## NC

### Framing

#### I negate the Resolved: The appropriation of outer space by private entities is unjust.

#### The value is Justice, defined as morally right and fair from Oxford Languages, because the only reason to value anything else is because humans value it, which concedes that humans are valuable and deserving. The presence of the word “just” in the resolution also indicates that questions of justice should come first on this topic.

#### Therefore, the value criterion is maximizing expected well-being for two reasons:

#### [1] State action – actors can only use util for morally right and just actions– outweighs since different actors have different obligations – all policies benefit some and hurts others – only util can resolve these cuz it gives a clear weighing mechanism

**[2] Intuition – everyday experience proves pain is bad and pleasure is good**

**Moen 16** [Ole Martin Moen, Research Fellow in Philosophy at University of Oslo “An Argument for Hedonism” Journal of Value Inquiry (Springer), 50 (2) 2016: 267–281] SJDI rc// Phoenix

Let us start by observing, empirically, that a widely shared judgment about intrinsic value and disvalue is that pleasure is intrinsically valuable and pain is intrinsically disvaluable. On virtually any proposed list of intrinsic values and disvalues (we will look at some of them below), pleasure is included among the intrinsic values and pain among the intrinsic disvalues. This inclusion makes intuitive sense, moreover, for there is something undeniably good about the way pleasure feels and something undeniably bad about the way pain feels, and neither the goodness of pleasure nor the badness of pain seems to be exhausted by the further effects that these experiences might have. “Pleasure” and “pain” are here understood inclusively, as encompassing anything hedonically positive and anything hedonically negative.2 The special value statuses of pleasure and pain are manifested in how we treat these experiences in our everyday reasoning about values. If you tell me that you are heading for the convenience store, I might ask: “What for?” This is a reasonable question, for when you go to the convenience store you usually do so, not merely for the sake of going to the convenience store, but for the sake of achieving something further that you deem to be valuable. You might answer, for example: “To buy soda.” This answer makes sense, for soda is a nice thing and you can get it at the convenience store. I might further inquire, however: “What is buying the soda good for?” This further question can also be a reasonable one, for it need not be obvious why you want the soda. You might answer: “Well, I want it for the pleasure of drinking it.” If I then proceed by asking “But what is the pleasure of drinking the soda good for?” the discussion is likely to reach an awkward end. The reason is that the pleasure is not good for anything further; it is simply that for which going to the convenience store and buying the soda is good.3 As Aristotle observes: “We never ask [a man] what his end is in being pleased, because we assume that pleasure is choice worthy in itself.”4 Presumably, a similar story can be told in the case of pains, for if someone says “This is painful!” we never respond by asking: “And why is that a problem?” We take for granted that if something is painful, we have a sufficient explanation of why it is bad. If we are onto something in our everyday reasoning about values, it seems that pleasure and pain are both places where we reach the end of the line in matters of value.

#### [3] Extinction must come first –

#### a.] if there is any chance of goodness existing, we ought to preserve our existence to maximize it

#### b.] if their framework is true, people dying is bad because it means those people can’t use their framework

#### Now onto my observations:

#### Observation 1: The affirmative must respond to each unique argument – to clarify, they cannot respond to a contention in its entirety or “group” as each part of the contention contains unique arguments – responding to specific parts creates for a fairer and cleaner debate and allows for depth of discussion distinguished between impacts and scenarios.

#### Observation 2: The negative only has to prove that the resolution produces some just action – anything more is a tremendous burden for the negative to fulfill in 7 minutes alongside answering the affirmative case.

#### Any responses to the observations must indicate why absence would make for a fairer debate – otherwise value my observations at the highest level in this debate.

### Contention 1 is Space Innovation

#### Subpoint A : Innovation is gently rising after a cruel period of stagnation – the affirmative world ruins that, Matt Murphy in Jan 2021 explains

Murphy ‘21

Murphy, Matt. “Why a Dawn of Technological Optimism Is Breaking.” The Economist, The Economist Newspaper, 16 Jan. 2021, [https://www.economist.com/leaders/2021/01/16/why-a-dawn-of-technological-optimism-is-breaking. //](https://www.economist.com/leaders/2021/01/16/why-a-dawn-of-technological-optimism-is-breaking.%20//) Phoenix

Today a dawn of technological optimism is breaking. The speed at which covid-19 vaccines have been produced has made scientists household names. Prominent breakthroughs, a tech investment boom and the adoption of digital technologies during the pandemic are combining to raise hopes of a new era of progress: optimists giddily predict a “roaring Twenties”. Just as the pessimism of the 2010s was overdone—the decade saw many advances, such as in cancer treatment—so predictions of technological Utopia are overblown. But there is a realistic possibility of a new era of innovation that could lift living standards, especially if governments help new technologies to flourish.

