# PFI Finals: Debris and China

## Framework

The value is **morality** and the value criterion is **utilitarianism**, defined as maximizing pleasure and minimizing pain through the consequences of actions. Prefer utilitarianism for the following reasons:

### 1. Consequentialism is key.

**Sinnot-Armstrong 19**

Sinnott-Armstrong, Walter, "Consequentialism", *The Stanford Encyclopedia of Philosophy* (Summer 2019 Edition), Edward N. Zalta (ed.), URL = <<https://plato.stanford.edu/archives/sum2019/entries/consequentialism/>>. [Chaminade ZS]

​​Consequentialism also might be supported by an *inference to the best explanation* of our moral intuitions. This argument might surprise those who think of consequentialism as counterintuitive, but in fact consequentialists can explain many moral intuitions that trouble deontological theories. Moderate **deontologists**, for example, often **judge that it is morally wrong to kill one person to save five but not morally wrong to kill one person to save a million.** **They never specify the line between what is morally wrong and what is not morally wrong, and it is hard to imagine any non-arbitrary way for deontologists to justify a cutoff point. In contrast, consequentialists can simply say that the line belongs wherever the benefits outweigh the costs** (including any bad side effects). Similarly, when two promises conflict, it often seems clear which one we should keep, and that intuition can often be explained by the amount of harm that would be caused by breaking each promise. In contrast, deontologists are hard pressed to explain which promise is overriding if the reason to keep each promise is simply that it was made (Sinnott-Armstrong 2009). If consequentialists can better explain more common moral intuitions, then consequentialism might have more explanatory coherence overall, despite being counterintuitive in some cases. (Compare Sidgwick 1907, Book IV, Chap. III; and Sverdlik 2011.) And even if act consequentialists cannot argue in this way, it still might work for rule consequentialists (such as Hooker 2000).

### 2. The actors of the resolution are governments and governments must be practical and cannot concern itself with metaphysical questions – its only role is to protect citizens’ interests

#### Rhonheimer 05

[(Martin, Prof Of Philosophy at The Pontifical University of the Holy Cross in Rome). “THE POLITICAL ETHOS OF CONSTITUTIONAL DEMOCRACY AND THE PLACE OF NATURAL LAW IN PUBLIC REASON: RAWLS’S “POLITICAL LIBERALISM” REVISITED” The American Journal of Jurisprudence vol. 50 (2005), pp. 1-70] [Chaminade AS]

It is a fundamental feature of political philosophy to be part of practical philosophy. **Political philosophy** belongs to ethics, which **is practical, for it** bothreflects on practical  knowledge and **aims at action. Therefore, it is not only normative, but must consider the concrete conditions of realization. The rationale of political institutions** and action **must be** understood as **embedded in concrete** cultural and, therefore, historical **contexts** and as meeting with problems that only in these contexts are understandable. **A** normative political **philosophy which would abstract from the conditions of  realizability** wouldbe  trying to establish norms for realizing the “idea of the good” or of “the just” (as Plato, in  fact, tried to do in his Republic). Such a purely metaphysical view, however, **is doomed to fail**ure**.** As a theory of political praxis, political philosophy must include in its reflection the concrete historical context, historical experiences and the corresponding knowledge of the proper logic of the political. 14 Briefly: political philosophy is not metaphysics, which contemplates the necessary order of being, but practical philosophy, which  deals with partly contingent matters and aims at action.  Moreover, **unlike moral norms in general**—natural law included,—which rule the  actions of a person—“my acting” and pursuing the good—, **the** logic of the **political is characterized by acts like framing institutions** and establishing legal rules **by which** not only personal actions but the actions of **a multitude** of persons **are regulated** by the coercive force of state power, and by which a part of citizens exercises power over others.  **Political actions are**, thus, both actions of **the whole** of the **body politic** and referring to  the whole of the community of citizens. 15 **Unless** wewish to espouse a platonic view according to which **some** persons **are** by  nature **rulers while others are** by nature **subjects**, we will stick to the Aristotelian differentiation between the “domestic” and the “political” kind of rule 16 : unlike domestic rule,  which is over people with a common interest and harmoniously striving after the same good [despotism]and, therefore, according to Aristotle is essentially “despotic,” political **rule is** exercised **over free persons who represent a plurality of interests and** pursue, in the common context of the polis, different goods. The exercise of **such political rule, therefore, needs justification and is** continuously **in search of  consent among those** who are**ruled**, but who potentially at the same time are also the rulers.

