## 1

#### The executive branch of the United States federal government should establish a binding internal policy banning intervention in Africa in the case of regional economic decline due to space mining.

## 2

#### Spacefaring Nations should:

#### increase funding for space-situational awareness technology, and

#### warn all states about known impending collisions on their space assets

#### develop satellites with automated collision avoidance systems.

#### Planks 1 and 2 solves collisions, assures allies, and avoids sharing key secrets

Hitchens and Johnson-Freese 16 (Theresa Hitchens and Joan Johnson-Freese. Johnson-Freese is a professor of national security affairs at the Naval War College in Newport, Rhode Island. Theresa Hitchens is a Senior Research Scholar at the University of Maryland’s Center for International and Security Studies at Maryland (CISSM), and former Director of the United Nations Institute for Disarmament Research (UNIDIR). “Toward a New National Security Space Strategy Time for a Strategic Rebalancing,” Atlantic Council Strategy Papers, No. 5, 2016, <https://www.atlanticcouncil.org/images/publications/AC_StrategyPapers_No5_Space_WEB1.pdf>)

Improved SSA is a foundational capability for any US space strategy in any and all circumstances, given the rapid changes in the space environment. The national space security community has recognized this repeatedly, although funding has arguably not been commensurate with the rhetoric. Attempts are now being made to rectify the funding situation because of the Russia/China threat scare. According to the Government Accountability Office (GAO), the Obama administration is planning to spend about $6 billion between 2015 and 2020 to beef up SSA capabilities—largely within the Pentagon, but also at contributing agencies NOAA and NASA.50 Calculating exact spending on SSA activities, however, is not possible due to the way the Defense Department tracks (or, rather, does not track) related spending. According to the GAO report:

• Compiling a budget for all SSA-related efforts is a challenge because many assets that support the SSA mission do not have it as their primary mission.

• DOD is not required to and does not track the budgets specific to its SSA efforts for multiple-mission systems, and it does not estimate what percentage would be allocated to SSA.

• For example, some portion of the ballistic missile defense sensors budget, which averages about $538 million per fiscal year over the next few years, supports SSA, but DOD does not track the efforts of multi-mission sensors in a manner that would provide such data.

• SSA-related efforts performed using intelligence community sensor systems are also not included in the core SSA budget because those efforts and their budgets are classified.51

SSA is also an area ripe for possible leveraging of commercial and foreign capabilities, both to provide resilience and to complicate an adversary’s calculations regarding an attack—one of the stated goals of the Obama administration’s NSP. However, that potential has yet to be fully exploited, and greater emphasis should be put on doing so.

On June 1, 2015, US Strategic Command (STRATCOM) initiated a six-month pilot program to research how to integrate commercial operators (and their SSA data) into the JSpOC, called the Commercial Integration Cell. The initial effort involves six operators: Intelsat, SES Government Solutions, Inmarsat, Eutelsat, DigitalGlobe, and Iridium Communications. The goal is to assess whether JSpOC operations can be enhanced via integration of industry capabilities and insights, and, if so, how.52 The pilot program comes after years of lobbying by industry, including through SDA, for closer cooperation and collaboration between commercial operators and the US military on space-object data tracking. One major hurdle has been that the computer systems and models used by JSpOC are antiquated, and incompatible with more up-to-date industry practices. While updates are planned, given the lack of adequate budget resources, this situation is not likely to be rectified anytime soon. This misalignment between ways and means should be addressed as soon as possible by the incoming administration.

Another question is the extent to which US allies will be allowed access to the improved SSA data, including the interference warnings and collision analysis it will provide.53 The issue with allies is not just technical, but also, and primarily, political. The uncertainty in the private sector about JSpOC-industry collaboration and data sharing is underscored by AGI’s COMSpOC. AGI is seeking to tap into the expanded (and unfilled by JSpOC) need for such data in the commercial marketplace, both in the United States and abroad.54

Lieutenant General John W. Raymond, Commander of the Joint Functional Component Command for Space, told the House Armed Services Strategic Forces Subcommittee on March 25, 2015, that STRATCOM is working on a new “tiered SSA Sharing Strategy.” Raymond stated: “The tenets of this strategy are to share more information in a timelier manner with the broadest range of partners. We aim to promote an interactive, exchange-based relationship with satellite 35 owners and operators where all parties gain. This open exchange of information also supports U.S. and allied efforts to detect, identify, and attribute actions in space that are contrary to responsible use and the long-term sustainability of the space environment.” He further noted that, as of March 2015, there were forty-six SSA-sharing agreements in place with forty-six commercial firms, eight nations, and two intergovernmental organizations, with ten more in the works.55 (The number of such SSA agreements, as of March 2016, is now at sixty-three.)56

