### 1

#### Interpretation: private entities is a generic bare plural. The aff may not defend that the appropriation of outer space by a subset of private entities is unjust.

Nebel 19 Jake Nebel [Jake Nebel is an assistant professor of philosophy at the University of Southern California and executive director of Victory Briefs.] , 8-12-2019, "Genericity on the Standardized Tests Resolution," Briefly, https://www.vbriefly.com/2019/08/12/genericity-on-the-standardized-tests-resolution/ SM

Both distinctions are important. Generic resolutions can’t be affirmed by specifying particular instances. But, since generics tolerate exceptions, plan-inclusive counterplans (PICs) do not negate generic resolutions. Bare plurals are typically used to express generic generalizations. But there are two important things to keep in mind. First, generic generalizations are also often expressed via other means (e.g., definite singulars, indefinite singulars, and bare singulars). Second, and more importantly for present purposes, bare plurals can also be used to express existential generalizations. For example, “Birds are singing outside my window” is true just in case there are some birds singing outside my window; it doesn’t require birds in general to be singing outside my window. So, what about “colleges and universities,” “standardized tests,” and “undergraduate admissions decisions”? Are they generic or existential bare plurals? On other topics I have taken great pains to point out that their bare plurals are generic—because, well, they are. On this topic, though, I think the answer is a bit more nuanced. Let’s see why. 1.1 “Colleges and Universities” “Colleges and universities” is a generic bare plural. I don’t think this claim should require any argument, when you think about it, but here are a few reasons. First, ask yourself, honestly, whether the following speech sounds good to you: “Eight colleges and universities—namely, those in the Ivy League—ought not consider standardized tests in undergraduate admissions decisions. Maybe other colleges and universities ought to consider them, but not the Ivies. Therefore, in the United States, colleges and universities ought not consider standardized tests in undergraduate admissions decisions.” That is obviously not a valid argument: the conclusion does not follow. Anyone who sincerely believes that it is valid argument is, to be charitable, deeply confused. But the inference above would be good if “colleges and universities” in the resolution were existential. By way of contrast: “Eight birds are singing outside my window. Maybe lots of birds aren’t singing outside my window, but eight birds are. Therefore, birds are singing outside my window.” Since the bare plural “birds” in the conclusion gets an existential reading, the conclusion follows from the premise that eight birds are singing outside my window: “eight” entails “some.” If the resolution were existential with respect to “colleges and universities,” then the Ivy League argument above would be a valid inference. Since it’s not a valid inference, “colleges and universities” must be a generic bare plural. Second, “colleges and universities” fails the upward-entailment test for existential uses of bare plurals. Consider the sentence, “Lima beans are on my plate.” This sentence expresses an existential statement that is true just in case there are some lima beans on my plate. One test of this is that it entails the more general sentence, “Beans are on my plate.” Now consider the sentence, “Colleges and universities ought not consider the SAT.” (To isolate “colleges and universities,” I’ve eliminated the other bare plurals in the resolution; it cannot plausibly be generic in the isolated case but existential in the resolution.) This sentence does not entail the more general statement that educational institutions ought not consider the SAT. This shows that “colleges and universities” is generic, because it fails the upward-entailment test for existential bare plurals. Third, “colleges and universities” fails the adverb of quantification test for existential bare plurals. Consider the sentence, “Dogs are barking outside my window.” This sentence expresses an existential statement that is true just in case there are some dogs barking outside my window. One test of this appeals to the drastic change of meaning caused by inserting any adverb of quantification (e.g., always, sometimes, generally, often, seldom, never, ever). You cannot add any such adverb into the sentence without drastically changing its meaning. To apply this test to the resolution, let’s again isolate the bare plural subject: “Colleges and universities ought not consider the SAT.” Adding generally (“Colleges and universities generally ought not consider the SAT”) or ever (“Colleges and universities ought not ever consider the SAT”) result in comparatively minor changes of meaning. (Note that this test doesn’t require there to be no change of meaning and doesn’t have to work for every adverb of quantification.) This strongly suggests what we already know: that “colleges and universities” is generic rather than existential in the resolution. Fourth, it is extremely unlikely that the topic committee would have written the resolution with the existential interpretation of “colleges and universities” in mind. If they intended the existential interpretation, they would have added explicit existential quantifiers like “some.” No such addition would be necessary or expected for the generic interpretation since generics lack explicit quantifiers by default. The topic committee’s likely intentions are not decisive, but they strongly suggest that the generic interpretation is correct, since it’s prima facie unlikely that a committee charged with writing a sentence to be debated would be so badly mistaken about what their sentence means (which they would be if they intended the existential interpretation). The committee, moreover, does not write resolutions for the 0.1 percent of debaters who debate on the national circuit; they write resolutions, at least in large part, to be debated by the vast majority of students on the vast majority of circuits, who would take the resolution to be (pretty obviously, I’d imagine) generic with respect to “colleges and universities,” given its face-value meaning and standard expectations about what LD resolutions tend to mean.

#### It applies to private entities:

#### Upward entailment test – spec fails the upward entailment test because saying that one company’s appropriation is bad does not entail that all companies’ appropriation is bad

#### Adverb test – adding “usually” to the res doesn’t substantially change its meaning

#### Vote neg:

#### 1] Precision –any deviation justifies the aff arbitrarily jettisoning words in the resolution at their whim which decks negative ground and preparation because the aff is no longer bounded by the resolution.

#### 2] Limits—specifying a type of appropriation offers huge explosion in the topic since they get permutations of hundreds of governments, specific companies, and different sectors in the world.

#### Drop the debater to preserve fairness and education – use competing interps –reasonability invites arbitrary judge intervention and a race to the bottom of questionable argumentation

#### Hypothetical neg abuse doesn’t justify aff abuse, and theory checks cheaty CPs

#### No RVIs—it’s their burden to be topical.

### 2

#### TEXT: The Outer Space Treaty ought to be amended to establish an international legal trust system governing outer space.

Fino 21 [Ivan Fino (Department of Law University of Turin), “Building a New Legal Model for Settlements on Mars,” A. Froehlich (ed.), Assessing a Mars Agreement Including Human Settlements, Studies in Space Policy 30, 2021. <https://doi.org/10.1007/978-3-030-65013-1_7>]CT

7.5 A Proposal for an International Legal Trust System

Since several legal and policy issues may arise from the actual legal framework, a new international legal regime for outer space shall: (a) Provide for property rights or a lease allocation system, both incentivising investments in the space sector. The system would be supervised and led by the United Nations (UN) through the United Nations Office for Outer Space Affairs (UNOOSA). (b) Establish the rule of law in outer space. A laissez faire system could turn into anarchy whereby countries and companies could race to grab as many resources as possible bringing considerable potential conflict. (c) Recognise outer space as common heritage of mankind, instead of res communis.24 (d) Provide a sustainable exploitation of celestial bodies, to avoid the uncontrolled production of space debris or to prevent the complete exhaustion of the celestial bodies’ masses or their natural orbits.25 The United Nations should manage the ordered and sustainable economic development in outer space for the present and future generations. (e) Prevent the militarisation of outer space and favours the international collaboration, which are the same aims of the Outer Space Treaty’ drafters. (f) Consider the weak points of the Moon Agreement which led to nations’ refusal to sign. Only a widely accepted agreement would have the power of law in the international context.

The abovementioned requirements could be met by establishing an international Legal Trust System (ILTS). A trust is an arrangement that assigns assets to one or more trustees that will manage them in the interest of one or more beneficiaries. The latter may include the trustee or the settlor.26 Translated in the ILTS, mankind would assume the role of settlor and beneficiary of the outer space resources. The UNOOSA would act as main trustee of outer space resources and trading property rights and leases to companies and countries. The rights over the celestial bodies or over its resources would depend on the nature of the celestial body itself. For example, property rights are preferable to a lease over asteroids, as they could just disappear after the exploitation. Both leases and property rights can be provided over lands and mining sites on Mars. Leases or defeasible titles are preferable for some land mass on those celestial bodies which could hypothetically be used by humankind pending an Earth disaster. In the case of lucrative activities, such as mining, companies will choose whether to get the exclusive use over the resource through payment of the lease or through annual payment linked to net proceeds or to production charges.

7.6 The Functioning of the International Legal Trust System

When a company is interested in leasing or buying an outer space resource, before starting any operations, it must send a plan of work to the United Nations

. The plan of work shall include all the details of the activity that would be carried out; it shall be consistent with pre-established parameters of sustainability and shall not interfere with other space activities. If the UN approves the company plan of work, the country of the company assumes the role of co-trustee for the specific resource. Thus, as a cotrustee, countries must investigate whether all activities of their national companies are consistent with the plan of work authorised by the UN. These supervisory duties would be added to the responsibility of nations for all space objects that are launched within their territory.27 The UN, as main trustee, would oversee that countries are performing their duties. This model would be the ordinary one. There would be also an extraordinary model, in which the UN would be the only trustee. This model would be possible in two instances: when the country of the applicant for a private company is not technologically able to act as a trustee or when the applicant of the activity is a country itself. Furthermore, as stated previously, the beneficiaries of this trust are the countries of the world and their citizens; hence all mankind would take concrete profit from lease transactions and benefit sharing. The income from the sales, leases and benefit sharing can be distributed to mankind by financing international global goals, following a similar model of the 17 Sustainable Development Goals adopted by the United Nations in 2015, which addressed poverty, inequality, climate change, environmental degradation, and peace and justice. Finally, the International Legal Trust System would meet acceptance because every country would obtain benefit sharing to improve its living standard and space faring nations would rely on property rights.

#### The legal trust would incentivize investment in space while preventing conflict and ensuring sustainable development and the equitable distributions of resources.