### 3. Moral uncertainty means any risk of extinction outweighs under any framework

#### Bostrom 13

Nick. "Existential risk prevention as global priority." Global Policy 4.1 (2013): 15-31. (Faculty of Philosophy and Oxford Martin School University of Oxford)// Elmer recut by SHS/JS

These reflections on moral uncertainty suggest an alternative, complementary way of looking at existential risk; they also suggest a new way of thinking about the ideal of sustainability. Let me elaborate. Our present understanding of axiology might well be confused. **We may not now know — at least not in concrete detail — what outcomes would count as a big win for humanity**; we might not even yet be able to imagine the best ends of our journey. If we are indeed profoundly uncertain about our ultimate aims, then we should recognize that there is a great option value in preserving — and ideally improving — our ability to recognize value and to steer the future accordingly. **Ensuring that there will be a future version of humanity** with great powers and a propensity to use them wisely **is plausibly the best way available to us to increase the probability that the future will contain a lot of value. To do this, we must prevent any existential catastrophe**.

**With that, let’s move to the case.**

## Contention 1 - Debris

### Rocket Launches, Satellites and Human Activity all inevitably create space debris

#### Polyakov 21

Polyakov, M. (2021, May 5). Where does space junk come from – and how do we clean it up? World Economic Forum. Retrieved December 6, 2021, from<https://www.weforum.org/agenda/2021/05/why-we-need-to-clean-up-space-junk-debris-low-earth-orbit-pollution-satellite-rocket-noosphere-firefly/> //ear Dr. Max Polyakov is the Founder of Noosphere Ventures, Firefly Aerospace, and EOS Data Analytics

**As long as humans launch objects into orbit, space debris is inevitable**. **Rocket launches leave boosters, fairings, interstages, and other debris in LEO.** **So do rocket explosions, which currently account for seven of the top 10 debris-creating events. Human presence also creates orbital flotsam** – such as cameras, pliers, an astronaut’s glove, a wrench, a spatula, even a tool bag lost during space walks. **Some debris is created naturally from the impacts of micrometeoroids** – dust-sized fragments of asteroids and comets. **With limited lifetimes, operational satellites can become space debris. Satellites run out of maneuvering fuel, batteries wear out, solar panels degrade – causing an orbital debris feedback loop, in which the problem is exacerbated when solar panels are sandblasted by micrometeoroids and tiny debris**. **As with rocket debris, spent satellites eventually re-enter Earth’s atmosphere and burn up, but the process can take years** – **and the higher they orbit above Earth, the longer those orbits take to decay**.

### Space Debris infinitely cascades due to the Kessler effect, making entire orbits unusable

#### Matignon 18

Matignon, L. D. G. (2019, June 18). The Kessler syndrome and space debris. Space Legal Issues. //ear<https://www.spacelegalissues.com/space-law-the-kessler-syndrome/> Louis de Gouyon Matignon has a PhD in space law (co-supervised by both Philippe Delebecque, from Université Paris 1 Panthéon-Sorbonne, France, and Christopher D. Johnson, from Georgetown University, Washington D.C.);

