Target Markets for Private Actors,” etc. In the “Selected Success Stories,” Vernile provides examples of successful private actors in space exploration (Vernile, 2018).

The current level of competition, which has developed on the space market, allows us to state the following fact. Private space companies have been able to compete with entire states in launching spacecraft, transporting cargo to orbital stations, and exploring space objects. The issue of mining on space objects, the creation of space settlements and the intensive development of the space tourism market are on the agenda.

In the 21st century, the creation of non-governmental commercial organizations specializing in the field of commercial space exploration, is regarded as an ordinary activity. They are established as parts of the universities around projects funded by private investors. For example, Astropreneurship & Space Industry Club based on the MIT community (Astropreneurship, 2019).

Large-scale research in the field of commercial space exploration, as well as the practical results achieved, led to the formation of a new paradigm called “New Space” ecosystem. The articles of Deganit Paikowsky’s (Paikowsky, 2017), Clelia Iacomino (Iacomino & Ciccarelli, 2018) et al. reveal its key meanings and the opportunities it offers in the space sector. The “New Space” ecosystem is a new vision for commercial space exploration. It is the formation of a cosmic worldview, in which the near space with all the wealth of its resources and capabilities, becomes a part of the global economy and the sustainable development of the society. The “New Space” ecosystem offers the following ways for commercial space exploration (Iacomino & Ciccarelli, 2018):

1. Innovative public procurement and support schemes, which significantly expand the role of commercial actors in space exploration.

2. Attracting new entrants in the space sector. First of all, these are companies working in the domain of Information and communications technology, artificial intelligence, etc. that are expanding their research in space markets. They offer innovative business models and new solutions to space commercialization.

3. Innovative industrial approaches based on new processes, methods, and industrial organization for the development and production of space systems or launchers.

4. Disruptive market solutions, which significantly reduce commercial space exploration prices, increase labor productivity, provide new types of services, etc.

5. Substantial private investment from different sources and involving different funding mechanisms. For instance, these are private fortunes, venture capital firms, business angels, private equity companies, or banks, etc.

6. Involvement of an increasing number of space-faring nations investing in the acquisition of turnkey space capabilities or even in the development of a domestic space industrial base. This expands the space markets and makes it more competitive.

The analysis of the research and advances in commercial space exploration allows us to draw the following conclusions:

1. In fact, the space market has already been created. It is currently undergoing continuous development that will integrate the resources and capabilities of the near space into the global economy over the next decade.

2. A new paradigm, denoted by the term “New Space” ecosystem, is at the heart of the created space market. The “New Space” ecosystem is a step towards the formation of cosmic thinking, in which outer space, with its resources and capabilities, is considered as a sphere of human activities.

3. Space market regulates space law, which is constantly evolving. The space law develops within the bounds of international law. In essence, the space market is integrated into the international legal field and is governed by its laws.

#### Massive spillover effects – solves resources, boosts international cooperation, and eliminates every existential risk.

Green 21 [Brian Patrick Green, director of technology ethics at the Markkula Center for Applied Ethics, Santa Clara University, “Space Ethics,” 2021, Rowman, pp. 4-5]

In favor of going into space are such basics as gaining scientific knowledge and developing beneficial new technologies, both of which space exploration and use have already begun to accomplish with dramatic and sometimes unexpected effects for humankind. Scientific advancements include astronomical and cosmological knowledge from various orbiting experiments and telescopes that have let us gain unprecedented understanding about our universe. But space activities have also contributed to a great deal of scientific knowledge about our Earth, including measurements of environmental status, habitat conversion and destruction, detailed knowledge of anthropogenic climate change, and much about Earth’s chemistry and geology. We have also learned a great deal about our local planets, for example, that a runaway “greenhouse effect” in the atmosphere of Venus makes the surface scorchingly hot, while too little greenhouse effect on Mars leaves the surface quite cold. There have also been significant contributions made to medical science, especially concerning the behavior of the human body when subjected to radiation, microgravity, nutritional restrictions, and so on.

On the technological side, everything with American global positioning system (GPS), Russian Glonass, or other global navigation systems—from smartphones to military vehicles—relies on a network of satellites above us, placed there by rocketry and painstakingly tracked with instruments developed for the task. So many technologies have been pioneered by space exploration and use that it is hard to list them all, but some of the more important ones include weather satellites (which are not only convenient but also allow preparation for and evacuation from severe weather), communication satellites, solar photovoltaic (PV) cells, advances in electronics and computers, advances in materials science, and so on.

Space is also an important location for the contention of national interests in a geopolitical and military sense. As the ultimate “high ground” in battle, space allows certain asset classes such as spy satellites to exist in a position unassailable by many or most opponents. While permanent weapons stations and weapons of mass destruction are banned from space by the United Nations Outer Space Treaty (OST), 6 that has not stopped the development of weapons that are impermanent (such as missiles, missile interceptors, and antisatellite weapons) or the research and development of possible space-based weapons platforms, such as were envisioned by U.S. president Ronald Reagan’s Strategic Defense Initiative, nicknamed “Star Wars.” While military and political interests may ultimately seem to be a less noble reason to explore and use space, relative power, safety, and security certainly are very human interests and are valuable to those who feel they are being protected by them.

Space activities are also a key way of promoting international cooperation and global awareness. While the international competition of the “space race” fueled one nation all the way to the Moon, shortly afterward, the Apollo-Soyuz program announced a thawing of this competition and commenced a period of cooperation between the United States of America and the Union of Soviet Socialist Republics. Currently the International Space Station continues this cross-national cooperation in space, with five space agencies (representing Canada, the European Space Agency nations, Japan, Russia, and the United States) participating. In addition to cooperation in space exploration itself, the perspective given from space has itself helped to produce some feelings of unity on Earth, with the famous “Blue Marble” and “Earthrise” pictures showing Earth’s oneness and scientific discoveries supported by space science, such as those related to climate change, helping to promote international cooperation to address these problems.

Gaining access to new critical resources may be another reason to go into space. Earth is a finite planet, and certain elements on Earth are very rare in the planetary crust, particularly platinum group metals that are very dense and siderophilic (iron-loving) and so have tended to sink toward the core over the natural history of the planet. However, asteroids and other objects in space (for example, planets, comets, and moons) can sometimes have these elements in abundance and in more available locations, making them potentially excellent sources for these valuable materials. Now-defunct asteroid-mining startup Planetary Resources once estimated that one “platinum-rich 500 meter wide asteroid contains . . . 1.5 times the known world-reserves of platinum group metals (ruthenium, rhodium, palladium, osmium, iridium, and platinum).” 7 In addition to returning elements to a resource-hungry Earth, further exploration and development of space will require access to resources that are not purely sourced from Earth. In particular, it will be necessary to gain access to water, which is relatively rare in the inner solar system and which would be far too costly to transport in any significant amounts from the Earth’s surface.

Another reason that humans may want to explore space would be to create a “backup Earth” to hedge against global catastrophic and existential risks (risks that may cause widespread disaster or human extinction, respectively) on our home planet. 8 Earth has always been a dangerous place for humans, with asteroid impacts, supervolcanic eruptions, pandemic disease, and other natural hazards threatening civilization. Now, in addition to these natural threats, human-made hazards such as nuclear weapons, climate change, biotechnology, nanotechnology, and artificial intelligence may threaten not only the viability of technological civilization but perhaps the survival of human life itself. A serious global-scale catastrophe could set back civilization many decades or centuries, and the worst disasters could cause human extinction. In one scenario, in which 100 percent of humanity dies, all of human effort for all of history would be for nothing. However, were the same global catastrophe to happen to Earth, yet humans were a multiplanetary species with just one self-sustaining settlement off-Earth, it would not result in the end of human civilization or human extinction. Instead while the same unimaginable fate would befall the Earth (certainly no mere triviality, with perhaps the deaths of 99.999 percent of all humans and possibly the destruction of the ecosphere and everything in it), at least all of human and planetory history would not be for nothing. Human life and culture would go on elsewhere, as well as other Earth species. This is a dire fate, but less terrible than the first.

### 1NC – DA

#### Xi’s regime is stable now, but its success depends on strong growth and private sector development.

**Mitter and Johnson 21** [Rana Mitter and Elsbeth Johnson, [Rana Mitter](https://hbr.org/search?term=rana%20mitter&search_type=search-all) is a professor of the history and politics of modern China at Oxford. [Elsbeth Johnson](https://hbr.org/search?term=elsbeth%20johnson&search_type=search-all), formerly the strategy director for Prudential PLC’s Asian business, is a senior lecturer at MIT’s Sloan School of Management and the founder of SystemShift, a consulting firm. May-June 2021, "What the West Gets Wrong About China," Harvard Business Review, [https://hbr.org/2021/05/what-the-west-gets-wrong-about-china accessed 12/14/21](https://hbr.org/2021/05/what-the-west-gets-wrong-about-china%20accessed%2012/14/21)] Adam

In China, however, growth has come in the context of stable communist rule, suggesting that democracy and growth are not inevitably mutually dependent. In fact, many Chinese believe that the country’s recent economic achievements—large-scale poverty reduction, huge infrastructure investment, and development as a world-class tech innovator—have come about because of, not despite, China’s authoritarian form of government. Its aggressive handling of Covid-19—in sharp contrast to that of many Western countries with higher death rates and later, less-stringent lockdowns—has, if anything, reinforced that view.

China has also defied predictions that its authoritarianism would inhibit its capacity to [innovate](https://hbr.org/2011/06/what-the-west-doesnt-get-about-china). It is a global leader in AI, biotech, and space exploration. Some of its technological successes have been driven by market forces: People wanted to buy goods or communicate more easily, and the likes of Alibaba and Tencent have helped them do just that. But much of the technological progress has come from a highly innovative and well-funded military that has invested heavily in China’s burgeoning new industries. This, of course, mirrors the role of U.S. defense and intelligence spending in the development of Silicon Valley. But in China the consumer applications have come faster, making more obvious the link between government investment and products and services that benefit individuals. That’s why ordinary Chinese people see Chinese companies such as Alibaba, Huawei, and TikTok as sources of national pride—international vanguards of Chinese success—rather than simply sources of jobs or GDP, as they might be viewed in the West.

Thus July 2020 polling data from the Ash Center at Harvard’s Kennedy School of Government revealed 95% satisfaction with the Beijing government among Chinese citizens. Our own experiences on the ground in China confirm this. Most ordinary people we meet don’t feel that the authoritarian state is solely oppressive, although it can be that; for them it also provides opportunity. A cleaner in Chongqing now owns several apartments because the CCP reformed property laws. A Shanghai journalist is paid by her state-controlled magazine to fly around the world for stories on global lifestyle trends. A young student in Nanjing can study propulsion physics at Beijing’s Tsinghua University thanks to social mobility and the party’s significant investment in scientific research.

#### Xi has committed to the commercial space industry as the linchpin of China’s rise – the plan is seen as a complete 180

**Patel 21** [Neel V. Patel, Neel is a space reporter for MIT Technology Review. 1-21-2021, "China’s surging private space industry is out to challenge the US," MIT Technology Review, <https://www.technologyreview.com/2021/01/21/1016513/china-private-commercial-space-industry-dominance/> accessed 12/14/21] Adam

Until recently, China’s space activity has been overwhelmingly dominated by two state-owned enterprises: the China Aerospace Science & Industry Corporation Limited (CASIC) and the China Aerospace Science and Technology Corporation (CASC). A few private space firms have been allowed to operate in the country for a while: for example, there’s the China Great Wall Industry Corporation Limited (in reality a subsidiary of CASC), which has provided commercial launches since it was established in 1980. But for the most part, China’s commercial space industry has been nonexistent. Satellites were expensive to build and launch, and they were too heavy and large for anything but the biggest rockets to actually deliver to orbit. The costs involved were too much for anything but national budgets to handle.

