# 1

#### Strong commercial space catalyzes tech innovation – progress at the margins and spinoff tech change global information networks

Joshua Hampson 2017, Security Studies Fellow at the Niskanen Center, 1-25-2017, “The Future of Space Commercialization”, Niskanen Center, https://republicans-science.house.gov/sites/republicans.science.house.gov/files/documents/TheFutureofSpaceCommercializationFinal.pdf

Innovation is generally hard to predict; some new technologies seem to come out of nowhere and others only take off when paired with a new application. It is difficult to predict the future, but it is reasonable to expect that a growing space economy would open opportunities for technological and organizational innovation. In terms of technology, the difficult environment of outer space helps incentivize progress along the margins. Because each object launched into orbit costs a significant amount of money—at the moment between $27,000 and $43,000 per pound, though that will likely drop in the future —each 19 reduction in payload size saves money or means more can be launched. At the same time, the ability to fit more capability into a smaller satellite opens outer space to actors that previously were priced out of the market. This is one of the reasons why small, affordable satellites are increasingly pursued by companies or organizations that cannot afford to launch larger traditional satellites. These small 20 satellites also provide non-traditional launchers, such as engineering students or prototypers, the opportunity to learn about satellite production and test new technologies before working on a full-sized satellite. That expansion of developers, experimenters, and testers cannot but help increase innovation opportunities. Technological developments from outer space have been applied to terrestrial life since the earliest days of space exploration. The National Aeronautics and Space Administration (NASA) maintains a website that lists technologies that have spun off from such research projects. Lightweight 21 nanotubes, useful in protecting astronauts during space exploration, are now being tested for applications in emergency response gear and electrical insulation. The need for certainty about the resiliency of materials used in space led to the development of an analytics tool useful across a range of industries. Temper foam, the material used in memory-foam pillows, was developed for NASA for seat covers. As more companies pursue their own space goals, more innovations will likely come from the commercial sector. Outer space is not just a catalyst for technological development. Satellite constellations and their unique line-of-sight vantage point can provide new perspectives to old industries. Deploying satellites into low-Earth orbit, as Facebook wants to do, can connect large, previously-unreached swathes of 22 humanity to the Internet. Remote sensing technology could change how whole industries operate, such as crop monitoring, herd management, crisis response, and land evaluation, among others. 23 While satellites cannot provide all essential information for some of these industries, they can fill in some useful gaps and work as part of a wider system of tools. Space infrastructure, in helping to change how people connect and perceive Earth, could help spark innovations on the ground as well. These innovations, changes to global networks, and new opportunities could lead to wider economic growth.

#### Short innovation cycles mean every contract counts

John J. Klein 19, Senior Fellow and Strategist at Falcon Research Inc. and adjunct professor at the George Washington University Space Policy Institute, 1-15-2019, "Rethinking Requirements and Risk in the New Space Age," Center for a New American Security, https://www.cnas.org/publications/reports/rethinking-requirements-and-risk-in-the-new-space-age

Unfortunately, these variances in models between the MDAP’s lengthy development cycle and the commercial space sector’s 18-month innovation cycle are a result of stark differences in thinking about requirements and risk. Requirements and risk for MDAPs commonly focus on ensuring critical mission capabilities at a given cost. In contrast, the commercial space sector tends to focus more on providing innovation quickly using economies of scale. The commercial sector understands that time dynamically shapes decisions related to requirements and risk because of the relatively short innovation cycle. In a highly competitive space sector with tight profit margins, those unable to innovate quickly will likely be out of business soon. Alternatively, space systems with mission assurance requirements – where failures are detrimental to national security and military operations – often drive DoD’s timelines. Program managers of critical national security space systems commonly require additional time to test and verify that satellites can perform missions with a very low probability of failure.

#### Tech innovation solves every existential threat – cumulative extinction events outweigh the aff

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. What if living ethically for the far future means living ethically now? Beckstead mentions some other broad, or very broad, ideas (these are all his descriptions): Help make computers faster so that people everywhere can work more efficiently Change intellectual property law so that technological innovation can happen more quickly Advocate for open borders so that people from poorly governed countries can move to better-governed countries and be more productive Meta-research: improve incentives and norms in academic work to better advance human knowledge Improve education Advocate for political party X to make future people have values more like political party X ”If you look at these areas (economic growth and technological progress, access to information, individual capability, social coordination, motives) a lot of everyday good works contribute,” Beckstead writes. “An implication of this is that a lot of everyday good works are good from a broad perspective, even though hardly anyone thinks explicitly in terms of far future standards.” Look at those examples again: It’s just a list of what normal altruistically motivated people, not effective altruism folks, generally do. Charities in the US love talking about the lost opportunities for innovation that poverty creates. Lots of smart people who want to make a difference become scientists, or try to work as teachers or on improving education policy, and lord knows there are plenty of people who become political party operatives out of a conviction that the moral consequences of the party’s platform are good. All of which is to say: Maybe effective altruists aren’t that special, or at least maybe we don’t have access to that many specific and weird conclusions about how best to help the world. If the far future is what matters, and generally trying to make the world work better is among the best ways to help the far future, then effective altruism just becomes plain ol’ do-goodery.\*

# 2

#### China’s “space dream” is key to Xi credibility – plan is a flip flop that undermines legitimacy

Kharpal 21 – senior technology correspondent based in Guangzhou, China at CNBC [Arjun, “China once said it couldn’t put a potato in space. Now it’s eyeing Mars,” 6/30/2021, https://www.cnbc.com/2021/06/30/china-space-goals-ccp-100th-anniversary.html]

Fast forward more than six decades and President Xi Jinping, China’s current leader, is seen congratulating three astronauts who were sent to the country’s own space station earlier this month.

Since Mao’s comments, China has launched satellites, sent humans to space and is now planning to build a base on Mars, achievements and ambitions Beijing has highlighted as the centennial of the CCP’s founding approaches. Space is now another battleground between the U.S. and China amid a broader technological rivalry for supremacy, one that could have scientific and military implications on Earth. “President Xi Jinping has declared that China’s ‘Space Dream’ is to overtake all nations and become the leading space power by 2045,” said Christopher Newman, professor of space law and policy at the U.K.’s Northumbria University. “This all feeds into China’s ambition to be the world’s single science and technology superpower.” Why space? In March, China highlighted space as a “frontier technology” it would focus on and research into the “origin and evolution of the universe.” But there are other implications too. “It is important for China and the US because it can advance technological development” in areas such as “national security and some socioeconomic development,” according to Sa’id Mosteshar, director of the London Institute of Space Policy and Law, and research fellow Christoph Beischl. While experts doubt it could spiral into war in space, extra-terrestrial activities can support military operations on Earth. Space achievements are also about the optics.Through space exploration to the Moon or to Mars, “China and the U.S. display their technological sophistication to the domestic audience and the world, increasing their domestic and international prestige, domestic legitimacy and international influence,” Mosteshar and Beischl said.

