# 1NC

### 1

#### Interpretation- The affirmative must defend the appropriation of outer space by private entities is unjust.

#### Outer space doesn’t include celestial bodies-

**Science Daily** [Outer Space. Science Daily. URL: <https://www.sciencedaily.com/terms/outer_space.htm>] JV

Outer space, also simply called space, refers to the relatively empty regions of the universe outside the atmospheres of celestial bodies. Outer space is used to distinguish it from airspace (and terrestrial locations). Contrary to popular understanding, outer space is not completely empty (i.e. a perfect vacuum) but contains a low density of particles, predominantly hydrogen gas, as well as electromagnetic radiation.

#### Violation- they defend Lunar heritage sites which aren’t a part of outer space.

#### Standards-

#### 1] Limits- By extending the term outer space they have access to an infinite amount of aff which the neg could never make up for. Even now, the definition of the term outer space leaves vagueness for the neg, but their extension makes it impossible to negative. Limits are key to proper clash and education which are the only impacts that matter.

#### 2] Precision – the resolution is the only stable locust of prep – taking that away decks our ability to prep and independently wrecks ground

#### Voters-

#### Fairness and education are voters – debate’s a game that needs rules to evaluate it and education gives us portable skills for life like research and thinking.

#### Precision o/w – anything else justifies the aff arbitrarily jettisoning words in the resolution at their whim which decks negative ground and preparation because the aff is no longer bounded by the resolution.

#### Drop the debater – a) they have a 7-6 rebuttal advantage and the 2ar to make args I can’t respond to, b) it deters future abuse and sets a positive norm.

#### Use competing interps – a) reasonability invites arbitrary judge intervention since we don’t know your bs meter, b) collapses to competing interps – we justify 2 brightlines under an offense defense paradigm just like 2 interps.

#### Condo good – it’s key to negative flexibility and testing the affirmative from multiple different angles which dispo and uncondo cant do

#### No RVIs – they incentivize baiting theory

### 2

#### CP: Spacefaring nations should create a multilateral agreement to establish a Lunar-Earth observatory.

#### The tech exists and we have 0 need for moon bases- no need for this cruddy link chain.

* They have ZERO evidence that we need lunar bases to establish an observatory. Lunar bases would require life systems because people live there- this observatory does not. Yikes yikes yikes

Hamill 16, Patrick. "Atmospheric observations from the moon: A lunar earth-observatory." 2016 Ieee International Geoscience and Remote Sensing Symposium (Igarss). IEEE, 2016. (Department of Physics and Astronomy at San Jose State University)//Elmer recut amrita

**The Lunar Earth-Observatory is** essentially **a telescope** placed somewhere on the surface of the Moon and focused on the Earth. The observatory would consist of a telescope **and** a number of **standard instruments** such as a diffraction grating with an associated CCD array, a CCD camera, a radiometer, and the associated telemetry. The telescope diameter should be between 0.5 and 0.75 meters, this being a compromise between the desire for a small instrument and the desire of high resolution. For the sake of comparison, a telescope with a diameter of only 0.25 meters has a theoretical resolution of about 1km X 1km on the Earth’s surface. The Ozone Measurement Instrument [3] (OMI on AURA) has a nadir pixel of 13km X 24km and it scans the entire Earth once per day. If the Lunar telescope had a resolution of 100km X 100km, and the CCD array were integrated over 1 sec, the entire disk of Earth, could be scanned in about 3.5 hours. The telescope would scan the disk of the Earth and the light from different points on the Earth would be sent through a diffraction grating onto the CCD array. This allows one to determine the column amounts of various atmospheric gases, such as ozone, CO2, SO2, NO2, as well as aerosols. When the opportunity arises, **the telescope could be used to track the image** of a bright star as it is occulted by Earth [4]. Such scans are best carried out as the star descends onto the dark limb of Earth to avoid “earthshine” and to obtain maximum contrast. From the vantage point of a satellite in a 500 km orbit, a star descends through the atmosphere at a speed of about 8 km/sec. From the vantage point of the Moon, a star descends at about 1 km/sec, that is, eight times slower. Thus since stellar occultation is possible from artificial satellites (the GOMOS instrument on ENVISAT [5], for example), it will be even easier from the surface of the Moon. Note that a star is always a point source, so scanning is not required, as in most solar occultation measurements. (One cannot carry out solar occultation from the Moon because it only occurs during “Earth eclipses.”) Infrared measurements usually require cooling instruments with cryogens, but on the lunar surface extremely low temperatures are obtainable by simply shading the instrument during the day. Furthermore, the side of the Moon facing Earth is dark for half of the month, so cycling between extreme cold and extreme heat allows one to consider the possibility of some sort of heat engine operating in (perhaps) a Stirling cycle to power various components. **The surface of the Moon is a highly stable** platform, **so the observatory** should be **built to operate for a** very **long time** (decades rather than years). This is reasonable when one considers that many satellite observing systems have lasted much longer than their expected lifetimes. (For example, the SAM II system lasted 15 years before it was turned off due to orbit degradation. The instrument was still operational.) Therefore, the instrumentation of the observatory should be standard and well developed rather than innovative. Although the surface of the Moon is certainly a difficult environment, it is perhaps more benign that the environment of an artificial satellite. The Moon is a stable platform **not requiring corrections** for drift nor subject to the vibrations of satellites. The temperature extremes on the Moon have a periodicity of a month rather than several hours.