The word “tiered” in Raymond’s statement is central, as part of the issue for the Defense Department is figuring out what data to share with whom, at what level of specificity and accuracy. There has traditionally been reluctance about “giving away the store,” particularly because many allies more closely integrate their civilian and military space operations, with less of a focus on protecting national security secrets. It is hard to underestimate the challenges— for example, simply regarding security clearances for access to US data. Further, some nations are leery of relying too closely on information provided by the US military. For this very reason, the European Union (EU) in 2009 launched an effort to pursue independent SSA capabilities— an effort that has proceeded in fits and starts, due to internal EU concerns about the sharing of both information and funding. As of early 2015, the nascent program is being funded by fourteen participating EU states, focusing largely on figuring out how to better coordinate European activities, but also looking at how to improve capabilities.57According to the European Space Agency (ESA): “To date, Europe’s access to information on what is happening in space has been largely dependent on non-European sources. In recent years, for example, data to trigger alerts on potential collisions between European satellites and debris objects have only come through the good will of other spacefaring nations. For this and other reasons, Europe needs an autonomous SSA capability.”58 It remains unclear how the EU SSA system, once established, will interact with that of the United States. This should be a major focus of future US space diplomacy and cooperation, to ensure that the systems are compatible and accessible—in part, to provide mission assurance.

The United States signaled its desire to forge the closest partnership on SSA sharing with Australia, Canada, and the United Kingdom, via a Memorandum of Understanding on Combined Space Operations, signed in September 2014.59 The details of the MoU, however, are vague.60 It should be noted that all three countries have assets that could contribute to US efforts, and would not simply benefit from a one-way absorption of US data.

Also, it is not only US allies who require better SSA in order to operate satellites safely and securely. More than seventy countries operate satellites, with 1,381 operating satellites in orbit at the end of 2015.61 Many of these operators lack sufficient SSA. In the July 2013 report adopted by the UN General Assembly in October 2013, the Group of Governmental Experts on Transparency and Confidence-Building Measures in Outer Space Activities cited the need for improved global access to space data, both for safety purposes and for building trust. The report stated that, beyond a lack of space capacity, “the inability of many States to acquire significant space-based information” is a factor “contributing to the lack of confidence.”62 Russia has proposed to the COPUOS Scientific and Technical Subcommittee that the UN Office of Outer Space Affairs consider the development of an international, open database of on-orbit objects (both operational satellites and debris) to fill this gap.63 The United States and its allies have rejected the Russian proposal, largely for budgetary reasons, but the United States has been internally mulling over a possible proposition to create an informal international group to discuss the challenges to sharing SSA data and how to overcome them. This would be a promising first step, and a testimony to continued leadership in SSA by the United States, consistent with a national space strategy aimed at reducing risks. Inevitably, some form of open-access space-object database is going to be required, simply to ensure on-orbit safety—particularly in LEO, as the number of so-called Cubesats (very small satellites) rises 37 dramatically. The United States should take the lead on developing a workable space-traffic management regime underpinned by SSA.

#### Plank 3 solves miscalc

Green 14 (Brian D. Green, “Space Situational Awareness Data Sharing: Safety Tool or Security Threat?” A thesis submitted to McGill University in partial fulfillment of the requirements of the degree of MASTER OF LAWS, December 2014, <http://digitool.library.mcgill.ca/webclient/StreamGate?folder_id=0&dvs=1569190779049~368>)

Countries with SSA capabilities would not need to reveal those types of critical information to provide warnings when a collision appears imminent, and thus could provide such warnings even for the benefit of a hostile country. If, for example, the United States detected that Iran’s Sina-1 satellite was in danger of colliding with another space object, it could issue Iran the warning without compromising the security of its own assets. If the US or an ally was in control of the satellite that was in danger of colliding, it could also perform or recommend a collision avoidance maneuver on its own. In either case, collision avoidance procedures would not require a country to provide potentially sensitive details such as a satellite’s current mission tasking, sensor resolution, or design blueprints. However, they could both avert a space-debris producing accident and show good faith in a way that could keep international tensions from escalating.