That all changed this past decade as the costs of making satellites and launching rockets plunged. In 2014, a year after Xi Jinping took over as the new leader of China, the Chinese government decided to treat civil space development as a key area of innovation, as it had already begun doing with AI and solar power. It issued a policy directive called [Document 60](https://archive.md/o/bc9l4/www.cpppc.org/en/zy/994006.jhtml) that year to enable large private investment in companies interested in participating in the space industry.

“Xi’s goal was that if China has to become a critical player in technology, including in civil space and aerospace, it was critical to develop a space ecosystem that includes the private sector,” says Namrata Goswami, a geopolitics expert based in Montgomery, Alabama, who’s been studying China’s space program for many years. “He was taking a cue from the American private sector to encourage innovation from a talent pool that extended beyond state-funded organizations.”

As a result, there are now 78 commercial space companies operating in China, according to a[2019 report by the Institute for Defense Analyses](https://archive.md/o/bc9l4/https:/www.ida.org/-/media/feature/publications/e/ev/evaluation-of-chinas-commercial-space-sector/d-10873.ashx). More than half have been founded since 2014, and the vast majority focus on satellite manufacturing and launch services.

For example, Galactic Energy, founded in February 2018, is building its Ceres rocket to offer rapid launch service for single payloads, while its Pallas rocket is being built to deploy entire constellations. Rival company i-Space, formed in 2016, became the first commercial Chinese company to make it to space with its Hyperbola-1 in July 2019. It wants to pursue reusable first-stage boosters that can land vertically, like those from SpaceX. So does LinkSpace (founded in 2014), although it also hopes to use rockets to deliver packages from one terrestrial location to another.

Spacety, founded in 2016, wants to turn around customer orders to build and launch its small satellites in just six months. In December it launched a miniaturized version of a satellite that uses 2D radar images to build 3D reconstructions of terrestrial landscapes. Weeks later, it [released the first images taken by the satellite](https://archive.md/o/bc9l4/https:/spacenews.com/spacety-releases-first-sar-images/), Hisea-1, featuring three-meter resolution. Spacety wants to launch a constellation of these satellites to offer high-quality imaging at low cost.

To a large extent, China is following the same blueprint drawn up by the US: using government contracts and subsidies to give these companies a foot up. US firms like SpaceX benefited greatly from NASA contracts that paid out millions to build and test rockets and space vehicles for delivering cargo to the International Space Station. With that experience under its belt, SpaceX was able to attract more customers with greater confidence.

Venture capital is another tried-and-true route. The IDA report estimates that VC funding for Chinese space companies was up to $516 million in 2018—far shy of the $2.2 billion American companies raised, but nothing to scoff at for an industry that really only began seven years ago. At least 42 companies had no known government funding.

And much of the government support these companies do receive doesn’t have a federal origin, but a provincial one. “[These companies] are drawing high-tech development to these local communities,” says Hines. “And in return, they’re given more autonomy by the local government.” While most have headquarters in Beijing, many keep facilities in Shenzhen, Chongqing, and other areas that might draw talent from local universities.

There’s also one advantage specific to China: manufacturing. “What is the best country to trust for manufacturing needs?” asks James Zheng, the CEO of Spacety’s Luxembourg headquarters. “It’s China. It’s the manufacturing center of the world.” Zheng believes the country is in a better position than any other to take advantage of the space industry’s new need for mass production of satellites and rockets alike.

Making friends

The most critical strategic reason to encourage a private space sector is to create opportunities for international collaboration—particularly to attract customers wary of being seen to mix with the Chinese government. (US agencies and government contractors, for example, are barred from working with any groups the regime funds.) Document 60 and others issued by China’s National Development and Reform Commission were aimed not just at promoting technological innovation, but also at drawing in foreign investment and maximizing a customer base beyond Chinese borders.

“China realizes there are certain things they cannot get on their own,” says Frans von der Dunk, a space policy expert at the University of Nebraska–Lincoln. Chinese companies like LandSpace and MinoSpace have worked to accrue funding through foreign investment, escaping dependence on state subsidies. And by avoiding state funding, a company can also avoid an array of restrictions on what it can and can’t do (such as constraints on talking with the media). Foreign investment also makes it easier to compete on a global scale: you’re taking on clients around the world, launching from other countries, and bringing talent from outside China.

Although China is taking inspiration from the US in building out its private industry, the nature of the Chinese state also means these new companies face obstacles that their rivals in the West don’t have to worry about. While Chinese companies may look private on paper, they must still submit to government guidance and control, and accept some level of interference. It may be difficult for them to make a case to potential overseas customers that they are independent. The distinction between companies that are truly private and those that are more or less state actors is still quite fuzzy, especially if the government is a frequent customer. “That could still lead to a lack of trust from other partners,” says Goswami. It doesn’t help that the government itself is often [very cagey about what its national program is even up to](https://archive.md/o/bc9l4/https:/www.bbc.com/news/science-environment-54076895).

And Hines adds that it’s not always clear exactly how separate these companies are from, say, the People’s Liberation Army, given the historical ties between the space and defense sectors. “Some of these things will pose significant hurdles for the commercial space sector as it tries to expand,” he says.

#### Shifts in regime perception threatens CCP’s legitimacy from nationalist hardliners

Weiss 19 Jessica Weiss 1-29-2019 “Authoritarian Audiences, Rhetoric, and Propaganda in International Crises: Evidence from China” <http://www.jessicachenweiss.com/uploads/3/0/6/3/30636001/19-01-24-elite-statements-isq-ca.pdf> (Associate Professor of Government at Cornell University)//Elmer

Public support—or the appearance of it—matters to many autocracies. As Ithiel de Sola Pool writes, modern dictatorships are “highly conscious of public opinion and make major efforts to affect it.”6 Mao Zedong told his comrades: “When you make revolution, you must first manage public opinion.”7 Because autocracies often rely on **nationalist mythmaking**,8 success or failure in defending the national honor in international crises could burnish the leadership’s patriotic credentials or spark opposition. **Shared outrage at the regime’s foreign policy failures could galvanize street protests or elite fissures, creating intraparty upheaval** or inviting military officers to step in to restore order. Fearing a domestic backlash, authoritarian leaders may feel compelled to take a tough international stance. Although authoritarian leaders are rarely held accountable to public opinion through free and fair elections, fears of popular unrest and irregular ouster often weigh heavily on autocrats seeking to maximize their tenure in office. Considering the harsh consequences that authoritarian elites face if pushed out of office, even a small increase in the probability of ouster could alter authoritarian incentives in international crises.9 A history of nationalist uprisings make Chinese citizens and leaders especially aware of the linkage between international disputes and domestic unrest. The weakness of the PRC’s predecessor in defending Chinese sovereignty at the Paris Peace Conference in 1919 galvanized protests and a general strike, forcing the government to sack three officials and reject the Treaty of Versailles, which awarded territories in China to Japan. These precedents have made Chinese officials particularly sensitive to the appearance of hewing to public opinion. As the People’s Daily chief editor wrote: “History and reality have shown us that public opinion and regime safety are inseparable.”10 One Chinese scholar even claimed: “the Chinese government probably knows the public’s opinion better and reacts to it more directly than even the U.S. government.”11

#### Xi will launch diversionary war to domestic backlash – escalates in multiple hotspots

Norris 17, William J. Geostrategic Implications of China’s Twin Economic Challenges. CFR Discussion Paper, 2017. (Associate professor of Chinese foreign and security policy at Texas A&M University’s Bush School of Government and Public Service)//Elmer

Populist pressures might tempt the **party leadership** to encourage **diversionary nationalism**. The logic of this concern is straightforward: the Communist Party might seek to **distract a restless domestic population** with **adventurism abroad**.19 The **Xi** administration wants to **appear tough** in its **defense of foreign encroachments** against China’s interests. This need stems from a long-running narrative about how a weak Qing dynasty was unable to defend China in the face of European imperial expansion, epitomized by the Opium Wars and the subsequent treaties imposed on China in the nineteenth century. The party is **particularly sensitive** to **perceptions of weakness** because much of its **claim to legitimacy**—manifested in **Xi’s Chinese Dream** campaign today—stems from the party’s claims of leading the **restoration of Chinese greatness**. For example, the May Fourth Movement, a popular protest in 1919 that helped catalyze the CPC, called into question the legitimacy of the Republic of China government running the country at that time because the regime was seen as not having effectively defended China’s territorial and sovereignty interests at the Versailles Peace Conference. **Diversionary nationalist frictions** would likely occur if the Chinese leadership portrayed a foreign adversary as having made the first move, thus forcing Xi to stand up for China’s interests. An example is the 2012 attempt by the nationalist governor of Tokyo, Shintaro Ishihara, to buy the Senkaku/Diaoyu Islands from a private owner.20 Although the Japanese central government sought to avert a crisis by stepping in to purchase the islands—having them bought and administered by Ishihara’s Tokyo metropolitan government would have dragged Japan into a confrontation with China—China saw this move as part of a deliberate orchestration by Japan to nationalize the islands. Xi seemingly had no choice but to defend China’s claims against an attempt by Japan to consolidate its position on the dispute.21 This issue touched off a period of heated tensions between China and Japan, lasting more than two years.22 Such dynamics are not limited to Japan. Other possible areas of conflict include, but are not necessarily limited to, **Taiwan**, **India**, and the **South China Sea** (especially with the **Philippines** and **Vietnam**). The Chinese government will use such tactics if it believes that the costs are relatively low. Ideally, China would like to appear tough while avoiding material repercussions or a serious diplomatic breakdown. Standing up against foreign encroachment—without facing much blowback—could provide Xi’s administration with a tempting source of noneconomic legitimacy. However, over the next few years, Xi will probably not be actively looking to get embroiled abroad. Cushioning the fallout from slower growth while managing a structural economic transition will be difficult enough. Courting potential international crises that distract the central leadership would make this task even more daunting. Even if the top leadership did not wish to provoke conflict, a smaller budgetary allotment for security could cause **military interests** in China to **deliberately instigate trouble** to **justify** their **claims over increasingly scarce resources**. For example, an air force interested in ensuring its funding for a midair tanker program might find the existence of far-flung territorial disputes to be useful in making its case. Such a case would be made even stronger by a pattern of recent frictions that highlights the necessity of greater air power projection. Budgetary pressures may be partly behind a recent People’s Liberation Army reorganization and headcount reduction. A slowing economy might cause a further deceleration in China’s military spending, thus increasing such pressures as budgetary belts tighten. Challenges to Xi’s Leadership Xi Jinping’s efforts to address economic challenges could fail, unleashing consequences that extend well beyond China’s economic health. For example, an **economic collapse** could give rise to a Vladimir **Putin–like redemption figure** in China. Xi’s approach of centralizing authority over a diverse, complex, and massive social, political, and economic system is a **recipe for brittleness**. Rather than designing a resilient, decentralized governance structure that can gracefully cope with localized failures at particular nodes in a network, a highly centralized architecture **risks catastrophic**, **system-level failure**. Although centralized authority offers the tantalizing chimera of stronger control from the center, it also puts all the responsibility squarely on Xi’s shoulders. With China’s ascension to great power status, the consequences of internecine domestic political battles are increasingly playing out on the world stage. The international significance of China’s domestic politics is a new paradigm for the Chinese leadership, and one can expect an adjustment period during which the outcome of what had previously been relatively insulated domestic political frictions will likely generate **unintended international repercussions**. Such dynamics will influence Chinese foreign policy and security behavior. Domestic arguments over ideology, bureaucratic power struggles, and strategic direction could all have **ripple effects abroad**. Many of China’s party heavyweights still employ a narrow and exclusively domestic political calculus. Such behavior increases the possibility of international implications that are not fully anticipated, **raising the risks** of **strategic miscalculation** on the world stage. For example, the factional power struggles that animated the Cultural Revolution were largely driven by domestic concerns, yet manifested themselves in Chinese foreign policy for more than a decade. During this period, China was not the world’s second largest economy and, for much of this time, did not even have formal representation at the United Nations. If today’s globally interconnected China became engulfed in similar domestic chaos, the effects would be felt worldwide.23 Weakened Fetters of Economic Interdependence If China successfully transitioned away from its export-driven growth model toward a consumption-driven economic engine over the next four or five years, it could no longer feel as constrained by economic interdependence. To the extent that such constraints are loosened, the U.S.-China relationship will be more prone to conflict and friction.24 While China has never been the archetypal liberal economic power bent on benign integration with the global economy, its export-driven growth model produced a strong strategic preference for stability. Although past behavior is not necessarily indicative of future strategic calculus, China’s “economic circuit breaker” logic seems to have held its most aggressive nationalism below the threshold of war since 1979. A China that is both comparatively strong and less dependent on the global economy would be a novel development in modern geopolitics. As China changes the composition of its international economic linkages, global integration could place fewer constraints on it. Whereas China has been highly reliant on the import of raw materials and semifinished goods for reexport, a consumption-driven China could have a different international trade profile. China could still rely on imported goods, but their centrality to the country’s overall economic growth would be altered. Imports of luxury goods, consumer products, international brands, and services may not exert a significant constraining influence, since loss of access to such items may not be seen as strategically vital. If these flows were interrupted or jeopardized, the result would be more akin to an inconvenience than a strategic setback for China’s rise. That said, China is likely to continue to highly depend on imported oil even if the economic end to which that energy resource is directed shifts away from industrial and export production toward domestic consumption.