In the history of capitalism rapid technological advance has been the norm. The 18th century brought the Industrial Revolution and mechanised factories; the 19th century railways and electricity; the 20th century cars, planes, modern medicine and domestic liberation thanks to washing machines. In the 1970s, though, progress—measured by overall productivity growth—slowed. The economic impact was masked for a while by women piling into the workforce, and a burst of efficiency gains followed the adoption of personal computers in the 1990s. After 2000, though, growth flagged again.

There are three reasons to think this “great stagnation” might be ending. First is the flurry of recent discoveries with transformative potential. The success of the “messenger RNA” technique behind the Pfizer-BioNTech and Moderna vaccines, and of bespoke antibody treatments, shows how science continues to empower medicine. Humans are increasingly able to bend biology to their will, whether that is to treat disease, edit genes or to grow meat in a lab. Artificial intelligence is at last displaying impressive progress in a range of contexts. A program created by DeepMind, part of Alphabet, has shown a remarkable ability to predict the shapes of proteins; last summer OpenAI unveiled GPT-3, the best natural-language algorithm to date; and since October driverless taxis have ferried the public around Phoenix, Arizona. Spectacular falls in the price of renewable energy are giving governments confidence that their green investments will pay off. Even China now promises carbon neutrality by 2060.

The second reason for optimism is booming investment in technology. In the second and third quarters of 2020 America’s non-residential private sector spent more on computers, software and research and development (R&D) than on buildings and industrial gear for the first time in over a decade. Governments are keen to give more cash to scientists (see [Briefing](https://www.economist.com/briefing/2021/01/16/the-case-for-more-state-spending-on-r-and-d)). Having shrunk for years, public R&D spending across 24 OECD countries began to grow again in real terms in 2017. Investors’ enthusiasm for technology now extends to medical diagnostics, logistics, biotechnology and semiconductors. Such is the market’s optimism about electric vehicles that Tesla’s CEO, Elon Musk, who also runs a rocket firm, is the world’s richest man.

#### Subpoint B : Private space appropriation creates massive innovation – SpaceX proves. Bob Peterson in Nov 2021 reveals

Peterson ‘21

Peterson, Bob. “Commercializing the Race to Space.” Insigniam, 19 Nov. 2021, https://insigniam.com/private-space-exploration-innovating-future-space/. // Phoenix

After publicly stalling out due to cost concerns circa 2011, America’s space race is quickly heating up again. Only instead of NASA, this time it’s being spearheaded through private space exploration by three billionaire investors and the companies that mirror these entrepreneurs’ out-of-this-world ambitions: Richard Branson (Virgin Galactic), Elon Musk (SpaceX) and Jeff Bezos (Blue Origin).

Expected to be a [$1.4 trillion market by 2030](https://www.cnbc.com/2020/10/02/why-the-space-industry-may-triple-to-1point4-trillion-by-2030.html), according to analysts at Bank of America, private space exploration and tourism are already ushering in a host of new innovations outside of traditional aerospace and defense realms. For example: Morgan Stanley suggests that the business world’s growing rush to reach orbit may also help [sate the world’s ever-growing appetite for high-speed satellite broadband technology](https://www.morganstanley.com/ideas/investing-in-space) and data, kick-start rocket-fueled delivery services and even enable asteroid mining in years to come. Here, we take a closer look at the field’s three front-runners, how each is pioneering new scientific advancements, and various trickle-down innovations that private space exploration may soon bring back to dozens of industries on planet Earth.

Virgin Galactic

On July 11—just 17 years after announcing the company—Virgin Group founder Richard Branson took his inaugural trip 53 miles above the Earth’s surface in Virgin Galactic’s suborbital, rocket-powered space plane VSS Unity. Capable of holding six passengers and two pilots, the craft isn’t likely to be earthbound for very long; the company has already sold around 600 tickets for flights at the princely sum of $200,000 to $250,000 apiece. As of early August, more tickets were available starting at $450,000 each.

The first of the billionaire space company founders to reach the edge of space (depending on the definition), Branson did so thanks to myriad scientific and business innovations made by his firm. Advancements not only include a new high-speed aircraft design that leverages modular technology to improve flight rate and maintenance access. They also incorporate a livery design built from a mirrorlike material that provides heightened thermal protection and color-changing potential, a spectacular display of the plane’s advanced capabilities in keeping with Branson’s notoriously flashy brand of showmanship. These upgrades have helped power Virgin Galactic’s ongoing push to capture public and media attention, enticing armchair astronauts to fulfill childhood dreams and fueling a booming business in space tourism.