#### Flip flops trigger the disad

Buckley and Myers 19 (Chris Buckley and Steven Lee Myers, “As China Trade Talks Stall, Xi Faces a Dilemma: Fold? Or Double Down?,” New York Times, May 9, 2019, https://www.nytimes.com/2019/05/09/world/asia/xi-jinping-donald-trump.html)

China had been willing to protect intellectual property and open its markets to American business, but the Trump administration wanted the agreement to specify that some of those changes be made in Chinese law. For China, any legislative change or policy reversal could be a very public — and potentially humbling — reminder that it gave ground under pressure. “That would bring back painful memories of the days of national humiliation in our history,” said Wang Yong, the director of the Center for International Political Economy at Peking University. “China has made too many concessions.” The blaring nature of the Trump administration’s broadsides has sharpened the dilemma that Mr. Xi faces in the negotiations. “To have Trump doing it so publicly is obviously very, very difficult for Xi Jinping,” said Susan L. Shirk, a professor at the University of California, San Diego, who worked as a deputy assistant secretary of state responsible for China under President Bill Clinton. “It makes it much more difficult for him to make the compromises needed.”

#### CCP instability causes extinction.

Perkinson 12 — Jessica, Faculty of the School of International Service of American University in Partial Fulfilment of the Requirements for the Degree of Master of Arts in International Affairs; reviewed by: Quansheng Zhao, Professor of international relations and Chair of Asian Studies Program Research Council at American University, and John C. King, Assistant Professor School of International Service, 2012 (“The Potential for Instability in the PRC: How the Doomsday Theory Misses the Mark,” American University, April 19th, Available Online at http://aladinrc.wrlc.org/bitstream/handle/1961/10330/Perkinson\_american\_0008N\_10238display.pdf?sequence=1)

Should the CCP undergo some sort of dramatic transformation – whether that be significant reform or complete collapse, as some radical China scholars predict2 – the implications for international and US national security are vast. Not only does China and the stability of the CCP play a significant role in the maintenance of peace in the East Asian region, but China is also relied upon by many members of the international community for foreign direct investment, economic stability and trade. China plays a key role in maintaining stability on the Korean Peninsula as one of North Korea’s only allies, and it is argued that instability within the Chinese government could also lead to instability in the already sensitive military and political situation across the Taiwan Strait. For the United States, the effect of instability within the CCP would be widespread and dramatic. As the United States’ largest holder of US treasury securities, instability or collapse of the CCP could threaten the stability of the already volatile economic situation in the US. In addition, China is the largest trading partner of a number of countries, including the US, and the US is reliant upon its market of inexpensive goods to feed demand within the US.

It is with this in mind that China scholars within the United States and around the world should be studying this phenomenon, because the potential for reform, instability or even collapse of the CCP is of critical importance to the stability of the international order as a whole. For the United States specifically, the potential - or lack thereof - for reform of the CCP should dictate its foreign policy toward China. If the body of knowledge on the stability of the Chinese government reveals that the Chinese market is not a stable one, it is in the best interests of the United States to look for investors and trade markets elsewhere to lessen its serious dependence on China for its economic stability, particularly in a time of such uncertain economic conditions within the US.

#### Korean war goes nuclear

**Ward 18** [Alex Ward, staff writer @ Vox covering international security and defense issues, co-host of Vox's "Worldly" podcast, formerly an associate director in the Atlantic Council's Brent Scowcroft Center on International Security where he worked on military issues and US foreign policy, wrote the #NatSec2016 newsletter for War on the Rocks, December 26, 2018, “This is exactly how a nuclear war would kill you, Vox, <https://www.vox.com/future-perfect/2018/10/19/17873822/nuclear-war-weapons-bombs-how-kill>]