## **3**

#### Commercial asteroid mining is coming now – lower costs and improving tech make it economically viable – and the legal basis is already in place in multiple countries– that helps acquire water for rocket fuel and rare earth metals

Gilbert, PhD student in space resources at the Colorado School of Mines, writes in 21 alex gilbert, is a complex systems researcher and a PhD student in space resources at the Colorado School of Mines. "Mining in Space Is Coming." Milken Institute Review, April 26, 2021, [www.milkenreview.org/articles/mining-in-space-is-coming](http://www.milkenreview.org/articles/mining-in-space-is-coming). [Quality Control]

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

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

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

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

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

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

What’s Out There

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

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

#### However, the legal framework that strikes the best balance of providing economic incentives for mining while preventing unbeneficial land claims requires a doctrine of appropriation – the plan prevents that

Meyers 15 Meyers, Ross. J.D. candidate at the University of Oregon Law School. "The doctrine of appropriation and asteroid mining: incentivizing the private exploration and development of outer space." Or. Rev. Int'l L. 17 (2015): 183. Italics in original. [Quality Control]

The doctrine of appropriation is a reasonable rule for adjudicating asteroid claims, and it could easily be modified to apply to asteroid mining. In the context of water rights, the doctrine of appropriation requires that the claimant be a landowner in order to claim the right to use a water source. It does not make sense, however, for the international community to grant complete ownership over asteroids toa single entity, so the landowner requirement of the rule should be removed. A similar modification would need to be made to the "beneficial use" language of the doctrine.

In the context of water rights, an appropriator obtains rights only to water that he or she can reasonably put to beneficial use. The metals contained in asteroids have a high level of marketability. For that reason, a mining entity could potentially put any amount of obtained metal to beneficial use, in the sense that the resources can be sold. This, however, would defeat the purpose of the rule, which is to limit such unreasonable claims. To ameliorate this problem, the doctrine of appropriation could be modified to define "beneficial use "constructively by providing that beneficial use is assumed for any resources that have been removed from the asteroid that the mining entity can reasonably hope to transport to market in a return journey. With the astronomical cost of undertaking a trip to such an asteroid, this modification would limit mining entities to only what they can carry back, thereby leaving the untapped resources available to other entities capable of making the same trip. Considering the size and profitability of metal deposits on asteroids, this modification to the doctrine of appropriation would not be overly burdensome to corporate interests. At the same time, it would satisfy the economic imperative of promoting the rapid development of asteroid resources.

By changing the landowner requirement, and qualifying the “beneficial use" language, the doctrine of appropriation would be essentially ready for application to asteroid mining claims. The only other changes necessary would be some additional requirements that are common to other space related provisions, like those found in the Outer Space Treaty of 1968. For example, a reporting requirement or clause guaranteeing asylum for other astronauts. A functional rule might read something like this:

*State parties or private entities may, upon actual possession, lay claim to natural resources found on or below the surface of asteroids. Rights to appropriate are given in order of seniority, starting with the first party to land on the surface of the asteroid and establish control over the resources, be it water, methane, metal, or any other beneficial substances. A party will be said to have established control over a resource once he has mined the substance and removed it from the asteroid. A senior appropriator may use as much of the asteroid's resources as he can take from the asteroid and put to beneficial use, and may continue to enlarge his share until another junior appropriator begins to appropriate resources from source for beneficial use. For the purposes of this Agreement, "beneficial use “refers to the amount of resources that an appropriator has removed from the asteroid that the actor may reasonably hope to bring home in a return voyage. Resources in excess of what an appropriator can reasonably hope to transport to market in a single voyage do not qualify as having a beneficial use, and are therefore not yet claimed. This means that the extraction of metal from an asteroid does not serve to provide ownership if the appropriator plans on letting the resources languish until another voyage is undertaken to secure the resources and bring them back to Earth. Junior appropriators receive rights in the source of resources (the asteroid) as they find it, and may prevent the senior appropriator from enlarging his share to the junior appropriator’s detriment under a no-injury rule. No state party will attempt to hinder other parties from landing on or using the asteroid, and parties will assist other entities on an asteroid, should they need emergency assistance. Mining claims on asteroids will be reported to the Secretary-General of the United Nations, and state parties agree to release the location of the asteroid, and any scientific findings to the United Nations, the general public, and the scientific community. In the event that the asteroid is on a collision course with any other celestial body, all state parties agree to follow the course of action suggested by the United Nations. Should the United Nations decide the asteroid must be destroyed, no state party may claim liability for resources contained within the asteroid, but not yet captured. This provision applies only to asteroids as classified by the scientific community, and does not apply to planets, comets, meteorites, or any other celestial body not mentioned.*

There is no doubt that asteroids may be extremely beneficial to mankind, both as a source of resources and as a jumping-off point to far off locations in space. The human-race has progressed scientifically and technologically to the point that space travel is within commercial reach, and the need for new international laws governing the ownership of space has never been more apparent. The Outer Space Treaty of 1968made great strides in developing rational rules for space and many of its provisions should be maintained in their original form. However, by allowing ownership of asteroids under the doctrine of appropriation, the international community can incentivize the exploration and development of space in a way that reflects the needs of society in general, without vesting an absolute monopoly in a single entity. The doctrine of appropriation helped drive American westward expansion, and its application to space mining would help drive the human race in its expansion into the space, the final frontier.