#### US–China war goes nuclear – crisis mis-management ensures conventional escalation - extinction

Kulacki 20 [Dr. Gregory Kulacki focuses on cross-cultural communication between the United States and China on nuclear and space arms control and is the China Project Manager for the Global Security Program at the Union of Concerned Scientists, 2020. Would China Use Nuclear Weapons First In A War With The United States?, Thediplomat.com, https://thediplomat.com/2020/04/would-china-use-nuclear-weapons-first-in-a-war-with-the-united-states/] srey

Admiral Charles A. Richard, the head of the U.S. Strategic Command, recently told the Senate Armed Service Committee he “could drive a truck” through the holes in China’s no first use policy. But when Senator John Hawley (R-MO) asked him why he said that, Commander Richard backtracked, described China’s policy as “very opaque” and said his assessment was based on “very little” information. That’s surprising. **China** has been exceptionally **clear** **about** its **intentions** **on** the possible **first** **use** **of** **nuclear** **weapons**. On the day of its first nuclear test on October 16, 1964, China declared it “will never at any time or under any circumstances be the first to use nuclear weapons.” That **unambiguous** **statement** **has** **been** a **cornerstone** **of** **Chinese** **nuclear** **weapons** policy for 56 years and has been repeated frequently in authoritative Chinese publications for domestic and international audiences, including a highly classified training manual for the operators of China’s nuclear forces. Richard should know about those publications, particularly the training manual. A U.S. Department of Defense translation has been circulating within the U.S. nuclear weapons policy community for more than a decade. The commander’s comments to the committee indicate a familiarity with the most controversial section of the manual, which, in the eyes of some U.S. analysts, indicates there may be some circumstances where **China** **would** **use** **nuclear** **weapons** **first** **in** a **war** **with** **the** **U**nited **S**tates. This U.S. misperception is understandable, especially given the difficulties the Defense Department encountered translating the text into English. The language, carefully considered in the context of the entire book, articulates a strong reaffirmation of China’s no first use policy. But it also reveals **Chinese** military planners are **struggling** **with** **crisis** **management** **and** **considering** **steps** **that** could **create** **ambiguity** **with** **disastrous** **consequences**. Towards the end of the 405-page text on the operations of China’s strategic rocket forces, in a chapter entitled, “Second Artillery Deterrence Operations,” the authors explain what China’s nuclear forces train to do if **“**a strong military power possessing nuclear‐armed missiles and an absolute advantage in high‐tech conventional weapons is carrying out intense and continuous attacks against our major strategic targets and we have no good military strategy to resist the enemy.**”** The military power they’re talking about is the United States. The authors indicate China’s nuclear missile forces train to take specific steps, including increasing readiness and conducting launch exercises, to “dissuade the continuation of the strong enemy’s conventional attacks.” The manual refers to these steps as an “adjustment” to China’s nuclear policy and a “lowering” of China’s threshold for brandishing its nuclear forces. Chinese leaders would only take these steps in extreme circumstances. The text highlights several triggers such as U.S. conventional bombing of China’s nuclear and hydroelectric power plants, heavy conventional bombing of large cities like Beijing and Shanghai, or other acts of **conventional** **warfare** **that** “**seriously** **threatened**” the “safety and **survival**” of the nation. U.S. Misunderstanding Richard seems to believe this planned adjustment in China’s nuclear posture means China is **preparing** **to** **use** **nuclear** **weapons** first under these circumstances. He told Hawley that there are a “number of situations where they may conclude that first use has occurred that do not meet our definition of first use.” The head of the U.S. Strategic Command appears to assume, as do other U.S. analysts, that the **Chinese** would **interpret** **these** types of U.S. conventional **attacks** **as** **equivalent** **to** a **U.S. first use** **of** **nuclear** **weapons** against China. But that’s not what the text says. “Lowering the threshold” refers to China putting its nuclear weapons on alert — it does not indicate Chinese leaders might lower their threshold for deciding to use nuclear weapons in a crisis. Nor does the text indicate Chinese nuclear forces are training to launch nuclear weapons first in a war with the United States. China, unlike the United States, keeps its nuclear forces off-alert. Its warheads are not mated to its missiles. China’s nuclear-armed submarines are not continuously at sea on armed patrols. The manual describes how China’s nuclear warheads and the missiles that deliver them are controlled by two separate chains of command. Chinese missileers train to bring them together and launch them after China has been attacked with nuclear weapons. All of these behaviors are consistent with a no first use policy. The “adjustment” Chinese nuclear forces are preparing to make if the United States is bombing China with impunity is to place China’s nuclear forces in a state of readiness similar to the state the nuclear forces of the United States are in all the time. This step is intended not only to end the bombing, but also to convince U.S. decision-makers they cannot expect to destroy China’s nuclear retaliatory capability if the crisis escalates. Chinese Miscalculation Unfortunately, alerting Chinese nuclear forces at such a moment could have terrifying consequences. Given the relatively small size of China’s nuclear force, a U.S. president might be tempted to try to limit the possible damage from a Chinese nuclear attack by destroying as many of China’s nuclear weapons as possible before they’re launched, especially if the head of the U.S. Strategic Command told the president China was preparing to strike first. One study concluded that if the United States used nuclear weapons to attempt to knock out a small fraction of the Chinese ICBMs that could reach the United States it may kill tens of millions of Chinese civilians. The authors of the text assume alerting China’s nuclear forces would “create a great shock in the enemy’s psyche.” That’s a fair assumption. But they also assume this shock could “dissuade the continuation of the strong enemy’s conventional attacks against our major strategic targets.” That’s highly questionable. There is a **substantial** **risk** **the** **U**nited **S**tates **would** **respond** **to** this implicit **Chinese** **threat** **to** **use** **nuclear** **weapons** **by** **escalating**, rather than halting, its **conventional** **attacks**. If China’s nuclear forces were targeted, it would put even greater strain on the operators of China’s nuclear forces. A **slippery** **slope** **to** **nuclear** **war** Chinese military planners are aware that attempting to coerce the United States into halting conventional bombardment by alerting their nuclear forces could fail. They also know it might trigger a nuclear war. But if it does, they are equally clear China won’t be the one to start it. Nuclear attack is often preceded by nuclear coercion. Because of this, in the midst of the process of a high, strong degree of nuclear coercion we should prepare well for a nuclear retaliatory attack. The more complete the preparation, the higher the credibility of nuclear coercion, the easier it is to accomplish the objective of nuclear coercion, and the lower the possibility that the nuclear missile forces will be used in actual fighting. They assume if China demonstrates it is well prepared to retaliate the United States would not risk a damage limitation strike using nuclear weapons. And even if the United States were to attack China’s nuclear forces with conventional weapons, China still would not strike first. In the opening section of the next chapter on “nuclear retaliatory attack operations” the manual instructs, as it does on numerous occasions throughout the entire text: According to our country’s principle, its stand of no first use of nuclear weapons, the Second Artillery will carry out a nuclear missile attack against the enemy’s important strategic targets, according to the combat orders of the Supreme Command, only after the enemy has carried out a nuclear attack against our country. Richard is wrong. There are no holes in China’s no first use policy. But the worse-case planning articulated in this highly classified military text is a significant and deeply troubling departure from China’s traditional thinking about the role of nuclear weapons. Mao Zedong famously called nuclear weapons “a paper tiger.” Many assumed he was being cavalier about the consequences of nuclear war. But what he meant is that they would not be used to fight and win wars. U.S. nuclear threats during the Korean War and the Taiwan Strait Crisis in the 1950s – threats not followed by an actual nuclear attack – validated Mao’s intuition that nuclear weapons were primarily psychological weapons. Chinese leaders decided to acquire nuclear weapons to free their minds from what Mao’s generation called “**nuclear** **blackmail**.” A former director of China’s nuclear weapons laboratories told me China developed them so its leaders could “sit up with a straight spine.” Countering nuclear blackmail – along with compelling other nuclear weapons states to negotiate their elimination – were the only two purposes Chinese nuclear weapons were meant to serve. Contemporary Chinese military planners appear to have added a new purpose: compelling the United States to halt a conventional attack. Even though it only applies in extreme circumstances, it **increases** the **risk** **that** a **war** between the United States and China **will** **end** **in** a nuclear exchange with unpredictable and **catastrophic** **consequences**. Adding this new purpose could also be the first step on a slippery slope to an incremental broadening the role of nuclear weapons in Chinese national security policy. Americans would be a lot safer if we could avoid that. The United States government should applaud China’s no first use policy instead of repeatedly calling it into question. And it would be wise to adopt the same policy for the United States. If both countries declared they would never use nuclear weapons first it may not guarantee they can avoid a nuclear exchange during a military crisis, but it would make one far less likely.

## Case

### Debris

#### Alt cause – broad space privatization and existing debris.

Muelhapt et al 19 [(Theodore J., Center for Orbital and Reentry Debris Studies, Center for Space Policy and Strategy, The Aerospace Corporation, 30 year Space Systems Analyst and Operator, Marlon E. Sorge, Jamie Morin, Robert S. Wilson), “Space traffic management in the new space era,” Journal of Space Safety Engineering, 6/18/19, <https://doi.org/10.1016/j.jsse.2019.05.007>] TDI

The last decade has seen rapid growth and change in the space industry, and an explosion of commercial and private activity. Terms like NewSpace or democratized space are often used to describe this global trend to develop faster and cheaper access to space, distinct from more traditional government-driven activities focused on security, political, or scientific activities. The easier access to space has opened participation to many more participants than was historically possible. This new activity could profoundly worsen the space debris environment, particularly in low Earth orbit (LEO), but there are also signs of progress and the outlook is encouraging. Many NewSpace operators are actively working to mitigate their impact. Nevertheless, NewSpace represents a significant break with past experience and business as usual will not work in this changed environment. New standards, space policy, and licensing approaches are powerful levers that can shape the future of operations and the debris environment.

2. Characterizing NewSpace: a step change in the space environment

In just the last few years, commercial companies have proposed, funded, and in a few cases begun deployment of very large constellations of small to medium-sized satellites. These constellations will add much more complexity to space operations. Table 1 shows some of the constellations that have been announced for launch in the next decade. Two dozen companies, when taken together, have proposed placing well over ~~20,000~~ [twenty thousand] satellites in orbit in the next ~~10~~ [10]years. For perspective, fewer than ~~8100~~[eight thousand one hundred] payloads have been placed in Earth orbit in the entire history of the space age, only 4800 [1] remain in orbit and approximately 1950 [2] of those are still active. And it isn't simply numbers – the mass in orbit will increase substantially, and long-term debris generation is strongly correlated with mass.