Still, there remains a genuine fear — perhaps slightly allayed now following Washington and Pyongyang’s diplomatic thaw — that the leaders might escalate their public squabble into a nuclear conflict. In February, Yochi Dreazen wrote for Vox that “a full-blown war with North Korea wouldn’t be as bad as you think. It would be much, much worse,” in part because “millions — plural — would die.” As Dreazen recounts, the US would likely have to send in around 200,000 troops to destroy Kim’s nuclear arsenal. Seoul, South Korea’s capital, would soon — if not already — lie in ruins due to North Korea’s large artillery capabilities. None of that may even be the worst part: Bruce Klingner, a 20-year veteran of the CIA who spent years studying North Korea, told me that Iraqi leader Saddam Hussein had stood by in 2002 as the US methodically built up the forces it used to invade the country — and oust Hussein — the following year. He said there was little chance that Kim would follow in Hussein’s footsteps and patiently allow the Pentagon to deploy the troops and equipment it would need for a full-on war with North Korea. “The conventional wisdom used to be that North Korea would use only nuclear weapons as part of a last gasp, twilight of the gods, pull the temple down upon themselves kind of move,” said Klingner, who now works for the conservative Heritage Foundation. “But we have to prepare for the real possibility that Kim would use nuclear weapons in the early stages of a conflict, not the latter ones.” In effect, any attempt to overthrow the Kim regime would prompt North Korea to launch nukes at the United States. Washington would almost certainly respond in kind, leading to one of the worst wars in world history. 2) US vs. Russia war Few experts discounted the idea that the US and Russia could yet engage in a nuclear war despite a decades-long standoff. After all, they’ve come close a few times. Here are just two examples: In September 1983, a missile attack system made it seem like the US had launched weapons at the Soviet Union. One man, Soviet Lt. Col. Stanislav Petrov, decided it was a false alarm and didn’t report the alert. Had he done so, Moscow likely would’ve responded with an actual nuclear strike. Stanislav Petrov, a former Soviet military officer known in the West as “The man who saved the world’’ for his role in averting a nuclear war over a false missile alarm, died in May, 2015 at age 77. Stanislav Petrov, a former Soviet military officer known in the West as “The man who saved the world’’ for his role in averting a nuclear war over a false missile alarm, died in May 2015 at age 77. Pavel Golovkin/AP Two months later, a too-real NATO war game — Able Archer 83 — made the Soviets believe Western forces were preparing for an actual attack. Moscow put its nuclear arsenal on high alert, but ultimately, neither side came to nuclear blows. Today, two main reasons explain why a US-Russia nuclear fight is a major concern. The first is the most obvious: Moscow just has so many nuclear weapons. Russia is the only country that could match the US bomb-for-bomb in any conflict. The longer Moscow has its weapons, the thinking goes, the higher the chance it uses them on the US — or vice versa. The second reason is the most troublesome: Washington and Moscow may be on a collision course. Russia is expanding further into Europe and encroaching on NATO territory. There’s even fear that Putin might authorize an invasion of a Baltic country that once was a part of the Soviet Union but is now in NATO. If that happens, the US would be treaty-bound to defend the Baltic country, almost assuredly setting up a shooting war with Moscow. Experts disagree on what would happen next. Some, including the Trump administration, claim Russia would use nuclear weapons early in a fight as a way to “escalate to deescalate” — do something so brash at the start of a conflict that it has to end before it gets even worse. Others say Russia would use the weapons only if its forces are on the brink of defeat. Magnets depicting Russian President Putin and President Trump on sale in Helsnki, Finland. Magnets depicting Russian President Putin and President Trump on sale in Helsnki, Finland. Alexander Demianchuk\TASS via Getty Images But Olga Oliker and Andrey Baklitskiy, experts on Russia’s nuclear strategy, wrote at War on the Rocks in February that Moscow’s “military doctrine clearly states that nuclear weapons will be used only in response to an adversary using nuclear or other weapons of mass destruction,” or if the country’s survival is in doubt. In other words, they say Russia would only use nukes in retaliation or to avoid certain extinction. Washington, of course, would likely respond with its own nuclear strikes after Moscow dropped its bombs. At that point, they’d be in a full-blown nuclear war with the potential to destroy each other and much of the world (more on that below). 3) India vs. Pakistan war India and Pakistan have gone to war four times since 1947, when Britain partitioned what had been a single colony into Hindu-majority India and Muslim-majority Pakistan. The worry today, though, is that a fifth conflict could go nuclear. Protesters hurl stones towards police and paramilitary men during clashes on the outskirts of Srinagar, India, on October 16, 2018. Protesters hurl stones towards police and paramilitary men during clashes on the outskirts of Srinagar, India, on October 16, 2018. Waseem Andrabi/Hindustan Times via Getty Images After decades of testing, India officially became a nuclear power in 1998. Islamabad, which had started a uranium enrichment program in the 1970s, soon joined New Delhi in the nuclear club. Two of their fights — the 1999 Kargil War and the 2001-’02 Twin Peaks Crisis — happened with fully functioning nuclear arsenals, but ultimately, neither country chose to use them. But the opportunity keeps presenting itself. Each side claims the other has violated an ongoing ceasefire in the contested, but India-administered, Kashmir region. The region continues to be roiled by violence; for instance, six people were killed in separate instances on September 27. The dispute over Kashmir is a key reason for current India-Pakistan tensions — and has the potential to spiral out of control. Javier Zarracina/Vox Some fear that India and Pakistan may reach for the proverbial nuclear button sooner rather than later. Here’s just one reason why, according to an April report by Tom Hundley for Vox: The Pakistan navy is likely to soon place nuclear-tipped cruise missiles on up to three of its five French-built diesel-electric submarines. ... Even more disturbing, Pakistani military authorities say they are considering the possibility of putting nuclear-tipped cruise missiles on surface vessels. ... Pakistan says its decision to add nuclear weapons to its navy is a direct response to India’s August 2016 deployment of its first nuclear submarine, the Arihant. A second, even more advanced Indian nuclear submarine, the Arighat, began sea trials last November, and four more boats are scheduled to join the fleet by 2025. That will give India a complete “nuclear triad,” which means the country will have the ability to deliver a nuclear strike by land-based missiles, by warplanes, and by submarines. In effect, India and Pakistan are in a nuclear arms race, and historical enemies will soon patrol dangerous waters in close proximity with nuclear weapons aboard their vessels. While there’s no real indication a fifth India-Pakistan war is on the horizon, it’s possible one flare-up puts both countries on the path to a nuclear crisis. Wild card: Trump’s temperament Cirincione, the head of the Ploughshares Fund, told me the risk of nuclear war is increasing because of one factor: Trump. “He is the greatest nuclear risk in the world, more than any person, any group, or any nation,” he said. “The policies he is pursuing are making most of our nuclear risks worse, and he is tearing down the global institutions that have reduced and restrained nuclear risks over the last few decades.” Activists marches with a model of a nuclear rocket during a demonstration against nuclear weapons on in Berlin, Germany, on November 18, 2017. About 700 demonstrators protested against the escalation of threat of nuclear attack between the US and North Ko Activists marches with a model of a nuclear rocket during a demonstration against nuclear weapons on in Berlin, Germany, on November 18, 2017. About 700 demonstrators protested against the escalation of threat of nuclear attack between the US and North Korea. Adam Berry/Getty Images Here’s what he means: The administration’s Nuclear Posture Review, released in February, lowered the threshold for dropping a bomb on an enemy. Basically, the US said that it would launch low-yield nuclear weapons — smaller, less deadly bombs — in response to nonnuclear strikes, such as a major cyberattack. That was in contrast with previous US administrations, which said they would respond with a nuke only in the event of the most egregious threats against the US, like the possible use of a biological weapon. The document also calls for more, smaller weapons on submarines and other platforms to attack enemies. Many experts worry that having tinier nukes makes them more usable, thereby increasing the chance of a skirmish turning into a full-blown nuclear war. (Think, for example, of the US-China trade war escalating to the point that Trump thinks his only option is to launch a smaller nuke, or how Trump could respond to Beijing after a devastating cyberattack on US infrastructure.) Plus, increasing the arsenal in this way would partially undo decades of the US’s work to stop nuclear proliferation around the world. Some experts, like Georgetown’s Kroenig, say having smaller tactical weapons is actually a good idea. Our current arsenal, which prioritizes older and bigger nukes, leads adversaries to think we would never use it. Having smaller bombs that America might use, then, makes the chance of a nuclear conflict less likely. “It gives us more options to threaten that limited response,” Kroenig told me. “We raise the bar with these lower-yield weapons.” But the Trump risk may have less to do with what kinds of bombs he has and more to do with his temperament. Take his tweet from January 2 toward the end of his spat with Kim Jong Un, the North Korean leader: Donald J. Trump ✔ @realDonaldTrump North Korean Leader Kim Jong Un just stated that the “Nuclear Button is on his desk at all times.” Will someone from his depleted and food starved regime please inform him that I too have a Nuclear Button, but it is a much bigger & more powerful one than his, and my Button works! 