**The Kessler syndrome is a theory** proposed by NASA scientist Donald J. Kessler in 1978, **used to describe a self-sustaining cascading collision of space debris in LEO**. In an article published on June 1, 1978 in the American Journal of Geophysical Research, a peer-reviewed – the evaluation of work by one or more people with similar competences as the producers of the work – scientific journal, containing original research on the physical, chemical, and biological processes that contribute to the understanding of the Earth, Sun, and Solar System, **authors Donald J. Kessler and Burton G. Cour-Palais, two NASA experts, identified the risk of an exponential increase in the number of space debris or orbital debris under the effect of mutual collisions**. **The two authors believed that a belt formed by these objects or fragments of objects around the Earth would soon form. Eventually threatening space activities, this phenomenon will be popularized a few years later under the name of Kessler syndrome**. **The Kessler syndrome, also called the Kessler effect, collisional cascading or ablation cascade, is a scenario in which the density of objects in Low Earth Orbit (LEO) is high enough that collisions between objects could cause a cascade where each collision generates space debris that increases the likelihood of further collisions**. **One implication is that the distribution of debris in orbit could render space activities and the use of satellites in specific orbital ranges impractical for many generations.** **Every satellite, space probe, and manned mission has the potential to produce space debris**. **A cascading Kessler syndrome becomes more likely as satellites in orbit increase in number.** The most commonly used orbits for both manned and unmanned space vehicles are Low Earth Orbit (LEO). **Clearly, the number of space debris that naturally falls back into the atmosphere is less than the number of those generated by the collision of existing space debris.** Even if all space activity and launch were halted tomorrow, the debris population would continue to increase exponentially, leading to a situation in which some orbits would become impassable in the long run. “As the number of artificial satellites in earth orbit increases, the probability of collisions between satellites also increases. **Satellite collisions would produce orbiting fragments, each of which would increase the probability of further collisions, leading to the growth of a belt of debris around the earth**. This process parallels certain theories concerning the growth of the asteroid belt. The debris flux in such an earth-orbiting belt could exceed the natural meteoroid flux, affecting future spacecraft designs. Amathematical model was used to predict the rate at which such a belt might form. Under certain conditions the belt could begin to form within this century and could be a significant problem during the next century. The possibility that numerous unobserved fragments already exist from spacecraft explosions would decrease this time interval. However, early implementation of specialized launch constraints and operational procedures could significantly delay the formation of the belt” – Collision frequency of artificial satellites: The creation of a debris belt, Journal of Geophysical Research, Volume 83, Issue A6, p. 2637-2646 (1978).

### Space Debris would destroy internet and GPS access worldwide

#### Iberdrola 21

IBERDROLA. (2021, June 30). Space Debris. Retrieved December 7, 2021, //ear from<https://www.iberdrola.com/sustainability/space-debris> //ear Iberdrola SA is a holding company, which engages in the generation, distribution, trading, and marketing of electricity. It operates through the following businesses: Networks, Liberalized, Renewables and Other Businesses.

According to the ESA, since 1961 there have been more than 560 fragmentation incidents, most of them caused by fuel explosions in rocket stages. As for direct collisions, there have only been seven, the most serious of which destroyed an inactive Russian satellite called Kosmos 2251 and the operational satellite Iridium 33. However, **it is the small fragments that pose the greatest danger**. **Micrometeorites** like paint flakes and solidified droplets of antifreeze **can damage** solar panels on **active satellites**. **Other dangerous debris includes vestiges of solid fuel which float about** in space **and are highly flammabl**e. They can cause damage and disperse pollutants into the atmosphere if they explode. Some Russian satellites contain nuclear batteries with radioactive material that could cause dangerous contamination if they returned to Earth. In any case, the heat of reentry destroys the majority of this space debris before it reaches the Earth. On rare occasions, larger fragments have reached the surface and caused considerable damage. SOLUTIONS TO SPACE DEBRIS **The main challenge is not to produce more space waste, particularly since swarms of small satellites are now circulating at low orbits to give high-speed internet access all over the planet.** When it comes to the debris already in orbit, many satellites, as well as the International Space Station, are equipped with Whipple Shields, an outer shell that protects the walls of the object from a possible collision. Here are some of the other strategies used to avoid this problem:

**Space Debris contaminates environments on earth**

**Luke**, C. (20**21**, **September 6**). What is Space Junk and How Does It Affect the Environment? Earth.Org - Past | Present | Future. Retrieved December 6, 2021, from<https://earth.org/space-junk-what-is-it-what-can-we-do-about-it/> //ear Earth.Org is a not-for-profit environmental organization based in Hong Kong. Their aim is to bring attention to what is happening to natural ecosystems worldwide. ... Climate change and environmental degradation create existential risks, caused by our decision to gamble on the outcomes of unsustainable activity.

The >4700 launches that have been conducted across the globe since Sputnik 1 in 1957 [have resulted in a steep upward trend in material mass in Earth orbit](https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20160012733.pdf), which has exceeded 700 metric tons and shows no signs of relenting. According to computer simulations focusing on the next 200 years, over this time [debris larger than approximately 20 cm across will multiply 1.5 times](https://www.nationalgeographic.co.uk/space/2019/04/space-junk-huge-problem-and-its-only-getting-bigger). Debris between 10 inches and 20 cm is set to multiply 3.2 times, and debris smaller than 10 cm will increase by a factor of 13 to 20. The risk this poses to satellites such as the ISS, [which as of 2016 has had to perform 25 debris collision avoidance manoeuvres since 1999,](https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20160012733.pdf) is considerable. **The problem is not confined to the risk posed to space exploration. A proportion of the space junk in low Earth orbit** [**will gradually lose altitude and burn up in Earth’s atmosphere**](https://www.nationalgeographic.co.uk/space/2019/04/space-junk-huge-problem-and-its-only-getting-bigger)**; larger debris, however, can occasionally impact with Earth and have detrimental effects on the environment. For example, debris from Russian Proton rockets,** launched from the Baikonur cosmodrome in Kazakhstan, **litters the Altai region of eastern** **Siberia.** **This includes debris from old fuel tanks containing highly toxic fuel residue,** unsymmetrical dimethylhydrazine (UDMH), **a carcinogen which is harmful to plants and animals**. While efforts are made to contain fallout from launches within a specified area, [it is extremely difficult to achieve completely](https://ui.adsabs.harvard.edu/abs/2013EGUGA..15.4537A/abstract). Anatoly Kuzin, deputy director of Khrunichev State Research and Production Space Centre, which manufactures Proton rockets, [maintains that thorough testing shows no correlation between reported illnesses in affected areas and the rocket launches](https://www.bbc.co.uk/news/world-europe-19127713). **Testimonies from locals, however, refer to a disproportionate number of cancer cases in the area which many believe is related to the UDMH in the fuel tank debris**; **in 2007, 27 people** [**were hospitalised**](https://www.universetoday.com/13196/space-junk-toxic-fuel-rains-down-on-siberian-region/) **in the Ust-Kansky District of Altai with cancer-related complications, many of them citing the rocket fuel as the suspected cause.**

## Contention 2: China

#### Currently, the Chinese space industry is set to surpass the US space industry

**Patel in 2021** [(Neel, **space reporter for MIT Technology Review**, and I also write The Airlock newsletter, your number one source for everything happening off this planet. Before joining, he worked as a freelance science and technology journalist, contributing stories to Popular Science, The Daily Beast, Slate, Wired, the Verge, and elsewhere. Prior to that, he was an associate editor for Inverse, where I grew and led the website’s space coverage.) “**China’s surging private space industry is out to challenge the US**” MIT Technology Review, 1/21/2021. https://www.technologyreview.com/2021/01/21/1016513/china-private-commercial-space-industry-dominance/] BC

How did China get here—and why?

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 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. 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, 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.