#### Asteroid mining offsets terrestrial growth that ruins the environment and enables solar power satellites – both solve climate change

Taylor 19 Chris Taylor is a veteran journalist. Previously senior news writer for Time.com a year later. In 2000, he was named San Francisco bureau chief for Time magazine. He has served as senior editor for Business 2.0, West Coast editor for Fortune Small Business and West Coast web editor for Fast Company. Chris is a graduate of Merton College, Oxford and the Columbia University Graduate School of Journalism. "How asteroid mining will save the Earth — and mint trillionaires." Mashable, 2019, mashable.com/feature/asteroid-mining-space-economy. [Quality Control]

The mission is essential, Joyce declares, to save Earth from its major problems. First of all, the fictional billionaire wheels in a fictional Nobel economist to demonstrate the actual truth that the entire global economy is sitting on a mountain of debt. It has to keep growing or it will implode, so we might as well take the majority of the industrial growth off-world where it can’t do any more harm to the biosphere.

Secondly, there’s the climate change fix. Suarez sees asteroid mining as the only way we’re going to build solar power satellites. Which, as you probably know, is a form of uninterrupted solar power collection that is theoretically more effective, inch for inch, than any solar panels on Earth at high noon, but operating 24/7. (In space, basically, it’s always double high noon).

The power collected is beamed back to large receptors on Earth with large, low-power microwaves, which researchers think will be harmless enough to let humans and animals pass through the beam. A space solar power array like the one China is said to be working on could reliably supply 2,000 gigawatts — or over 1,000 times more power than the largest solar farm currently in existence.

“We're looking at a 20-year window to completely replace human civilization's power infrastructure,” Suarez told me, citing the report of the Intergovernmental Panel on Climate Change on the coming catastrophe. Solar satellite technology “has existed since the 1970s. What we were missing is millions of tons of construction materials in orbit. Asteroid mining can place it there.”

The Earth-centric early 21st century can’t really wrap its brain around this, but the idea is not to bring all that building material and precious metals down into our gravity well. Far better to create a whole new commodities exchange in space. You mine the useful stuff of asteroids both near to Earth and far, thousands of them taking less energy to reach than the moon. That’s something else we’re still grasping, how relatively easy it is to ship stuff in zero-G environments.

#### Environmental destruction is profoundly unjust – prioritize environmental justice over primarily human concerns

Cafaro 14 Dr. Philip Cafaro (philip.cafaro@colostate.edu) is Professor of Philosophy at Colorado State University, an affiliated faculty member with CSU's School of Global Environmental Sustainability and Book Review Editor of Elsevier's Biological Conservation journal. His main research interests are in environmental ethics, consumption and population issues, and wild lands preservation. He is the author of Thoreau's Living Ethics and Life on the Brink: Environmentalists Confront Overpopulation, among other books. Dr. Richard B. Primack (primack@bu.edu) is Professor of Biology at Boston University [go terriers!] and Editor-in-Chief of Biological Conservation, an Elsevier journal focusing on the protection of biodiversity. His research concerning the effects of climate change on the plants and animals of Massachusetts is the focus of a new book coming out in March titled Walden Warming: Climate Change Comes to Thoreau's Woods. "Species extinction is a great moral wrong." Elsevier Connect, 12 Feb. 2014, [www.elsevier.com/connect/species-extinction-is-a-great-moral-wrong](http://www.elsevier.com/connect/species-extinction-is-a-great-moral-wrong). [Quality Control]

Extinguishing species through the continued expansion of human economic activities appears to be morally acceptable to Kareiva, Marvier and some other Anthropocene proponents, as long as this destruction does not harm people themselves. But this view is selfish and unjust. Human beings already control more than our fair share of Earth's resources. If increased human population and economic demands threaten to extinguish the polar bear and many other species, then we need to limit our population and economic demands, not make excuses that will just lead to greater ecological damage.