[Table 1 Omitted]

This table is in constant flux. It is based largely on U.S. filings with the Federal Communications Commission (FCC) and various press releases, but many of the companies here have already altered or abandoned their original plans, and new systems are no doubt in work. Although many of these large constellations may never be launched as listed, the traffic created if just half are successful would be more than double the number of payloads launched in the last 60 years and more than 6 times the number of currently active satellites.

Current space safety, space surveillance, collision avoidance (COLA) and debris mitigation processes have been designed for and have evolved with the current population profile, launch rates and density of LEO space.

By almost any metric used to measure activity in space, whether it is payloads in orbit, the size of constellations, the rate of launches, the economic stakes, the potential for debris creation, the number of conjunctions, NewSpace represents a fundamental change.

3. Compounding effects of better SSA, more satellites, and new operational concepts

The changes in the space environment can be seen on this figurative map of low Earth orbit. Fig. 1 shows the LEO environment as a function of altitude. The number of objects found in each 10 km “bin” is plotted on the horizontal axis, while the altitude is plotted vertically. Objects in elliptical orbits are distributed between bins as partial objects proportional to the time spent in each bin. Some notable resident systems are indicated in blue text on the right to provide an altitude reference. The (dotted) red line shows the number of objects in the current catalog tracked by the U.S. Space Surveillance Network (SSN). All the COLA alerts and actions that must be taken by the residents are due to their neighbors in the nearby bins, so the currently visible risk is proportional to the red line.



The red line of the current catalog does not represent the complete risk; it indicates the risk we can track and perhaps avoid. A rule of thumb is that the current SSN LEO catalog contains objects about 10 cm or larger. It is generally accepted that an impact in LEO with an object 1 cm or larger will cause damage likely to be fatal to a satellite's mission. Therefore, there is a large latent risk from unobserved debris. While we cannot currently track and catalog much smaller than 10 cm, experiments have been performed to detect and sample much smaller objects and statistically model the population at this size [3]. The (solid) blue line represents the model of the 1 cm and larger debris that is likely mission-ending, usually called lethal but not trackable. If LEO operators avoid collisions with all the objects in the red line, they are nonetheless inherently accepting the risk from the blue line. This risk is already present.

The (dashed) orange line is an estimate of the population at 5 cm and larger and is thus an estimate of what the catalog might conservatively be a few years after the Space Fence, a new radar system being built by the Air Force, comes on line (currently planned for 2019) [4]. Commercial companies offering space surveillance services, such as LeoLabs, ExoAnalytics, Analytic Graphics Inc., Lockheed, and Boeing, might also add to the number of objects currently tracked. Space Policy Directive 3 (SPD-3) [13] specifically seeks to expand the use of commercial SSA services.

Existing operators can expect a sharp increase in the number of warnings and alerts they will receive because of the increase in the cataloged population. Almost all the increase will come from newly detected debris [5].

The pace of safety operations for each satellite on orbit will significantly change because of the increase in the catalog from the Space Fence. This effect is compounded because the NewSpace constellations described in Table 1 will drastically change the profile of satellites in LEO. The green bars in Fig. 1 represent the number of objects that will be added to the catalog (red or orange lines) from only the NewSpace large LEO constellations at their operational altitudes. This does not include the rocket stages that launch them, or satellites in the process of being phased into or removed from the operational orbits. Neighbors of one of these new constellations may face a radically different operations environment than their current practices were designed to address.

Satellites in these large LEO constellations typically have planned operational lifetimes of 5–10 years. Some companies have proposed to dispose of their satellites using low thrust electric propulsion systems, which would spiral satellites down over a period of months or years from operating altitudes as high as 1500 km through lower orbits where the Hubble Space Telescope, the International Space Station, and other critical LEO satellites operate [6]. Similar propulsive techniques would raise replacement satellites from lower launch injection orbits to higher operational orbits. These disposal and replenishment activities will add thousands of satellites each year transiting through lower altitudes and posing a risk to all resident satellites in those lower orbits. More importantly, failures will occur both among transiting satellites and operational constellations, potentially leaving hundreds more stranded along the transit path.

**Probability – 0.1% chance of a collision.**

**Salter 16** [(Alexander William, Economics Professor at Texas Tech) “SPACE DEBRIS: A LAW AND ECONOMICS ANALYSIS OF THE ORBITAL COMMONS” 19 STAN. TECH. L. REV. 221 \*numbers replaced with English words] TDI

The probability of a collision is currently low. Bradley and Wein estimate that the maximum probability in LEO of a collision over the lifetime of a spacecraft remains below one in one thousand, conditional on continued compliance with NASA’s deorbiting guidelines.3 However, the possibility of a future “snowballing” effect, whereby debris collides with other objects, further congesting orbit space, remains a significant concern.4 Levin and Carroll estimate the average immediate destruction of wealth created by a collision to be approximately $30 million, with an additional $200 million in damages to all currently existing space assets from the debris created by the initial collision.5 The expected value of destroyed wealth because of collisions, currently small because of the low probability of a collision, can quickly become significant if future collisions result in runaway debris growth.

**Time frame – Kessler effect 200 years away**

**Stubbe 17** [(Peter, PhD in law @ Johann Wolfgang Goethe University Frankfurt) “State Accountability for Space Debris: A Legal Study of Responsibility for Polluting the Space Environment and Liability for Damage Caused by Space Debris,” Koninklijke Brill Publishing, ISBN 978-90-04-31407-8, p. 27-31] TDI

The prediction of possible scenarios of the future evolution of the debris p o p ulation involves many uncertainties. Long-term forecasting means the prediction of the evolution of the future debris environment in time periods of decades or even centuries. Predictions are based on models84 that work with certain assumptions, and altering these parameters significantly influences the outcomes of the predictions. Assumptions on the future space traffic and on the initial object environment are particularly critical to the results of modeling efforts.85 A well-known pattern for the evolution of the debris population is the so-called Kessler effect’, which assumes that there is a certain collision probability among space objects because many satellites operate in similar orbital regions. These collisions create fragments, and thus additional objects in the respective orbits, which in turn enhances the risk of further collisions. Consequently, the num ber of objects and collisions increases exponentially and eventually results in the formation of a self-sustaining debris belt aroundthe Earth. While it has long been assumed that such a process of collisional cascading is likely to occur only in a very long-term perspective (meaning a time 1 n of several hundred years),87 a consensus has evolved in recent years that an uncontrolled growth of the debris population in certain altitudes could become reality much sooner.88 In fact, a recent cooperative study undertaken by various space agencies in the scope of i a d c shows that the current l e o debris population is unstable, even if current mitigation measures are applied. The study concludes:

Even with a 90% implementation of the commonly-adopted mitigation measures [...] the l e o debris population is expected to increase by an average of 30% in the next 200 years. The population growth is primarily driven by catastrophic collisions between 700 and 1000 km altitudes and such collisions are likely to occur every 5 to 9 years.89

**No ‘space war’ – Insurmountable barriers and everyone has an interest in keeping space peaceful**

**Dobos 19** [(Bohumil Doboš, scholar at the Institute of Political Studies, Faculty of Social Sciences, Charles University in Prague, Czech Republic, and a coordinator of the Geopolitical Studies Research Centre) “Geopolitics of the Outer Space, Chapter 3: Outer Space as a Military-Diplomatic Field,” Pgs. 48-49] TDI

Despite the theorized potential for the achievement of the terrestrial dominance throughout the utilization of the ultimate high ground and the ease of destruction of space-based assets by the potential space weaponry, the utilization of space weapons is with current technology and no effective means to protect them far from fulfilling this potential (Steinberg 2012, p. 255). In current global international political and technological setting, the utility of space weapons is very limited, even if we accept that the ultimate high ground presents the potential to get a decisive tangible military advantage (which is unclear). This stands among the reasons for the lack of their utilization so far. Last but not the least, it must be pointed out that the states also develop passive defense systems designed to protect the satellites on orbit or critical capabilities they provide. These further decrease the utility of space weapons. These systems include larger maneuvering capacities, launching of decoys, preparation of spare satellites that are ready for launch in case of ASAT attack on its twin on orbit, or attempts to decrease the visibility of satellites using paint or materials less visible from radars (Moltz 2014, p. 31). Finally, we must look at the main obstacles of connection of the outer space and warfare. The first set of barriers is comprised of physical obstructions. As has been presented in the previous chapter, the outer space is very challenging domain to operate in. Environmental factors still present the largest threat to any space military capabilities if compared to any man-made threats (Rendleman 2013, p. 79). A following issue that hinders military operations in the outer space is the predictability of orbital movement. If the reconnaissance satellite's orbit is known, the terrestrial actor might attempt to hide some critical capabilities-an option that is countered by new surveillance techniques (spectrometers, etc.) (Norris 2010, p. 196)-but the hide-and-seek game is on. This same principle is, however, in place for any other space asset-any nation with basic tracking capabilities may quickly detect whether the military asset or weapon is located above its territory or on the other side of the planet and thus mitigate the possible strategic impact of space weapons not aiming at mass destruction. Another possibility is to attempt to destroy the weapon in orbit. Given the level of development for the ASAT technology, it seems that they will prevail over any possible weapon system for the time to come. Next issue, directly connected to the first one, is the utilization of weak physical protection of space objects that need to be as light as possible to reach the orbit and to be able to withstand harsh conditions of the domain. This means that their protection against ASAT weapons is very limited, and, whereas some avoidance techniques are being discussed, they are of limited use in case of ASAT attack. We can thus add to the issue of predictability also the issue of easy destructibility of space weapons and other military hardware (Dolman 2005, p. 40; Anantatmula 2013, p. 137; Steinberg 2012, p. 255). Even if the high ground was effectively achieved and other nations could not attack the space assets directly, there is still a need for communication with those assets from Earth. There are also ground facilities that support and control such weapons located on the surface. Electromagnetic communication with satellites might be jammed or hacked and the ground facilities infiltrated or destroyed thus rendering the possible space weapons useless (Klein 2006, p. 105; Rendleman 2013, p. 81). This issue might be overcome by the establishment of a base controlling these assets outside the Earth-on Moon or lunar orbit, at lunar L-points, etc.-but this perspective remains, for now, unrealistic. Furthermore, no contemporary actor will risk full space weaponization in the face of possible competition and the possibility of rendering the outer space useless. No actor is dominant enough to prevent others to challenge any possible attempts to dominate the domain by military means. To quote 2016 Stratfor analysis, "(a) war in space would be devastating to all, and preventing it, rather than finding ways to fight it, will likely remain the goal" (Larnrani 20 16). This stands true unless some space actor finds a utility in disrupting the arena for others.

#### Public sector mining thumps

NASA 19 [“NASA Invests in Tech Concepts Aimed at Exploring Lunar Craters, Mining Asteroids,” NASA, June 11, 2019, <https://www.nasa.gov/press-release/nasa-invests-in-tech-concepts-aimed-at-exploring-lunar-craters-mining-asteroids>] TDI

NASA Invests in Tech Concepts Aimed at Exploring Lunar Craters, Mining Asteroids

Robotically surveying lunar craters in record time and mining resources in space could help NASA establish a sustained human presence at the Moon – part of the agency’s broader [Moon to Mars exploration](https://www.nasa.gov/specials/moon2mars/) approach. Two mission concepts to explore these capabilities have been selected as the first-ever Phase III studies within the [NASA Innovative Advanced Concepts](https://www.nasa.gov/niac) (NIAC) program.