**A thriving private space industry is crucial in order for government sponsored operations in space to be economically feasible**

**Patel 21** [(Neel, **space reporter for MIT Technology Review**, and I also write The Airlock newsletter, your number one source for everything happening off this planet. Before joining, he worked as a freelance science and technology journalist, contributing stories to Popular Science, The Daily Beast, Slate, Wired, the Verge, and elsewhere. Prior to that, he was an associate editor for Inverse, where I grew and led the website’s space coverage.) “China’s surging private space industry is out to challenge the US” MIT Technology Review, 1/21/2021. https://www.technologyreview.com/2021/01/21/1016513/china-private-commercial-space-industry-dominance/] BC

At first glance, the Ceres-1 launch might seem unremarkable. Ceres-1, however, wasn’t built and launched by China’s national program. **It was a commercial rocket**—only the second from a Chinese company ever to go into space. And the launch happened less than three years after the company was founded. **The achievement is a milestone for China’s fledgling—but rapidly growing—private space industry, an increasingly critical part of the country’s quest to dethrone the US as the world’s preeminent space power.**

The rivalry between the US and China, whose space program has surged over the last two decades, is what most people mean when they refer to the **21st-century's space race**. China is set to build a new space station later this year and will likely attempt to send its taikonauts to the moon before the decade ends. **But these big-picture projects represent just one aspect of the country’s space ambitions**. Increasingly, the focus is now on **the commercial space industry as well**. The nation's growing private space business is less focused on bringing prestige and glory to the nation and more concerned with **reducing the cost of spaceflight**, **increasing its international influence**—and making money.

“The state is really great at large, ambitious projects like going to the moon or developing a large reconnaissance satellite,” says Lincoln Hines, a Cornell University researcher who focuses on Chinese foreign policy. “But it’s not **responsive to meeting market needs**”—one big way to encourage rapid technological growth and innovation. “I think the government thinks its commercial space sector can be **complementary to the state**,” he says.

What are the market needs that Hines is referring to? Satellites, and rockets that can launch them into orbit. The space industry is undergoing a renaissance thanks to two big trends spurred by the commercial industry: we can make satellites for less money by making them smaller and using off-the-shelf hardware; and we can also make rockets for less money, by using less costly materials or reusing boosters after they’ve already flown (which SpaceX pioneered with its Falcon 9). These trends mean it is now cheaper to send stuff into space, and the services and data that satellites can offer have come down in price accordingly.

**China has seen an opportunity**. A 2017 report by Bank of America Merrill Lynch estimates that the space industry could be worth up to $2.7 trillion by 2030. Setting foot on the moon and establishing a lunar colony might be a statement of national power, but securing a share of such a highly lucrative business is perhaps even more **important to the country’s future.**

“In the future, **there will be tens of thousands of satellites waiting to launch, which is a major opportunity for Galactic Energy**” says Wu Yue, a company spokesperson.

The problem is, China has to make up decades’ worth of ground lost to the West.

#### If the Chinese space industry surpasses the U.S. space industry, they will proliferate extremely dangerous Anti-Satellite Weapons – only the affirmative can prevent this – China has a history of foregoing international commitments