Moreover, unlike traditional crewed rockets, which launch from ground-based locales, Virgin’s ships lift off from bigger planes that drop them off in midair. It’s a highly efficient technique that consumes less fuel and reduces the need for custom launch pad infrastructure. Passengers, who can enjoy three to five minutes of weightlessness, will soon include scientists who can run experiments midflight, as opposed to primarily using traditional suborbital space testing methods—i.e., spacecraft without a crew.

SpaceX

Tesla founder Elon Musk’s SpaceX is an all-purpose space technology firm that designs and manufactures myriad cutting-edge rockets and spacecraft. Case in point: Its Dragon capsule has already proved it can cost-efficiently carry crew and cargo to the International Space Station. The company’s Starship large-scale rocket and spacecraft system is also designed to carry massive payloads into orbit—and, thanks to NASA’s support, is expected soon to land the first astronauts on the moon since the Apollo program.

Not yet 20 years old, SpaceX is additionally focused on introducing more dependable equipment at a fraction of standard production and operating costs. Other innovations include the Falcon 9, a reusable two-stage rocket for repeatedly transporting people and equipment into space, and Falcon Heavy, the world’s most powerful rocket today, which can carry twice as much weight as its closest competitor. SpaceX’s ambitions even extend to commercial space flight and ride-sharing if you or your company’s inventory need to catch a quick lift into the atmosphere.

Almost as curious as the company’s public-facing creations are those powering its operations behind the scenes, including a fleet of autonomous drone ships that catch rockets as they hurtle back to earth, landing in the ocean. SpaceX is also heavily investing in building out Starlink, a broadband internet service powered by thousands of satellites that has the potential to bring high-speed connectivity to remote and rural areas around the globe. In short, by leveraging a host of leading-edge technical advancements to power practical innovations in communications, transport and aerospace operations, SpaceX aims to privatize the field of space flight as a whole. No wonder NASA ranks among the company’s biggest customers.

Blue Origin

The brainchild of Amazon founder Jeff Bezos, Blue Origin was founded in 2000 with the mission of expanding humanity’s reach into space, fueling interstellar exploration, and powering the search for new material and energy resources. It hopes to do so by delivering low-cost, fully or partly reusable orbital launch vehicles that can serve the needs of businesses and individuals alike. One person recently [paid an astounding $28 million for a ticket](https://www.washingtonpost.com/technology/2021/06/12/jeff-bezos-blue-origin-auction/).

Unlike Virgin Galactic, Blue Origin makes spacecraft that are able to cross the Kármán line—the 62-mile-high measurement that most countries consider to be the boundary of outer space. (The U.S. uses 50 miles as a benchmark instead.) The company’s mantra is “Launch, Land, Repeat,” a testimonial to its commitment to drastically lower expenses associated with space travel, and to the built-in vertical takeoff and landing technology that allows used vehicles to be quickly refurbished and once again take flight. Note that Blue Origin is also experimenting with oversized lunar landers designed to ferry astronauts and equipment affordably to and from the moon.

Investment Opportunities and New Innovations

The increasing desire for private space exploration points to companies’ growing desire to more cost-efficiently use resources, leverage emerging or preexisting technology in new ways, optimize processes and workflows, and pioneer new markets by democratizing access to resources and equipment.

Each of the big three players has sought to tap into a mix of proprietary and community knowledge bases, leverage new high-tech and engineering advancements to lower overhead and operating costs, and boost the accessibility of space travel. Likewise, all have looked to raise public awareness, amortize their investments in new innovations and extend potential revenue streams by finding new business applications for their proprietary solutions at every turn.

#### Subpoint C : New Space innovation spills over to the tech sector. Ignasi Sayol in Aug. 2021 explains

Sayol ‘21

Sayol, Ignasi. “Aerospace Innovation. Pioneer towards New Horizons.” Ignasi Sayol, 4 Aug. 2021, https://ignasisayol.com/en/aerospace-innovation/. // Phoenix

During the last decade, the aerospace industry has undergone a great transformation. It has witnessed countless disruptive innovations that have materialized and laid the foundation for future developments that are already on the horizon.

The application of multisectoral technologies such as 5G, advanced satellite systems, 3D printing, Big Data, [quantum technology](https://ignasisayol.com/en/quantum-computing/), among others, has allowed to update and scale the activity of operations in the air and space. Operations that were previously considered impossible.

