### 1

#### Interpretation – the Affirmative must present a delineated enforcement mechanism in the 1AC.

#### Frameworks for appropriation already exist – how/where they’re enforced on private entities is the core question of the topic

Norton **Rose, 21** (Norton Rose, Outer Space: The New Frontier for Restructuring and Insolvency, No Publication, https://www.nortonrosefulbright.com/en/knowledge/publications/b34b1f80/outer-space-the-new-frontier-for-restructuring-and-insolvency, 9-2021)//iLake-💣🍔

Moreover, the liability framework established by the Outer Space Treaty and the Liability Convention does not provide direct enforcement remedies to private entities, despite non-state activity in outer space overtaking the traditional government-focused space initiatives of previous decades

#### Violation: they don’t

#### Standards

#### 1] Shiftiness- They can redefine the 1AC’s enforcement mechanism in the 1AR which allows them to recontextualize their enforcement mechanism to wriggle out of DA, NC and K links since all links are predicated on type of enforcement i.e. Mining DA, Property NC, and any PIC or Counterplan

#### 2] Real World - Policymakers will always specify how the mandates of the plan should be endorsed. It also means zero solvency, absent spec, governments can circumvent the Aff’s movement since there is no delineated way to enforce the affirmative which means there’s no way to actualize any of their solvency arguments – we also can never take their education into the real world

#### ESpec isn’t regressive or arbitrary- it’s central to any advocacy about private appropriation since the only concern with international space frameworks is how effective its enforcement is – their lack of uniqueness ev on the 1AC proves the need to spec

#### Fairness and education are voters – its how judges evaluate rounds and why schools fund debate

#### DTD – it’s key to norm set and deter future abuse

#### Neg theory is DTD - 1ARs control the direction of the debate because it determines what the 2NR has to go for – DTD allows us some leeway in the round by having some control in the direction

#### Competing interps – Reasonability invites arbitrary judge intervention and a race to the bottom of questionable argumentation – it also collapses since brightlines operate on an offense-defense paradigm

#### No RVIs – A – Going all in on theory kills substance education which outweighs on timeframe B - Discourages checking real abuse which outweighs on norm-setting C – Encourages theory baiting – outweighs because if the shell is frivolous, they can beat it quickly D – its illogical for you to win for proving you were fair – outweighs since logic is a litmus test for other arguments

### 2

#### Counterplan Text: The appropriation of outer space by private entities is unjust except by space mining expeditions.

#### Mining is now – multiple companies are competing in mineral exploitation to obtain rare earth metals.

Gilbert 21 [Alex Gilbert is a complex systems researcher and a PhD student in space resources at the Colorado School of Mines. Milken Institute, “Mining in Space Is Coming”; <https://www.milkenreview.org/articles/mining-in-space-is-coming>] kelvin

Space exploration is back. after decades of disappointment, a combination of better technology, falling costs and a rush of competitive energy from the private sector has put space travel front and center. indeed, many analysts (even some with their feet on the ground) believe that commercial developments in the space industry may be on the cusp of starting the largest resource rush in history: mining on the Moon, Mars and asteroids.

While this may sound fantastical, some baby steps toward the goal have already been taken. Last year, NASA awarded contracts to four companies to extract small amounts of lunar regolith by 2024, effectively beginning the era of commercial space mining. Whether this proves to be the dawn of a gigantic adjunct to mining on earth — and more immediately, a key to unlocking cost-effective space travel — will turn on the answers to a host of questions ranging from what resources can be efficiently.

As every fan of science fiction knows, the resources of the solar system appear virtually unlimited compared to those on Earth. There are whole other planets, dozens of moons, thousands of massive asteroids and millions of small ones that doubtless contain humungous quantities of materials that are scarce and very valuable (back on Earth). Visionaries including Jeff Bezos imagine heavy industry moving to space and Earth becoming a residential area. However, as entrepreneurs look to harness the riches beyond the atmosphere, access to space resources remains tangled in the realities of economics and governance.

Start with the fact that space belongs to no country, complicating traditional methods of resource allocation, property rights and trade. With limited demand for materials in space itself and the need for huge amounts of energy to return materials to Earth, creating a viable industry will turn on major advances in technology, finance and business models.

That said, there’s no grass growing under potential pioneers’ feet. Potential economic, scientific and even security benefits underlie an emerging geopolitical competition to pursue space mining. The United States is rapidly emerging as a front-runner, in part due to its ambitious Artemis Program to lead a multinational consortium back to the Moon. But it is also a leader in creating a legal infrastructure for mineral exploitation. The United States has adopted the world’s first space resources law, recognizing the property rights of private companies and individuals to materials gathered in space.

However, the United States is hardly alone. Luxembourg and the United Arab Emirates (you read those right) are racing to codify space-resources laws of their own, hoping to attract investment to their entrepot nations with business-friendly legal frameworks. China reportedly views space-resource development as a national priority, part of a strategy to challenge U.S. economic and security primacy in space. Meanwhile, Russia, Japan, India and the European Space Agency all harbor space-mining ambitions of their own. Governing these emerging interests is an outdated treaty framework from the Cold War. Sooner rather than later, we’ll need new agreements to facilitate private investment and ensure international cooperation.

What’s Out There

Back up for a moment. For the record, space is already being heavily exploited, because space resources include non-material assets such as orbital locations and abundant sunlight that enable satellites to provide services to Earth. Indeed, satellite-based telecommunications and global positioning systems have become indispensable infrastructure underpinning the modern economy. Mining space for materials, of course, is another matter.

In the past several decades, planetary science has confirmed what has long been suspected: celestial bodies are potential sources for dozens of natural materials that, in the right time and place, are incredibly valuable. Of these, water may be the most attractive in the near-term, because — with assistance from solar energy or nuclear fission — H2O can be split into hydrogen and oxygen to make rocket propellant, facilitating in-space refueling. So-called “rare earth” metals are also potential targets of asteroid miners intending to service Earth markets. Consisting of 17 elements, including lanthanum, neodymium, and yttrium, these critical materials (most of which are today mined in China at great environmental cost) are required for electronics. And they loom as bottlenecks in making the transition from fossil fuels to renewables backed up by battery storage.