“We are pursuing new technologies across our development portfolio that could help make deep space exploration more Earth-independent by utilizing resources on the Moon and beyond,” said Jim Reuter, associate administrator of NASA’s Space Technology Mission Directorate. “These NIAC Phase III selections are a component of that forward-looking research and we hope new insights will help us achieve more firsts in space.”

The Phase III proposals outline an aerospace architecture, including a mission concept, that is innovative and could change what’s possible in space. Each selection will receive as much as $2 million. Over the course of two years, researchers will refine the concept design and explore aspects of implementing the new technology. The inaugural Phase III selections are:

Robotic Technologies Enabling the Exploration of Lunar Pits

William Whittaker, Carnegie Mellon University, Pittsburgh

This mission concept, called Skylight, proposes technologies to rapidly survey and model lunar craters. This mission would use high-resolution images to create 3D model of craters. The data would be used to determine whether a crater can be explored by human or robotic missions. The information could also be used to characterize ice on the Moon, a crucial capability for the sustained surface operations of NASA’s Artemis program. On Earth, the technology could be used to autonomously monitor mines and quarries.

[Mini Bee Prototype to Demonstrate the Apis Mission Architecture and Optical Mining Technology](https://www.nasa.gov/directorates/spacetech/niac/2019_Phase_I_Phase_II/Mini_Bee_Prototype)

Joel Sercel, TransAstra Corporation, Lake View Terrace, California

This flight demonstration mission concept proposes a method of asteroid resource harvesting called optical mining. Optical mining is an approach for excavating an asteroid and extracting water and other volatiles into an inflatable bag. Called Mini Bee, the mission concept aims to prove optical mining, in conjunction with other innovative spacecraft systems, can be used to obtain propellant in space. The proposed architecture includes resource prospecting, extraction and delivery.

#### Asteroid mining fails

Fickling 20 [(David, Bloomberg opinion columnist, previously at Guardian and Financial Times, MA in Eng Lit from Cambridge) “We’re Never Going to Mine the Asteroid Belt,” Bloomberg Opinion, December 21, 2020, <https://www.bloomberg.com/opinion/articles/2020-12-21/space-mining-on-asteroids-is-never-going-to-happen>] TDI

It’s wonderful that people are shooting for the stars — but those who declined to fund the expansive plans of the nascent space mining industry were right about the fundamentals. Space mining won’t get off the ground in any foreseeable future — and you only have to look at the history of civilization to see why.

One factor rules out most space mining at the outset: gravity. On one hand, it guarantees that most of the solar system’s best mineral resources are to be found under our feet. Earth is the largest rocky planet orbiting the sun. As a result, the cornucopia of minerals the globe attracted as it coalesced is as rich as will be found this side of Alpha Centauri.

Gravity poses a more technical problem, too. Escaping Earth’s gravitational field makes transporting the volumes of material needed in a mining operation hugely expensive. On Falcon Heavy, the large rocket being developed by Elon Musk’s SpaceX, transporting a payload to the orbit of Mars comes to as little as [$5,357 per kilogram](https://www.spacex.com/media/Capabilities&Services.pdf) — a drastic reduction in normal launch costs. Still, at those prices just lofting a single half-ton drilling rig to the asteroid belt would use up the annual exploration budget of a small mining company.

Power is another issue. The international space station, with 35,000 square feet of solar arrays, generates up to 120 kilowatts of electricity. That drill would need a [similar-sized power plant](https://www.rocktechnology.sandvik/en/products/exploration-drill-rigs-and-tools/compact-core-drill-rigs/) — and most mining companies operate multiple rigs at a time. Power demands rise drastically once you move from exploration drilling to mining and processing. Bringing material back to Earth would raise the costs even more. Japan’s Hayabusa2 satellite spent six years and 16.4 billion yen ($157 million) recovering a single gram of material from the asteroid Ryugu and returning it to Earth earlier this month.

#### Non UQ – squo debris thumps- CX proves that they have no squo sustaiable warrant

Orwig 16 [(Jessica, MS in science and tech journalism from Texas A&M, BS in astronomy and physics from Ohio State) “Russia says a growing problem in space could be enough to spark a war,” Insider,’ January 26, 2016, <https://www.businessinsider.com/russia-says-space-junk-could-spark-war-2016-1>] TDI

NASA has already [warned that](https://www.businessinsider.com/space-junk-at-critical-density-2015-9) the large amount of space junk around our planet is growing beyond our control, but now a team of Russian scientists has cited another potentially unforeseen consequence of that debris: War.

Scientists estimate that anywhere from 500,000 to 600,000 pieces of human-made space debris between 0.4 and 4 inches in size are currently orbiting the Earth and traveling at speeds over [17,000 miles per hour](https://www.nasa.gov/mission_pages/station/news/orbital_debris.html).

If one of those pieces smashed into a military satellite it "may provoke political or even armed conflict between space-faring nations," Vitaly Adushkin, a researcher for the Institute of Geosphere Dynamics at the Russian Academy of Sciences, reported in a paper set to be published in the peer-reviewed journal [Acta Astronautica](https://www.sciencedirect.com/science/article/pii/S0094576515303416), which is sponsored by the International Academy of Astronautics.

#### Millions undetected now—Pen reads blue

1AC Dockrill 16 [Peter; 2016; Award-winning science & technology journalist. “Space Junk Accidents Could Trigger Armed Conflict, Study Finds.” <https://www.sciencealert.com/space-junk-accidents-could-trigger-armed-conflict-expert-warns>] brett

The increasingly crowded space in Earth's low orbit could set the stage for an international armed conflict, says a new study. Researchers from the Russian Academy of Sciences warn that accidents stemming from the steady rise in space junk floating around the planet could incite political rows and even warfare, with nations potentially mistaking debris-caused incidents as the results of intentional aggressive acts by others. In a paper published in Acta Astronautica, the team suggests that space debris in the form of spent rocket parts and other fragments of hardware hurtling at high speed pose a "special political danger" that could dangerously escalate tensions between nations. According to the study, destructive impacts caused by random space junk cannot easily be told apart from military attacks. "The owner of the impacted and destroyed satellite can hardly quickly determine the real cause of the accident," the authors write. The risks of such an event occurring are compounded by the sheer volume of debris now orbiting Earth. Recent figures from NASA indicate that there are more than 500,000 pieces of space junk currently being tracked in orbit, travelling at speeds up to 28,160 km/h (17,500 mph). The majority of those objects are small – around the size of a marble – but some 20,000 of them are bigger than a softball. In addition to these 500,000 or so fragments – which are big enough for scientists to know about them – NASA estimates that there are millions of undetectable pieces of debris in orbit that are too small to be monitored. But even extremely small fragments such as these pose a threat – in fact, they're considered a greater risk than trackable debris, as their invisible status means spacecraft and satellites can't do anything to avoid them until it's too late. As NASA observed in 2013: "Even tiny paint flecks can damage a spacecraft when travelling at these velocities. In fact a number of space shuttle windows have been replaced because of damage caused by material that was analysed and shown to be paint flecks… With so much orbital debris, there have been surprisingly few disastrous collisions." While we may have been lucky in the past, we can't rely on that to continue. The study by the Russian team cites the repeated sudden failures of defence satellites in past decades that were never explained. The researchers attribute two possible causes: either unrecorded collisions with space junk, or aggressive actions from adversaries. "This is a politically dangerous dilemma," the authors write.

#### Space debris creates existential deterrence and a taboo

Bowen 18 [(Bleddyn, lecturer in International Relations at the University of Leicester) “The Art of Space Deterrence,” European Leadership Network, February 20, 2018, <https://www.europeanleadershipnetwork.org/commentary/the-art-of-space-deterrence/>] TDI

Fourth, the ubiquity of space infrastructure and the fragility of the space environment may create a degree of existential deterrence. As space is so useful to modern economies and military forces, a large-scale disruption of space infrastructure may be so intuitively escalatory to decision-makers that there may be a natural caution against a wholesale assault on a state’s entire space capabilities because the consequences of doing so approach the mentalities of total war, or nuclear responses if a society begins tearing itself apart because of the collapse of optimised energy grids and just-in-time supply chains. In addition, the problem of space debris and the [political-legal hurdles to conducting debris clean-up](https://doi.org/10.1080/14777622.2014.890489) operations mean that even a handful of explosive events in space can render a region of Earth orbit unusable for everyone. This could caution a country like China from excessive kinetic intercept missions because its own military and economy is increasingly reliant on outer space, but perhaps not a country like North Korea which does not rely on space. The usefulness, sensitivity, and fragility of space may have some existential deterrent effect. [China’s catastrophic anti-satellite weapons test in 2007](https://defenceindepth.co/2017/01/11/chinas-space-weapons-test-ten-years-on-behemoth-pulls-the-peasants-plough/) is a valuable lesson for all on the potentially devastating effect of kinetic warfare in orbit.

### Ozone

#### No impact to Ozone hole- also unknown causes

Hand 2/10/16. Eric Hand is a staff writer who writes about planetary issures. <http://www.sciencemag.org/news/2016/02/record-ozone-hole-may-open-over-arctic-spring>, Ben Bernstein

Lingering atmospheric pollutants and a blast of frigid air have carved an unusually deep hole in Earth’s protective ozone layer over the Arctic, and it threatens to get deeper. Atmospheric scientists are analyzing data from weather balloons and satellites for clues to how the ozone will fare when sunlight—a third factor in ozone loss—returns to the Arctic in the spring. But they are already worrying about how extra ultraviolet light might affect humans and ecosystems below and wondering whether climate change will make such Arctic holes more common or severe. Record cold temperatures in the Arctic stratospheric ozone layer, 15 to 35 kilometers up, are the proximate cause for this year’s losses, because they help to unleash ozone-destroying chemicals. “This winter has been stunning,” says Markus Rex, an atmospheric chemist at the Alfred Wegener Institute in Potsdam, Germany. By next week, about 25% of the Arctic’s ozone will be destroyed, he says. This time of year, the stratosphere tends to warm up with the breakdown of the polar vortex, a cyclone that traps cold air. But if a strong vortex persists another month as light returns to the Arctic after the dark winter, ozone losses will get much bigger, Rex says. Conditions are ripe for losses to surpass a record Arctic ozone hole observed in the spring of 2011, he adds. At Earth’s surface, ozone is a caustic chemical and a health hazard. But in the stratosphere, it shields the planet from ultraviolet light. Scientists noticed in the 1980s that chlorine-containing chemicals commonly used in refrigerants were reacting to form compounds that ate away stratospheric ozone, especially over the poles. The 1989 Montreal Protocol led to the phaseout of those chemicals, but their long atmospheric lifetime means that seasonal ozone losses will persist well into this century. Every year, a major ozone hole opens up over Antarctica, where winters are colder and polar vortices are stronger and more stable than over the Arctic. But this year, the Arctic could be the poster child. Cold temperatures have allowed nitric acid, mostly from natural sources, to condense and form the peculiar, iridescent clouds that have been spotted all over northern latitudes this winter. “They’re beautiful, but once I see them, I’m concerned—they’re dangerous,” Rex says. That’s because the clouds catalyze the reactions that mobilize chlorine into active chemicals that can react in the presence of sunlight to destroy ozone. An instrument on the NASA AURA satellite has detected record lows of the inert forms of chlorine and rising amounts of the active ones, notes Gloria Manney, an atmospheric scientist at NorthWest Research Associates in Socorro, New Mexico. “Conditions are primed,” she says. “The last ingredient we need is sunlight.” Weather models are predicting some warming of the stratosphere this week, she adds, but probably not enough to halt the ozone destroying brew. The Arctic vortex tends to behave erratically, with blobs of cold air often dipping into more heavily populated northern latitudes. The influx of ozone-poor air could cause problems for people there, who are unused to wearing sunscreen in March, Rex says. “If we get such a deep minimum, then people need to be informed,” he says. The extra radiation could even adversely affect phytoplankton, which typically bloom in the Arctic Ocean each spring, Rex suggests. Ross Salawitch, an atmospheric chemist at the University of Maryland, College Park, says the health hazards shouldn’t be sensationalized. “The worst-case scenario would be folks in high northern latitudes being in a type of ultraviolet environment that people are exposed to all the time in San Diego.” For Salawitch, the bigger question is what role climate change might be playing. The notoriously mercurial polar weather is the main factor determining how much ozone is destroyed each spring, he says. But climate change is also expected to cool the stratosphere over the long run. The same greenhouse gases that trap heat in the lower atmosphere allow the stratosphere to more effectively radiate energy into space. On its own, the stratospheric cooling could make bad ozone years in the Arctic more common. It should also make polar vortices stronger, and more stable. But there is evidence that storminess at lower latitudes—another thing that is expected to increase in a warming world—will make stable polar vortices less common. Which effects will win out? Salawitch offers a parallel to hurricanes. Climate change is expected to make tropical hurricanes less frequent but more intense. Persistent Arctic vortices, too, could become scarcer but stronger. “When you have cold winters, they tend to be whoppers.” And that could mean that Arctic holes like this year’s could get deeper in the future.