475K 7:49 PM - Jan 2, 2018 Twitter Ads info and privacy 324K people are talking about this While tensions with North Korea were high early on in Trump’s presidency, he has yet to face a situation, like his predecessors did, where it seemed nuclear war was likely. The 13-day Cuban missile crisis in October 1962, where the Soviet Union had secretly placed missiles in Cuba — just 90 miles from the US mainland — comes to mind. Members of President John F. Kennedy’s team, especially his military advisers, called for airstrikes on Cuba and even an invasion. But Kennedy decided to set up a blockade of the island and try to work out a diplomatic settlement with the Soviets, in part because a military confrontation might turn nuclear. Ultimately, the situation ended when they agreed on a deal: The Soviets would withdraw the missiles from the island, and the US would take out its missiles in Turkey. Before that conclusion, both sides came as close to nuclear war as ever. Customers gather to watch President John F. Kennedy as he delivers a televised address to the nation on the subject of the Cuban Missile Crisis, on October 22, 1962. Customers gather to watch President John F. Kennedy as he delivers a televised address to the nation on the subject of the Cuban Missile Crisis, on October 22, 1962. Ralph Crane/The LIFE Picture Collection/Getty Images How would Trump handle himself in a similar situation? Would he resist the urges of some in his military brass to strike an enemy — perhaps with a lower-yield nuke — or would he simply tweet out a threat in a hair-trigger moment? The fact is we don’t know — but what we do know about Trump makes his demeanor in such a situation a potential, even if very small, nuclear risk. Here’s what happens in a nuclear attack The theory around whether someone might drop a nuclear bomb takes away from the most serious matter in these discussions: the human and physical toll. Simply put, a nuclear strike of any magnitude would unleash suffering on a scale not seen since World War II. And with the advances in nuclear technology since then, it’s possible the devastation of the next nuclear strike would be far, far worse. It’s hard to picture what the effect of a modern-day nuclear attack would actually look like. But Wellerstein, the nuclear historian, created a website called Nukemap that allows users to “drop” a specific bomb — say, the roughly 140-kiloton explosive North Korea tested in September 2017 — on any target. So I did just that, detonating that North Korean device on the Capitol building in the heart of Washington, DC — and, well, see for yourself: Christina Animashaun/Vox Roughly 220,000 people would die from this one attack alone, according to the Nukemap estimate, while another 450,000 would sustain injuries. By comparison, America’s two nuclear attacks on Japan in 1945 killed and injured a total of around 200,000 people (granted, Hiroshima and Nagasaki had smaller populations than the Washington metro area). It’s very likely that North Korea wouldn’t launch just one bomb, but multiple at DC and likely some at New York City, the West Coast, and possibly US military bases in Guam and/or Hawaii. But for simplicity’s sake, let’s focus on the effects of this one horrible attack. The center yellow circle is the fireball radius — that is, the mushroom cloud — which would extend out about 0.25 square miles. Those within the green circle, approximately a 1.2-square-mile area, would face the heaviest dose of radiation. “Without medical treatment, there can be expected between 50% and 90% mortality from acute effects alone. Dying takes between several hours and several weeks,” according to the website. Radiation poisoning is a horrible way to die. Here are just some of the symptoms people sick with radiation get: Nausea and vomiting Spontaneous bleeding Diarrhea, sometimes bloody Severely burnt skin that may peel off The dark grey circle in the middle is where a shock wave does a lot of damage. In that 17-square-mile area, the bomb would flatten residential buildings, certainly killing people in or near them. Debris and fire would be everywhere. People in the bigger yellow circle, a 33.5-square-mile area, would receive third-degree burns. “There’s a bright flash of light,” Brian Toon, a scientist and expert on nuclear disasters at the University of Colorado Boulder, told me about when the bomb goes off. Those exposed to the light, which would stretch for miles, would get those burns if their skin were exposed. The light would also “easily ignite fires with flammable objects like leaves, twigs, paper, or your clothing,” he added. The victims may not feel much pain, however, because the burn will destroy pain nerves. Still, some will suffer major scarring or have the inability to use certain limbs, and others might require amputation, according to Wellerstein’s site. A mother tends her injured child, a victim of the atomic bomb blast at Hiroshima. A mother tends her injured child, a victim of the atomic bomb blast at Hiroshima. Keystone/Getty Images The biggest circle encompasses the near entirety of the air-blast zone: a 134-square-mile area. People can still die, or at least receive severe injuries, in that location. The blast would break windows, and those standing near the glass might be killed by shards, or at least shed blood from myriad cuts. Those who survive the bombing and its effects will have to walk through burning rubble and pass lifeless, charred bodies to reach safety. Some of them will ultimately survive, but others will succumb to sustained injuries or radiation. The wind, meanwhile, will carry the irradiated debris and objects — known as fallout because they drop from the sky — far outside the blast zone and sicken countless others. As for Washington, it will likely take decades and billions of dollars not only to rebuild the city but clean it of radiation entirely. It’s worth reiterating that all of the above are estimates for one strike on one location. An actual nuclear war would have much wider and more devastating consequences. And if that war spiraled out of control, the effects after the conflict would be much worse than the attacks themselves — and change the course of human history. “Almost everybody on the planet would die” It’s possible you have an idea of what a post-nuclear hellscape looks like. After all, disaster movies are obsessed with that kind of world. But scientists and other nuclear experts care deeply about this issue too — and their research shows the movies may be too optimistic. Alan Robock, an environmental sciences professor at Rutgers University, has spent decades trying to understand what a nuclear war would do to the planet. The sum of his work, along with other colleagues’, is based on economic, scientific, and agricultural models. Here’s what he found: The most devastating long-term effects of a nuclear war actually come down to the black smoke, along with the dust and particulates in the air, that attacks produce. People walking through the ruins of Hiroshima in the weeks following the atomic bomb blast. People walking through the ruins of Hiroshima in the weeks following the atomic bomb blast. Bernard Hoffman/The LIFE Picture Collection/Getty Images In a nuclear war, cities and industrial areas would be targeted, thereby producing tons of smoke as they burn. Some of that smoke would make it into the stratosphere — above the weather — where it would stay for years because there’s no rain to wash it out. That smoke would expand around the world as it heats up, blocking out sunlight over much of Earth. As a result, the world would experience colder temperatures and less precipitation, depleting much of the globe’s agricultural output. That, potentially, would lead to widespread famine in a matter of years. The impact on the world, however, depends on the amount of rising smoke. While scientists’ models and estimates vary, it’s believed that around 5 million to 50 millions tons of black smoke could lead to a so-called “nuclear autumn,” while 50 million to 150 millions tons of black smoke might plunge the world into a “nuclear winter.” If the latter scenario came to pass, Robock told me, “almost everybody on the planet would die.”