The Moon is a prime space mining target. Boosted by NASA’s mining solicitation, it is likely the first location for commercial mining. The Moon has several advantages. It is relatively close, requiring a journey of only several days by rocket and creating communication lags of only a couple seconds — a delay small enough to allow remote operation of robots from Earth. Its low gravity implies that relatively little energy expenditure will be needed to deliver mined resources to Earth orbit.

The Moon may look parched — and by comparison to Earth, it is. But recent probes have confirmed substantial amounts of water ice lurking in permanently shadowed craters at the lunar poles. Further, it seems that solar winds have implanted significant deposits of helium-3 (a light stable isotope of helium) across the equatorial regions of the Moon. Helium-3 is a potential fuel source for second and third-generation fusion reactors that one hopes will be in service later in the century. The isotope is packed with energy (admittedly hard to unleash in a controlled manner) that might augment sunlight as a source of clean, safe energy on Earth or to power fast spaceships in this century. Between its water and helium-3 deposits, the Moon could be the resource stepping-stone for further solar system exploration.

Asteroids are another near-term mining target. There are all sorts of space rocks hurtling through the solar system, with varying amounts of water, rare earth metals and other materials on board. The asteroid belt between the orbits of Mars and Jupiter contains most of them, many of which are greater than a kilometer in diameter. Although the potential water and mineral wealth of the asteroid belt is vast, the long distance from Earth and requisite travel times and energy consumption rule them out as targets in the near term.

Even the surface of celestial bodies pose a challenge to mining machinery since they consist of unconsolidated rocky materials called regolith instead of more familiar soil.

Wannabe asteroid miners will thus be looking at smaller near-Earth asteroids. While they are much further away than the Moon, many of them could be reached using less energy — and some are even small enough to make it technically possible to tow them to Earth orbit for mining.

Space mining may be essential to crewed exploration missions to Mars. Given the distance and relatively high gravity of Mars (twice that of the Moon), extraction and export of minerals to Earth seems highly unlikely. Rather, most resource extraction on Mars will focus on providing materials to supply exploration missions, refuel spacecraft and enable settlement.

Technology Is the Difference

The prospects for space mining are being driven by technological advances across the space industry. The rise of reusable rocket components and the now-widespread use of off-the-shelf parts are lowering both launch and operations costs. Once limited to government contract missions and the delivery of telecom satellites to orbit, private firms are now emerging as leaders in developing “NewSpace” activities — a catch-all term for endeavors including orbital tourism, orbital manufacturing and mini-satellites providing specialized services. The space sector, with a market capitalization of $400 billion, could grow to as much as $1 trillion by 2040 as private investment soars.

But despite the high-profile commercial advances, governments still call the shots on the leading edge of space resource technologies. The United States extracted the first extraterrestrial materials in space from the Moon during the Apollo missions, followed by the Soviet Union’s recoveries from crewless Luna missions. President Biden recently borrowed one of the Apollo lunar rocks for display in the Oval Office, highlighting the awe that deep space can still summon.

For the time being, scientific samples remain the goal of mining. Last October, NASA’s OSIRIS-REx mission — due to return to Earth in 2023 — collected a small amount of material from the asteroid Bennu. In December, Japan returned a sample of the asteroid Ryugu with the Hayabusa2 spacecraft. And several weeks later, China’s Chang’e 5 mission returned the first lunar samples since the 1970s.

Sample collection is accelerating, with recent missions targeting Mars. Japan is planning to visit the two moons of Mars and extract a sample from one. NASA’s robotic Perseverance rover will collect and cache drilled samples on Mars that could later be returned to Earth. Perseverance also carries gear for the unique MOXIE experiment on Mars — an attempt to produce oxygen on the planet with technologies that could eventually extract oxygen for astronauts to breath and refuel spacecraft.It’s about as wide as the Eiffel Tower is tall and it could be where we obtain the elements needed to power bases on the moon, Mars or in orbit one day.

#### Private companies are key to space mining – investors, profitability, and market demand.

Krishnan 20 [C A Krishnan, 8-6-2020, "Space mining: Just around the corner?," Week, <https://www.theweek.in/news/sci-tech/2020/08/06/Space-mining-Just-around-the-corner.html> [accessed 12-6-21] lydia