Finoa ’20 – Ivan Finoa [Department of Law, University of Turin], “An international legal trust system to deal with the new space era,” 71st International Astronautical Congress (IAC) – The CyberSpace Edition, (12-14 October 2020). <<https://d1wqtxts1xzle7.cloudfront.net/66728932/_IAC_20_E7.VP.8.x58518_An_international_legal_trust_system_to_deal_with_the_new_space_era_BY_IVAN_FINO-with-cover-page-v2.pdf?Expires=1642044926&Signature=asvt6StaK5n9UnpXuJIlo4ziI839WzFYjDZy37bm70ObGy3vFJyHwWNGxhn2beze4QzYDPPX0pVEXAwYvDaINVNxN01Ify8YwG5loNRddlat-grf3iawic7KvwqPowxFe2GuemVvbB-KW8ZVBxigwS-gelSKIVy4KYR9UgiDrM6e6deEBnUTcULSwmsH-JdHNg13ytZ3vNVMMlxZW2MPOCRuB2WlOHdCLoC86VqafSoMwuec-d~Aisbgyt5F2vO-GjvI60bR7h2MSp0iT6P7apIDUUpHUsDGbvcdxp22HSxXdlvr7lSqtLnL5rKxujGDYq~R9B~WuGiorVL2hn74UQ__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA>>CT

Considering the worsening climate change, in the future outer space might be our last Noah’s Ark. Now, humans must look to space as an opportunity to support growing resource requirements. Asteroids are rich in metals, which could be transported back to Earth. Unfortunately, the existing international legal framework discourages investments in the space economy. Once an enterprise invests billions of dollars in discovering and developing a mining site, it cannot claim any ownership because of the non-appropriation principle stipulated in Article 2 of the Outer Space Treaty (OST). Thus, other entities could legally access and exploit the same resource without any participation in the initial financial investment, increasing the risk of potential conflict

. Bearing this in mind, the question arises, which legal regime could ensure effective allocation of resources, avoiding a chaotic space race to acquire valuable assets? The aim of this research is to argue that the first two articles of OST should be amended, to set up an international legal trust system which would guarantee different kinds of rights, dependently on the nature of the celestial body. E.g., property rights could be preferable to a lease over asteroids, as they could be exploited to their disappearance. This proposed system would be led by the United Nations Office for Outer Space Affairs (UNOOSA), as the main trustee. The co-trustees would be the nations of the world. Prior to initiating any space activity, every entity would send a request to their national government. If all the legal parameters are respected, the nation would forward the operational request to the UNOOSA. In the case of acceptance, UNOOSA would record the permit on an international public registry. The country in which the company has been registered would investigate whether the activities of its national company are consistent with the permit. This would be the ordinary model. The extraordinary model would be when the applicant for the space activity is a state, then the trustee would be the UN. All lucrative activities would be subject to benefit-sharing. Finally, this research will demonstrate the valuable outcome of the International Legal Trust System and its advantages for all humankind. Private companies would rely on property rights, while the benefit-sharing could be used to finance the 17 Sustainable Development Goals adopted by the UN in 2015, which address peace, climate change, inequalities and poverty.

### 3

#### The Republic of India should ban the appropriation of outer space by private entities except for appropriation for space-based solar power. The Republic of India should cooperate with China to facilitate the appropriation of outer space by private entities for space-based solar power.

#### Indian space solar power crucial to promoting cooperation with China.

Saha and Filijovic 21 [Rushali Saha and Marko Filijovic “HIGH SKY – LOW TENSION: CAN INDIA AND CHINA FIND COMMON INTEREST IN OUTER SPACE?” https://www.ips.ac.rs/wp-content/uploads/2021/04/Casopis-Politicka-revija-1-21.pdf#page=201]

Both India and China have developed significantly and stand as major economic, political powers on the global stage, driving the Asian century. Nevertheless, both continue to have unresolved, increasingly complex geostrategic issues which complicate the exisiting security dillema which governs their relationship. However, the ambitions of China and India correspond to a large extent, which opens up opportunities for cooperation that can be beneficial for both countries and at the same time provides a space for geopolitical competition if the two countries embark on a space or arms race. By all accounts, the answer to the question of whether China and India will move towards cooperation or confrontation in space will largely be determined by several important factors. It will primarily be influenced by the national strategic interests of these countries, on the basis of which some key foreign policy projects have been carried out and by further development of their space programmes in the forthcoming period as well. In other words it is common knowledge that both countries, are developing their navigation systems and national lunar programmes and are constantly investing in space science, placing multiple satellite systems in orbit. Looking at the development of the situation from a commercial point of view, it seems that both countries also understand that there is a good market for various space technology products and they are keen to establish themselves as globally important players in the satellite launch market. Accordingly, as Lele explains, “they are utilizing space technologies to significantly drive socioeconomic development, using space as a medium not only for development and economics, but also to meet some of their own foreign policy objectives, like providing data or technology assistance to various smaller states” (Lele, 2020). In this regard, an important factor in the future of China-India relations in space will be the certainty of the success of (pan)regional projects – the BRI, on the one hand, and the Bay of Bengal Initiative for MultiSectoral Technical and Economic Cooperation, on the other hand. In addition, the relations between the two countries will be affected by the dynamism within and between different organisations, such as the Asia-Pacific Space Cooperation Organisation (APSCO) led by China and the South Asian Association for Regional Cooperation (SAARC), led by India.7 Of course, one of the major factors will be the behaviour of other great powers, particularly of the United States, but it will also be affected by the comprehensive geopolitical movements taking place on and around the planet. So far, as some authors observe, there is enough potential for IndiaChina cooperation in spheres apart from space. This means that although their relations are somewhat burdened by the issue of borders, the fact is that for over 40 years there have been no open conflicts between these countries, in addition, China is India’s second largest trading partner (Lele, 2019). With this in mind, Lele (2019) believes that joint research on the fourth dimension could encourage new forms of cooperation and have the beneficial effect of reducing differences between the two nations, or at least causing cosmic activism to be excluded from the total geopolitical matrix present on Earth. The author refers to the US and Russia as an example, whose cooperation in space is constantly present despite many terrestrial challenges such as the issue of Crimea, the situation in Syria, etc. Considering that China and India are large energy consumers, perhaps collaboration in exploration and exploitation of space resources could be a suitable platform to start more intensive cooperation between the two Asian powers. That such assessments are not baseless is evidenced by the fact that in November 2012 (during the visit of the then Indian President to Beijing), Chinese officials proposed that the two nations begin joint work to build a solar satellite that would serve the energy needs of both countries (Nair, 2014:7). As a matter of fact, according to Lele (2019), there have been repeated appeals on the part of Chinese side to intensify cooperation in this area as well as in the others. In Weija’s view, if China and India seize the opportunity created by opening the fourth dimension, it could, in addition to economic exchange and the development of cutting-edge technologies, also promote mutual trust. The author concludes that China and India currently face a “great challenge”, but also a “great chance” if wisdom prevails (Weija, 2019). After all, both countries have launched their space programmes in the light of different motives that have changed over time, which does not exclude the possibility that they may be further transformed in the future to suit common interests.

### 4

#### The private sector is essential for asteroid mining – competition is key and government development is not effective, efficient, or cheap enough. Thiessen 21:

Marc Thiessen, 6-1, 21, Washington Post, Opinion: SpaceX’s success is one small step for man, one giant leap for capitalism, https://www.washingtonpost.com/opinions/2020/06/01/spacexs-success-is-one-small-step-man-one-giant-leap-capitalism/

It was one small step for man, one giant leap for capitalism. Only three countries have ever launched human beings into orbit. This past weekend, SpaceX became the first private company ever to do so, when it sent its Crew Dragon capsule into space aboard its Falcon 9 rocket and docked with the International Space Station. This was accomplished by a company Elon Musk started in 2002 in a California strip mall warehouse with just a dozen employees and a mariachi band. At a time when our nation is debating the merits of socialism, SpaceX has given us an **incredible testament to the power of American free enterprise.** While the left is advocating unprecedented government intervention in almost every sector of the U.S. economy, from health care to energy, **today Americans are celebrating the successful privatization of space travel.** If you want to see the difference between what government and private enterprise can do, consider: It took a private company to give us the first space vehicle with touch-screen controls instead of antiquated knobs and buttons. It took a private company to give us a capsule that can fly entirely autonomously from launch to landing — including docking — without any participation by its human crew. It also took a private company to invent a reusable rocket that can not only take off but land as well. When the Apollo 11 crew reached the moon on July 20, 1969, Neil Armstrong declared “the Eagle has landed.” On Saturday, SpaceX was able to declare that the Falcon had landed when its rocket settled down on a barge in the Atlantic Ocean — ready to be used again. That last development will save the taxpayers incredible amounts of money. The cost to NASA for launching a man into space on the space shuttle orbiter was **$170 million per seat, compared with just $60 million** to $67 million on the Dragon capsule. The cost for the space shuttle to send a kilogram of cargo into to space was $54,500; with the Falcon rocket, the cost is just $2,720 — **a decrease of 95 percent.** And while the space shuttle cost $27.4 billion to develop, the Crew Dragon was designed and built for just $1.7 **billion — making it the lowest-cost spacecraft developed in six decades.** SpaceX did it in six years — far faster than the time it took to develop the space shuttle. ***The private sector does it better, cheaper, faster and more efficiently than government***. **Why? Competition.** Today, SpaceX has to compete with a constellation of private companies — including legacy aerospace firms such as Orbital ATK and United Launch Alliance and innovative start-ups such as Blue Origin (which is designing a Mars lander and whose owner, Jeff Bezos, also owns The Post) and Virgin Orbit (which is developing rockets than can launch satellites into space from the underside of a 747, avoiding the kinds of weather that delayed the Dragon launch). In the race to put the first privately launched man into orbit, upstart SpaceX had to beat aerospace behemoth Boeing and its Starliner capsule to the punch. It did so — for more than $1 billion less than its competitor. **That spirit of competition and innovation will revolutionize space travel in the years ahead.** Indeed, Musk has his sights set far beyond Earth orbit. Already, SpaceX is working on a much larger version of the Falcon 9 reusable rocket called Super Heavy that will carry a deep-space capsule named Starship capable of carrying up to 100 people to the moon and eventually to Mars. Musk’s goal — the reason he founded SpaceX — is to colonize Mars and make humanity a multiplanetary species. He has set a goal of founding a million-person city on Mars by 2050 complete with iron foundries and pizza joints. Can it be done? Who knows. But this much is certain: **Private-sector innovation is opening the door to a new era of space exploration**. Wouldn’t it be ironic if, just as capitalism is allowing us to explore the farthest reaches of our solar system, Americans decided to embrace socialism back here on Earth?