# Case

## Framework

#### This util but not really util stuff doesn’t work – they agree to calculate consequences and weigh them but just nebulously say that structural violence comes first. Materiality controls their impacts – racism, structural violence, etc are only bad if pain is bad an pleasure is good. By appealing to things like poverty and structural violence they’re implicitly conceding to some util weighing

#### Extinction o/ws under any framework, even under moral uncertainty – infinite future generations

Pummer 15 — (Theron Pummer, Junior Research Fellow in Philosophy at St. Anne's College, University of Oxford, “Moral Agreement on Saving the World“, Practical Ethics University of Oxford, 5-18-2015, Available Online at http://blog.practicalethics.ox.ac.uk/2015/05/moral-agreement-on-saving-the-world/, accessed 7-2-2018, HKR-AM) \*\*we do not endorse ableist language=

There appears to be lot of disagreement in moral philosophy. Whether these many apparent disagreements are deep and irresolvable, I believe there is at least one thing it is reasonable to agree on right now, whatever general moral view we adopt: that it is very important to reduce the risk that all intelligent beings on this planet are eliminated by an enormous catastrophe, such as a nuclear war. How we might in fact try to reduce such existential risks is discussed elsewhere. My claim here is only that we – whether we’re consequentialists, deontologists, or virtue ethicists – should all agree that we should try to save the world. According to consequentialism, we should maximize the good, where this is taken to be the goodness, from an impartial perspective, of outcomes. Clearly one thing that makes an outcome good is that the people in it are doing well. There is little disagreement here. If the happiness or well-being of possible future people is just as important as that of people who already exist, and if they would have good lives, it is not hard to see how reducing existential risk is easily the most important thing in the whole world. This is for the familiar reason that there are so many people who could exist in the future – there are trillions upon trillions… upon trillions.There are so many possible future people that reducing existential risk is arguably the most important thing in the world,even if the well-being of these possible people were given only 0.001% as much weight as that of existing people. Even on a wholly person-affecting view – according to which there’s nothing (apart from effects on existing people) to be said in favor of creating happy people – the case for reducing existential risk is very strong. As noted in this seminal paper, this case is strengthened by the fact that there’s a good chance that many existing people will, with the aid of life-extension technology, live very long and very high quality lives. You might think what I have just argued applies to consequentialists only. There is a tendency to assume that, if an argument appeals to consequentialist considerations (the goodness of outcomes), it is irrelevant to non-consequentialists. But that is a huge mistake. Non-consequentialism is the view that there’s more that determines rightness than the goodness of consequences or outcomes; it is not the view that the latter don’t matter. Even John Rawls wrote, “All ethical doctrines worth our attention take consequences into account in judging rightness. One which did not would simply be irrational, crazy.” Minimally plausible versions of deontology and virtue ethics must be concerned in part with promoting the good, from an impartial point of view. They’d thus imply very strong reasons to reduce existential risk, at least when this doesn’t significantly involve doing harm to others or damaging one’s character. What’s even more surprising, perhaps, is that even if our own good (or that of those near and dear to us) has much greater weight than goodness from the impartial “point of view of the universe,” indeed even if the latter is entirely morally irrelevant, we may nonetheless have very strong reasons to reduce existential risk. Even egoism, the view that each agent should maximize her own good, might imply strong reasons to reduce existential risk. It will depend, among other things, on what one’s own good consists in. If well-being consisted in pleasure only, it is somewhat harder to argue that egoism would imply strong reasons to reduce existential risk – perhaps we could argue that one would maximize her expected hedonic well-being by funding life extension technology or by having herself cryogenically frozen at the time of her bodily death as well as giving money to reduce existential risk (so that there is a world for her to live in!). I am not sure, however, how strong the reasons to do this would be. But views which imply that, if I don’t care about other people, I have no or very little reason to help them are not even minimally plausible views (in addition to hedonistic egoism, I here have in mind views that imply that one has no reason to perform an act unless one actually desires to do that act). To be minimally plausible, egoism will need to be paired with a more sophisticated account of well-being. To see this, it is enough to consider, as Plato did, the possibility of a ring of invisibility – suppose that, while wearing it, Ayn could derive some pleasure by helping the poor, but instead could derive just a bit more by severely harming them. Hedonistic egoism would absurdly imply she should do the latter. To avoid this implication, egoists would need to build something like the meaningfulness of a life into well-being, in some robust way, where this would to a significant extent be a function of other-regarding concerns (see chapter 12 of this classic intro to ethics). But once these elements are included, we can (roughly, as above) argue that this sort of egoism will imply strong reasons to reduce existential risk. Add to all of this Samuel Scheffler’s recent intriguing arguments (quick podcast version available here) that most of what makes our lives go well would be undermined if there were no future generations of intelligent persons. On his view, my life would contain vastly less well-being if (say) a year after my death the world came to an end. So obviously if Scheffler were right I’d have very strong reason to reduce existential risk. We should also take into account moral uncertainty. What is it reasonable for one to do, when one is uncertain not (only) about the empirical facts, but also about the moral facts? I’ve just argued that there’s agreement among minimally plausible ethical views that we have strong reason to reduce existential risk – not only consequentialists, but also deontologists, virtue ethicists, and sophisticated egoists should agree. But even those (hedonistic egoists) who disagree should have a significant level of confidence that they are mistaken, and that one of the above views is correct. Even if they were 90% sure that their view is the correct one (and 10% sure that one of these other ones is correct), they would have pretty strong reason, from the standpoint of moral uncertainty, to reduce existential risk. Perhaps most disturbingly still, even if we are only 1% sure that the well-being of possible future people matters, it is at least arguable that, from the standpoint of moral uncertainty, reducing existential risk is the most important thing in the world. Again, this is largely for the reason that there are so many people who could exist in the future – there are trillions upon trillions… upon trillions. (For more on this and other related issues, see this excellent dissertation). Of course, it is uncertain whether these untold trillions would, in general, have good lives. It’s possible they’ll be miserable. It is enough for my claim that there is moral agreement in the relevant sense if, at least given certain empirical claims about what future lives would most likely be like, all minimally plausible moral views would converge on the conclusion that we should try to save the world. While there are some non-crazy views that place significantly greater moral weight on avoiding suffering than on promoting happiness, for reasons others have offered (and for independent reasons I won’t get into here unless requested to), they nonetheless seem to be fairly implausible views. And even if things did not go well for our ancestors, I am optimistic that they will overall go fantastically well for our descendants, if we allow them to. I suspect that most of us alive today – at least those of us not suffering from extreme illness or poverty – have lives that are well worth living, and that things will continue to improve. Derek Parfit, whose work has emphasized future generations as well as agreement in ethics, described our situation clearly and accurately: “We live during the hinge of history. Given the scientific and technological discoveries of the last two centuries, the world has never changed as fast. We shall soon have even greater powers to transform, not only our surroundings, but ourselves and our successors. If we act wisely in the next few centuries, humanity will survive its most dangerous and decisive period.Our descendants could, if necessary, go elsewhere, spreading through this galaxy…. Our descendants might, I believe, make the further future very good. But that good future may also depend in part on us. If our selfish recklessness ends human history, we would be acting very wrongly.” (From chapter 36 of On What Matters)

#### And, it’s a gateway issue – dying ends the morality question so you must prevent extinction to resolve the fw debate even if u think theyre mostly winning

#### Magnitude outweighs probability – even if risk is low extinction causes incomprehensible suffering and loss of value

#### No ecological stuff – you kill millions of microscopic bugs with literally every action you take making it infeasible

#### and any government action inadvertently kills trillions of life forms that we don’t notice which means even if you do weigh ecological disruption is negligible compared to the coincidental deaths in any gov action

they also haven’t justified counting animals in our calc they’ve just explained how wed go about doing it

## Mars Col

#### No ev that its coming now so no impact

Public mars col

## Mining

#### They never read ev that mining is coming now

#### Too many barriers to successful asteroid mining – err neg because the commercial space industry is overly optimistic

Scoles 17 (Sarah. 1/23. Contributing writer at WIRED Science, a contributing editor at Popular Science, and the author of the book ​Making Contact: Jill Tarter and the Search for Extraterrestrial Intelligence. “ASTEROID MINING SOUNDS HARD, RIGHT? YOU DON’T KNOW THE HALF OF IT” <https://www.wired.com/2017/01/asteroid-mining-sounds-hard-right-dont-know-half/>) 8/27/19 RK