#### Warming is irreversible and inevitable– even if humans stop emissions.

Mark Kaufman 21, Mark is a science reporter at Mashable, “What Earth was like last time CO2 levels were this high,” Mashable, 4-20-2021, https://mashable.com/article/carbon-dioxide-earth-co2/ //EM

It’s a time called the Pliocene or mid-Pliocene, some 3 million years ago, when sea levels were around 30 feet higher (but possibly much more) and giant camels dwelled in a forested high Arctic. The Pliocene was a significantly warmer world, likely at some 5 degrees Fahrenheit (around 3 degrees Celsius) warmer than pre-Industrial temperatures of the late 1800s. Much of the Arctic, which today is largely clad in ice, had melted. Heat-trapping carbon dioxide levels, a major temperature lever, hovered around 400 parts per million, or ppm. Today, these levels are similar but relentlessly rising, at some 418 ppm.

Humanity is currently on track to warm Earth to Pliocene-like temperatures by century’s end – unless nations ambitiously slash carbon emissions in the coming decades. Sea levels, of course, won’t instantly rise by tens of feet: Miles-thick ice sheets take many centuries to thousands of years to melt. But, critically, humanity is already setting the stage for a relatively quick return to Pliocene climes, or climes at least significantly warmer than now. It’s happening fast. When CO2 naturally increases in the atmosphere, pockets of ancient air preserved in ice show this CO2 rise happens gradually, over thousands of years. But today, carbon dioxide levels are skyrocketing as humans burn long-buried fossil fuels.

"CO2 in the atmosphere has gone up 100 ppm in my lifetime," said Kathleen Benison, a geologist at West Virginia University who researches past climates. “That’s incredibly fast geologically."

"You don’t have to be a scientist to realize something totally weird is going on, and that weird thing is humans," noted Dan Lunt, a climate scientist at the University of Bristol who has researched the Pliocene.

A NASA graphic, from 2013, showing Earth's atmospheric CO2 levels had already reached levels similar to the Pliocene.

The problematic Pliocene

Sure, it takes a long time for sea levels to catch up with Earth’s warming. But in a plethora of other ways, the planet is already reacting to about 2 F (1.1 C) of warming since the late 1800s: Wildfires are surging in the U.S., major Antarctic ice sheets have destabilized, heat waves are smashing records, storms are intensifying, and beyond.

More warming will further exacerbate these consequences of increased heat. It will get worse. But will it get Pliocene bad? That’s up to the most fickle, unpredictable factor of the climate equation: humans.

"CO2 levels are going to increase," said Lunt. "We could hit the Pliocene in terms of temperature. But it depends on how rapidly we emit [greenhouse gases]."

Some of the human-driven changes happening on Earth today won’t be reversed for centuries or thousands of years. In large part, that’s because civilization continues to deposit prodigious loads of carbon into the atmosphere each year, and all these heat-trapping gases won’t magically vanish from the air, even if we instantly stop adding carbon to the atmosphere. Rather, they’ll have impacts upon the planet – like gradually rising seas and acidifying oceans – for at least centuries. Already, sea levels have risen by some eight to nine inches since the late 1800s, and a conservative estimate, from the UN's Intergovernmental Panel on Climate Change, is sea levels will rise by another one to two feet by the century's end. But, this could very well be more like two or three feet, or even more depending on what Antarctica’s colossal, melting Thwaites Glacier (it’s the size of Britain) purges into the sea this century.

"Sea level rise and ocean acidification are permanent on a human time scale," said Julie Brigham-Grette, a geologist at the University of Massachusetts Amherst who researches how the Arctic has changed since the Pliocene.

#### Biodiversity, nitrogen, and pollution are not existential – even losing 90% of all species would not lead to extinction

Kareiva and Carranza 18 – (Peter Kareiva, Valerie Carranza, Institute of the Environment and Sustainability, University of California, Los Angeles, *Existential risk due to ecosystem collapse: Nature strikes back*, Futures, 5 January 2018)

The interesting question is whether any of the planetary thresholds other than CO2 could also portend existential risks. Here the answer is not clear. One boundary often mentioned as a concern for the fate of global civilization is biodiversity (Ehrlich & Ehrlich, 2012), with the proposed safety threshold being a loss of greater than 0.001% per year (Rockström et al., 2009). There is little evidence that this particular 0.001% annual loss is a threshold—and it is hard to imagine any data that would allow one to identify where the threshold was (Brook, Ellis, Perring, Mackay, & Blomqvist, 2013; Lenton & Williams, 2013). A better question is whether one can imagine any scenario by which the loss of too many species leads to the collapse of societies and environmental disasters, even though one cannot know the absolute number of extinctions that would be required to create this dystopia. While there are data that relate local reductions in species richness to altered ecosystem function, these results do not point to substantial existential risks**.** The data are small-scale experiments in which plant productivity, or nutrient retention is reduced as species numbers decline locally (Vellend, 2017), or are local observations of increased variability in fisheries yield when stock diversity is lost (Schindler et al., 2010). Those are not existential risks. To make the link even more tenuous, there is little evidence that biodiversity is even declining at local scales (Vellend et al., 2013, 2017). Total planetary biodiversity may be in decline, but local and regional biodiversity is often staying the same because species from elsewhere replace local losses, albeit homogenizing the world in the process. Although the majority of conservation scientists are likely to flinch at this conclusion, there is growing skepticism regarding the strength of evidence linking trends in biodiversity loss to an existential risk for humans (Maier, 2012; Vellend, 2014). Obviously if all biodiversity disappeared civilization would end—but no one is forecasting the loss of all species. It seems plausible that the loss of 90% of the world’s species could also be apocalyptic, but not one is predicting that degree of biodiversity loss either. Tragic, but plausible is the possibility of our planet suffering a loss of as many as half of its species. If global biodiversity were halved, but at the same time locally the number of species stayed relatively stable, what would be the mechanism for an end-of-civilization or even end of human prosperity scenario? Extinctions and biodiversity loss are ethical and spiritual losses, but perhaps not an existential risk.What about the remaining eight planetary boundaries? Stratospheric ozone depletion is one—but thanks to the Montreal Protocol ozone depletion is being reversed (Hand, 2016). Disruptions of the nitrogen cycle and of the phosphorous cycle have also been proposed as representing potential planetary boundaries (one boundary for nitrogen and one boundary for phosphorous). There are compelling data linking excesses in these nutrients to environmental damage. For example, over-application of fertilizer in Midwestern USA has led to dead zones in the Gulf of Mexico. Similarly, excessive nitrogen has polluted groundwater in California to such an extent that it is unsuitable for drinking and some rural communities are forced to drink bottled water. However, these impacts are local. At the same time that there is too much N loading in the U.S., there is a need for more N in Africa as a way of increasing agricultural yields (Mueller et al., 2012). While the disruption of nitrogen and phosphorous cycles clearly perturb local ecosystems, end-of-the-world scenarios seem a bit far-fetched. Another hypothesized planetary boundary entails the conversion of natural habitats to agricultural land. The mechanism by which too much agricultural land could cause a crisis is unclear—unless it is because land conversion causes so much biodiversity loss that species extinctions are the proximate cause of an ecocatastrophe. Excessive chemical pollution and excessive atmospheric aerosol loading have each been suggested as planetary boundaries as well. In the case of these pollution boundaries, there are well-documented mechanisms by which surpassing some concentration of a pollutant inflicts severe human health hazards. There is abundant evidence linking chemical and aerosol pollution to higher mortality and lower reproductive success in humans, which in turn could cause a major die-off. It is perhaps appropriate then that when Hollywood envisions an unlivable world, it often invokes a story of humans poisoning themselves. That said, it is doubtful that we will poison ourselves towards extinction. Data show that as nations develop and increase their wealth, they tend to clean up their air and water and reduce environmental pollution (Flörke et al., 2013; Hao & Wang, 2005). In addition, as economies become more circular (see Mathews & Tan, 2016), environmental damage due to waste products is likely to decline. The key point is that the pollutants associated with the planetary boundaries are so widely recognized, and the consequences of local toxic events are so immediate, that it is reasonable to expect national governments to act before we suffer a planetary ecocatastrophe. In summary, six of the nine proposed planetary boundaries (phosphorous, nitrogen, biodiversity, land use, atmospheric aerosol loading, and chemical pollution) are unlikely to be associated with existential risks. They all correspond to a degraded environment, but in our assessment do not represent existential risks. However, the three remaining boundaries (climate change, global freshwater cycle, and ocean acidification) do pose existential risks. This is because of intrinsic positive feedback loops, substantial lag times between system change and experiencing the consequences of that change, and the fact these different boundaries interact with one another in ways that yield surprises. In addition, climate, freshwater, and ocean acidification are all directly connected to the provision of food and water, and shortages of food and water can create conflict and social unrest.

#### Food insecurity empirically solves international terrorism.

Adelaja 19 [Adesoji Adelaja, Justin George, Takashi Miyahara, and Eva Penar, \* John A. Hannah Distinguished Professor in Land Policy at Michigan State University, “Food Insecurity and Terrorism,” 2019, *Applied Economic Perspectives and Policy*, Vol. 41, Issue 3, https://doi.org/10.1093/aepp/ppy021, EA]

In this study, we also found that both domestic and transnational terrorism increase (not decrease) with increased food availability. This is consistent with the findings of studies on the role of food insecurity in conflict (Bellemare 2015; Koren 2018), but we now confirm this role in the case of terrorism. The irrelevance of both the utilization (UT) and stability (ST) proxies in the presence of controls in both the models with and without instruments suggests that these dimensions do not explain either domestic or transnational terrorism. Utilization is difficult to measure at the national level and the regional, within-country variations are probably more relevant in the context of unrest. Similarly, a country which experiences extended periods of food insecurity may not necessarily be unstable with respect to its food insecurity measures. Our study reveals that the food access and availability measures are the most relevant to terrorism, at least given the specific measures we chose to evaluate food insecurity.

The direct relationships of terrorism to the unemployment rate, to rurality, to population, and to our polity variable are noteworthy. The suggestion that nations that are highly populated, but with large rural populations, are likely to be more challenged by the problem of terrorism sheds some light on where some of the future flashpoints might be. There appears to be a difference in the susceptibility of places to domestic vs. transnational attacks. The role of food insecurity in transnational attacks is not as clear as domestic attacks.

In conclusion, does food insecurity explain terrorism? The answer is a qualified yes, at least in the case of one food access indicator, the food price index. However, this study’s approach is essentially focused on intercountry associations. Further advancements can be made in exploring the causal relationship between elements of food insecurity and terrorism using subnational, micro-level data.