Conservation biologists, with our knowledge and appreciation of other species, are the last people who should be making excuses for their displacement or making light of their extinction. It is particularly inappropriate for Peter Kareiva to do so, given his position as chief scientist at the Nature Conservancy, an organization dedicated to preserving biodiversity. TNC's fundraising rests in part on appeals to a strong and widely shared moral view that other species have a right to continued existence. Much of the conservation value of TNC's easements and land purchases depends on society-wide moral and legal commitments to preserve threatened and endangered species and their habitats. Kareiva and Marvier state that they "do not wish to undermine the ethical motivations for conservation action," or presumably, conservation law. Yet their articles do precisely that, with potentially disastrous implications for practical conservation efforts, particularly in the long term.

To be clear: We do not think there is anything wrong with people looking after our own legitimate needs. This is an important aspect of conservation. Kareiva and Marvier are right to remind us that protecting ecosystem services for human beings is important. They are right that concern for our own wellbeing can sometimes motivate significant biodiversity preservation. We believe that people should preserve other species both for their sakes and for ours.

But it is a mistake to reduce conservation solely to concern for our own well-being, or to assume that it is acceptable to extinguish species that do not benefit humans. Such an overly economistic approach to conservation leads us astray morally. It makes us selfish, which is the last thing we want when the very existence of so many other life forms is at stake. Fairly sharing the lands and waters of Earth with other species is primarily a matter of justice, not economic convenience.

# Case

## Adv1

### Scen 1

#### Squo solves debris – private tracking, surveillance, in-orbit servicing and green satellite tech all happening now – private sector and P3s are key and outpacing government monitoring

CSTP 20 – OECD Committee, The strategic objectives of the Committee as defined in its Mandate and by the work priorities agreed by Member countries' Ministers responsible for science and technology provide the framework for the Secretariat's proposals for activities to be developed or initiated under the aegis of the Committee itself or its subsidiary bodies (NESTI, TIP, GSF, BNCT and IPSO) [This paper was approved and declassified by written procedure by the Committee for Scientific and Technological Policy (CSTP) on 11 March 2020 and prepared for publication by the OECD Secretariat, “SPACE SUSTAINABILITYTHE ECONOMICS OF SPACE DEBRIS IN PERSPECTIVE,” OECD Science, Technology and Industry Policy Papers, April 2020, No. 87, https://www.oecd-ilibrary.org/science-and-technology/space-sustainability\_a339de43-en]

An emerging “space debris economy”?

* Will we see a more intensive use of cubesats and miniaturised technologies in lower orbits? Cubesats have been the fastest-growing category of launched satellites in the last years and, when launched at lower altitudes, are naturally compliant with debris mitigation guidelines. They are also ever more performant and affordable, and dedicated launch opportunities become more widespread. Furthermore, they increasingly receive preferential treatment in risk-based national legislations (e.g. introduction of sliding scale in the UK Outer Space Act for insurance requirements).
* Space surveillance and tracking capabilities, in both GEO and LEO: New (private) sources of situational awareness data are becoming increasingly important, with data analytics and modelling fuelled by advances in digital technologies. Private sector debris catalogues and tracking capabilities for the geostationary orbit may now be almost as good as government capabilities (IDA, 2016[76]), while solutions for the low-earth orbit are emerging. Start-ups such as LeoLabs provide data and services based on low-cost ground equipment and sophisticated data analysis. The company, which in October 2019 had three radars in the United States and New Zealand, has developed a cloud-based “Space Regulatory and Sustainability Platform” for the New Zealand Space Agency, a first of its kind, destined to track objects launched from New Zealand to ensure compliance with permit conditions (MBIE, 2019[77]). A novel project called TruSat intends to use blockchain technology to crowdsource and validate satellite orbital positions worldwide via open source software (TruSat, 2019[78]). The US Air Force Research Laboratory has signed agreements with several commercial space situational awareness data providers (e.g. Numerica, LeoLabs, ExoAnalytics) to get access to sensor networks and algorithms (Numerica, 2019[79]). The Space Situational Awareness (SSA) open-architecture data-sharing platform under development by the US Department of Commerce, including data from different government agencies, is also expected to spur innovative value-added products and services.
* In-orbit servicing solutions: Several governmental agencies and commercial companies have developed, or are in the process of acquiring, some capabilities for in-orbit servicing (e.g. NASA, DARPA, ESA, JAXA). In-orbit servicing involves a number of complex operations in space: the servicing of space platforms (e.g. satellite, space station) to replenish consumables and degradables (e.g. propellants, batteries, solar array); replacing failed functionality; and/or enhancing the mission through software and hardware upgrades. This is a major challenge as, when on orbit, space platforms can move at speeds of several kilometres a minute. The first commercial in-orbit servicing mission was launched in 2019, by a MEV-1 spacecraft developed by Orbital ATK for an Intelsat geostationary satellite. The main short-term market is seen in the life extension of geostationary satellites, with some 300 potential candidates, at least in theory (Kennedy, 2018[80]). However, the key benefits of in-orbit servicing are expected in the future. Satellite design is currently heavily restricted by extreme launch conditions, but the possibility of servicing could enable a much more flexible and modular satellite design, able to take advantage of the latest advances in materials and electronics, beyond software upgrades (Jaffart, 2018[81]). Market forecasts estimate a USD 3 billion market for in-orbit servicing over the 2017-27 period, mainly driven by life extension services (Northern Sky Research, 2018[82]).
* Active debris removal solutions: Active debris removal is at a less mature technological level, but several firms are preparing demonstration missions (e.g. Astroscale in 2020). Potential candidates for removal include more than 200 critical debris objects (3-9 tonnes); mainly rocket bodies, but also the European Envisat satellite. JAXA, has formally launched a project to remove a large piece of debris by 2025 (a Japanese rocket body) in a public-private partnership (Japanese Delegation to UNCOPUOS, 2019[83]). Both Airbus and Thales Alenia Space are developing in-orbit servicing vehicles with debris removal functions, some of which have been tested on the RemoveDEBRIS mission (Surrey Space Centre, 2019[84]; OECD, 2019[11]).