THE COMMERCIAL SPACE industry pushes a particular brand of optimism. Its urge to inspire manifests as soaring soundtracks to three-minute mission-promo videos, press releases with words like “humanity,” and slick graphics of spacecraft that don’t exist yet but could any day now. In the particular case of asteroid mining, business leaders are selling a future in which materials plucked from space rocks make up for Earth’s shortfalls and support a thriving civilization. Everyone is rich, all are happy, and no one wants for anything. O pioneers! We are them! OK, fine, that’s an exaggeration. But the toned-down version of asteroid mining’s prospects is still hyperreal. "Our vision is to catalyze humanity's growth, both on and off the Earth," says Peter Diamandis, co-founder of mining company Planetary Resources, in a PR video. A graphical spacecraft, presumably future-theirs, flies away from our planet while he speaks. "At the end, the entire human race will be the beneficiary, as we expand our reach beyond the Earth, into the solar system," he continues. But traveling the road to space-based industry will require giant leaps. Like picking the most lucrative asteroids—the ones with lots of water and precious metals—from far afield. And negotiating spacecraft near their complicated gravitational fields. To do that, companies will have to leave the comfy confines of Earth's orbit, where they currently do all their experimenting. In May, Planetary Resources raised $21 million of venture capital for an Earth-observation program called Ceres. Ten small satellites will fly low around the planet, taking twice-daily images of Earth in wavelengths ranging from mid-infrared to visible—images that will “benefit multiple industries including agriculture, oil & gas, water quality, financial intelligence and forestry.” These satellites will, essentially, be prospecting Earth, using the same sensors Planetary Resources has developed to prospect asteroids. The utility, says president and CEO Chris Lewicki, is dual. “We are taking pictures of the Earth and using them not only to understand how our technology works but also to understand more about our planet,” he says. True enough, but it's also about the balance sheet: Earth-facing spacecraft, as all that venture capital suggests, are big money. Which is important for a company that has to continue existing until it can actually mine asteroids. The other big name in the industry, Deep Space Industries, is also in the Earth-observation business, kind of: It sells its spacecraft technologies to other companies, some of whom want to use them to peer down at our planet. Like HawkEye 360, a company that plans to monitor and map radio-wave broadcasts in near real-time. Deep Space Industries is the prime contractor developing and making the satellites that will become HawkEye's Pathfinder prototype. “Earth observation is kind of the hot thing in space right now,” says Meagan Crawford, Deep Space Industries' chief operating officer. “It’s where most of the value is being created.” But unlike Planetary Resources, Deep Space Industries isn’t planning its own world-watching missions, even if they plan to profit from others’. Their personal path to an asteroid is straighter: They hope to launch the prototype Prospector-X this year to see how its propulsion performs, how its avionics stand up to space radiation, and how its optical navigation system fares against obstacles. It will be in Earth orbit, but it’s not on the Earth-observation beat. It’s meant to show that the follow-on Prospector-1 will work—hopefully going to an asteroid by the end of the decade, the same timescale on which Deep Space is also working. “We think the best way to determine what these asteroids are really like is to go touch and feel and interact with one,” Crawford says. Spacecraft shortfalls Becoming a prime prospector of Earth doesn’t quite translate to asteroids, as the two space-body types are quite different. For one, Earth is, like, right here. Asteroids are way out there, moving very fast. And that makes getting to know them hard. The companies need to know about a specific rock's composition before embarking on a mining mission—something they can't accomplish with the same sensors they are deploying in Earth orbit, the same ones they hope to use to get detailed information once they are actually close to an asteroid. Scientific missions specced to learn more about what asteroids are made of, like NASA's newly funded Lucy and Psyche, will help the companies get the knowledge they need to get power. But Crawford admits that "the biggest missing piece for asteroid mining is scientific knowledge of target asteroids." Asteroids’ specifics are still fuzzy. That’s why space agencies keep sending missions like Lucy and Psyche, as well as the already-launched OSIRIS-REx, Dawn, and Hayabusa to them: because we don’t know a super lot about their details, beyond predictive models based on broad categories. “We don’t have a lot of experience with the real characteristics of asteroids,” says Zoe Szajnfarber, who studies the dynamics of technological innovation at George Washington University. What if a company chose a target asteroid based on predictions, only to find, upon arrival, that it holds much less water and platinum than checkbooks and customers hoped? Too bad, so sad. “If you make the choice to go to the one asteroid, that’s where you’re going,” says Szajnfarber. “It’s almost impossible to have enough fuel to change your mind and go to a different one.” Then, once you get there, there’s the problem of gravity. The companies' craft may master constellation- or formation-flying around our planet. But Earth, as globes have suggested for centuries, is basically a sphere. And its mass is pretty evenly distributed. Gravity is basically the same everywhere in a spacecraft’s orbit. Keeping spacecraft in line in such a boring gravitational field is “easy.” But have you seen pictures of asteroids? Those pockmarked potato colonies with weird peaks and valleys have complicated gravity and composition. The companies will have to climb over both these early obstacles before they get to even bigger ones: that part where they have to build robots that can mine and spacecraft that can bring the haul back into humanity’s reach. They can’t do any of it by planetary navel-gazing alone. But they are going to do planetary navel-gazing, whether under their own flags or customers’. That globe-centric system will at least make the companies money, which means they may be able to survive long enough to figure out how to do what they really want to do.

#### But if it is possible its good

#### 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.

## Debris

#### They don’t read the ev that says private companies are uniquely bad for dbris which means they cnat solve because the public sphere just creates and equal amount of debris

#### Debris collision risk is tiny

Wein 9 [Lawrence M. Wein, Professor & Senior Fellow at Stanford’s Center for International Security and Cooperation Jeffrey S. Skoll Professor of Management Science at Stanford University and Senior Fellow at Stanford’s Center for International Security and Cooperation, former DEC Leaders for Manufacturing Professor of Management Science at MIT, and Andrew M. Bradley, PhD-Institute for Computational and Mathematical Engineering at Stanford University, Space debris: Assessing risk and responsibility, Advances in Space Research 43 (2009) 1372–1390]

More importantly, while our numerical results mimic earlier results (Liou and Johnson, 2005; Walker and Martin, 2004) that stressed the importance of postmission deorbiting, we do not necessarily agree with the claim that the only way to prevent future problems is to remove existing large intacts from space (Liou and Johnson, 2006, 2008). The divergence between our views and those in Liou and Johnson (2006, 2008) is perhaps due to the different performance metrics used. The root causes for alarm in Liou and Johnson (2006, 2008) appear to be the growth rate of fragments and the small increase in the rate of catastrophic collisions over the next 200 years (Liou and Johnson, 2008, Fig. 2). However, the great majority of catastrophic collisions in the SOI do not involve operational spacecraft, and are hazardous only in the sense that the fragments generated from such a collision could subsequently damage or destroy operational spacecraft. Therefore, we introduced the notion of the lifetime risk of an operational spacecraft as the primary performance metric. Our model predicts that the lifetime risk is <5x10^-4 [less than .0005%] over the next two centuries, and always stays <10^-3 [less than .001%] than if there is very high (>98%) spacecraft deorbiting compliance. These risks appear to be low relative to the immense cost and considerable technological uncertainty involved in removing large objects from space, are dwarfed by the ~20% historical mission-impacting (but not necessarily mission-ending) failure rate of spacecraft (Frost and Sullivan, 2004), and could be overestimated if improved traffic management techniques lower future collision risks (Johnson, 2004). Hence, the need to bring large objects down from space does not appear to be as clear cut as suggested in Liou and Johnson (2006, 2008). Nonetheless, our model does not incorporate the possibility of intentional catastrophic collisions (ASAT tests, space wars) that could conceivably occur in the future. In addition, Fig. 5 considers only catastrophic collisions, whereas noncatastrophic intact-fragment collisions could easily disable an operational spacecraft. If the operational lifetime risk is modified to include noncatastrophic collisions with fragments >= 10cm, then the sustainable risk rises by ~50%: it increases from 2.19x10^-2 [.0219%] to 3.09x10^-2 in the base case, and increases from 4.91x10^-4 [.000491%] to 7.94x10^-4 in the full compliance case. Moreover, if fragments >= 1 cm (rather than >= 10 cm) are harmful to spacecraft (Johnson, 2004), then we (as well as other researchers) could be underestimating the risk.

#### No one’s going to war over a downed satellite

Bowen 18 [Bleddyn Bowen, Lecturer in International Relations at the University of Leicester. The Art of Space Deterrence. February 20, 2018. https://www.europeanleadershipnetwork.org/commentary/the-art-of-space-deterrence/]

Space is often an afterthought or a miscellaneous ancillary in the grand strategic views of top-level decision-makers. A president may not care that one satellite may be lost or go dark; it may cause panic and Twitter-based hysteria for the space community, of course. But the terrestrial context and consequences, as well as the political stakes and symbolism of any exchange of hostilities in space matters more. The political and media dimension can magnify or minimise the perceived consequences of losing specific satellites out of all proportion to their actual strategic effect.