Aeronautics innovation includes atmosphere and outer space activity developments. Aerospace engineering consists of aeronautics and astronautics, where aerospace organizations research, design, manufacture, operate or maintain aircraft and spacecraft.

Consider that many of these sector developments have been pioneers for the later application in other branches and that many of them are now improving many business sectors and daily life. The weather forecast, GPS or satellite television are examples that depend fundamentally on space infrastructure.

On the other hand, trends in space technology (SpaceTech) are gaining ground. Combining the increase in this industry private investments and the emerge of companies focused on this sector developing new technologies that facilitate movement, operations and communications between the earth and space.

Similarly, aviation is a branch that is accelerating the technology industry rate. An important motivation to improve the way airplanes operate is strongly driven by geopolitics. Let’s not forget that aviation has the power to turn friends into enemies and vice versa.

The aerospace industry pollinates sectors towards innovation

The aerospace sector over time has traditionally been seen as one of the greatest instigators of technological change. In disciplines such as engineering, electronics, communication, the use of new materials such as metals and plastic compounds, as well as the development of more efficient and sustainable energy systems.

The aerospace industry has a strong influence on manufacturing process innovation. It serves as a testing scenario for broader developments within automation, assembly, and inspection. Aircraft manufacturing is an example of systems and assembly’s complexity, that when solved, have great implications on many other sectors.

#### The impact is extinction ; Tech innovation prevents an array of threats stops that. Dylan Matthews in 2018 concludes

Dylan **Matthews 18**. Co-Founder of Vox, citing Nick Beckstead @ Rutgers University. 10-26-2018. "How To Help People Millions Of Years From Now." Vox. https://www.vox.com/future-perfect/2018/10/26/18023366/far-future-effective-altruism-existential-risk-doing-good

If you care about improving human lives, you should overwhelmingly care about those quadrillions of lives rather than the comparatively small number of people alive today. The 7.6 billion people now living, after all, amount to less than 0.003 percent of the population that will live in the future. It’s reasonable to suggest that those quadrillions of future people have, accordingly, hundreds of thousands of times more moral weight than those of us living here today do. That’s the basic argument behind Nick Beckstead’s 2013 Rutgers philosophy dissertation, “On the overwhelming importance of shaping the far future.” It’s a glorious mindfuck of a thesis, not least because Beckstead shows very convincingly that this is a conclusion any plausible moral view would reach. It’s not just something that weird utilitarians have to deal with. And Beckstead, to his considerable credit, walks the walk on this. He works at the Open Philanthropy Project on grants relating to the far future and runs a charitable fund for donors who want to prioritize the far future. And arguments from him and others have turned “long-termism” into a very vibrant, important strand of the effective altruism community. But what does prioritizing the far future even mean? The most literal thing it could mean is preventing human extinction, to ensure that the species persists as long as possible. For the long-term-focused effective altruists I know, that typically means identifying concrete threats to humanity’s continued existence — like unfriendly artificial intelligence, or a pandemic, or global warming/out of control geoengineering — and engaging in activities to prevent that specific eventuality. But in a set of slides he made in 2013, Beckstead makes a compelling case that while that’s certainly part of what caring about the far future entails, approaches that address specific threats to humanity (which he calls “targeted” approaches to the far future) have to complement “broad” approaches, where instead of trying to predict what’s going to kill us all, you just generally try to keep civilization running as best it can, so that it is, as a whole, well-equipped to deal with potential extinction events in the future, not just in 2030 or 2040 but in 3500 or 95000 or even 37 million. In other words, caring about the far future doesn’t mean just paying attention to low-probability risks of total annihilation; it also means acting on pressing needs now. For example: We’re going to be better prepared to prevent extinction from AI or a supervirus or global warming if society as a whole makes a lot of scientific progress. And a significant bottleneck there is that the vast majority of humanity doesn’t get high-enough-quality education to engage in scientific research, if they want to, which reduces the odds that we have enough trained scientists to come up with the breakthroughs we need as a civilization to survive and thrive. So maybe one of the best things we can do for the far future is to improve school systems — here and now — to harness the group economist Raj Chetty calls “lost Einsteins” (potential innovators who are thwarted by poverty and inequality in rich countries) and, more importantly, the hundreds of millions of kids in developing countries dealing with even worse education systems than those in depressed communities in the rich world.