A Mars mission carrying 100 metric tons cargo in 2022 followed by a manned mission by 2024 are the immediate milestones of Elon Musk’s SpaceX plan which aims to create a self sustaining Mars city by 2050. Just a few decades back this would have sounded as fantasy, but today it looks as if this time frame may actually be bettered. Space missions are set to undergo revolutionary changes and Elon Musk’s vision and timelines are indicators of this. Space is increasingly being seen as a treasure trove of precious minerals and also a place for future human habitation beyond the earth. Global private space industry investors believe that space mining has the potential to shape and define the 21st Century. NASA estimates that the 'Asteroid belt’ holds minerals worth quintillion of dollars. American astrophysicist Neil Degrasse Tyson believes, “The first trillioners will be those who mine asteroids”. The “Main Asteroid Belt” is located between the orbits of Mars and Jupiter, about 450 to 650 million Kilometers from earth, with million asteroids in it. Over the decades, apart from Moon and Mars, governments and private agencies have been carrying out extensive research and studying asteroids for their composition, possibility of mining them and their mining value —Asteriod ‘Bennu’ has been assessed at $670 million and asteroid ‘2011 UW158’ at $ 5.7 trillion. Transportation of the mined resources for utilisation, however, poses major hurdles. A ‘BBC Future’ report by Sarah Cruddas puts the cost of shipping a ton of water into space at about $ 50 million. As per Chris Lewicki, president of Planetary Resources, an asteroid mining company, it takes more energy to escape the first 300 kilometers from the Earth than the next 300 million kilometers. Similarly, bringing back anything more than a few kilograms of samples from space to the Earth would be even more complex in terms of logistics. To start with, therefore, global space industry investors are focusing on keeping mined space resources in space itself for ‘in situ resource utilisation’. Availability of water on the Moon, Mars and asteroids offer very attractive prospects; apart from being crucial for supporting life and growing food, it also opens the possibility of using its constituents, hydrogen and oxygen, for making rocket fuel. Today, the possibility of manufacturing tools and even building habitats on Moon or Mars with the help of 3D printers using iron, nickel, cobalt, gold, platinum, and iridium etc which are available on the Moon, Mars and asteroids seem within reach. Researchers are working on using regolith, the weathered rock particles found on lunar surface for making moon bricks using 3D printers. These bricks will form the basic construction material for the first moon station and even the first moon hotel. Space industry players believe that an investment of $ 4 billion in water mining in space can generate annual revenue worth about $2.4 billion. Similarly, there is a new community of customers who are already looking for buying propellant in space. American space launch provider, United Launch Alliance (ULA), a Lockheed Martin and Boeing joint venture that provides launch rockets, has made it known that, ULA is willing to pay about $ 3000 a Kg for propellant in low earth orbit. Fast paced developments are taking place in the field of space mining technology with private players in the lead. Optical mining using concentrated sunlight, robotics, automated mining applications, advanced drilling machines etc are just a few examples. Participation of private players has reduced the investment burden and greatly enhanced the width and pace of innovation. It is believed that launch of the first asteroid mining vehicle as well as setting up of the first fuelling stations on the Moon and in low earth orbit could become a reality within a decade. Japanese mission ‘Hayabusa’ was the first to bring samples from an asteroid to earth in 2010. ‘Hayabusa - 2’ made its rendezvous with the near earth asteroid ‘162173 RYUGU’ in June 2018, left the asteroid after collecting samples in November 2019 and will be back on earth on December 6, 2020. Similarly the NASA mission OSIRIS-REx, costing about $ 1 billion, launched in 2016 is due to return to earth with samples of asteroid ‘101955 Bennu’ on September 24, 2023. The latest US space mission, ‘Perseverance’ launched on July 30, 2020 will land on Mars on February 18, 2021. It will be using a helicopter on Mars, set to be the first use of a helicopter outside the earth. Apart from collecting samples from Mars and search for signs of habitable conditions on Mars, it will also test the possibility of manufacturing molecular oxygen from the carbon dioxide-rich Mars atmosphere. Beyond the technological capability, there are, however, complex legal issues. While making fuel and water in space and its ‘in situ resource utilisation’ may pass the scrutiny, commercial exploitation of space through minerals mining, tourism, real estate etc may prove hugely contentious in terms of international legal framework for space. The current legal frameworks were adopted when space activities were entirely within the domain of national governments and were confined to research alone. But with the nature of space activities moving from purely research activities to military applications to commercial activities and with the entry of private players and a new community of consumers in space, the vintage outer space treaty has been rendered grossly inadequate; vagueness of the treaty does not cater for the ‘new types of uses’ or the ‘new users’ of space. Louis de Gouyon Matignon, in a thesis on the subject observed that “some states have already taken the absence of express prohibition as a sign that the utilisation of space resources is permissible, and both the USA and Luxembourg recently adopted national legislations expressly allowing it”. This has, however, triggered a response from the international community denouncing such unilateral initiatives and recommending a collective approach on the lines of the laws for high seas and deep sea bed. Whether a widely acceptable new space treaty comes through or not, Space mining is a reality and the early entrants are likely to retain monopoly and huge economic advantages for a very long time.

#### Signals indicate government support for space mining but even the perception of disapproval destroys business plans and kills investment

Ian **Christensen 16,**

"Building Confidence and Reducing Risk in Space Resources Policy," Room, The Space Journal, [https://room.eu.com/article/building-confidence-and-reducing-risk-in-space-resources-policy 2016](https://room.eu.com/article/building-confidence-and-reducing-risk-in-space-resources-policy%202016)

Like most areas of economic activity, space resource utilisation business plans are based upon the ability to access a resource, produce a product, service, or goods based from the resource, and produce revenue from that product based on established market activities.

An economic system requires a level of regulation and oversight to ensure it functions. Regulation and governmental oversight is part of an overall market framework that provides stability and confidence in validity for commercial entities and those that invest in them. Just as the commercial companies are in the initial stages of developing and validating hardware, governments have begun to establish regulatory and policy frameworks.

US President Barack Obama signed into a law in November 2015 a fairly comprehensive piece of legislation focusing on the development of the US commercial space sector, the ‘US Commercial Space Launch Competitiveness Act of 2015’. One title of this law, Title IV - Space Resource Exploration and Utilization, has elicited considerable international attention.

It authorises US commercial entities engaged in the recovery of space resources to possess, own, transport, use and sell space or asteroid resources obtained in accordance with US and international law. In layman’s terms, the Act makes asteroid mining permissible under US law for US entities.

This provision has led many to question whether the US law violates the Outer Space Treaty (OST), the document which represents the primary source of international law governing space activities. At issue is whether authorising the use of space resources violates Article II of the Treaty, which states ‘Outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claims of sovereignty, by means of use or occupation, or by other means’.

The most prohibitive interpretation of this Article would suggest all extractive or consumptive uses of space resources on celestial bodies would be prohibited. An interpretation of this type would have obvious negative impact on business plans focused on space resources utilisation, and by extension the security of investments in those plans. However, opinion is consolidating around the interpretation that the US law is in compliance with the OST.

Both the International Institute of Space Law (IISL) - the primary international professional society for attorneys in the space sector - and European Union (EU) officials have issued statements indicating belief that the Act is compliant. The Act itself contains an explicit disclaimer of extraterritorial sovereignty.

In February 2016, the Government of Luxembourg announced its intent to develop a specific legal and regulatory regime focused on space resources. While the exact details of this legislation are unknown at this time, it is certain that it will be supportive of the legal right to access, possess, use, transport and sell space resources, as the policy is part of a broader initiative designed to attract space resources companies to operate from Luxembourg.