#### Indian private sector crucial for asteroid mining. Marlborough reads yellow

**AC Nanda 10/13** (Prakash Nanda has been commenting on politics, foreign policy on strategic affairs for nearly three decades. A former National Fellow of the Indian Council for Historical Research and recipient of the Seoul Peace Prize Scholarship, he is also a Distinguished Fellow at the Institute of Peace and Conflict Studies. October 13, 2021, As India Opens Up Space, How ISRO Could Help Indian Air Force Become An Aerospace Superpower, Eurasian Times, Prime Minister Narendra Modi on October 11 launched the Indian Space Association (ISpA) – the premier industry association of space and satellite companies. <https://eurasiantimes.com/as-india-opens-up-space-how-isro-could-help-indian-air-force-become-an-aerospace-superpower/)//ww> pbj

He said: “Today is the day the Indian space sector receives new wings. **For 75 years since independence, Indian space has been dominated by a single umbrella of Indian government and government institutions**. Scientists of India have made huge achievements in these decades, but the need of the hour is that there should be **no restrictions on Indian talent, whether it is in the public sector or in the private sector**. “In a way, the country has given a new gift to the **talent of India’s entrepreneurs by opening up India’s space sector in its 75th year of independence**. Let this collective power of India’s population take the space sector forward in an organized manner. The Indian Space Association (ISpA) will play a huge role in this.” ISpA aims at contributing to the government’s vision of making India “Atmanirbhar” (self-reliant) and a global leader in the space arena, which is fast emerging as the next growth frontier for mankind. **The association is supposed to engage with stakeholders across the ecosystem for the formulation of an enabling policy framework that will also work towards building global linkages for the Indian space industry to bring in critical technology and investments.** Its founding members include Bharti Airtel, Larson & Toubro, Nelco (Tata Group), OneWeb, Mapmyindia, Walchandnagar Industries, and Alpha Design Technologies. Other core members include Godrej, Hughes India, Ananth Technology Limited, Azista-BST Aerospace Private Limited, BEL, Centum Electronics, and Maxar India. India Lagging Behind According to ISRO, the current size of the global space economy stands at about $360 billion. **However, India accounts for only about 2% of the space economy with a potential to capture 9% of the global market share by 2030.** This needs to change. Despite Rafale Boost, Why Indian Air Force Remains ‘Ill-Equipped’ To Battle Chinese PLAAF Over The LAC? And here comes the **role of the IAF in safeguarding the space economy**, among other reasons. With the **increasing private sector activities in space, such as the launching of commercial satellites, the introduction of ‘space tourism’, asteroid mining of minerals, and a range of other fascinating stuff, these space assets of the country need protection from the enemy forces. This explains why many countries have been creating their respective “space forces”.** The US created one in 2019, with the space force becoming a new military branch to protect the nation’s satellites and other space assets, which are vital to everything from national security to day-to-day communications. The United Kingdom, France, Canada, and Japan are said to be following suit. Last month, Germany announced the development of a military space command. China’s “Strategic Support Force”, established in 2015, takes care of its space assets. And Russia since 2015 has had dedicated “Russian Aerospace Forces”. India’s Defence Space Agency It is against this background that Prime Minister Modi had in 2018 **announced the government’s intention to create the Defence Space Agency (DSA)** by integrating space assets from the army, navy, and air force. It was formally set up in 2019 with a staff of some 200 officers drawn from the three services, commanded by an air force officer. It took over the Defence Imagery Processing and Analysis Centre and the Defence Satellite Control Centre. Pioneer In Indian Aviation – Can Tatas Again ‘Rule The Roost’ After Acquiring National Carrier – Air India? In fact, the DSA conducted its first integrated space warfare exercise in July 2019, bringing together personnel from across the services. It “focused on using communications and reconnaissance satellites to integrate intelligence and fires across the range of Indian military assets, indicating a firm understanding of the necessity of access to space.” However, the **DSA is still a work in progress. It is yet to become fully operational**. It is to be located in Delhi and supposed to work closely with the Defence Research Development Organisation (DRDO) and ISRO to **integrate military assets, surveillance platforms such as the AWACS and AEW&C, and commercial and military satellites for intelligence sharing across all three services.** It may be noted that satellites are vitally important to modern warfare as they are a key communication link for ground, sea, and airborne assets, which require sufficient data for voice and data communication. The **DSA, therefore, is also expected to play a greater role in enunciating the planned policies for space-based assets, allowing Indian agencies and companies to work towards meeting these requirements**. A 2016 report on ‘Exploiting Indian Military Capacity in Outer Space’ by the Centre for Joint Warfare Studies (CENJOWS), states that while indigenous satellites provide an adequate capability, “but despite these, India does not get uninterrupted observation of the interested area which is possible only if India launches constellation of satellites for observation which is an emerging trend.” However, it did not mean that India never had dedicated satellites for military purposes before. India had created an “Integrated Space Cell” in June 2008 under the command of the Integrated Defence Services Headquarters with the responsibility to coordinate activities of ISRO and the Indian Armed forces. Integrating Space Assets By 2017, India had reportedly some 14 satellites that were being used for surveillance purposes. This number must have gone up by now, with the country developing ASAT (Anti-satellite) capability, though it is said to be in a nascent stage. Besides, India’s National Technical Research Organization (NTRO), which is controlled by the Research and Analysis Wing, India’s premier intelligence agency, makes extensive use of IRS (Indian Remote Satellites), RISAT (Radar Imaging Satellites), and CARTOSAT (optical earth observation satellites) data to aid in building a comprehensive intelligence picture. All this makes it clear why the Indian government has now realized the need for integrating space assets and capabilities. But, the IAF had realized this very well by publishing in 2012 “Basic Doctrine of the Indian Air Force, 2012”. In it, the IAF repeatedly mentioned “air and space power”. The doctrine was not talking of “air power” in isolation of “space power”; it talked of “aerospace power”. However, the problem has been that while the IAF has been very clear that it has an aerospace role and in this task, it needs the help of the ISRO, the latter has not been that enthusiastic to join hands, at least publicly. As India is a signatory to the international treaty that outlaws military activities (Outer Space Treaty) in space, a common property of mankind, the ISRO seems to have taken a too legalistic view of abhorring the IAF. But then the fact is that the Outer Space Treaty has been the subject of diplomatic wrangles over the precise definition of space weapons, other than nuclear weapons. Besides, there has been no transparency on the part of major world powers in keeping the outer space free from military activities, with the result that one hears concepts like “Star Wars” (Strategic Defence Initiative) by the US and anti satellites (ASAT) by Russia. In any case, it is a fact that the US and its allies have used space resources extensively in fighting recent wars in Iraq and Afghanistan. All told, contrary to the conventional wisdom, the **aerospace power of the IAF will protect the space tools like satellites that are used by the ISRO to augment the country’s economic and scientific power. And this will be possible when there is the capacity to destroy the adversary’s space weapons, based in space, air, land, and water.** Secondly, developing aerospace power does not necessarily mean that there will be war. In most cases, augmented power or strength will ensure that the enemy will not dare to attack you. Instead of being a frontier now, **space complements airpower in numerous missions as an enabler.** That is why analysts say that air and space should be complementary components of defense so that they compensate for each other’s inadequacies in maintaining surveillance of the vertical dimension and in **countering threats from systems like ballistic missiles that transit and maneuver through both air and space. They must be integrated so that the diverse and yet potent elements of air and space are networked adequately. Now that the space sector is being opened up by the Modi government, it is hoped that such a network will be a reality, sooner rather than later.**

#### Asteroid mining can happen with private sector innovation and is key to solve a laundry list of impacts--climate change, economic decline and asteroid collisions. Taylor 19

Chris Taylor [journalist, was senior news writer for Time.com, San Francisco bureau chief for Time magazine], 19 - ("How asteroid mining will save the Earth — and mint trillionaires," Mashable, 2019, accessed 12-13-2021, https://mashable.com/feature/asteroid-mining-space-economy)//ML