**Rajagopalan on May 12th** [(Dr Rajeswari (Raji) Pillai Rajagopalan is the Director of the Centre for Security, Strategy and Technology (CSST) at the Observer Research Foundation, New Delhi.  Dr Rajagopalan was the Technical Advisor to the United Nations Group of Governmental Experts (GGE) on Prevention of Arms Race in Outer Space (PAROS) (July 2018-July 2019).  She was also a Non-Resident Indo-Pacific Fellow at the Perth USAsia Centre from April-December 2020.  As a senior Asia defence writer for The Diplomat, she writes a weekly column on Asian strategic issues. Dr Rajagopalan joined ORF after a five-year stint at the National Security Council Secretariat (2003-2007), Government of India, where she was an Assistant Director.  Prior to joining the NSCS, she was Research Officer at the Institute of Defence Studies and Analyses, New Delhi.  She was also a Visiting Professor at the Graduate Institute of International Politics, National Chung Hsing University, Taiwan in 2012. Dr Rajagopalan has authored or edited nine books including Global Nuclear Security: Moving Beyond the NSS (2018), Space Policy 2.0 (2017), Nuclear Security in India (2015), Clashing Titans: Military Strategy and Insecurity among Asian Great Powers (2012), The Dragon's Fire: Chinese Military Strategy and Its Implications for Asia (2009).  She has published research essays in edited volumes, and in peer reviewed journals such as India Review, Strategic Studies Quarterly, Air and Space Power Journal, International Journal of Nuclear Law and Strategic Analysis.  She has also contributed essays to newspapers such as The Washington Post, The Wall Street Journal, Times of India, and The Economic Times.  She has been invited to speak at international fora including the United Nations Disarmament Forum (New York), the UN Committee on the Peaceful Uses of Outer Space (COPUOS) (Vienna), Conference on Disarmament (Geneva), ASEAN Regional Forum (ARF) and the European Union.) “China’s irresponsible behaviour: A threat to space security” Observer Research Foundation, 5/12/2021. https://www.orfonline.org/expert-speak/chinas-irresponsible-behaviour-a-threat-to-space-security/] BC

With China planning an ambitious space programme that includes its own space station, it is likely that there will be more such **risky incidents** in the future as well.  It is somewhat disturbing because China’s space programme has advanced to a degree that it undertakes missions including **landing on the South Pole-Aitken Basin** (on the far side of the Moon), **returning rocks from the moon**, **and an interplanetary mission to Mars**, which clearly demonstrates China has the technical capability to de**sign and launch rockets whose spent stages can land without putting others at risk**.  **That it has not done so is odd**. It is **not** exactly what can be characterised as **responsible behaviour in space.**

Another example of China breaking norms and engaging in irresponsible behaviour in space is its ASAT test. China’s first successful anti-satellite (ASAT) test in January 2007, at an altitude of 850 kilometres, resulted in creating around 3,000 pieces of space debris. **More significantly, it broke the unwritten moratorium that was in place for two decades**. Beijing also started developing various counterspace capabilities with the goal of competing with the US. Nevertheless, **each of China’s actions have led to a spiral effect, with others seeking to match China’s actions, especially in the Indo-Pacific region, given the contested nature of Asian and global geopolitics**. For example, China’s repeated ASAT tests have led to the **US’ own** ASAT test (Operation Burnt Frost in 2008), **and India’s ASAT test** (Mission Shakti in 2019). India had no plans to go down this path until China’s first ASAT test, which became a gamechanging moment for India. Even so, **India did not react to it for more than a decade, but the final decision was a carefully calibrated and a direct response to China’s growing military space capabilities and its less-than responsible behaviour**. Other countries like **Japan** and **France** are also contemplating moves in this direction. **Australia** may not be far behind either.

Even though it may not be linked to the uncontrolled re-entry of the Chinese rocket, Jonathan McDowell, an astrophysicist at the Astrophysics Center at Harvard University noted that “about six minutes after Tianhe and the CZ-5B separated, they both came close to the ISS—under 300 km, which given uncertainties in trajectory is a tad **alarming**.”  Making this point, he **added “it’s \*possible\* that this ISS/Tianhe close encounter was one of those unlikely coincidences**. I’m open to that possibility, but they should still have spotted the closeness **and warned NASA** (or better, called a collision avoidance hold in the count).”

Rocket re-entries are not uncommon, but space powers have tried to avoid the freefalls by usually conducting controlled re-entries so that they may fall in the ocean, or they may be directed towards the so-called “graveyard” orbits that may lie there for decades. But Jonathan McDowell, an astrophysicist at the Astrophysics Center at Harvard University argues **that the Chinese rocket was designed in a manner that “leaves these big stages in low orbit.”**  And even in the case of controlled re-entries, there are failures sometimes and they can be dangerous too. SpaceX’s rocket debris landing on a farm in Washington in March this year is a case in point.