• “Green” satellite design and technology: The demand for space-environment friendly satellite design is picking up. This includes features to reduce or avoid debris creation (explosion-safe batteries, deorbit technologies) and/or facilitating active removal (e.g. markers or grapple fixtures). One example is OneWeb, which is installing grapple fixtures on their satellites. In Europe, all future Sentinel satellites will be designed for demise. Affordable deorbit technologies are already being tested on orbit. Canada’s three-kilo CanX-7 satellite was launched in 2016 and is currently using its four 1 m2 drag sails to deorbit at a significantly faster rate than it would have without the sails. Amazon’s Kuiper constellation intends to use unpressurised and non-explosive propellant to mitigate accidental explosions, and satellites losing contact with ground control would automatically deactivate themselves, first by self-passivation and orbit-lowering, then depleting all energy reservoirs and switching off charging circuits (FCC, 2019[85]). SpaceX’ Starlink satellites are equipped with automated collision avoidance systems (although it is unclear which role the system played in the near-collision with the ESA Aeolus satellite).

A recent promising initiative is the “Space Sustainability Rating” scheme, originally conceived by teams from the MIT Media Lab, European Space Agency, and World Economic Forum. The initiative intends to be similar to the most widely used green building rating system in the construction industry, called the LEED certification for Leadership in Energy and Environmental Design. The objective is to promote mission designs and operational concepts that mitigate debris creation, and create a label that can encourage operators to behave more responsibly.

#### The environment is resilient and ecosystem loss doesn’t cascade

**Kareiva et al 12 –** Chief Scientist and Vice President, The Nature Conservancy(Peter, Michelle Marvier **--**professor and department chair of Environment Studies and Sciences at Santa Clara University, Robert Lalasz **--** director of science communications for The Nature Conservancy, Winter, “Conservation in the Anthropocene,” http://thebreakthrough.org/index.php/journal/past-issues/issue-2/conservation-in-the-anthropocene/)