How much, exactly? We’re only just beginning to guess. [Asterank](http://www.asterank.com/), a service that keeps track of some 6,000 asteroids in NASA’s database, prices out the estimated mineral content in each one in the current world market. More than 500 are listed as “>$100 trillion.” The estimated profit on just the top 10 asteroids judged “most cost effective” — that is, the easiest to reach and to mine, subtracting rocket fuel and other operating costs, is around $1.5 trillion.¶ Is it ours for the taking? Well, here’s the thing — we’re taking it already, and have been doing so since we started mining metals thousands of years ago. Asteroid strikes are the only reason rare metals exist in the Earth’s crust; the native ones were all sucked into our planet’s merciless iron core millions of years ago. Why not go to the source?¶ As a side project, space mining can grab water from the rocks and comets — water which, with a little processing makes rocket fuel. Which in turn makes even more currently unimaginable space operations possible, including ones that could give the planet all the energy it needs to avert climate catastrophe. Cislunar space — the bit around us and the moon, the local neighborhood, basically — is about to get very interesting.¶ It’s hard, even for the most asteroid-minded visionaries, to truly believe the full scope of this future space economy right now. Just as hard as it would have been in 1945, when an engineer named Vannevar Bush first proposed [a vast library of shared knowledge that people the world over would access via personal computers](https://en.wikipedia.org/wiki/Memex), to see that mushroom into a global network of streaming movies and grandmas posting photos and trolls and spies who move the needle on presidential elections. ¶ No technology’s pioneer can predict its second-order effects.¶ The space vision thing is particularly difficult in 2019. Not only do we have plenty of urgent problems with democracy and justice to keep us occupied, but the only two companies on the planet to have gone public with asteroid-mining business plans, startups that seemed to be going strong and had launched satellites already, were just bought by larger companies that are, shall we say, less comfortable executing on long-term visions.¶ Planetary Resources was founded in 2012 in a blaze of publicity. Its funding came from, among others, Larry Page, Eric Schmidt, Ross Perot, and the country of Luxembourg. It had inked an orbital launch deal with Virgin Galactic. And it was sold last October to a blockchain software company. (To 21st century readers, this paragraph would look like I’m playing tech world mad libs.)¶ In January, the other company, Deep Space Industries, also partly funded by Luxembourg (way to get in the space race, Luxembourg!), was sold to Bradford Space, owned by a U.S. investment group called the American Industrial Acquisition Corporation. Maybe these new overlords plan on continuing their acquisitions' asteroid mining endeavors rather than stripping the companies for parts. Both companies have been notably silent on the subject. “The asteroid mining bubble has burst,” [declared The Space Review](http://www.thespacereview.com/article/3633/1), one of the few online publications to even pay attention.¶ That’s also to be expected. After all, anyone trying to build Google in 1945 would go bankrupt. Just as the internet needed a half-dozen major leaps forward in computing before it could even exist, space industry needs its launch infrastructure.¶ Currently, the world’s richest person and its most well-known entrepreneur, Jeff Bezos and Elon Musk, respectively, are working on the relatively cheap reusable rockets asteroid pioneers will need. (As I was writing this, Bezos announced in an email blast that one of his New Shepherd rockets had flown to space and back five times like it was nothing, delivering 38 payloads for various customers while remaining entirely intact.) ¶ Meanwhile, quietly, Earth’s scientists are laying the groundwork of research the space economy needs. Japan’s Hayabusa 2 spacecraft has been in orbit around asteroid Ryugu for the last year and a half, learning everything it can. (Ryugu, worth $30 billion according to Asterank, is the website's #1 most cost-effective target.) The craft dropped [tiny hopping robot rovers](https://www.space.com/41941-hayabusa2-asteroid-rovers-hopping-tech.html) and a [small bomb](https://www.space.com/japan-hayabusa2-asteroid-bomb-video.html) on its target; pictures of the small crater that resulted were released afterwards.¶ Officially, the mission is to help us figure out how the solar system formed. Unofficially, it will help us understand whether all those useful metals clump together at the heart of an asteroid, as some theorize. If so, it’s game on for asteroid prospectors. If not, we can still get at the metals with other techniques, such as optical mining (which basically involves sticking an asteroid in a bag and drilling with sunlight; sounds nuts to us, but [NASA has proved it in the lab](https://www.nasa.gov/directorates/spacetech/niac/2017_Phase_I_Phase_II/Sustainable_Human_Exploration/)). It’ll just take more time.¶ Effectively, we’ve just made our first mark at the base of the first space mineshaft. And there’s more to come in 2020 when Hayabusa 2 returns to Earth bearing samples. If its buckets of sand contain a modicum of gold dust, tiny chunks of platinum or pebbles of compressed carbon — aka diamonds — then the Duchy of Luxembourg won’t be the only deep-pocketed investor to sit up and take notice.¶ The possibility of private missions to asteroids, with or without a human crew, is almost here. The next step in the process that takes us from here to where you are? Tell us an inspiring story about it, one that makes people believe, and start to imagine themselves mining in space. How would you explain the world-changing nature of the internet to 1945? How would you persuade them that there was gold to be mined in Vannevar Bush’s idea? You’d let the new economy and its benefits play out in the form of a novel.¶ As Hayabusa dropped a bomb on Ryugu, Daniel Suarez was making the exact same asteroid the target of his fiction. Suarez is a tech consultant and developer turned New York Times bestselling author. His novels thus far have been techno-thrillers: his debut, [Daemon](https://www.amazon.com/dp/B003QP4NPE/ref=dp-kindle-redirect?_encoding=UTF8&btkr=1), a novel of Silicon Valley’s worst nightmare, AI run rampant, made more than a million dollars.¶ So it was a telling shift in cultural mood that Suarez’s latest thriller is also a very in-depth description of — and thinly-disguised advocacy for — asteroid mining. In [Delta-v](https://www.amazon.com/Delta-v-Daniel-Suarez-ebook/dp/B07FLX8V84/ref=sr_1_1?crid=UMNUUSR3NCBX&keywords=delta-v&qid=1556930756&s=digital-text&sprefix=delta-v%2Cdigital-text%2C204&sr=1-1), published in April, a billionaire in the 2030s named Nathan Joyce recruits a team of adventurers who know nothing about space — a world-renowned cave-diver, a world-renowned mountaineer — for the first crewed asteroid mission.¶ Elon Musk fans might expect this to be Joyce’s tale, but he soon fades into the background. The asteroid-nauts are the true heroes of Delta-v. Not only are they offered a massive payday — $6 million each for four years’ work — they also have agency in key decisions in the distant enterprise. Suarez deliberately based them on present-day heroes. The mission is essential, Joyce declares, to save Earth from its major problems. First of all, the fictional billionaire wheels in a fictional Nobel economist to demonstrate the actual truth that the entire global economy is sitting on a [mountain of debt](https://www.washingtonpost.com/opinions/the-247-trillion-global-debt-bomb/2018/07/15/64c5bbaa-86c2-11e8-8f6c-46cb43e3f306_story.html?noredirect=on&utm_term=.5fb3ff1155d9). It has to keep growing or it will implode, so we might as well take the majority of the industrial growth off-world where it can’t do any more harm to the biosphere.¶ Secondly, there’s the climate change fix. Suarez sees asteroid mining as the only way we’re going to build [solar power satellites](https://en.wikipedia.org/wiki/Space-based_solar_power). Which, as you probably know, is a form of uninterrupted solar power collection that is theoretically more effective, inch for inch, than any solar panels on Earth at high noon, but operating 24/7. (In space, basically, it’s always double high noon). ¶ The power collected is beamed back to large receptors on Earth with large, low-power microwaves, which researchers think will be harmless enough to let humans and animals pass through the beam. A space solar power array like [the one China is said to be working on](https://www.forbes.com/sites/scottsnowden/2019/03/12/solar-power-stations-in-space-could-supply-the-world-with-limitless-energy/#2d3f78a54386) could reliably supply 2,000 gigawatts — or over 1,000 times more power than the largest solar farm currently in existence. ¶ “We're looking at a 20-year window to completely replace human civilization's power infrastructure

,” Suarez told me, citing the report of the Intergovernmental Panel on Climate Change on the coming catastrophe. Solar satellite technology “has existed since the 1970s. What we were missing is millions of tons of construction materials in orbit. Asteroid mining can place it there.”¶ The Earth-centric early 21st century can’t really wrap its brain around this, but the idea is not to bring all that building material and precious metals down into our gravity well. Far better to create a whole new commodities exchange in space. You mine the useful stuff of asteroids both near to Earth and far, thousands of them taking less energy to reach than the moon. That’s something else we’re still grasping, how relatively easy it is to ship stuff in zero-G environments. ¶ Robot craft can move 10-meter boulders like they’re nothing. You bring it all back to sell to companies that will refine and synthesize it in orbit for a myriad of purposes. Big pharma, to take one controversial industry, would [benefit by taking its manufacturing off-world](https://medium.com/fitch-blog/why-is-big-pharma-interested-in-the-space-economy-c078ac1bf67c). The molecular structure of many chemicals grows better in microgravity.¶ The expectation is that a lot of these space businesses — and all the orbital infrastructure designed to support them — will be automated, controlled remotely via telepresence, and monitored by AI. But Suarez is adamant that thousands if not millions of actual human workers will thrive in the space economy, even as robots take their jobs in old industries back on Earth.¶ “Our initial expansion into space will most likely be unsettled and experimental. Human beings excel in such environments,” he says. “Humans can improvise and figure things out as we go. Robots must be purpose-built, and it's going to take time and experience for us to design and build them.”¶ Which is another way startups back on Earth will get rich in the new economy: designing and building those robots, the nearest thing to selling picks and shovels to prospectors in the space gold rush. Thousands of humans in space at any one time will also require the design and construction of stations that spin to create artificial gravity. Again, this isn’t a great stretch: Using centrifugal force to simulate gravity in space was first proposed by scientists in the 19th century. NASA has had workable designs for spinning cislunar habitats called [O’Neill cylinders](https://en.wikipedia.org/wiki/O%27Neill_cylinder) since the 1970s. We just haven’t funded them. ¶ But the trillionaires clearly will.¶ In short, Suarez has carefully laid out a vision of the orbital economy that offers something for everyone in our divided society. For Green New Deal Millennials, there’s the prospect of removing our reliance on fossil fuels at a stroke and literally lifting dirty industries off the face of the planet. For libertarians and other rugged individualists, there’s a whole new frontier to be developed, largely beyond the reach of government. ¶ For those who worry about asteroids that could wipe out civilization — though luckily, [this isn't likely to happen any time soon](https://mashable.com/article/armageddon-asteroid-threat) — here is a way for humanity to get proficient in moving them out of the way, fast. Indeed, the National Space Society has offered [a proposal](https://space.nss.org/technologies-for-asteroid-capture-into-earth-orbit/) to capture the asteroid Aphosis (which is set to miss Earth in the year 2029, but [not by a very comfortable margin](https://www.space.com/asteroid-apophis-2029-flyby-planetary-defense.html)), keep it in orbit, and turn it into 150 small solar-power satellites, as a proof of concept. ¶ For the woke folks who care about the bloody history of diamond production, there’s the likelihood that space mining would wipe out Earth’s entire diamond industry. “They will be found in quantities unattainable on Earth,” claims Suarez, with good reason. We are starting to discover that there is more crystalized carbon in the cosmos than we ever suspected. Astronomers have identified one [distant planet made entirely of diamond](https://www.nationalgeographic.com/science/phenomena/2014/06/24/diamond-the-size-of-earth/); there may be more, but they are, ironically, hard to see. ¶ We don’t have diamond planets in our solar system (and we can’t do interstellar missions), but we do have diamond-studded asteroids. Mine them for long enough and you will wear diamonds on the soles of your shoes.¶ For investors and entrepreneurs, there is the thrill of racing to be the first member of the four-comma club. ([Neil deGrasse Tyson believes that the first trillionaire will be an asteroid mining mogul](https://www.nbcnews.com/science/space/neil-degrasse-tyson-says-space-ventures-will-spawn-first-trillionaire-n352271); Suarez isn’t sure whether they’ll be the first, but he suspects that asteroid mining “will mint more trillionaires than any industry in history.”) ¶ For the regular guy or gal with a 401K, there’ll be a fast-rising stock market — inflated not by financial shenanigans this time, but an actual increase in what the world counts as wealth.¶ For workers, there is the promise of sharing in the untold riches, both legally and otherwise. It would be hard to stop miners attaining mineral wealth beyond their paycheck, under the table, when your bosses are millions of miles away. Then there’s the likelihood of rapid advancement in this new economy, where the miners fast gain the knowledge necessary to become moguls.¶ “After several tours in space working for others, perhaps on six-month or year-long contracts, it's likely that some workers will partner to set up their own businesses there,” says Suarez. “Either serving the needs of increasing numbers of workers and businesses in space, marketing services to Earth, or launching asteroid mining startups themselves.” All in all, it’s starting to sound a damn sight more beneficial to the human race than the internet economy is. Not a moment too soon. I’ve written encouragingly about asteroid mining several times before, each time touting the massive potential wealth that seems likely to be made. And each time there’s been a sense of disquiet among my readers, a sense that we’re taking our rapacious capitalist ways and exploiting space.¶ Whereas the truth is, this is exactly the version of capitalism humanity has needed all along: the kind where there is no ecosystem to destroy, no marginalized group to make miserable. A safe, dead space where capitalism’s most enthusiastic pioneers can go nuts to their hearts’ content, so long as they clean up their space junk. ¶ ([Space junk](https://mashable.com/category/space-junk) is a real problem in orbital space because it has thousands of vulnerable satellites clustered closely together around our little blue rock. The vast emptiness of cislunar space, not so much.)¶ And because they’re up there making all the wealth on their commodities market, we down here on Earth can certainly afford to focus less on growing our stock market. Maybe even, whisper it low, we can afford a fully functioning social safety net, plus free healthcare and free education for everyone on the planet.¶ It’s also clearly the area where we should have focused space exploration all along. If we settle on Mars, we may disturb as-yet-undiscovered native bacteria — and as the character Nathan Joyce shouts at a group of “Mars-obsessed” entrepreneurs in Delta-V, Mars is basically filled with toxic sand and is thus looking increasingly impossible to colonize. (Sorry, Mark Watney from The Martian, those potatoes would probably kill you.)