While the question of how the US Act relates to Article II of the OST is not the primary focus of this article, the discussion does highlight the current role of political risk in the nascent space mining industry.

Speaking at a panel in 2013, Bob Richards, CEO of prospective lunar resources company Moon Express, stated there was a risk in assuming governments will be supportive in defending space resources businesses’ rights to operate in space. He said: “We are making some broad assumptions and interpretations to existing treaties that were set up by governments in the past. We are assuming that commercial ventures will be allowed and there will not be some kind of international backlash.”

Signalling this support - ie, reducing political risk and establishing the underlying frameworks to enable activity - is one reason governments enact legislation of the type represented by the US Act. Legislation and regulation is also a means by which governments ensure that they meet obligations to international agreements and treaties. In this regard the US law is as notable for what it does not include, as for what it does.

Article VI of the OST establishes an obligation for states to be responsible for the space activities of their entities, including non-governmental actors such as commercial companies. It states, in part, that ‘the activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorisation and continuing supervision by the appropriate State Party to the Treaty’. States typically respond to this obligation through national regulations, laws and licensing regimes.

The space resources provisions in the US Act did not establish any elements of this regulatory framework, instead requiring the executive branch of the US government to deliver a report with recommendations (which would cover other activities in addition to space resources). It can be expected that the pending legislation in Luxembourg might also address a regulatory approach.

This results in a condition of uncertainty – or risk – as the commercial entities continue to execute their business plans. The lack of a regulatory framework does not necessarily create an environment conducive to business development.

The current situation in the US is one in which the government has clearly signalled its intent to support commercial space resources development - but has yet to fully implement the regulatory framework to enable that support. The passage of the US Act, legislative action in other countries and the increasing activities of space resources-focused commercial enterprises creates a window - and a need - for additional action to define a regulatory scheme that reduces the political risk faced by the commercial sector while simultaneously upholding national obligations to the international legal system.

#### Commercial mining solves extinction from scarcity, climate, terror, war, and disease.

Pelton 17—(Director Emeritus of the Space and Advanced Communications Research Institute at George Washington University, PHD in IR from Georgetown).. Pelton, Joseph N. 2017. The New Gold Rush: The Riches of Space Beckon! Springer. Accessed 8/30/19.