2. **As conservation became a global enterprise in the 1970s and 1980s, the movement's justification for saving nature shifted from spiritual and aesthetic values to focus on biodiversity**. **Nature was described as primeval, fragile, and at risk of collapse from too much human use and abuse**. And indeed, **there are consequences** **when** **humans convert landscapes for mining, logging, intensive agriculture, and urban development and when key species or ecosystems are lost.**¶ But **ecologists and conservationists have grossly overstated the fragility of nature,** frequently arguing that once an ecosystem is altered, it is gone forever. **Some ecologists suggest that if a single species is lost, a whole ecosystem will be in danger of collapse, and that if too much biodiversity is lost, spaceship Earth will start to come apart. Everything, from the expansion of agriculture to rainforest destruction to changing waterways, has been painted as a threat to the delicate inner-workings of our planetary ecosystem.¶** **The fragility trope dates back**, at least, **to** Rachel **Carson**, **who wrote plaintively in Silent Spring of the delicate web of life and warned that perturbing the intricate balance of nature could have disastrous consequences**.22 Al Gore made a similar argument in his 1992 book, Earth in the Balance.23 And the 2005 Millennium Ecosystem Assessment warned darkly that, while the expansion of agriculture and other forms of development have been overwhelmingly positive for the world's poor, ecosystem degradation was simultaneously putting systems in jeopardy of collapse.24¶ The trouble for conservation is that **the data simply do not support the idea of a fragile nature at risk of collapse**. Ecologists now know that **the disappearance of one species does not necessarily lead to the extinction of any others, much less all others in the same ecosystem**. In many circumstances, **the demise of formerly abundant species can be inconsequential to ecosystem function. The American chestnut**, **once a dominant tree in eastern North America, has been extinguished by a foreign disease, yet the forest ecosystem is surprisingly unaffected. The passenger pigeon**, once so abundant that its flocks darkened the sky, **went extinct, along with countless other species from the Steller's sea cow to the dodo**, **with no catastrophic or even measurable effects.¶ These stories of resilience are not isolated examples -- a thorough review of the scientific literature identified 240 studies of ecosystems following major disturbances such as deforestation, mining, oil spills, and other types of pollution. The abundance of plant and animal species as well as other measures of ecosystem function recovered**, at least partially, **in** 173 **(72 percent) of these studies**.25¶ **While global forest cover is continuing to decline, it is rising in the Northern Hemisphere, where "nature" is returning to former agricultural lands**.26 Something similar is likely to occur in the Southern Hemisphere, after poor countries achieve a similar level of economic development. A 2010 report concluded **that rainforests that have grown back over abandoned agricultural land had 40 to 70 percent of the species of the original forests**.27 Even Indonesian orangutans, which were widely thought to be able to survive only in pristine forests, have been found in surprising numbers in oil palm plantations and degraded lands.28¶ **Nature is so resilient that it can recover rapidly from even the most powerful human disturbances. Around the Chernobyl nuclear facility,** which melted down in 1986, **wildlife is thriving, despite the high levels of radiation**.29 **In the Bikini Atoll, the site of multiple nuclear bomb tests**, including the 1954 hydrogen bomb test that boiled the water in the area, **the number of coral species has actually increased relative to before the explosions**.30 More recently, **the massive 2010 oil spill in the Gulf of Mexico was degraded and consumed by bacteria at a remarkably fast rate**.31¶ Today, **coyotes roam downtown Chicago, and** peregrine falcons **astonish San Franciscans as they sweep down skyscraper canyons to pick off pigeons for their next meal**. **As we destroy habitats, we create new ones: in the southwestern U**nited **S**tates **a rare and federally listed salamander species seems specialized to live in cattle tanks** -- to date, it has been found in no other habitat.32 **Books have been written about the collapse of cod in the Georges Bank, yet recent trawl data show the biomass of cod has recovered to precollapse levels**.33 **It's doubtful that books will be written about this cod recovery since it does not play well to an audience somehow addicted to stories of collapse and environmental apocalypse.¶** **Even that classic symbol of fragility -- the polar bear**, seemingly stranded on a melting ice block -- **may have a good chance of surviving global warming if the changing environment continues to increase the populations and northern ranges of harbor seals and harp seals**. **Polar bears evolved from brown bears 200,000 years ago during a cooling period in Earth's history**, developing a highly specialized carnivorous diet focused on seals. Thus, the fate of polar bears depends on two opposing trends -- the decline of sea ice and the potential increase of energy-rich prey. **The history of life on Earth is of species evolving to take advantage of new environments only to be at risk when the environment changes again.¶** **The wilderness ideal presupposes that there are parts of the world untouched by humankind, but today it is impossible to find a place on Earth that is unmarked by human activity. The truth is humans have been impacting their natural environment for centuries.** The wilderness so beloved by conservationists -- places "untrammeled by man"34 -- never existed, at least not in the last thousand years, and arguably even longer.

#### Cyberattacks thump their early warning satellites scenario

Beebe 10/7/19 [George Beebe is vice president and director of studies at the Center for the National Interest, a nonpartisan think tank in Washington. He is also the former head of Russia analysis at the CIA, and the author of The Russia Trap: How Our Shadow War with Russia Could Spiral into Nuclear Catastrophe. We’re More at Risk of Nuclear War With Russia Than We Think. October 7, 2019. https://www.politico.com/magazine/story/2019/10/07/were-more-at-risk-of-nuclear-war-with-russia-than-we-think-229436]

Cyber technology is also magnifying fears of our adversaries’ strategic intentions while prompting questions about whether warning systems can detect incoming attacks and whether weapons will fire when buttons are pushed. This makes containing a crisis that might arise between U.S. and Russian forces over Ukraine, Iran or anything else much more difficult. It is not hard to imagine a crisis scenario in which Russia cyber operators gain access to a satellite system that controls both U.S. conventional and nuclear weapons systems, leaving the American side uncertain about whether the intrusion is meant to gather information about U.S. war preparations or to disable our ability to conduct nuclear strikes. This could cause the U.S. president to wonder whether he faces an urgent “use it or lose it” nuclear launch decision. It doesn’t help that the lines of communication between the United States and Russia necessary for managing such situations are all but severed.