#### Warming causes extinction.

Bill **McKibben 19**, Schumann Distinguished Scholar at Middlebury College; fellow of the American Academy of Arts and Sciences; holds honorary degrees from 18 colleges and universities; Foreign Policy named him to their inaugural list of the world’s 100 most important global thinkers. "This Is How **Human Extinction** Could Play Out." Rolling Stone. 4-9-2019. https://www.rollingstone.com/politics/politics-features/bill-mckibben-falter-climate-change-817310/

Oh, it could get **very bad**. In 2015, a study in the Journal of Mathematical Biology pointed out that if the world’s **oceans** kept warming, by 2100 they might become hot enough to “**stop oxygen production** by **phyto-plankton** by disrupting the process of photosynthesis.” Given that **two-thirds** of the **Earth’s oxygen** comes from phytoplankton, that would “likely result in the **mass mortality of animals and humans**.”A year later, above the Arctic Circle, in Siberia, a heat wave thawed a reindeer carcass that had been trapped in the permafrost. The exposed body released anthrax into nearby water and soil, infecting two thousand reindeer grazing nearby, and they in turn infected some humans; a twelve-year-old boy died. As it turns out, **permafrost** is a “very good preserver of **microbes** and **viruses**, because it is cold, there is no oxygen, and it is dark” — scientists have managed to revive an eight-million-year-old bacterium they found beneath the surface of a glacier. Researchers believe there are fragments of the **Spanish flu virus**, **smallpox**, and **bubonic plague** buried in Siberia and Alaska. Or consider this: as ice sheets melt, they take weight off land, and that can **trigger earthquakes** — seismic activity is already increasing in Greenland and Alaska. Meanwhile, the added weight of the new seawater starts to bend the Earth’s crust. “That will give you a **massive increase in volcanic activity**. It’ll activate faults to create earthquakes, submarine landslides, tsunamis, the whole lot,” explained the director of University College London’s Hazard Centre. Such a landslide happened in Scandinavia about eight thousand years ago, as the last Ice Age retreated and a Kentucky-size section of Norway’s continental shelf gave way, “plummeting down to the abyssal plain and creating a series of **titanic waves** that roared forth with a vengeance,” **wiping all signs of life** from coastal Norway to Greenland and “drowning the Wales-sized landmass that once connected Britain to the Netherlands, Denmark, and Germany.” When the waves hit the Shetlands, they were sixty-five feet high. There’s even this: if we keep raising carbon dioxide levels, we may not be able to think straight anymore. At a thousand parts per million (which is within the realm of possibility for 2100), human cognitive ability falls 21 percent. “The largest effects were seen for Crisis Response, Information Usage, and Strategy,” a Harvard study reported, which is too bad, as those skills are what we seem to need most. I could, in other words, do my best to scare you silly. I’m not opposed on principle — changing something as fundamental as the composition of the atmosphere, and hence the heat balance of the planet, is certain to trigger all manner of horror, and we shouldn’t shy away from it. The dramatic uncertainty that lies ahead may be the most frightening development of all; the physical world is going from backdrop to foreground. (It’s like the contrast between politics in the old days, when you could forget about Washington for weeks at a time, and politics in the Trump era, when the president is always jumping out from behind a tree to yell at you.) But let’s try to occupy ourselves with the most likely scenarios, because they are more than disturbing enough. Long before we get to tidal waves or smallpox, long before we choke to death or stop thinking clearly, we will need to concentrate on the most mundane and basic facts: everyone needs to eat every day, and an awful lot of us live near the ocean. FOOD SUPPLY first. We’ve had an amazing run since the end of World War II, with crop yields growing fast enough to keep ahead of a fast-rising population. It’s come at great human cost — displaced peasant farmers fill many of the planet’s vast slums — but in terms of sheer volume, the Green Revolution’s fertilizers, pesticides, and machinery managed to push output sharply upward. That climb, however, now seems to be running into the brute facts of heat and drought. There are studies to demonstrate the dire effects of warming on coffee, cacao, chickpeas, and champagne, but it is cereals that we really need to worry about, given that they supply most of the planet’s calories: corn, wheat, and rice all evolved as crops in the climate of the last ten thousand years, and though plant breeders can change them, there are limits to those changes. You can move a person from Hanoi to Edmonton, and she might decide to open a Vietnamese restaurant. But if you move a rice plant, it will die. A 2017 study in Australia, home to some of the world’s highest-tech farming, found that “**wheat productivity** has **flatlined** as a **direct result of climate change**.” After tripling between 1900 and 1990, wheat yields had stagnated since, as temperatures increased a degree and rainfall declined by nearly a third. “The chance of that just being variable climate without the underlying factor [of climate change] is less than one in a hundred billion,” the researchers said, and it meant that despite all the expensive new technology farmers kept introducing, “they have succeeded only in standing still, not in moving forward.” Assuming the same trends continued, yields would actually start to decline inside of two decades, they reported. In June 2018, researchers found that a two-degree Celsius rise in temperature — which, recall, is what the Paris accords are now aiming for — could cut U.S. corn yields by 18 percent. A four-degree increase — which is where our current trajectory will take us — would cut the crop almost in half. The United States is the world’s largest producer of corn, which in turn is the planet’s most widely grown crop. **Corn is vulnerable** because even a week of high temperatures at the key moment can **keep it from fertilizing**. (“You only get one chance to pollinate a quadrillion kernels of corn,” the head of a commodity consulting firm explained.) But even the hardiest crops are susceptible. Sorghum, for instance, which is a staple for half a billion humans, is particularly hardy in dry conditions because it has big, fibrous roots that reach far down into the earth. Even it has limits, though, and they are being reached. Thirty years of data from the American Midwest show that heat waves affect the “vapor pressure deficit,” the difference between the water vapor in the sorghum leaf’s interior and that in the surrounding air. Hotter weather means the sorghum releases more moisture into the atmosphere. Warm the planet’s temperature by two degrees Celsius — which is, again, now the world’s goal — and sorghum yields drop 17 percent. Warm it five degrees Celsius (nine degrees Fahrenheit), and yields drop almost 60 percent. It’s hard to imagine a topic duller than sorghum yields. It’s the precise opposite of clickbait. But **people have to eat**; in the human game, the single most important question is probably “What’s for dinner?” And when the answer is “Not much,” things **deteriorate fast**. In 2010 a severe heat wave hit Russia, and it wrecked the grain harvest, which led the Kremlin to ban exports. The global **price of wheat spiked**, and that helped **trigger the Arab Spring** — Egypt at the time was the largest wheat importer on the planet. That experience set academics and insurers to work gaming out what the next **food shock** might look like. In 2017 one team imagined a vigorous El Niño, with the attendant floods and droughts — for a season, in their scenario, corn and soy yields declined by 10 percent, and wheat and rice by 7 percent. The result was chaos: “quadrupled commodity prices, civil unrest, significant negative humanitarian consequences . . . **Food riots** break out in urban areas across the Middle East, North Africa, and Latin America. The euro weakens and the main European stock markets lose ten percent.” At about the same time, a team of British researchers released a study demonstrating that even if you can grow plenty of food, the transportation system that distributes it runs through just fourteen major choke-points, and those are vulnerable to — you guessed it — massive disruption from climate change. For instance, U.S. rivers and canals carry a third of the world’s corn and soy, and they’ve been frequently shut down or crimped by flooding and drought in recent years. Brazil accounts for 17 percent of the world’s grain exports, but heavy rainfall in 2017 stranded three thousand trucks. “It’s the glide path to a perfect storm,” said one of the report’s authors. Five weeks after that, another report raised an even deeper question. What if you can figure out how to grow plenty of food, and you can figure out how to guarantee its distribution, but the food itself has lost much of its value? The paper, in the journal Environmental Research, said that rising carbon dioxide levels, by speeding plant growth, seem to have reduced the amount of protein in basic staple crops, a finding so startling that, for many years, agronomists had overlooked hints that it was happening. But it seems to be true: when researchers grow grain at the carbon dioxide levels we expect for later this century, they find that minerals such as calcium and iron drop by 8 percent, and protein by about the same amount. In the developing world, where people rely on plants for their protein, that means huge reductions in nutrition: India alone could lose 5 percent of the protein in its total diet, putting 53 million people at new risk for protein deficiency. The loss of zinc, essential for maternal and infant health, could endanger 138 million people around the world. In 2018, rice researchers found “significantly less protein” when they grew eighteen varieties of rice in high–carbon dioxide test plots. “The idea that food became less nutritious was a surprise,” said one researcher. “It’s not intuitive. But I think we should continue to expect surprises. We are completely altering the biophysical conditions that underpin our food system.” And not just ours. People don’t depend on goldenrod, for instance, but bees do. When scientists looked at samples of goldenrod in the Smithsonian that dated back to 1842, they found that the protein content of its pollen had “declined by a third since the industrial revolution — and the change closely tracks with the rise in carbon dioxide.” Bees help crops, obviously, so that’s scary news. But in August 2018, a massive new study found something just as frightening: crop pests were thriving in the new heat. “It gets better and better for them,” said one University of Colorado researcher. Even if we hit the UN target of limiting temperature rise to two degrees Celsius, pests should cut wheat yields by 46 percent, corn by 31 percent, and rice by 19 percent. “Warmer temperatures accelerate the metabolism of insect pests like aphids and corn borers at a predictable rate,” the researchers found. “That makes them hungrier[,] and warmer temperatures also speed up their reproduction.” Even fossilized plants from fifty million years ago make the point: “**Plant damage** from insects **correlated** with rising and falling **temperatures**, reaching a maximum during the warmest periods.”