Moriba Jah, an Associate Professor at The University of Texas at Austin argues in a media interview that **such events are going to become more common, and will happen more frequently and, therefore, humanity should come together to “jointly manage near earth space as a commons in need of coordination, protocols, and practices to maximise safety, security, and sustainability.**” On the NASA Administrator’s statement, Jah said this should not be “singling out China.” Certainly, this is not about apportioning blame, but **China’s actions cannot be condoned either.**

What can be done? Given that usable orbits in space are finite in nature, there will need to be steps taken by all the space players to ensure that their actions do not contribute to further pollution of space and make it unusable in the near term. States have to invest in technologies that would aid in cleaning up and getting rid of some of the debris. States also need to come together in developing norms, rules of the road, and legally binding and political instruments on large rocket body re-entries.

The Long March 5B episode has yet again rekindled the debate on the need for rules for rocket and large body re-entries. Brian Weeden of the Secure World Foundation, for instance, questioned why, despite all ranting about China’s rocket re-entry issues, the US State Department has “consistently oppose[d] anything stronger than voluntary guidelines.”  Weeden has provided a useful Twitter thread on the US hesitancy to get on board with legal agreements on outer space. One problem is that while the US abides by international obligations, other do not.  This is a concern that Weeden notes “has a grain of truth” but adds the caveat that “reality is not that definitive”.

While he is correct to note that the issue is complicated**, it is also true that countries like China have a terrible track record when it comes to meeting their treaty commitments.** China’s violation of its own commitments with respect to nuclear non-proliferation, or in the South China Sea and East China Sea are well-known. Given this history, **it is difficult to believe that China will allow itself to be bound by any restraints on its space programme, even if it signs any of these agreements.** But given the US’ almost allergic reaction to signing legal agreements that others like China may violate, it doesn’t hurt China to keep bringing up PPWT-like (Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force Against Outer Space Objects) measures every now and then. **This puts the whole international community in a bind**. If we have to ensure safe and uninterrupted access to space, creating a secure, sustainable, and predictable outer space framework is essential. But unless all states demonstrate a commitment to living up to existing rules and norms, creating new ones will be difficult.

#### Development of Chinese Anti-Satellite Weapons emboldens China to invade Taiwan. If China invades, the U.S. has two options. First, it doesn’t follow through on its defense commitment to Taiwan, which will hurt its alliances. Second, it defends Taiwan, which will lead to nuclear war.

**Chow and Kelley on August 21st [(Brian G., policy analyst for the Institute of World Politics**, Ph.D in physics from Case Western Reserve University, MBA and Ph.D in finance from the University of Michigan, **and Brandon, graduate of** Georgetown’s School of Foreign Service**) “**China’s Anti-Satellite Weapons Could Conquer Taiwan—Or Start a War,” National Interest, 8/21/2021] JL

If current trends hold, then China’s Strategic Support Force will be capable by the **late 2020s** of **holding key U.S. space assets at risk**. Chinese military doctrine, statements by senior officials, and past behavior all suggest that China may well believe threatening such assets to be an effective means of deterring U.S. intervention. If so, then the United States would face a type of “Sophie’s Choice”: decline to intervene, potentially leading allies to follow suit and Taiwan to succumb without a fight, thereby enabling Xi to achieve his goal of “peacefully” snuffing out Taiwanese independence; or start a war that would at best be long and bloody and might well even cross the nuclear threshold.

This emerging crisis has been three decades in the making. In 1991, China watched from afar as the United States used space-enabled capabilities to obliterate the Iraqi military from a distance in the first Gulf War. The People’s Liberation Army quickly set to work developing capabilities targeted at a perceived Achilles’ heel of this new American way of war: reliance on vulnerable space systems.