## Agriculture Turn

#### If debris collisions take out all satellites, that’s good

#### Precision farming via satellites *locks in* unsustainable agriculture practices by securing agri-business’ hold over small farmers globally

Ruiz-Marrero 02 (Carmelo Ruiz-Marrero, Fellow at the Society of Environmental Journalists and a Research Associate at the Institute for Social Ecology, “Precision Farming: Agribusiness Meets Spy Technology”, 10/2/02, http://www.councilforresponsiblegenetics.org/ViewPage.aspx?pageId=131)

Which corporations are involved? Joining forces to promote precision farming are farm equipment manufacturers like John Deere, agrochemical companies like Monsanto and DowElanco, pharmaceutical/biotech companies like Rhone-Poulenc, Novartis and AstraZeneca, as well as information brokering and data management firms. Not surprisingly, corporations with a long history of service to the military-industrial complex and intelligence agencies, like Rockwell and Lockheed Martin, are also jumping onto the precision farming bandwagon. For example, in a 1,000-acre potato farm, aerospace behemoth Lockheed Martin can place meteorological stations that measure 13 different weather parameters every 15 minutes and telemeter the data to a computer base station. "More than 430 gauges measure irrigation. Yield measurements are taken every three seconds during harvest. Crop quality samples are analyzed," boasts Lockheed's promotional material. What's more, "Soil is tested for 18 nutrient parameters. Microbialcommunities in the topsoil are studied." The Downside An interesting historical parallel comes to mind. Just as World War Two military contractors developed the chemicals and machinery that fueled the Green Revolution of the 1970's, precision farming is, to a large extent, an outgrowth of the space-age surveillance technologies used in the Cold War. The tight relationship between the military industries and industrial agriculture continues well into the twenty-first century. Some observers fear that these new technologies bode ill for sustainable agriculture and democratic governance, and could impose new forms of dependence on farmers. "Precision farming has less to do with mitigating agricultural pollution than with advancing industrial modes of production", according to social scientists Steven Wolf of the University of California, Berkeley and Fred Buttel of the University of Wisconsin. Action Group on Erosion, Technology and Concentration (ETC Group) Research Director Hope Shand agrees. "Precision farming is about commodification and control of information and it is among the high-tech tools that are driving the industrialization of agriculture, the loss of local farm knowledge and the erosion of farmers rights", she told CorpWatch. "With precision farming, farmers increasingly depend on off-farm decision making to determine precise levels of inputs. For example, dictating what seed, fertilizer, chemicals, row spacing, irrigation and harvesting techniques are used, and other management requirements," Shand explained. Precision farming seeks to legitimate and reinforce the uniformity and chemical-intensive requirements of industrial agriculture under the guise of protecting the environment and improving efficiency, according to Shand. How it Works: Remote Sensing Remote sensing is an important component of precision agriculture. For example, NASA is a partner in Ag 20/20, a long-range research project that involves remote sensing. A satellite-mounted sensor looks down on farm fields, distinguishing as many as 256 light wavelengths. Similar systems that work with land-based and plane-mounted sensors are also in the works. With the right hardware, software and know-how, the precision farmer can use this spectral information to find out a crop's health status. Does it need irrigation? Is it under attack by pests? Are weeds gaining ground? Are soil nitrogen levels OK? A great number of quantifiable variables can be measured. The use of satellites in agriculture is already a reality. The government of the southern Pacific island of Tasmania is using GPS technology on some 600 farms as part of an identity protection pilot program, which it plans to extend to all of Tasmania's farms by 2005. In Argentina, satellite surveillance is being used to catch farmers who cheat on their taxes by underreporting the size of their fields, and to prevent them from saving seed, which is illegal there. Who Will Benefit? Will farmers want, or be able, to understand the advanced gadgetry of precision farming? In Puerto Rico, for example, only 14% of farmers have college degrees, and a higher percentage might be illiterate altogether. The average Puerto Rican farmer is 55 years old, according to the US Farm Census. Many are probably too traditional to embrace advanced software, satellite imaging and other new technologies. To get around this obstacle, precision farming contractors plan to offer farmers a plethora of consulting services. Critics fear that these services will exacerbate farmers' dependence on the purveyors of agribusiness even further. Of course, the more fundamental question is what farmer will be able to afford precision farming technology, whose basic packages start at $15,000 to $20,000? How can family farms in the United States, facing extinction by economic strangulation, afford these dazzling technological advances? What will happen to rural U.S. and worldwide farming communities if food processors, retailers and other major purchasers of agricultural produce start requiring suppliers to use precision farming and identity protection technology? Large U.S. industrial farms, heavily capitalized and subsidized by the government with tens of billions of dollars every year, will easily afford the technology. But struggling family farms could be put out of business. Suing the Victim These remote sensing technologies can also be used to distinguish GM from non-GM crops and trace genetic pollution. Runaway pollen and seeds from GM crops like soy, corn and canola have been a great concern since the commercial cultivation of GM plants began in 1996. Last year, GM corn was found to be aggressively proliferating in Mexico, causing farmers, scientists and environmentalists to worry about potential consequences for the environment, biodiversity and world agriculture. Agribusiness corporations can use satellite imaging to find out what farmers have had their crops contaminated with GM pollen and sue them. This actually happened to Canadian farmer Percy Schmeiser of Bruno, Saskatchewan. When he complained that his organic canola crop had been genetically contaminated by a GM canola field somewhere upwind, Monsanto's lawyers sued him for illegally planting the corporation's patented seed. Kafka could have hardly thought of a more bizarre scenario. Monsanto didn't accept Schmeiser's argument that the corporation's GM canola had blown downwind to his farm, and neither did the judge, who ruled that how the GM seed got there is irrelevant. In September 2002 Schmeiser lost his appeal and now intends to take his case to Canada's Supreme Court. [For more information about Schmeiser’s plight, visit www.percyschmeiser.com]. Unfortunately, Schmeiser's ordeal is not an isolated case. Monsanto is suing farmers all over Canada and the United States for allegedly planting its patented GM seeds without authorization. Many of them claim they never knowingly planted Monsanto's seeds, and that their fields were contaminated by upwind GM plantations. Once again, the tortilla gets flipped. The same corporations that vehemently denied that GM pollution by pollination would ever take place, may soon be eager — too eager — to believe every report of such contamination, especially if the information can be used to sue the victims. Precision Agriculture and Global Trade This type of persecution could reach global proportions through the Trade-Related Intellectual Property Rights agreement (TRIPS) enforced by the World Trade Organization (WTO). Under TRIPS, the WTO can impose economic sanctions against countries deemed guilty of illegally using patented products, like seeds. The intellectual property rights provisions of NAFTA are even more draconian, since the agreement allows private entities to sue governments. Given this possibility, one can visualize a scenario in which Monsanto sues Mexico under NAFTA for illegally planting its GM corn. The corporation could conceivably demand a compensation ranging in the hundreds of millions of dollars. What are advocates of socially responsible and environmentally sustainable agriculture doing about precision farming? Many in the movement against corporate globalization hold that this and other new agro-technologies must be addressed within the context of a broader critique of industrial agriculture. "The reality is that farmers do not control precision farming," notes Hope Shand of ETC Group. "Rather, precision agriculture is more likely to dictate decision making, control and management of the farmer." Shand compares precision agriculture to a kind of high tech feudalism: "Precision farming reinforces bioserfdom and the role of the farmer as a ‘renter of germplasm.’"

#### Unsustainable ag production is *independently* responsible for the biodiversity crisis

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An increase in agricultural output can be achieved in various ways and the great increases seen in the second half of the twentieth century came mainly from intensification and corresponding increases in yields (FAOSTAT; Klein Goldewijk et al., 2011). Nonetheless the clear consensus from global land-use models is that some of the additional future production will come from expanding the agricultural land area. According to the Agricultural Model Intercomparison and Improvement Project or AgMIP, the area of world cropland in 2050 will be between 10 and 25% larger than today, under a reference scenario in which world food production rises by 43 to 99% (von Lampe et al., 2014; Schmitz et al., 2014).