#### An asteroid collision would ensure extinction – would fundamentally alter the biosphere, don’t underestimate its risk. Hudson 19

Wesley Hudson ’19, news reporter for Express, “Asteroid alert: NASA warning as kilometre long space rock set to skim Earth at 25,000mph”, 8/28/19, Express, https://www.express.co.uk/news/science/1170826/asteroid-news-NASA-latest-space-rock-asteroid-1998-HL1-earth-danger-apocalypse

AN ASTEROID almost a kilometre wide is currently barreling through space at more than 25,000mph and is due to skim the earth towards the end of October. NASA’s Jet Propulsion Laboratory (JPL) claim the space rock will shoot past the earth within a “close” proximity of the planet in the early hours of October 26. The asteroid, dubbed 1998 HL1, is a so-called Near-Earth Object (NEO) flying on a Close Approach Trajectory. NASA expects the 1998 HL1 to come flying by dangerously close around 1.21am BST (17.21pm PDT). The daunting moment will mark anther journey around the sun for the asteroid since it was discovered in 1998. The asteroid will be travelling at a staggering speed of over 25,000mph as it barrels past the Earth. The JPL predict the asteroid could be between 440m and 990m wide. At its largest an asteroid of this size is bigger than the tallest building in the world, the Burj Khalifa in Dubai. Even at it’s smallest, 1998 HL1 is still bigger than The Shard. Since it was discovered, 1998 HL1 has been seen up to 408 times. An NEO is an asteroid or comet which is on an orbital path intersecting that of the Earth's. This asteroid will miss the Earth by almost four million miles. If it were to strike the Earth, an asteroid of this size would cause catastrophic damage. The extinction of the dinosaurs in the Cretaceous-Tertiary event 65million years ago is famously believed to have been caused by a massive asteroid impact. The Chicxulub Crater in Mexico is the most commonly accepted point of impact, with the responsible body thought to be around 10km in diameter. A car-sized asteroid is estimated to hit the Earth roughly once a year. The majority of asteroids on track for the planet are usually burnt up as they enter the Earth's atmosphere. NASA administrator Jim Bridenstine has previously warned a potential asteroid collision is **more likely** then people realise. He said: "We have to make sure that people understand that this is not about Hollywood, it's not about the movies. "This is about ultimately protecting the only planet we know, right now, to host life - and that is the planet Earth.” NASA is currently in the process of developing the Double Asteroid Redirection Test (DART). DART will test if it is possible to redirect asteroids that are threatening to impact with Earth. SpaceX chief Elon Musk had previously tweeted fears of a deadly collision that Earth was not prepared for. Mr Musk tweeted: “**A big rock will hit Earth eventually & we currently have no defence**.”

#### Don’t write our impacts off as low probability – asteroid collision is complex and the existence of space keyholes exponentially increases the risk of collision. Vereš ’19

Peter Vereš ’19, Harvard-Smithsonian Center for Astrophysics, “Chapter 6 Vision of Perfect Observation Capabilities”, 2019, Planetary Defense, Space and Society, https://dl1.cuni.cz/pluginfile.php/634091/mod\_resource/content/1/Planetary%20Defence.pdf

Often, uncertain orbits are a source of elevated impact risks of some NEOs with the Earth. The impact probability of an asteroid with Earth is a **complex problem**. First, the orbits of Earth and the asteroid should be close enough or even intersect; second, the Earth and asteroid should meet at the intersection at the same time. If these conditions are met, then one can assess how close the asteroid flies around the Earth at a given time, or whether it will hit the Earth. One must remember that **each asteroid orbit comes with uncertainties** and therefore, instead of a single accurate solution where the asteroid will hit the Earth or miss it, there is always a realm of possible solutions within the orbit uncertainties. The tangent plane to the asteroid’s trajectory at the time of impact, or close approach, is called a b-plane. At a given time of a predicted impact, all possible closest distances to the Earth of possible orbits create an area on the tangent plane. If the area contains the Earth, then the impact probability for that epoch is non-zero and in a simple approximation can be denoted as a ratio of an area of Earth cross section and the entire area with possible orbits going through the b-plane. It happens that a newly discovered NEO with a short arc that is coming very close to the Earth has a non-zero impact probability, because its orbit is highly uncertain and the area on the b-plane is very large. Typically, further observations improve the orbit, and the impact risk for a given epoch falls to zero. Some objects, however, have orbits with low orbital uncertainty, but still have non-zero impact probability, such as Bennu. The non-zero impact probability is computed for a given time in the future, but even if the orbit is known very well today, **small perturbations** from planets and non-gravitational forces **increase the uncertainty** for future impacts. That is why NASA’s Sentry is providing predictions only for the next 100 years. A close flyby of a spacecraft around an asteroid may improve the asteroid’s orbit significantly, however, it does not fully mitigate its impact in the future, due to the presence of keyholes (Chodas 1999)—small areas in space near Earth. Keyholes are specific for asteroids flying very close to the Earth and are rather small, from a few to hundreds of kilometers across. If the keyhole is hit during the NEO flyby, the orbit of the NEO becomes resonant with Earth and the NEO will return to Earth regularly, **increasing its impact probability**. Thus, in case of a very near Earth flyby, **the orbit needs to be known with such precision** (~km) **that keyhole avoidance is confirmed**. NASA has even created the NEO Deflection App,1 where the public can try to change the orbit of a hypothesized NEO on direct impact trajectory. For Earth impact monitoring, the accuracy of orbits and orbital uncertainties is crucial and deserves more attention. The future of orbit determination and uncertainty mitigation will depend more and more on sophisticated software that will be able to handle orbital computation in detail; assess uncertainties and errors of measurements; coordinate a list of objects that are crucial for follow-up or orbit improvement, or even automatically point the telescopes in a network to observe those asteroids; measure their positions; and submit the data to MPC. This automated process is more or less implanted by several surveys (CSS, LCOGT) and agencies (ESA, MPC).

# Case

### A1

#### Tensions non-unique - Pollard 21 isolates alt causes like the Chinese invasion of India

#### LINK FILTER – The affirmative does not stop the commercialization of space. Barring appropriation only limits the ownership of real property, use is still allowed. 100% of aff harms result from use, like the claiming of resources in space, not ownership of real estate.