#### Empirics prove shortages don’t cause war. However, they ensure trade and globalization.

James 21 — Harold James; Professor of History and International Affairs at Princeton University. [Published: 4-20-2021; "Globalization’s Coming Golden Age"; *Foreign Affairs* “Trade Wars” May/June 2021; Accessed: 5-10-2021; [https://www.foreignaffairs.com/articles/united-states/2021-04-20/globalizations-coming-golden-age]//KL](https://www.foreignaffairs.com/articles/united-states/2021-04-20/globalizations-coming-golden-age%5d//KL)

THE FIRST TIME AROUND

The 1840s were a disaster. Crops failed, people went hungry, disease spread, and financial markets collapsed. The best-known catastrophe was the Irish potato famine, which began in 1845 and led to the deaths of nearly one million people, mostly from diseases caused by malnutrition. The same weather that made potatoes vulnerable to fungal rot also led to widespread crop failures and famine across Europe. In The Communist Manifesto, published in 1848, Karl Marx and Friedrich Engels articulated how global integration was driving the world toward social and political upheaval. “The development of Modern Industry,” they argued, “cuts from under its feet the very foundation on which the bourgeoisie produces and appropriates products.”

Europe was a tinderbox. In 1848, it ignited in an inferno of nationalist revolution, with populations rising up in France, Italy, and central Europe. But the economic shock of the 1840s did not reverse the course of global integration. Instead, trade expanded, governments reduced tariff barriers, capital mobility surged, and people moved across continents. Migration was not only a response to social and political immiseration; it also reflected the promise of new prosperity.

Historians now think of the second half of the nineteenth century as the first age of globalization. Food shortages highlighted the need for broad and diversified supply chains, and leaders realized that a modern state needed reliable access to supplies from beyond its borders. In the United Kingdom, the British government initially responded to the Irish famine by importing corn from outside Europe. At the time, The Economist argued that “except Russia, Egypt, and the United States, there are no countries in the world able to spare any quantity of grain worthy of mention.”

Historic ruptures often generate and accelerate new global links.

Imports, however, failed catastrophically. This was in part because the new food was unfamiliar, but above all, it was because London couldn’t work out how to pay for the goods. Trade deficits generated currency shortages, which pushed up interest rates in the United Kingdom and France. This intensified a manufacturing crisis—itself the result of a decline in purchasing power caused by surging food prices. Although the best solution was to sell more goods abroad, that would have required governments to lower trade barriers and open up their markets.

These shortages generated popular demands for more competent governments. Although it was only in 1981 that the economist Amartya Sen’s pioneering work on the 1943 great Bengal famine definitively showed that famines are often manmade, that intuition was already widely shared in the 1840s. John Mitchel, an Irish nationalist who emigrated to the United States, concluded, “No sack of Magdeburg, or ravage of the Palatinate, ever approached in horror and desolation to the slaughters done in Ireland by mere official red tape and stationery, and the principles of political economy.”

Governments everywhere eventually responded to these demands. That meant learning from successful efforts elsewhere. The United Kingdom enacted a series of civil service reforms, adopting a competitive examination process in place of arcane patronage. The most striking extension of state capacity, however, occurred across the English Channel, where Louis-Napoléon, the nephew of the emperor, was elected president of France in 1848. After a coup and a series of plebiscites advertising his competence and activism, Napoleon made himself president for life and, eventually, emperor—Napoleon III. His policies were designed to show the benefits of an efficient autocrat over divided liberal regimes. He initiated large-scale public works projects—including railroad expansions and Baron Haussmann’s famous rebuilding of Paris.

Napoleon also demonstrated his competence by negotiating the Anglo-French tariff agreement of 1860, which reduced duties on important goods traded across the channel. Other countries quickly followed suit and negotiated bilateral trade deals of their own across Europe. But even before 1860, improved communication and transportation meant commerce was surging: global trade in goods accounted for just 4.5 percent of output in 1846 but shot up to 8.9 percent in 1860.

The events of the 1840s also laid the foundation for a wave of institutional changes to address the proliferation of small states with a limited ability to deal with migration. The creation of new nation-states with novel currencies and banking systems, notably Germany and Italy, and administrative reform in the Habsburg empire—ending internal customs duties and serf labor—were all designed to push economic growth. In this context, the American Civil War and the Meiji Restoration in Japan were also nation-building efforts meant to maximize the effectiveness and capacity of institutions. The abolition of slavery in the United States and feudalism in Japan were profound social and economic transformations. Both upheavals, moreover, led to monetary and banking reforms.

Business competence was also newly in demand. In 1851, the United Kingdom celebrated its industrial strength with the Great Exhibition—an international fair intended to display British ingeniousness and mechanical superiority, as well as the virtues of peaceful commerce. Some of the most stunning products, however, were neither British nor particularly peaceful—among them, the steel cannon, invented by a German, Alfred Krupp, and the revolver, developed by an American, Samuel Colt. British observers saw continental Europeans catching up and overtaking their own country. To the British scientist Lyon Playfair, the exhibition showed “very clearly and distinctly that the rate of industrial advance of many European nations, even of those who were obviously in our rear, was at a greater rate than our own.” He went on: “In a long race the fastest sailing ship will win, even though they are for a time behind.” The event taught world leaders a powerful lesson: international trade was vital for enhancing national performance. Competition was central to generating competence.

The result was an abrupt psychological shift from catastrophism to optimism, and from despair to self-confidence. This new mood initiated the first wave of globalization—its so-called golden age, in which international trade and finance expanded rapidly. Eventually, however, this optimism gave way to complacency, then doubts about the benefits of globalization and increasing disillusion among those left behind (notably European farmers). The upswing came to an end with World War I. That conflict prompted a massive international rebuilding effort that faltered bloodily with the rise of fascism in the 1930s and the advent of World War II.

A SHOCK TO THE SYSTEM

The makers of the postwar settlement in 1945 had learned a great deal from the mistakes of the last century. They created an extensive framework of international institutions but left substantial economic control in the hands of national authorities. As a result, the end of World War II did not immediately unleash waves of capital mobility like those that had characterized the nineteenth century. Nearly three decades later, however, the dilemmas raised by shortages and scarcity that had led to earlier versions of integration finally returned—setting the stage for the current era of globalization.

In the 1970s, after two large oil price hikes, the industrialized world saw its way of life threatened. Oil prices had been stable in the 1960s, but a surge in demand taught producers that they could exploit control over the world’s most important commodity. Adding to the crunch, the first oil shock, in 1973–74, was accompanied by a 30 percent rise in wheat prices, after the Soviet Union experienced poor harvests and bought up U.S. grain to compensate. Shortages reappeared. Some oil-importing countries imposed “car-free days” as a way of rationing gasoline consumption. As states spent more on oil, grain, and other commodities, they found their balance of payments squeezed. Unable to afford vital goods from abroad, governments had to make hard choices. Many floundered as they tried to ration scarce goods: mandating who could drive cars when or struggling over whether they should pay nurses more than teachers, police officers, or civil servants.

The immediate and instinctual response to scarcity was protectionism. In the United Kingdom, where the balance-of-payments problem appeared earlier than elsewhere, the government tried a domestic purchasing campaign, supported by all the major political parties. Leaders encouraged citizens to wear stickers and badges with the Union Jack and the message “I’m backing Britain.” (The press magnate Robert Maxwell distributed T-shirts with a similar slogan, but they turned out to be made in Portugal.) In the mid-1970s, after the first oil shock, the government briefly flirted with what the Labour Party’s left flank called a “siege economy,” including extensive import restrictions. In the United States, there was acute anxiety about Japanese competition, and in 1981, Washington pressured Tokyo to sign an agreement that limited Japanese car exports. The move backfired, however. Because of the new restrictions, Japanese producers merely shifted their focus away from cheap, fuel-efficient cars and toward luxury vehicles.

Despite these gestures at economic nationalism, the oil shock—paradoxically at first—created more globalization. In conjunction with price increases, a financial revolution driven by the emergence of large international banks transferred huge surpluses accumulated by oil producers into lendable funds. The new availability of money made resources easily accessible for governments all over the world that wanted to push development and growth. International demand thus surged. In contrast, in the United Kingdom, Labour’s siege economy looked like it would cut off access to markets and prosperity.

Familiar historical forces will drive post-pandemic reglobalization.

Thus, crises in the 1970s led to the same realization as in the 1840s: openness produced resilience, and financing needed to be available for trade to expand. The eventual impact was obvious: trade in goods and services, which in 1970 had amounted to 12.1 percent of global GDP, increased to 18.2 percent by 1980. The cycle swung back to globalization once again.

Protectionism in the 1970s also triggered a discussion of whether governments were handling the crisis competently. At first, the debate was personalized and highly caricatured: in the United States, it centered on Richard Nixon’s crookery, Gerald Ford’s supposed inability to chew gum and walk, or Jimmy Carter’s micromanagement. In the United Kingdom, commentators focused on the detached bachelor existence of Prime Minister Edward Heath and then on allegations of cronyism against his successor, Harold Wilson. France went into the oil shock under the very sick President Georges Pompidou, who died of cancer in 1974. In West Germany, the revelation that Chancellor Willy Brandt’s closest assistant was an East German spy undermined the country’s reputation for competence. His successor, Helmut Schmidt, believed that Germany was returning to the chaos of the interwar Weimar Republic.

The many examples of personal incompetence in rich industrial democracies generated the thesis that such countries had become ungovernable. The political theorist Jean-François Revel concluded that democracies were perishing and that the Soviet Union was winning the Cold War. Autocracies such as Chile under Augusto Pinochet and Iran under Mohammad Reza Shah Pahlavi appeared better suited to handle modern global challenges. The autocrats lectured others about their superiority. In reality, however, they were bloody, corrupt, and, in many cases, spectacularly unsuccessful.

The real insight of the debate over administrative effectiveness was that governments could overstretch themselves by taking on too many tasks. That realization inspired a key tenet of what was later widely derided as “neoliberalism”: the belief that if governments took on microdecisions, such as determining wage and price levels (a central part of both Nixon’s and the British government’s bids to contain inflation), they risked their legitimacy and reputation for competence. Official decisions would appear both arbitrary and unenforceable because powerful groups would quickly make sure that new settlements favored their interests.

INFLATION NATION

The shortages of the 1840s and the 1970s both seemed to have an apparent cure: inflation. Inflation can help accommodate shocks, often painlessly. Because people have more cash or bank credit, monetary abundance generates the impression that they can have everything they want. Only gradually do consumers realize that prices are rising and that their money buys less.

In the 1850s, inflation may have been partially unintended. It was largely the result of the 1849 California Gold Rush, which vastly increased the world’s gold stock. Price increases were also driven by financial innovation, primarily Europe’s adoption of new types of banking that drove money creation, such as the so-called crédits mobiliers, which developed industrial lending in France and central Europe. By giving people apparently greater wealth, this increase in the supply of money (and the resulting mild inflation) helped governments appear more competent and made businesses and consumers more confident. It prompted a genuine global surge in production, which generated greater prosperity and security.

After 1971, when Nixon finally severed the link between the dollar and gold, monetary policy was no longer constrained by a metallic standard. In times of crisis, governments could now print more money to drive growth. In many countries, the immediate response to oil price increases was therefore to accommodate the shock through expansive fiscal and monetary stimulus: people could still go on buying. That reaction spurred inflation, which by 1974 had risen to 11 percent in the United States and beyond that in some other countries: in 1975, the United Kingdom’s inflation rate reached 24 percent.

Although inflation initially seemed to be the solution to the scarcity problem, it soon appeared in diagnoses of government incompetence. The economist Arthur Okun developed a popular “misery index” by simply adding inflation and unemployment. The metric became an important political weapon. The Democratic presidential challenger George McGovern used it against Nixon in 1972, Carter used it against Ford in 1976, and Ronald Reagan used it against Carter in 1980.