Are We Humans Doomed to Extinction? What will we do when Earth’s resources are used up by humanity? The world is now hugely over populated, with billions and billions crammed into our overcrowded cities. By 2050, we may be 9 billion strong, and by 2100 well over 11 billion people on Planet Earth. Some at the United Nations say we might even be an amazing 12 billion crawling around this small globe. And over 80 % of us will be living in congested cities. These cities will be ever more vulnerable to terrorist attack, natural disaster, and other plights that come with overcrowding and a dearth of jobs that will be fueled by rapid automation and the rise of artifi cial intelligence across the global economy. We are already rapidly running out of water and minerals. Climate change is threatening our very existence. Political leaders and even the Pope have cautioned us against inaction. Perhaps the naysayers are right. All humanity is at tremendous risk. Is there no hope for the future? This book is about hope. We think that there is literally heavenly hope for humanity. But we are not talking here about divine intervention. We are envisioning a new space economy that recognizes that there is more water in the skies that all our oceans. Th ere is a new wealth of natural resources and clean energy in the reaches of outer space—more than most of us could ever dream possible. There are those that say why waste money on outer space when we have severe problems here at home? Going into space is not a waste of money. It is our future. It is our hope for new jobs and resources. The great challenge of our times is to reverse public thinking to see space not as a resource drain but as the doorway to opportunity. The new space frontier can literally open up a “gold rush in the skies.” In brief, we think there is new hope for humanity. We see a new a pathway to the future via new ventures in space. For too long, space programs have been seen as a money pit. In the process, we have overlooked the great abundance available to us in the skies above. It is important to recognize there is already the beginning of a new gold rush in space—a pathway to astral abundance. “New Space” is a term increasingly used to describe radical new commercial space initiatives—many of which have come from Silicon Valley and often with backing from the group of entrepreneurs known popularly as the “space billionaires.” New space is revolutionizing the space industry with lower cost space transportation and space systems that represent significant cost savings and new technological breakthroughs. “New Commercial Space” and the “New Space Economy” represent more than a new way of looking at outer space. These new pathways to the stars could prove vital to human survival. If one does not believe in spending money to probe the mysteries of the universe then perhaps we can try what might be called “calibrated greed” on for size. One only needs to go to a cubesat workshop, or to Silicon Valley or one of many conferences like the “Disrupt Space” event in Bremen, Germany, held in April 2016 to recognize that entrepreneurial New Space initiatives are changing everything [ 1 ]. In fact, the very nature and dimensions of what outer space activities are today have changed forever. It is no longer your grandfather’s concept of outer space that was once dominated by the big national space agencies. The entrepreneurs are taking over. The hopeful statements in this book and the hard economic and technical data that backs them up are more than a minority opinion. It is a topic of growing interest at the World Economic Forum, where business and political heavyweights meet in Davos, Switzerland, to discuss how to stimulate new patterns of global economic growth. It is even the growing view of a group that call themselves “space ethicists.” Here is how Christopher J. Newman, at the University of Sunderland in the United Kingdom has put it: Space ethicists have offered the view that space exploration is not only desirable; it is a duty that we, as a species, must undertake in order to secure the survival of humanity over the longer term. Expanding both the resource base and, eventually, the habitats available for humanity means that any expenditure on space exploration, far from being viewed as frivolous, can legitimately be rationalized as an ethical investment choice. (Newman) On the other hand there are space ethicists and space exobiologists who argue that humans have created ecological ruin on the planet—and now space debris is starting to pollute space. Th ese countervailing thoughts by the “no growth” camp of space ethicists say we have no right to colonize other planets or to mine the Moon and asteroids—or at least no right to do so until we can prove we can sustain life here on Earth for the longer term. However, for most who are planning for the new space economy the opinion of space philosophers doesn’t really fl oat their boat. Legislators, bankers, and aspiring space entrepreneurs are far more interested in the views of the super-rich capitalists called the space billionaires. A number of these billionaires and space executives have already put some very serious money into enterprises intent on creating a new pathway to the stars. No less than five billionaires with established space ventures—Elon Musk, Paul Allen, Jeff Bezos, Sir Richard Branson, and Robert Bigelow—have invested millions if not billions of dollars into commercializing space. They are developing new technologies and establishing space enterprises that can bring the wealth of outer space down to Earth. This is not a pipe dream, but will increasingly be the economic reality of the 2020s. These wealthy space entrepreneurs see major new economic opportunities. To them space represents the last great frontier for enterprising pioneers. Th us they see an ever-expanding space frontier that offers opportunities in low-cost space transportation, satellite solar power satellites to produce clean energy 24h a day, space mining, space manufacturing and production, and eventually space habitats and colonies as a trajectory to a better human future. Some even more visionary thinkers envision the possibility of terraforming Mars, or creating new structures in space to protect our planet from cosmic hazards and even raising Earth’s orbit to escape the rising heat levels of the Sun in millennia to come. Some, of course, will say this is sci-fi hogwash. It can’t be done. We say that this is what people would have said in 1900 about airplanes, rocket ships, cell phones and nuclear devices. The skeptics laughed at Columbus and his plan to sail across the oceans to discover new worlds. When Thomas Jefferson bought the Louisiana Purchase from France or Seward bought Alaska, there were plenty of naysayers that said such investment in the unknown was an extravagant waste of money. A healthy skepticism is useful and can play a role in economic and business success. Before one dismisses the idea of an impending major new space economy and a new gold rush, it might useful to see what has already transpired in space development in just the past five decades. The world’s first geosynchronous communications satellite had a throughput capability of about 500 kb / s. In contrast, today’s state of the art Viasat 2 —a half century later— has an impressive throughput of some 140 Gb/s. Th is means that the relative throughput is nearly 300,000 greater, while its lifetime is some ten times longer (Figs. 1.1 and 1.2 ). Each new generation of communications satellite has had more power, better antenna systems, improved pointing and stabilization, and an extended lifetime. And the capabilities represented by remote sensing satellites , meteorological satellites , and navigation and timing satellites have also expanded their capabilities and performance in an impressive manner. When satellite applications first started, the market was measured in millions of dollars. Today commercial satellite services exceed a quarter of a billion dollars. Vital services such as the Internet, aircraft traffi c control and management, international banking, search and rescue and much, much more depend on application satellites. Th ose that would doubt the importance of satellites to the global economy might wish to view on You Tube the video “If Th ere Were a Day Without Satellites?” [ 2 ]. Let’s check in on what some of those very rich and smart guys think about the new space economy and its potential. (We are sorry to say that so far there are no female space billionaires, but surely this, too, will come someday soon.) Of course this twenty-fi rst century breakthrough that we call the New Space economy will not come just from new space commerce. It will also come from the amazing new technologies here on Earth. Vital new terrestrial technologies will accompany this cosmic journey into tomorrow. Information technology, robotics, artificial intelligence and commercial space travel systems have now set us on a course to allow us humans to harvest the amazing riches in the skies—new natural resources, new energy, and even totally new ways of looking at the purpose of human existence. If we pursue this course steadfastly, it can be the beginning of a New Space renaissance. But if we don’t seek to realize our ultimate destiny in space, Homo sapiens can end up in the dustbin of history—just like literally millions of already failed species. In each and every one of the five mass extinction events that have occurred over the last 1.5 billion years on Earth, some 50–80 % of all species have gone the way of the T. Rex, the woolly mammoth, and the Dodo bird along with extinct ferns, grasses and cacti. On the other hand, the best days of the human race could be just beginning. If we are smart about how we go about discovering and using these riches in the skies and applying the best of our new technologies, it could be the start of a new beginning for humanity. Konstantin Tsiokovsky, the Russian astronautics pioneer, who fi rst conceived of practical designs for spaceships, famously said: “A planet is the cradle of mankind, but one cannot live in a cradle forever.” Well before Tsiokovsky another genius, Leonardo da Vinci, said, quite poetically: “Once you have tasted flight, you will forever walk the earth with your eyes turned skyward, for there you have been, and there you will always long to return.” The founder of the X-Prize and of Planetary Resources, Inc., Dr. Peter Diamandis, has much more brashly said much the same thing in quite diff erent words when he said: “The meek shall inherit the Earth. The rest of us will go to Mars.” The New Space Billionaires Peter Diamandis is not alone in his thinking. From the list of “visionaries” quoted earlier, Elon Musk, the founder of SpaceX; Sir Richard Branson, the founder of Virgin Galactic; and Paul Allen, the co-founder of Microsoft and the man who financed SpaceShipOne, the world’s first successful spaceplane have all said the future will include a vibrant new space economy. Th ey, and others, have said that we can, we should and we soon shall go into space and realize the bounty that it can offer to us. Th e New Space enterprise is today indeed being led by those so-called space billionaires , who have an exciting vision of the future. They and others in the commercial space economy believe that the exploitation of outer space may open up a new golden age of astral abundance. They see outer space as a new frontier that can be a great source of new materials, energy and various forms of new wealth that might even save us from excesses of the past. Th is gold rush in the skies represents a new beginning. We are not talking about expensive new space ventures funded by NASA or other space agencies in Europe, Japan, China or India. No, these eff orts which we and others call New Space are today being forged by imaginative and resourceful commercial entrepreneurs. Th ese twenty-fi rst century visionaries have the fortitude and zeal to look to the abundance above. New breakthroughs in technology and New Space enterprises may be able to create an “astral life raft” for humanity. Just as Columbus and the Vikings had the imaginative drive that led them to discover the riches of a new world, we now have a cadre of space billionaires that are now leading us into this New Space era of tomorrow. These bold leaders, such as Paul Allen and Sir Richard Branson, plus other space entrepreneurs including Jeff Bezos of Amazon and Blue Origin, and Robert Bigelow, Chairman of Budget Suites and Bigelow Aerospace, not only dream of their future in the space industry but also have billions of dollars in assets. These are the bright stars of an entirely new industry that are leading us into the age of New Space commerce. These space billionaires, each in their own way, are proponents of a new age of astral abundance. Each of them is launching new commercial space industries. They are literally transforming our vision of tomorrow. These new types of entrepreneurial aerospace companies—the New Space enterprises—give new hope and new promise of transforming our world as we know it today. The New Space Frontier What happens in space in the next few decades, plus corresponding new information technologies and advanced robotics, will change our world forever. These changes will redefi ne wealth, change our views of work and employment and upend almost everything we think we know about economics, wealth, jobs, and politics. Th ese changes are about truly disruptive technologies of the most fundamental kinds. If you thought the Internet, smart phones, and spandex were disruptive technologies, just hang on. You have not seen anything yet. In short, if you want to understand a transition more fundamental than the changes brought to the twentieth century world by computers, communications and the Internet, then read this book. There are truly riches in the skies. Near-Earth asteroids largely composed of platinum and rare earth metals have an incredible value. Helium-3 isotopes accessible in outer space could provide clean and abundant energy. There is far more water in outer space than is in our oceans. In the pages that follow we will explain the potential for a cosmic shift in our global economy, our ecology, and our commercial and legal systems. These can take place by the end of this century. And if these changes do not take place we will be in trouble. Our conventional petro-chemical energy systems will fail us economically and eventually blanket us with a hydrocarbon haze of smog that will threaten our health and our very survival. Our rare precious metals that we need for modern electronic appliances will skyrocket in price, and the struggle between “haves” and “have nots” will grow increasingly ugly. A lack of affordable and readily available water, natural resources, food, health care and medical supplies, plus systematic threats to urban security and systemic warfare are the alternatives to astral abundance. The choices between astral abundance and a downward spiral in global standards of living are stark. Within the next few decades these problems will be increasingly real. By then the world may almost be begging for new, out of- the-box thinking. International peace and security will be an indispensable prerequisite for exploitation of astral abundance, as will good government for all. No one nation can be rich and secure when everyone else is poor and insecure. In short, global space security and strategic space defense, mediated by global space agreements, are part of this new pathway to the future.