Švec et al 20 [Martin Švec, Petr Boháček, and Nikola Schmidt, “Utilization of Natural Resources in Outer Space: Social License to Operate as an Alternative Source of Both Legality and Legitimacy,” Oil Gas Energy Law J, 2020. <https://planetary-defense.eu/wp-content/uploads/2020/11/ov18-1-article17-notitle.pdf>] CT

2.2.1. Is the Utilization of Space Resources Implicitly Prohibited by the OST?

When the OST was drafted, exploitation of space resources was not considered feasible. Thus, the treaty does not contain any specific reference to space resource activities. However, silence of the OST does not necessarily imply unlawfulness of these activities. On the contrary, the freedom of exploration, use and access is one of the most fundamental principles of international space law. Art I of the OST reads: “Outer space, including the Moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies.“25 It is worth mentioning that France already in 1966, during the negotiations of the OST, emphasised that it is important to know exactly what is meant by the term ‘use’, and whether it is an equivalent to the term ‘exploitation’. 26 While there is a general consensus on the interpretation of the term “exploration” as referring to discovery activities of the space environment for scientific reasons, a large disagreement exists concerning the term ‘use’.27 In this context the Board of Directors of the International Institute of Space Law (IISL) hold that there is no international agreement whether the right of “free use” includes the right to take and consume nonrenewable natural resources, including minerals and water on celestial bodies.28 The authors of this article are of the opinion that the term “use” seems to be broad enough to encompass the exploitation of natural resources. Pursuant to the Vienna Convention on the Law of Treaties, a treaty shall be interpreted in good faith in accordance with the ordinary meaning to be given to the terms of the treaty in their context and in the light of its object and purpose. First, the term “use” usually refers to both the non-economic and economic utilization and, thus, the use of outer space for economic ends can include exploitation with the objective of making economic profit.29 Second, the OST’s preamble reveals that the treaty does not aim to restrict the use of outer space, but rather to promote free exploration and use of outer space and the opposite interpretation would lead to an unnecessary impediment to the development of the uses of outer space.30 What is more, these conclusions may also be derived from the Moon Agreement. Although this agreement has been ratified only by 18 states, it may help understand the meaning of the international space law principles enshrined in the OST. The preamble of the Moon Agreement refers to the “benefits which may be derived from the exploitation of the natural resources of the moon and other celestial bodies,” and art 11 envisages the establishment of an international regime to govern the exploitation of natural resources of the Moon. In addition, Hobe argues, that specific uses are only excluded if they are explicitly excluded in other provisions of the OST, such as prohibition of certain military activities.31

2.2.2. Does the Utilization of Space Resources Contradict the Principle of NonAppropriation?

The principle of non-appropriation is one of the most fundamental rules regulating the exploration and use of outer space. Art II of the OST reads as follows: “Outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.” As a consequence, outer space is generally understood as a res communis omnium, 32 in its legal characterisation similar to the law governing the high seas or the deep seabed. An analysis of these already existing regimes based on the non-appropriation principle reveals that an exploitation of natural resources is perfectly compatible with the principle of nonappropriation.33 Additionally, even the Moon Agreement suggests that the exploitation of the natural resources of the moon does not constitute a means of appropriation. In particular, art 11 of the Moon Agreement reiterates that outer space is not subject to national appropriation and it explicitly envisages the establishment of an international legal regime to govern the exploitation of space resources.34

#### Turn: The QUAD deters Chinese aggression.

John Grady [John Grady, a former managing editor of Navy Times, retired as director of communications for the Association of the United States Army], “‘Quad’ Will Continue to Push Back Against Chinese Aggression in Indo-Pacific, Panel Says,” *USNI News*. Nov. 3, 2021. Accessed April 10, 2022. <https://news.usni.org/2021/11/03/quad-will-continue-to-push-back-against-chinese-aggression-in-indo-pacific-panel-says> AT

The more China pursues its ambitions in the Indo-Pacific, the more the United States, Japan, India and Australia will do to push back against Beijing’s bullying, a panel of regional security experts said Tuesday.¶ Michael Green, senior vice president for Asia at the Center for Strategic and International Studies, said President Xi Jinping “is not putting on his Mr. Nice face” in looking abroad, as he heads into the next party Congress.¶ “These four navies [in the Quad] are very powerful” and when acting together send a message to China that they intend to secure trade routes and, as democracies, uphold the rule of law in international disputes, as in the case of Taiwan, he said.¶ Speaking from Canberra, Susannah Patton, a research fellow at the United States Studies Center at the University of Sydney, said “the Quad does [thwart Chinese ambitions] just by existing. It’s a positive partnership” that showed its value to the region in the past year by distributing COVID-19 vaccines to control the pandemic.

#### Space is key to Indian Economic growth. Pandey 3/30

Shubhang Pandey, “How Indian Economy Can Be Expanded Through Space Privatisation,” *Swarajya.* 3/30/22. <https://swarajyamag.com/science/how-indian-economy-can-be-expanded-through-space-privatisation>

After nearly six decades, the Indian space sector is gearing up for transformation. Allowing private entities into end-to-end space activity, predominantly a government monopoly so far, is a welcome change and one in line with the view of achieving a $5 trillion economy by 2024.

Despite the success of its comparatively nascent and relatively cheap missions to space, India manages to occupy only 2 per cent, or $7 billion, of the global space economy. The small share isn’t solely based on technology and resources but on policy too.

The space economy market is said to grow by over $1 trillion by 2040, in line with the government’s aim of making India a $5 trillion economy by 2024. The Indian space sector then would need to grow to $50 billion by 2024 and contribute 1 per cent to the GDP (gross domestic product).

Only the private sector, particularly the downstream sector, can achieve 48 per cent CAGR (compound annual growth rate), so it is critical that Indian private players participate in the new commercial space age.

#### Econ growth key – millions live in poverty.

SOS Children’s Village, “POVERTY IN INDIA: FACTS AND FIGURES ON THE DAILY STRUGGLE FOR SURVIVAL” No Date. <https://www.soschildrensvillages.ca/news/poverty-in-india-602>

Two-thirds of people in India live in poverty: 68.8% of the Indian population lives on less than $2 a day. Over 30% even have less than $1.25 per day available - they are considered extremely poor. This makes the Indian subcontinent one of the poorest countries in the world; women and children, the weakest members of Indian society, suffer most.

Indian economic decline risks nuclear war:

Ramesh Thakur, 10/6/2014 (Professor in the Crawford School of Public Policy, Australian National University, “India’s illusory nuclear gains,” <http://www.japantimes.co.jp/opinion/2014/10/06/commentary/world-commentary/indias-illusory-nuclear-gains/>, Accessed 7/14/2016, rwg)

For nuclear Armageddon, deterrence or fail-safe mechanisms need to break down only once. This is not a comforting equation. As long as any one country has nuclear weapons, others will want them. As long as nuclear weapons exist, they will be used again someday by design, miscalculation, rogue launch, human error or system malfunction. And any nuclear war fought by any set of nuclear-armed states could be catastrophic for the whole world. Nuclear weapons may be sought for (1) compellence, (2) defense, (3) deterrence and/or (4) status. “Compellence” means the use of coercion to force an adversary to stop or reverse something already being done, or to do something he would not otherwise do. There is no demonstrable instance of a nonnuclear state having been cowed into changing its behavior by the threat of being bombed with nuclear weapons. Indian doctrine, backed by deployment patterns, explicitly eschews any intent to use nuclear weapons as tools of coercion. It is hard to see any role for India’s nuclear armaments as instruments of defense. India’s no-first-use doctrine disavows use of nuclear weapons in response to conventional attacks. Nuclear weapons cannot be used for defense by nuclear-armed rivals whose mutual vulnerability to second-strike retaliatory capability guarantees that any escalation through the nuclear threshold would be mutual national suicide. India’s nuclear arsenal offers no defense against a major conventional attack by China, Russia or the U.S. — the only three countries with the capability to do so. As for intent, Russia is a diplomatic ally and friend of long standing. Relations with the U.S. have warmed to a remarkable degree, including a just concluded high-profile visit by Prime Minister Narendra Modi, which was remarkable for the fact that a person denied a U.S. visa from 2005 until May 2014 was hosted to a state dinner by President Barack Obama. Deepening and broadening bilateral Sino-Indian relations, and cooperation on several major international issues based on converging interests in forums like the group of Brazil, Russia, India, China and South Africa (BRICS), provide considerable substance, texture and ballast to that relationship today. During his recent visit, Chinese President Xi Jinping signed agreements to invest $20 billion to upgrade India’s woeful infrastructure. With nuclear weapons being unusable for defense, their sole operational purpose and role is mutual deterrence. Deterrence stability depends on rational decision-makers being always in office on all sides: a shaky precondition. It depends equally critically on there being no rogue launch, human error or system malfunction: an impossibly high bar. Nuclear weapons have failed to stop wars between nuclear and nonnuclear rivals (Korea, Afghanistan, Falklands, Vietnam, 1991 Persian Gulf War). To believe in deterrence is to argue that Iran should be encouraged, indeed facilitated in getting the bomb in order to contribute to the peace and stability of the Middle East where presently Israel is the only nuclear-armed state. Good luck and good night. The subcontinent’s history since 1998 gives the lie to the then-hopes and expectations, on both sides of the border, that nuclearization would prove to be a largely stabilizing factor. Powerful domestic constituencies have grown in both countries to identify multiple threats that justify a matching expansion of a highly elastic nuclear posture. The low-cost, low-risk covert war in the shadow of the subcontinent’s nuclearization had three attractions for Pakistan: It would weaken India by raising the human and economic costs of Kashmir’s occupation; the fear of nuclear escalation would raise the threshold for cross-border Indian retaliatory raids; and it would help internationalize the Kashmir dispute by highlighting the risk of nuclear escalation. Pakistan has invested in terrorist groups as part of its unconventional inventory against India. In responding to a terrorist attack, any deliberate escalation by India through the nuclear threshold would be extremely high-risk. The development of tactical missiles and battlefield nuclear weapons by the two sides, whose utility is contingent on proximity to battlefields, multiply the risks. India must also live with the nightmare possibility of jihadists getting their hands on Pakistan’s nuclear weapons. While obviously more acute for Pakistan, the threat is grave for India also. Just what is a “credible minimum deterrent” — India’s official doctrine — that would dissuade nuclear blackmail and coercion and permit second-strike nuclear retaliation? China and Pakistan are incommensurate in their national power, strategic frames and military capabilities. The requirements of numbers, reach, deployment patterns and locations, and the distribution between land-based, air-launched and sea-borne platforms, are as mutually incompatible between them. That which is credible toward China cannot be the minimum toward Pakistan, and vice versa. Few analysts would take issue with the claim that currently nonnuclear-armed Germany has a higher status, weight and clout in Europe and the world than nuclear-armed Britain and France. Nuclear brinkmanship earns North Korea neither prestige, power nor friends; nonnuclear-armed South Korea fares better on all three counts. India does have a higher international profile today than in 1998. This is despite, not because of, nuclear weapons, and rests in its economic performance and information technology credentials. No serious Indian analyst is likely to claim that Pakistan’s profile has risen alongside India’s since 1998, despite Islamabad’s more focused efforts on expanding, deepening and broadening its nuclear weapons capability. If India’s economy stutters, its social pathologies intensify and multiply and its political system proves incapable of making and implementing hard decisions. The fact that India has nuclear weapons will add to international unease and worries rather than enhance its global stature and international prestige. If India’s economic future is mortgaged to bad governance rooted in populist politics pursued by corrupt politicians, other countries will return India to the basket of benign neglect while offering ritual but empty praise for its rich civilization and culture. Prime Minister Modi at least seems to get this.