### Scen 2

#### It won’t impact important satellites.

#### 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.

#### Debris doesn’t matter there

Von Fange 17 [Daniel Von Fange is a full stack developer that builds web platforms and engineer, with a particular interest in space applications. Kessler Syndrome is Over Hyped. May 21, 2017. braino.org/essays/kessler\_syndrome\_is\_over\_hyped/]

GEO - If you put a satellite far enough out from earth, the speed that the satellite travels around the earth will match the speed of the surface of the earth rotating under it. From the ground, the satellite will appear to hang motionless. Usually the geostationary orbit is used by big weather satellites and big TV broadcasting satellites. (This apparent motionlessness is why satellite TV dishes can be mounted pointing in a fixed direction. You can find approximate south just by looking around at the dishes in your northern hemisphere neighborhood.) For Kessler purposes, GEO orbit is roughly a ring 384,400 km around. However, all the satellites here are moving the same direction at the same speed - debris doesn’t get free velocity from the speed of the satellites. Also, it’s quite expensive to get a satellite here, and so there aren’t many, only about one satellite per 1000km of the ring. Kessler is not a problem here.

## Adv2

#### No middle east or Africa escalation, and great powers wouldn’t get involved

Mead 14 – Walter Russell Mead, James Clarke Chace Professor of Foreign Affairs and Humanities at Bard College and Professor of American foreign policy at Yale University, Editor-at-Large of The American Interest magazine and a non-resident Scholar at the Hudson Institute, 2014 (“Have We Gone From a Post-War to a Pre-War World?” *Huffington Post*, July 7th, <http://www.huffingtonpost.com/walter-russell-mead/new-global-war_b_5562664.html>)

The Middle East today bears an ominous resemblance to the Balkans of that period. The contemporary Middle East has an unstable blend of ethnicities and religions uneasily coexisting within boundaries arbitrarily marked off by external empires. Ninety-five years after the French and the British first parceled out the lands of the fallen Ottoman caliphate, that arrangement is now coming to an end. Events in Iraq and Syria suggest that the Middle East could be in for carnage and upheaval as great as anything the Balkans saw. The great powers are losing the ability to hold their clients in check; the Middle East today is at least as explosive as the Balkan region was a century ago.

GERMANS THEN, CHINESE NOW

What blew the Archduke's murder up into a catastrophic world war, though, was not the tribal struggle in southeastern Europe. It took the hegemonic ambitions of the German Empire to turn a local conflict into a universal conflagration. Having eclipsed France as the dominant military power in Europe, Germany aimed to surpass Britain on the seas and to recast the emerging world order along lines that better suited it. Yet the rising power was also insecure, fearing that worried neighbors would gang up against it. In the crisis in the Balkans, Germany both felt a need to back its weak ally Austria and saw a chance to deal with its opponents on favorable terms.

Could something like that happen again? China today is both rising and turning to the sea in ways that Kaiser Wilhelm would understand. Like Germany in 1914, China has emerged in the last 30 years as a major economic power, and it has chosen to invest a growing share of its growing wealth in military spending.

But here the analogy begins to get complicated and even breaks down a bit. Neither China nor any Chinese ally is competing directly with the United States and its allies in the Middle East. China isn't (yet) taking a side in the Sunni-Shia dispute, and all it really wants in the Middle East is quiet; China wants that oil to flow as peacefully and cheaply as possible.

AMERICA HAS ALL THE ALLIES

And there's another difference: alliance systems. The Great Powers of 1914 were divided into two roughly equal military blocs: Austria, Germany, Italy and potentially the Ottoman Empire confronted Russia, France and potentially Britain.

Today the global U.S. alliance system has no rival or peer; while China, Russia and a handful of lesser powers are disengaged from, and in some cases even hostile to, the U.S. system, the military balance isn't even close.

While crises between China and U.S. allies on its periphery like the Philippines could escalate into US-China crises, we don't have anything comparable to the complex and finely balanced international system at the time of World War I. Austria-Hungary attacked Serbia and as a direct result of that Germany attacked Belgium. It's hard to see how, for example, a Turkish attack on Syria could cause China to attack Vietnam. Today's crises are simpler, more direct and more easily controlled by the top powers.