#### REM mining uses slave labor worst form of exploitaiton

### 3

#### China is ramping up aggression in outer space

Broad 21 [(William J, is a science journalist and senior writer.) "How Space Became the Next ‘Great Power’ Contest Between the U.S. and China," 1-24-2021 updated 5-6-2018, https://www.nytimes.com/2021/01/24/us/politics/trump-biden-pentagon-space-missiles-satellite.html] TDI

For years, the Chinese studied — with growing anxiety — the American military, especially its invasions of Afghanistan in 2001 and Iraq in 2003. The battlefield successes were seen as rooted in space dominance. Planners noted that thousands of satellite-guided bombs and cruise missiles had rained down with devastating precision on Taliban forces and Iraqi defenses.

While the Pentagon’s edge in orbital assets was clearly a threat to China, planners argued that it might also represent a liability.

“They saw how the U.S. projected power,” said Todd Harrison, a space analyst at the Center for Strategic and International Studies, a Washington think tank. “And they saw that it was largely undefended.”

China began its antisatellite tests in 2005. It fired two missiles in two years and then made headlines in 2007 by shattering a derelict weather satellite. There was no explosion. The inert warhead simply smashed into the satellite at blinding speed. The successful test reverberated globally because it was the first such act of destruction since the Cold War.

The whirling shards, more than 150,000 in all, threatened satellites as well as the International Space Station. Ground controllers raced to move dozens of spacecraft and astronauts out of harm’s way.

The Bush administration initially did little. Then, in a show of force meant to send Beijing a message, in 2008, it fired a sophisticated missile to shoot down one of its own satellites.

Beijing conducted about a dozen more tests, including ones in which warheads shot much higher, in theory putting most classes of American spacecraft at risk.

China also sought to diversify its antisatellite force. A warhead could take hours to reach a high orbit, potentially giving American forces time for evasive or retaliatory action. Moreover, the speeding debris from a successful attack might endanger Beijing’s own spacecraft.

In tests, China began firing weak laser beams at satellites and studying other ways to strike at the speed of light. However, all the techniques were judged as requiring years and perhaps decades of development.

Then came the new idea. Every aspect of American space power was controlled from the ground by powerful computers. If penetrated, the brains of Washington’s space fleets might be degraded or destroyed. Such attacks, compared with every other antisatellite move, were also remarkably inexpensive.

In 2005, China began to incorporate cyberattacks into its military exercises, primarily in first strikes against enemy networks. Increasingly, its military doctrine called for ~~paralyzing~~ early attacks.

In 2008, hackers seized control of a civilian imaging satellite named Terra that orbited low, like the military’s reconnaissance craft. They did so twice — first in June and again in October — roaming control circuits with seeming impunity. Remarkably, in both cases, the hackers achieved all the necessary steps to command the spacecraft but refrained from doing so, apparently to reduce their fingerprints.

#### Chinese aggression makes escalation inevitable – draws in other powers

Fabian 19 [Christopher David Fabian, Bachelor of Science, United States Air Force Academy. (“A Neoclassical Realist’s Analysis Of Sino-U.S. Space Policy”, *University of North Dakota Scholarly Commons*, January, Available Online at: <https://commons.und.edu/cgi/viewcontent.cgi?article=3456&context=theses>]

Second, Chinese strikes on U.S. space assets must not result in uncontrolled escalation. The advantage of possessing soft-kill technology is the suitability for low-intensity conflicts, while the use of destructive/non-reversible attacks will not be constrained during high-intensity conflicts.234 The use of exclusively non-lethal versus a combination of lethal and non-lethal capabilities can serve as strategic signaling about the phase of combat. However, due to a capability and vulnerability gap, combined with a lack of credible retaliatory threat, a tit-for-tat strategy along a clearly defined escalation ladder may not be a legitimate strategy for the Sino-U.S. relationship. 235 Counterspace action intended to have a tactical/operational effect may cross American strategic red lines, resulting in unintended escalation. For example, an attack on American overhead persistent infrared (OPIR) sensors would degrade their capability to detect conventional medium range ballistic missiles, with targets in the first island chain also interfering with the early detection of nuclear capable ICBMs launched against the U.S.236 Concerningly enough, there is evidence that the implication of interfering with or destroying strategically important U.S. capabilities has only been appreciated on the tactical and operational levels within the Chinese military.