This project came to fruition with a direct ascent ASAT weapons test in 2007, but the test was limited in two key respects. First, it only reached low Earth orbit. Second, it generated thousands of pieces of long-lasting space junk, provoking immense international ire. This backlash appears to have taken China by surprise, driving it to seek new, more usable ASAT types with minimal debris production. Now, one such ASAT is nearing operational status: spacecraft capable of rendezvous and proximity operations (RPOs).

Such spacecraft are inevitable and cannot realistically be limited. The United States, European Union, China, and others are developing them to provide a range of satellite services essential to the new space economy, such as in situ repairs and refueling of satellites and active removal of space debris. But RPO capabilities are dual-use: if a satellite can grapple space objects for servicing, then it might well be capable of grappling an adversary’s satellite to move it out of its servicing orbit. Perhaps it could degrade or disable it by bending or disconnecting its solar panels and antennas all while producing minimal debris.

This is a serious threat, primarily because **no international rules presently exist to limit close approaches in space**. Left unaddressed, this lacuna in international law and space policy could enable a prospective attacker to pre-position, during peacetime, as many spacecraft as they wish as close as they wish to as many high-value targets as they wish. The result would be an ever-present possibility of sudden, bolt-from-the-blue attacks on vital space assets—and worse, on many of them at once.

China has conducted at least half a dozen tests of RPO capabilities in space since 2008, two of which went on for years. Influential space experts have noted that these tests have plausible peaceful purposes and are in many cases similar to those conducted by the United States. This, however, does not make it any less important to establish effective legal, policy, and technical counters to their offensive use. **Even if it were certain that these capabilities are intended purely for peaceful applications**—and it is not at all clear that that is the case—**China (or any other country) could at any time decide to repurpose these capabilities for ASAT use**.

**There is still time to get out ahead of this threat, but likely not for much longer**. China’s RPO capabilities have, thus far, lagged about five years behind those of the United States. There are reasons to believe this gap may close, but even assuming that it holds, we should expect to see China demonstrate an operational dual-use rendezvous spacecraft by around 2025. (The first instance of a U.S. commercial satellite docking with another satellite to change its orbit occurred in February 2020.)

At the same time, **China is expanding its capacity for rapid spacecraft manufacturing**. The Global Times reported in January that China’s first intelligent mass production line is set to produce 240 small satellites per year. In April, Andrew Jones at SpaceNews reported that China is developing plans to quickly produce and loft a thirteen thousand-satellite national internet megaconstellation. It is not unreasonable to assume that China could manufacture two hundred small rendezvous ASAT spacecraft by 2029, possibly more.

If this happens, and Beijing was to decide in 2029 to launch these two hundred small RPO spacecraft and position them in close proximity to strategically vital assets, then **China would be able to simultaneously threaten disablement of the entire constellations of U.S. satellites for missile early warning** (about a dozen satellites with spares included); communications in a nuclear-disrupted environment (about a dozen); and positioning, navigation, and timing (about three dozen); along with several dozen key communications, imagery, and meteorology satellites. Losing these assets would severely degrade U.S. deterrence and warfighting capabilities, yet once close pre-positioning has occurred such losses become almost impossible to prevent. For this reason, such pre-positioning could conceivably deter the United States from coming to Taiwan’s aid due to the prospect that intervention would spur China to disable these critical space systems. Without their support, the war would be much bloodier and costlier—a daunting proposition for any president.

Should the United States fail to intervene, the **consequences would be disastrous for** both Washington and its allies in East Asia, and potentially **the credibility of U.S. defense commitments around the globe**. Worse yet, however, might be what could happen if China believes that such a threat will succeed but proves to be wrong. History is rife with examples of **major wars arising from miscalculations** such as this, and there are many pathways by which such a situation could easily escalate out of control to a full-scale conventional conflict or even to **nuclear use**.