## Case

#### The aff is circumvented because of public private partnerships with space agencies.

**Davenport 20** (Christian Davenport covers NASA and the space industry for The Washington Post's Financial desk. He joined The Post in 2000 and has served as an editor on the Metro desk and as a reporter covering military affairs. He is the author of "The Space Barons: Elon Musk, Jeff Bezos and the Quest to Colonize the Cosmos". “A dollar can’t buy you a cup of coffee but that’s what NASA intends to pay for some moon rocks”. December 3, 2020.)

**NASA** **announced** Thursday **that several companies had won contracts to mine the moon** and turn over small samples to the space agency for a small fee. In one case, a company called Lunar Outpost bid $1 for the work, a price NASA jumped at after deciding the Colorado-based robotics firm had the technical ability to deliver. “You’d be surprised at what a dollar can buy you in space,” Mike Gold, NASA’s acting associate administrator for international and interagency relations, said in a call with reporters. But the modest financial incentives are not the driver of the program. Nor to a large extent is the actual lunar soil. NASA is asking for only small amounts — between 50 and 500 grams (or 1.8 ounces to about 18 ounces). While there would be scientific benefits to the mission, **it’s** really **a tech**nology **development program, allowing companies to practice extracting resources from the lunar surface** and then selling them. It would also establish a legal precedent that would pave the way for companies to mine celestial bodies in an effort blessed by the U.S. government to help build a sustainable presence on the moon and elsewhere. To do that, **NASA** says it **needs its astronauts**, like the western pioneers, to “live off the land,” **using the resources in space instead of hauling them from Earth**. The moon, for example, has plenty of water in the form of ice. **That’s not only key to sustaining human life, but** the hydrogen and oxygen in water **could also be used as rocket fuel, making the moon a potential gas station in space** that could help explorers reach farther into the solar system. **Asteroids also have significant resources, particularly precious metals that could be used for in-space manufacturing.** While the prospect of large mining and manufacturing facilities in orbit is still many years away, NASA wants to use the mining program as a small step toward that goal. NASA is now trying to return astronauts to the moon under its Artemis program for the first time since 1972. Unlike its predecessor, Apollo, where the astronauts visited the lunar surface for a short while before coming home, the Artemis program would create a permanent presence on and around the moon. “**The ability to extract and utilize space resources is the key to achieving this objective of sustainability**,” Gold said. “We must learn to generate our own water, air and even fuel. Living off the land will enable ambitious exploration activities that will result in awe-inspiring science and unprecedented discoveries.” In 2015, then-President Barack Obama signed a law that allowed private companies the right to own the resources they mined in space. Under the program announced Thursday, NASA said the materials would be transferred from the private companies to NASA. **The effort would not violate the 1967 Outer Space Treaty**, NASA officials have said, which prohibits nations from claiming sovereignty over a celestial body. NASA Administrator Jim Bridenstine previously likened the policy to the rules governing the seas. “We do believe **we can extract and utilize the resources of the moon, just as we can extract and utilize tuna from the ocean**,” he said earlier this year. As part of its lunar exploration mission, NASA has been working to get countries around the world to adopt what it calls the Artemis Accords, a legal framework that would govern behavior in space and on celestial bodies such as the moon. The rules would allow private companies to extract lunar resources and create safety zones to prevent conflict and ensure that countries act transparently about their plans in space, while sharing their scientific discoveries. The mining announcement came during the same week that China landed a spacecraft on the moon, extracted resources and then lifted off from the lunar surface in an effort to return the sample to Earth. Instead of developing and sustaining a big government sample-return mission, **NASA is taking another approach by partnering with the private sector**. “If you step back and think about how really amazing it is that NASA can essentially piggyback on the private-sector space capabilities to perform this mission, it would not have been possible 10 years ago,” said Phil McAlister, the director of NASA’s commercial spaceflight division. **In addition to Lunar Outpost, the other companies chosen for NASA’s** program **are**: **ispace Japan and Europe**, which would each charge $5,000 for the material; **and Masten Space Systems of California**, would charge $15,000. All of the companies would already be on the moon, according to NASA, conducting other missions. McAlister said Lunar Outpost would be ferried to the moon by the lunar lander known as Blue Moon being developed by Jeff Bezos’s Blue Origin. (Bezos owns The Washington Post.) The company later clarified that it was looking at a number of landers to get it to the lunar surface, and not just Blue Origin’s. The ispace companies would fly on a Japanese lander, McAlister said, and Masten, already part of another NASA lunar contract, would use its own Masten XL-1 lander.

#### ^^ that proves our NC true because it means innovation in the world of negative – where the world of the aff takes away that

### CC Impact

#### Turn the impact -- Commercial mining solves climate change better

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.

### space debris impact

#### No impact to debris bc they’re spread 40 miles apart