237 Similarly, a Chinese attack on U.S. space systems at the outset of a low-grade conflict could raise the likelihood of a “space Pearl Harbor,” which could, in turn, provoke the United States to contemplate pre-emptive attacks or horizontal escalation on the Chinese mainland.238 In addition, commercial-military integration and combined efforts may result in escalation with third parties. A significant portion of U.S. military communication and imaging capabilities are purchased from commercial companies or provided by allied nations, meaning that to adequately degrade U.S. military capabilities, an attack on non-military and/or non-U.S. assets is required.

#### India space participation is crucial to India’s soft power – independently Indian norm setting curbs Chinese militarization

Castro ’17. [Bhavani Castro Fellow of Indian Studies at the Getulio Vargas Foundation in São Paulo, 03-03-2017, "Why India Should Help Shape Norms for Outer Space Activities," The Diplomat, <https://thediplomat.com/2017/03/why-india-should-help-shape-norms-for-outer-space-activities/>] TDI

The past years have been groundbreaking for the Indian Space Program. In 2014, its first interplanetary mission, Mangalyaan, entered into Mars orbit, putting the Indian Space Research Organization (ISRO) into the select group of space agencies to reach Mars, and the first one to succeed entering its orbit in the first attempt. In 2015, the agency launched its first space observatory, Astrosat, aimed to observe distant planets and astronomical objects, a first-class technology mastered by few countries. Last year, India also set a record by launching 20 satellites at once, many from other countries. However, India could go one step further in the space business and engage in a much more rewarding activity for its ambitions: taking the lead in shaping norms for outer space activities.

As the ISRO achieved a new world record in February – the launching of 104 satellites on a single rocket – Prime Minister Narendra Modi should consider giving new focus to the diplomacy surrounding the use of space. India has not been very active in the ongoing international efforts to update the outer space regime. It has not supported the European Union’s proposal for a Code of Conduct for Outer Space Activities, and it also watched silently while China and Russia joined efforts to issue a draft for a treaty on the prevention of the placement of weapons in outer space. However, if India aims for greater recognition in the international scenario, it is about time to take a more proactive stance on the creation of new norms and rules in global governance.

The existing international space regime includes several outdated treaties – mainly the Outer Space Treaty from 1967 and the Moon Treaty from 1979. These documents do not deal with urgent issues for today’s space exploration, including the prohibition of non-nuclear weapons tests in space and the creation of risky debris from the destruction of old satellites. The entrance of new actors, specifically in the space communications industry, makes it increasingly difficult to coordinate the positioning of new satellites in an already overcrowded orbit. Moreover, it is still unknown how those new actors – including China and India – will behave in space: whether they will choose to follow the peaceful use of space, or whether militarization will be their path.

It is crucial for India to work actively for new norms in the current scenario because of a variety of reasons. First, India needs to consider its national security interests. The vacuum created by the slow growth of the US and Russia on space capabilities is being filled by China, whose intentions are not entirely clear. In 2007, Beijing launched an anti-satellite weapon (ASAT) to destroy an old satellite. This move, not previously notified to the international community, not only produced thousands of harmful debris in orbit, but also evidenced China’s growing military capacity. If India wants to curb potentially harmful Chinese activities in outer space, it needs to endorse rules that fit its national interests.

India also needs to promote the regulation of space activities to enhance its cooperation with other space-faring nations – possibly including China, if the two countries decide for cooperation instead of competition. Vital sectors of the economy, as finance and communications, are dependent on space technologies, which makes cooperation essential for countries in a globalized world. India is proud of the indigeneity of its space technology, but it is about time to engage in technology sharing and commercial agreements with other countries. Space technologies are economic stimulants and useful tools in communication, resource management, and disaster prevention activities, all of which are essential assets for emerging economies like India.

More importantly, engaging in and committing to the creation of a new space governance framework would project India as an agenda-setter in a field of increasing importance for international relations. As in other realms of global governance, the future of space research is in the hands of Asia.

India can promote the creation of a more comprehensive regime for the use of outer space in a variety of ways. It is possible, for example, to start discussions within organizations like the BRICS (Brazil, Russia, India, China, and South Africa), IBSA (India, Brazil, South Africa), and the Shanghai Cooperation Organization. India can also actively engage with existing forums, such as the UN Committee on the Peaceful Use of Outer Space and ongoing discussions held by the European Union on the creation of a code of conduct.

The Outer Space Treaty will be celebrating its 50th anniversary this year; 2017 might be a good year for India to start an active campaign for an upgrade in the space regime. It might be difficult for India to build a new international institution or create legally binding treaties, but it can work on the promotion and creation of new conventions, cooperation agreements, and consensual norms.

#### Private sector is key

Rajagopalan ’20 [Dr Rajeswari (Raji) Pillai Rajagopalan is the Director of the Centre for Security, Strategy and Technology (CSST) at the Observer Research Foundation, New Delhi., 5-24-2020, "India’s Space Programme: A role for the private sector, finally?," ORF, <https://www.orfonline.org/research/indias-space-programme-a-role-for-the-private-sector-finally-66661/>] NChu

India’s finance minister Nirmala Sitharaman announced last week that India’s private sector will play a key role in augmenting India’s space programme, and that the government intends to share the facilities of the Indian Space Research Organisation (ISRO) with the private sector. This announcement was part of the Narendra Modi government’s call for new and bold reforms in an effort to promote its ‘self-reliant India’ mission. It is the fourth segment of the Rs 20 lakh crore Aatma Nirbhar Bharat Abhiyan special economic stimulus.