1. **India-US Relations Key to every existential threat**

**Armitage et al ‘10**

**[Richard is the President of Armitage International and former Deputy Secretary of State. R. Nicholas Burns is a Professor in the Practice of Diplomacy and International Politics, Kennedy School of Government, Harvard University. Richard Fontaine is the President of the Center for New American Security. “Natural Allies: A Blueprint for the Future of U.S.-India Relations,” October, Center for New American Security, http://belfercenter.ksg.harvard.edu/files/Burns%20-%20Natural%20Allies.pdf]**

**A strengthened U.S.-India strategic partnership is thus imperative in this new era. The transformation of U.S. ties with New Delhi over the past 10 years, led by Presidents Clinton and Bush, stands as one of the most significant triumphs of recent American foreign policy.** It has also been a bipartisan success. In the last several years alone, the United States and India have completed a landmark civil nuclear cooperation agreement, enhanced military ties, expanded defense trade, increased bilateral trade and investment and deepened their global political cooperation.¶ **Many prominent Indians and Americans, however, now fear this rapid expansion of ties has stalled.** **Past projects remain incomplete, few new ideas have been embraced by both sides, and the forward momentum that characterized recent cooperation has subsided.** The Obama administration has taken significant steps to break through this inertia, including with its Strategic Dialogue this spring and President Obama’s planned state visit to India in November 2010. Yet there remains a sense among observers in both countries that this critical relationship is falling short of its promise.¶ We believe **it is critical to rejuvenate the U.S.- India partnership and put U.S. relations with India on a more solid foundation.** The relationship requires a bold leap forward. The United States should establish a vision for what it seeks in the relationship and give concrete meaning to the phrase “strategic partnership.” A nonpartisan working group of experts met at the Center for a New American Security (CNAS) over the past eight months to review the main pillars of the U.S.-India relationship and we articulate here a specific agenda of action.¶ In order to chart a more ambitious U.S.-India strategic partnership, we believe that the United States should commit, publicly and explicitly, to work with India in support of its permanent membership in an enlarged U.N. Security Council; seek a broad expansion of bilateral trade and investment, beginning with a Bilateral Investment Treaty; greatly expand the security relationship and boost defense trade; support Indian membership in key export control organizations, a step toward integrating India into global nonproliferation efforts; and liberalize U.S. export controls, including the removal of Indian Space Research Organization (ISRO) subsidiaries from the U.S. Entity List**.**¶ These and the other actions outlined in this report will require India to make a number of commitments and policy changes, including taking rapid action to fully implement the Civil Nuclear Agreement; raising its caps on foreign investment; reducing barriers to defense and other forms of trade; enhancing its rules for protecting patents and other intellectual property; further harmonizing its export control lists with multilateral regimes; and seeking closer cooperation with the United States and like-minded partners in international organizations, including the United Nations**.** ¶ The U.S. relationship with India should be rooted in shared interests and values and should not be simply transactional or limited to occasional collaboration. India’s rise to global power is, we believe, in America’s strategic interest. As a result, the United States should not only seek a closer relationship with India, but actively assist its further emergence as a great powe**r.**¶ **U.S. interests in a closer relationship with India include:**¶ • **Ensuring a stable Asian and global balance of power.**¶ **• Strengthening an open global trad[e]ing system.**¶ **• Protecting and preserving access to the global commons (air, sea, space, and cyber realms).**¶ **• Countering terrorism and violent extremism.**¶ **• Ensuring access to secure global energy resources.**¶ **• Bolstering the international nonprolif**

**eration regime.**¶ **• Promoting democracy and human rights.**¶ **• Fostering greater stability, security and economic prosperity in South Asia, including in Pakistan, Afghanistan, Nepal, Bangladesh and Sri Lanka.**¶ **A strong U.S.-India strategic partnership will prove indispensable to the region’s continued peace and prosperity. Both India and the United States have a vital interest in maintaining a stable balance of power in Asia. Neither seeks containment of China, but the likelihood of a peaceful Chinese rise increases if it ascends in a region where the great democratic powers are also strong. Growing U.S.-India strategic ties will ensure that Asia will not have a vacuum of power and will make it easier for both Washington and New Delhi to have productive relations with Beijing. In addition, a strengthened relationship with India, a natural democratic partner, will signal that the United States remains committed to a strong and enduring presence in Asia.**¶ The need for closer U.S.-India cooperation goes well beyond regional concerns. In light of its rise, **India will play an increasingly vital role in addressing virtually all major global challenges.** **Now is the time to transform a series of bilateral achievements into a lasting regional and global partnership.**

### A2

#### Government development makes space race non-unique - Gettleman and Kumar 19 says that a government test of an ASAT weapon increased tensions, not private commercialization. Nanda says government is creating DSA

#### No NFU link - Bano 20 doesn’t even mention nuclear weapons at all

#### Competition in space increases cooperation and decreases conflict.

Cobb 20 [Whitman, Cobb, Wendy N.. Privatizing Peace : How Commerce Can Reduce Conflict in Space, Taylor & Francis Group, 2020. ProQuest Ebook Central, <http://ebookcentral.proquest.com/lib/marlboroughschool-ebooks/detail.action?docID=6228909>.] CT

The value of competition

As noted in the first chapter, a subsidiary argument offered here is that, even if a space race should break out, military or civilian in nature, competition is not necessarily a bad thing. Much of the technological development noted previously that arose from space investment came at the height of the space race as both the US and the USSR were pouring billions of dollars into a race to the moon. The race itself had a civilian face with a military undertone, but its benefits were on the whole, positive. No overt military conflict arose, there was a significant investment in research, development, and technology, and the two space powers realized that they needed some sort of international framework to preserve their ability to operate in space. Both of these elements continue to be present today.

First, the increased threat of conflict in space could, coming as it does with an increased number of public and private actors and a greater economic threat, impress upon space participants the need to reign in dangerous actions and rhetoric. While it took an atmospheric nuclear test on the part of the Soviets to encourage both the US and USSR to come to the table in the 1960s, increasing awareness of economic and military dependence and the consequences arising from conflict in space could increase the enthusiasm to pursue new international agreements. For its part, the US military increasingly recognizes the dangers and the need to mitigate them, however, mitigation efforts have largely concentrated on offensive rather than defensive capabilities. 59 A focus on offensive weapons can only aggravate the situation and there are still significant technological hurdles in developing on-orbit offensive weapons. As such, a move away from such rhetoric, like Johnson-Freese argues for, is necessary.

Competition can also increase technological capabilities and those technological capabilities can in turn enable cooperation. 60 China is a case in point. In the 1990s and early 2000s when they were beginning to restart a human spaceflight program, Chinese officials often stated their desire to work with other powers in space, particularly the United States. China did in fact forge ties with other countries via space, in particular Brazil. However, as Chinese spaceflight technology advanced, the rhetoric of cooperation was pulled back some over a desire to enter into a partnership on equal footing. Once the Chinese could establish their abilities in space, they would be able to cooperate with potential partners as an equal, rather than junior, partner. 61

As more countries develop space technologies, the ability to help one another out also increases.

The Agreement on the Rescue of Astronauts obligates signatories to “take all possible steps to rescue and assist astronauts in distress and promptly return them to the launching state.” 62 More states with the ability to conduct crewed operations in space will only facilitate this type of help and cooperation. While fictional, this is just the type of scenario that played out in the book (and later movie) The Martian . When a supply rocket blows up on launch, NASA turns to China for a replacement that enables a Mars crew to return to Mars to rescue a stranded astronaut. These types of cooperative activities can in turn foster greater cooperation in areas other than space and science. In fact, one of the causal mechanisms through which the economic peace is hypothesized to act is via increased connections between people and private actors which can foster communication and mutual trust. 63 Similarly, sociological liberalism embraces the importance of links among people to create more peaceful global relations. 64 As greater cooperation emerges in space, it can spill over into other areas of interstate relations.

To return to the discussion of space as a global commons, the increased competition and potentially increased cooperation could lead to the type of situation that Ostrom finds powerful in fostering collective action. Increased ties, diplomatically and/or economically, can reduce the costs of engaging in collective action. Historically, space itself has been used to monitor and verify international agreements, thereby lowering the information costs for participants. The openness of space and the vulnerability of space infrastructure makes it an arena that is easily monitored; it takes a fairly low level of technology to track satellites in their orbits. States can provide the means through which private actors are coordinated and norms enforced. Private actors, given their increasing role in the commercial and military aspects of space can also be empowered and lend considerable weight to the discussions. Thus, while the commercial space peace theory presented here may seem rather pessimistic about the possibility of cooperation among states, it can also be seen as an optimistic vision where increased economic ties between space and among actors, state and non-state alike, bring countries to the negotiating table and create the conditions needed to ensure collective action.

The remainder of this book will take up various aspects related to this argument. The next chapter examines military and geopolitical considerations in space conflict while Chapter 6 discusses the various actors involved. Chapter 6, in particular, focuses on the new non-state actors that are driving significant change in earth’s relationship to space. Finally, Chapter 7 looks at the possibility of space races in the future given this new space environment with its proliferation of players. It ends with several policy suggestions that could be pursued to reduce the level of tension among space powers and create a scenario that recognizes both the dangers and promises of space.