The expansion of modern agriculture through a combination of intensification and extensification has managed to sustain the world population explosion that began with the industrial revolution and accelerated in the early to mid twentieth century (United Nations, 2015). For example, the prevalence of undernourishment has declined globally (Fogel, 1997; World Bank, 2016), while the real prices of agricultural commodities fell quite significantly between 1950 and 2000 (Alston and Pardey, 2014).2 However, the expansion of modern agriculture has had other, less desirable consequences.

Both agricultural intensification – of the prevailing, nonecological or unsustainable variety (cf. Bommarco et al., 2013; Godfray and Garnett, 2014) – and extensification have been primary causes of a historically unprecedented loss of global biodiversity. According to the Millennium Ecosystem Assessment (2005), the current global rate of species extinction is up to 1000 times higher than the background rate that has been estimated from the fossil record. A broader index of global biodiversity has been in decline since 1970 (the first year for which data are available) and there is no statistical indication that the rate of decline is slowing (Butchart et al., 2010). Local species richness is estimated to have declined by over 10% in the last 200 years, globally on average (Newbold et al., 2015).

#### BioD loss causes extinction and turns everything

Torres 16 (Phil, founder of the X-Risks Institute, an affiliate scholar at the Institute for Ethics and Emerging Technologies, and the author of The End: What Science and Religion Tell Us About the Apocalypse, "Biodiversity loss: An existential risk comparable to climate change," Bulletin of Atomic Scientists, 4/11, http://thebulletin.org/biodiversity-loss-existential-risk-comparable-climate-change9329)

But there is another existential threat that the Bulletin overlooked in its Doomsday Clock announcement: biodiversity loss. This phenomenon is often identified as one of the many consequences of climate change, and this is of course correct. But biodiversity loss is also a contributing factor behind climate change. For example, deforestation in the Amazon rainforest and elsewhere reduces the amount of carbon dioxide removed from the atmosphere by plants, a natural process that mitigates the effects of climate change. So the causal relation between climate change and biodiversity loss is bidirectional. Furthermore, there are myriad phenomena that are driving biodiversity loss in addition to climate change. Other causes include ecosystem fragmentation, invasive species, pollution, oxygen depletion caused by fertilizers running off into ponds and streams, overfishing, human overpopulation, and overconsumption. All of these phenomena have a direct impact on the health of the biosphere, and all would conceivably persist even if the problem of climate change were somehow immediately solved. Such considerations warrant decoupling biodiversity loss from climate change, because the former has been consistently subsumed by the latter as a mere effect. Biodiversity loss is a distinct environmental crisis with its own unique syndrome of causes, consequences, and solutions—such as restoring habitats, creating protected areas (“biodiversity parks”), and practicing sustainable agriculture. The sixth extinction. The repercussions of biodiversity loss are potentially as severe as those anticipated from climate change, or even a nuclear conflict. For example, according to a 2015 study published in Science Advances, the best available evidence reveals “an exceptionally rapid loss of biodiversity over the last few centuries, indicating that a sixth mass extinction is already under way.” This conclusion holds, even on the most optimistic assumptions about the background rate of species losses and the current rate of vertebrate extinctions. The group classified as “vertebrates” includes mammals, birds, reptiles, fish, and all other creatures with a backbone. The article argues that, using its conservative figures, the average loss of vertebrate species was 100 times higher in the past century relative to the background rate of extinction. (Other scientists have suggested that the current extinction rate could be as much as 10,000 times higher than normal.) As the authors write, “The evidence is incontrovertible that recent extinction rates are unprecedented in human history and highly unusual in Earth’s history.” Perhaps the term “Big Six” should enter the popular lexicon—to add the current extinction to the previous “Big Five,” the last of which wiped out the dinosaurs 66 million years ago. But the concept of biodiversity encompasses more than just the total number of species on the planet. It also refers to the size of different populations of species. With respect to this phenomenon, multiple studies have confirmed that wild populations around the world are dwindling and disappearing at an alarming rate. For example, the 2010 Global Biodiversity Outlook report found that the population of wild vertebrates living in the tropics dropped by 59 percent between 1970 and 2006. The report also found that the population of farmland birds in Europe has dropped by 50 percent since 1980; bird populations in the grasslands of North America declined by almost 40 percent between 1968 and 2003; and the population of birds in North American arid lands has fallen by almost 30 percent since the 1960s. Similarly, 42 percent of all amphibian species (a type of vertebrate that is sometimes called an “ecological indicator”) are undergoing population declines, and 23 percent of all plant species “are estimated to be threatened with extinction.” Other studies have found that some 20 percent of all reptile species, 48 percent of the world’s primates, and 50 percent of freshwater turtles are threatened. Underwater, about 10 percent of all coral reefs are now dead, and another 60 percent are in danger of dying. Consistent with these data, the 2014 Living Planet Report shows that the global population of wild vertebrates dropped by 52 percent in only four decades—from 1970 to 2010. While biologists often avoid projecting historical trends into the future because of the complexity of ecological systems, it’s tempting to extrapolate this figure to, say, the year 2050, which is four decades from 2010. As it happens, a 2006 study published in Science does precisely this: It projects past trends of marine biodiversity loss into the 21st century, concluding that, unless significant changes are made to patterns of human activity, there will be virtually no more wild-caught seafood by 2048. Catastrophic consequences for civilization. The consequences of this rapid pruning of the evolutionary tree of life extend beyond the obvious. There could be surprising effects of biodiversity loss that scientists are unable to fully anticipate in advance. For example, prior research has shown that localized ecosystems can undergo abrupt and irreversible shifts when they reach a tipping point. According to a 2012 paper published in Nature, there are reasons for thinking that we may be approaching a tipping point of this sort in the global ecosystem, beyond which the consequences could be catastrophic

for civilization. As the authors write, a planetary-scale transition could precipitate “substantial losses of ecosystem services required to sustain the human population.” An ecosystem service is any ecological process that benefits humanity, such as food production and crop pollination. If the global ecosystem were to cross a tipping point and substantial ecosystem services were lost, the results could be “widespread social unrest, economic instability, and loss of human life.” According to Missouri Botanical Garden ecologist Adam Smith, one of the paper’s co-authors, this could occur in a matter of decades—far more quickly than most of the expected consequences of climate change, yet equally destructive. Biodiversity loss is a “threat multiplier” that, by pushing societies to the brink of collapse, will exacerbate existing conflicts and introduce entirely new struggles between state and non-state actors. Indeed, it could even fuel the rise of terrorism. (After all, climate change has been linked to the emergence of ISIS in Syria, and multiple high-ranking US officials, such as former US Defense Secretary Chuck Hagel and CIA director John Brennan, have affirmed that climate change and terrorism are connected.) The reality is that we are entering the sixth mass extinction in the 3.8-billion-year history of life on Earth, and the impact of this event could be felt by civilization “in as little as three human lifetimes,” as the aforementioned 2012 Nature paper notes. Furthermore, the widespread decline of biological populations could plausibly initiate a dramatic transformation of the global ecosystem on an even faster timescale: perhaps a single human lifetime. The unavoidable conclusion is that biodiversity loss constitutes an existential threat in its own right. As such, it ought to be considered alongside climate change and nuclear weapons as one of the most significant contemporary risks to human prosperity and survival.