Sitharaman’s announcement entails a role for the private sector, possibly with the goal of greater investments in technology development and acquisition, capacity-building and space exploration, including planetary exploration. The minister, while announcing these reforms, appeared to understand that the private sector can help augment India’s space capability. While praising the work done by ISRO, she also pointed out that the private sector is also doing a lot of work in developing space technology. She also acknowledged that the existing regulations prevent private entities from using or even testing their products.

Therefore, to level the playing field, the government “will make a provision for the private sector to benefit from the assets which are available to ISRO and for India (in general) to benefit from.” The minister also said the new reforms would allow the private sector to play an active role in “satellites, launches and space-based services”.

But as always, implementation is key. Properly executing these reforms will require enabling policies and appropriate regulatory frameworks.

That the new reforms will allow private sector players to use ISRO facilities is a big deal. This indeed must be music to the ears of commercial players who have been seeking to get a fair share of the pie in terms of manufacturing of satellites and propellant technologies, among other areas. It should not be too difficult for India’s private space sector because there is a sizeable talent pool available outside ISRO. More importantly, the entry of the private sector, as in the telecom sector, can bring several advantages in terms of cost and access.

Following the announcement, ISRO tweeted that it will follow the government’s guidelines to allow the private sector to undertake space activities in the country. Though this did not seem particularly welcoming of the government’s initiative, ISRO’s support is critical to making it a success.

ISRO has in the last few years been opening up to the Indian private space sector in a gradual manner – mostly as a matter of compulsion because ISRO simply does not have the in-house capacity to address India’s growing requirements. Today, the Indian space programme is not just about civilian applications for remote-sensing, meteorology and communication, as in the early decades. India’s space sector and its requirements have grown enormously in the last decade to include television and broadband services, space science and exploration, space-based navigation and, of course, defence and security applications.

Among others, Ambassador Rakesh Sood has articulated the need for legislation to facilitate ISRO’s partnership with industries and entrepreneurs. Narayan Prasad and Prateep Basu, two prominent faces in the Indian space start-up segment, have argued that despite ISRO’s successes, “India’s space competitiveness has suffered from the absence of a globally reputed, private space industry.”

The private sector, especially the NewSpace industry and start-ups, have an advantage in terms of low-cost operations, which itself should be a big incentive for the government to make it an active stakeholder. A certain amount of democratisation of space technology with the participation of the private sector can ensure costs are kept low. And expanding the number of stakeholders will also ensure more transparency and better accountability and regulatory practices. This has been missing in India’s space sector. The same agency has undertaken promotion, commercialisation and regulatory functions – which is not healthy.

Following the minister’s announcement, I spoke to a few key players in the private sector to capture their sense of the reforms in the pipeline. Sadly, the general mood is not one of excitement but rather to wait and watch. To them, as stated earlier, the key is implementation. One of them, who did not wish to be named, argued that unless there is a conducive structure for the private sector to engage with, the announcement is more lip service. Narayan Prasad said that there need to be basic changes for the reforms to be effective. The private sector is particularly concerned about issues such as sharing intellectual property for products developed by the private sector. Prasad argued that IP-centric policymaking has to be taken for real reform.

Right now, ISRO thinks they will use the suppliers only as manufacturing or services partners. So all IP is controlled by ISRO and suppliers just replace ISRO technicians and production facilities. This means most suppliers have no real IP of their own, and just depend on cost plus contracts from ISRO for business. The only way to change that is to create reforms where local industry can invest in building their own IP and/or products that can match global standards.

This in turn means that policymakers will need to view industry as more than sweatshops and look at what steps can be taken for IP/product development by private industry. This is the only way to integrate India’s private sector into the global supply chain. Prasad adds that if ISRO is serious about partnering with the private sector, it must spell out the requirements and select the best available. Several private-sector actors have articulated the need for an independent regulator.

This is an area that has been a common thread in many of my conversations with Indian entrepreneurs. Rohan M. Ganapathy, CEO and CTO of Bellatrix Aerospace in Bengaluru, also made a strong case for an autonomous regulator, and acknowledged a need for the government to clarify R&D risk funding, which is crucial to realise new technologies.

It is not that ISRO has not engaged the private sector. ISRO has long been associated with private firms like Larsen & Toubro, Godrej and Walchand Nagar Industries. It is just that the mode of participation envisaged through the new reforms is very different. The current mode of work, more of an outsourcing model, is becoming inadequate. In the last few years, because of significant capacity deficit, ISRO began to work with a few in the private sector such as the Bengaluru-based Alpha Design Technologies, contracted to build satellites. Similarly, Bellatrix Aerospace began to work with ISRO on advanced in-space propulsion systems. But these remain exceptions.

But ISRO does recognise the new compulsions and has been trying to change. The newly formed commercial enterprise called the NewSpace India Limited (NSIL), under the Department of Space, is an initiative to engage the private sector. NSIL is meant to help the private sector with transfer of some technologies to the private sector, especially the small satellite launch vehicle that is being developed and even the older PSLV. But the pace of ISRO’s engagement with the private sector needs to quicken.

Followed up effectively, the new government initiatives could help. Indeed, ISRO needs to expand its operations significantly if it has to remain competitive, both from a domestic and international outlook. The Indian space programme has several advantages, the most important being cost: the ability to provide reliable launches in a cost-effective manner is a big advantage. The Polar Satellite Launch Vehicle remains a tried and tested launch vehicle and has managed to remain the cheapest for launching small satellites into space. But competition in this sector is picking up.

Jeff Bezos’ Blue Origin, Elon Musk’s SpaceX and start-ups from China want a share of the global commercial market, estimated to be worth around $350 billion (Rs 26.46 lakh crore). If ISRO does not improve its launch infrastructure and increase the number of launches, it will be at a disadvantage. And despite India’s cost advantages, it has a mere 2% share of this, worth $7 billion. India can gain significantly if ISRO and the country’s private space sector can cooperate effectively and synergistically. This requires the government to actually act on the initiatives it announced.