High inflation at first superficially stabilizes societies, but over time, it becomes a threat. Inflation often pushes interest groups—internationally, producer cartels such as OPEC, and domestically, labor unions—to mobilize, organize, and lobby in the hope of acquiring a greater share of monetary and fiscal resources. Depending on the extent of that mobilization, it can pull societies apart, as unions leapfrog each other with aggressive wage demands and inflation erodes the pay and pensions of the nonunionized and the retired. By demonstrating that governments are vulnerable to organized pressure, inflation is thus a destabilizing force in the long term. Indeed, analysts have argued that it was at least in part generalized international inflation in the 1960s that pushed oil producers to organize—leading to the price hikes of the 1970s.

Monetary experiments of this sort created demands for new ordering frameworks. After the surge in economic growth of the mid-nineteenth century, the world internationalized the gold standard to create a common framework for international payments. Although policymakers went a different route after the inflation and liberalization of the 1970s, they were also looking for a return to stability. To end the monetary disorder, central banks targeted a low inflation rate, and governments engaged in new patterns of cooperation abroad—creating the G-5 and then the G-7 and the G-20 as forums for discussing collective responses to global economic challenges. The quest for stability was also aided by the steady march of globalization. Greater global integration lowered production costs and thus helped correct the inflationary surge that initially accompanied the shortage economy. Inflation, which first fueled globalization in the 1850s, was, by the end of the twentieth century, eventually tamed by it.

PAST AS PROLOGUE

Today, the COVID-19 pandemic has produced a deep economic crisis, but it is different from many past ones. The shock is not a demand-driven downturn, like the Great Depression or the 2008 recession. Although lockdowns have interrupted supply and caused unemployment to soar, there is no overall shortage of demand. Large rescue and stimulus packages in rich countries have generated a financial buffer, and savings have shot up as people spend less. The best estimate is that in 2020, the United States piled up $1.6 trillion in excess savings, equivalent to seven percent of GDP. People are waiting to unleash their pent-up purchasing power. On top of that, finance ministers and international institutions are listening to U.S. Treasury Secretary Janet Yellen’s demand that “the time to go big is now” when it comes to fiscal relief.

Yet the current crisis does share key characteristics with the crises of the 1840s and the 1970s. The world of scarcity, for one thing, is already here. The pandemic has led to shortages of medical supplies such as face masks and glass vials for vaccine storage. Food prices have soared to their highest level since 2014—the result of a combination of dry weather in South America that has hurt wheat and soybean crops and pandemic-induced shipping disruptions. In the initial stages of the pandemic, laptops became scarce as employees scrambled to update their work-from-home setups. There is also a worldwide chip shortage, as the demand for microprocessors in medical, managerial, and leisure use has increased. Freight rates between China and Europe quadrupled at points in 2020. Steel, too, is in short supply.

Much as the crises in the 1840s and the 1970s did, the pandemic has also raised questions of government competence. At first, China seemed able to deal with the crisis better than its Western competitors—its cover-up of the severity of the pandemic notwithstanding—which prompted many observers to question whether democracies were capable of swift, effective action. Donald Trump’s presidency collapsed because of his chaotic handling of the crisis. British Prime Minister Boris Johnson faced a revolt among conservative members of Parliament because of his complex, contradictory, and constantly shifting lockdown rules. The European Commission lost credibility because of its poor management of vaccine purchases. As in the past, citizens personalized the incompetence. Americans debated, for example, how much blame to put on Trump’s son-in-law, Jared Kushner, who led part of the response. In the United Kingdom, much of the outrage focused on Dominic Cummings, the prime minister’s policy adviser, who had violated the country’s lockdown rules.

The challenge of the new upswing in the cycle of globalization will be to find ways to learn and adapt.

For other observers, the unifying theme behind the mismanagement was populism, with Trump, Johnson, Brazilian President Jair Bolsonaro, Indian Prime Minister Narendra Modi, and Philippine President Rodrigo Duterte all botching the response. But even in countries where the crisis has been handled relatively well, there have been surges of protests against the way governments have reacted to the pandemic. In Germany, “alternative thinkers” protesting new lockdown measures attacked the parliament building in August 2020. Even in Japan, where there is a long tradition of the use of face masks as a hygiene measure, a movement calling itself the Popular Sovereignty Party organized “cluster protests” again mask wearing.

Given these challenges, it’s easy to assume that governments and citizens alike would prioritize nationalization—cultivating supposedly resilient domestic supply chains to hedge against the next crisis. But that’s unlikely to happen. Instead, people are desperately looking for new leadership and new visions. As was true during previous supply shocks, leaders can make a good case for the importance of foreign models: some countries have done much better than others in dealing with the health and economic consequences of COVID-19. Although some of these countries are small or relatively isolated, by most metrics, the country with the most competent response was the biggest: China. That is not without irony, to put it mildly: the country responsible for unleashing the virus has also been a major beneficiary—with some states now looking to Beijing for leadership. But instead of condemning China’s response or demanding reparations for the pandemic’s costs, other countries should consider how to use Beijing’s example, just as the United Kingdom in the 1850s realized that it could learn from foreign producers.

NO SURPRISES

Familiar historical forces will drive post-pandemic reglobalization. In a world facing enormous challenges, not just the pandemic but also climate change, solutions are global public goods. In 1945, the architects of the postwar order believed that peace and prosperity were indivisible and could not be the property of one nation. Now, health and happiness are the same. Both are impossible for individual states or regions to enjoy alone.

Technology is also transforming a globalizing planet, as it did in the 1840s and the 1970s. In the mid-nineteenth century, the drivers were the steamship, the undersea cable, and the railroad. In the last quarter of the twentieth century, it was computing power: the first widely available personal computers appeared in the early 1980s. Today, data occupies the same position—linking the world and offering solutions to major problems, including government incompetence. New types of information might help leaders attack some of the inequalities and injustices highlighted by the COVID-19 pandemic. More automation might mean that machines can take on some of the repetitive and dangerous tasks performed by low-paid essential workers. Telemedicine and data-driven public health can trigger faster and more precisely targeted pharmaceutical or medical interventions.

As in past crises, there is also an immediate and powerful global demand for cheap and reliable products. In the mid-nineteenth century, it was foodstuffs, and in the 1970s, it was oil and commodities. In the 2020s, it is medical supplies, data chips, and rare-earth metals. To be resilient to new shocks, these commodities need to be produced and traded internationally, by a multiplicity of suppliers.

Governments and businesses also need to continuously innovate. As it did in the 1840s, isolationism today would mean cutting off opportunities to learn from different experiments. No single country, or its particular culture of science and innovation, was responsible for the development of an effective COVID-19 vaccine—one of the miracles of 2020. Success was the product of intense international collaboration. This story of innovation also applies to government competence. No state can succeed alone. Even if one particular decision is by chance spectacularly successful—say, Germany’s impressive testing record or the United Kingdom’s fast vaccine rollout—it is usually difficult to repeat that success in other policy areas. Policymakers may stride confidently past their first victory, only to slip on a banana peel.

The United States, in particular, may find this a hard pill to swallow. Americans have long been attached to the idea of their country’s superiority, akin to the belief held by the British in the mid-nineteenth century. COVID-19, like the 1840s famines and the 1970s oil shocks, presents both a crisis and a learning opportunity. The United States has coasted on the idea that the world needs the English language and the U.S. dollar. Neither of those assumptions can hold forever. Just as automatic translation technology is increasing linguistic accessibility, a different currency could become a new international standard. The dollar is not an adequate insurance policy or a viable basis for Washington to reject the need for change.

The challenge of the new upswing in the cycle of globalization will be to find ways to learn and adapt—increasing the effectiveness of government and business—without compromising fundamental values. As in the 1840s and the 1970s, financial and monetary innovation, or the tonic of inflation, will drive transformational change. Memories of crisis will push countries and governments to adapt in 2021 and beyond, just as they have before.

#### Innovation solves everything and saves billions of lives — including resource shortages in the long run.

* Solves warming, resource shortages, and natural disasters.

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The course of human history has been shaped by many different forces, from kings and empires, to wars and treaties, to science and technology. Frequently, however, the world has been changed—or, better yet, improved—by a single idea.

Over the past 150 years alone, the invention of toilets, synthetic fertilizers, blood transfusions, and vaccines are all credited with saving more than a billion lives each1, while countless other innovations—from pasteurization to water chlorination to bifurcated needles—have saved tens of millions more. In most cases, these breakthroughs have been the result of meticulous, single-minded research to solve a specific problem, but many of the world’s most important life-saving inventions have been stumbled upon by accident, or developed for a completely different purpose than that which they would ultimately fulfill.

The laminated safety glass most commonly used in car windshields, for example, was invented when French scientist Edouard Benedictus carelessly dropped a glass flask containing cellulose nitrate, a liquid plastic that not only stopped the glass from shattering but enabled it to retain its original shape. Penicillin, meanwhile, was discovered when Scottish researcher Alexander Fleming accidentally contaminated a petri dish of bacteria he was working on, and noticed that the mold that formed prevented the bacteria culture from growing. And X-rays were a fortuitous byproduct of German physics professor Wilhelm Röntgen’s experiments with cathode ray tubes.

As science and technology have grown more sophisticated, world-changing discoveries—both deliberate and inadvertent—have become more and more frequent, with new innovations that enhance, protect or even save people’s lives appearing at astoundingly regular intervals. But just as our ability to advance or safeguard our species has grown and evolved, so too have the problems we face. For all our ingenuity, Covid-19 brought the world to a virtual standstill in the past year, highlighting the need for innovative solutions that can respond quickly to emergency situations, while the challenges posed by climate change, dwindling resources, and natural disaster events continue to loom large.

#### Rising populism and decline in trade causes nuclear war.

von der Heyden 17 — Co-Chairman of the American Academy in Berlin, was awarded the Duke University Medal for Distinguished Meritorious Service, recipient of The International Center in New York's Award of Excellence, M.B.A. from the Wharton School of the University of Pennsylvania [Karl; Published: June 12, 2017; “I Survived World War II. Nationalism Is a Path to War”; TIME; [https://time.com/4815170/wwii-nationalism-donald-trump-america-first/]//CYang](https://time.com/4815170/wwii-nationalism-donald-trump-america-first/%5d//CYang)

Similarly, seventy years after World War II, millions of people in the U.S. and Europe have forgotten the lessons learned from that war and from the peace that followed. Nascent nationalist and popular movements converged in Britain to produce a vote to leave the European Union. Similar coalitions heavily influence the American political scene today, as they do in Poland, Hungary and even the Netherlands.

White House communications that appear to realign foreign policy put in place over the last half-century are beginning to concern America’s allies.

I understand why the “America First” movement propagated by Donald Trump sounds patriotic to many voters, as do other movements that favor isolationism. It is natural to blame others for our failure to adjust to new technologies, to immigration and to competition from countries whose growth rates are higher than our own. But the truth is that the “America First” movement runs the risk that it could trigger a global decline in productivity. Free trade has benefitted the U.S, Europe and much of the rest of the world. Many new businesses, particularly in information technology, can now start with a global footprint on Day One instead of being confined to a local market. NATO has preserved the freedom of the Western World from Communism. It has recently become more relevant again in view of the Russia’s efforts to disrupt it.

Perhaps most worrisome is the apparent cooling of relations between European NATO allies and the United States, which has compelled German Chancellor Angela Merkel to say, “The times when we could fully rely on others are to some extent over… We Europeans must really take our fate into our own hands.”

Problems arise when we start classifying our own and other countries as “winners” or “losers.” Free trade, immigration and the treatment of refugees will never be perfect — far from it. But the alternatives of walling off people, as well as trade, are worse. Appealing to ultra-nationalist and xenophobic feelings is playing with fire. With easy access to weapons of mass destruction, the danger is greater than ever.

Growing up in Germany, I saw the dangers of fascism and nationalism. I saw leaders who only made matters worse by appealing to the majority of voters who feared minorities and foreigners. Anyone who appreciates history would know better than to make even casual references to the possibility of nuclear war.