### 3

#### CP: Private entities should fully agree with and comply with the LHS guidelines set by NASA.

#### Prevents exploitation of LHS but still allows for private appropriation- means it competes and solves every scenario bc we ensure regulation. Your author.

OSTP 18 Office of Science and Technology Policy March 2018 “PROTECTING & PRESERVING APOLLO PROGRAM LUNAR LANDING SITES & ARTIFACTS” (The Office of Science and Technology Policy is a department of the United States government, part of the Executive Office of the President, established by United States Congress on May 11, 1976, with a broad mandate to advise the President on the effects of science and technology on domestic and international affairs.)//Elmer recut amrita

NASA Recommendations **To** proactively **identify** lunar surface approach strategies and **determine a safe method of visiting historic sites, NASA leveraged the LHS team to** help **guide the flight** and surface planning of future visiting vehicles to those USG historic sites. Along with documenting a technical analysis of damage mechanisms, the NASA LHS team **identified a** small **set of** flight **operations recommendations and** surface **mobility methods which**, if followed, help **protect the sites, while allowing** robotic missions, including **commercial ventures, to achieve** their **mission objectives**. These measures are captured in the “NASA Recommendations to Space-Faring Entities: How to Protect and Preserve the Historic and Scientific Value of U.S. Government Lunar Artifacts,” (Technical Guidelines) published in 2011.2 Until more formal USG guidance is developed and perhaps a multilateral approach is established to reflect various nations’ views on lunar hardware of scientific and historic value**, the Technical Guidelines** developed by the NASA LHS team provide interim recommendations for lunar vehicle design and mission planning teams. While the Technical Guidelines do not represent mandatory USG or international requirements, **they inform** lunar spacecraft mission **planners** interested **in** helping **preserve and protect lunar** historic **artifacts** and potential science opportunities for future missions. Moon Express (U.S.), PTScientists (Germany), and Astrobotics (U.S.) have already announced their intentions to follow NASA’s LHS Technical Guidelines.

### 4

#### CP: The United States Federal Government and Russian Federation should establish a bilateral agreement that distinguishes historical artifacts on the Moon from the territory they occupy and create domestic recognition sites that cannot be encroached upon by any entities.

#### Competes:

#### 1] Normal means would make American heritage sites under the jurisdiction of the UN—their evidence.

Hertzfeld and Pace 13 (, H. and Pace, S., 2013. International Cooperation on Human Lunar Heritage. [online] Cpb-us-e1.wpmucdn.com. Available at: <https://cpb-us-e1.wpmucdn.com/blogs.gwu.edu/dist/7/314/files/2018/10/Hertzfeld-and-Pace-International-Cooperation-on-Human-Lunar-Heritage-t984sx.pdf> [Accessed 18 January 2022] Dr. Hertzfeld is an expert in the economic, legal, and policy issues of space and advanced technological development. Dr. Hertzfeld holds a B.A. from the University of Pennsylvania, an M.A. from Washington University, and a Ph.D. degree in economics from Temple University. He also holds a J.D. degree from the George Washington University and is a member of the Bar in Pennsylvania and the District of Columbia. Dr. Hertzfeld joined the Space Policy Institute in 1992. His research projects have included studies on the privatization of the Space Shuttle, the economic benefits of NASA R&D expenditures, and the socioeconomic impacts of earth observation technologies. He teaches a course in Space Law and a course in microeconomics through the Economics Department at G.W. Dr. Hertzfeld has served as a Senior Economist and Policy Analyst at both NASA and the National Science Foundation, and has been a consultant to many U.S. and international organizations, including a recent project on space applications with the OECD. He is the co-editor of Space Economics (AIAA 1992). Selected other publications include a study of the issues for privatizing the Space Shuttle (2000), an analysis of the value of information from better weather forecasts, an analysis of sovereignty and property rights published in the Journal of International Law (University of Chicago, 2005), and an economic analysis of the space launch vehicle industry (2005). Dr. Hertzfeld has also edited and prepared a new edition of the Study Guide and Case Book for Managerial Economics (Sixth Edition, W.W. Norton & Co.). Dr. Scott N. Pace is the Deputy Assistant to the President and Executive Secretary of the National Space Council (NSpC). He joined the NSpC in August 2017. From 2008-2017, he was the Director of the Space Policy Institute and a Professor of the Practice of International Affairs at George Washington University’s Elliott School of International Affairs. From 2005-2008, he served as the Associate Administrator for Program Analysis and Evaluation at NASA. Prior to NASA, he was the Assistant Director for Space and Aeronautics in the White House Office of Science and Technology Policy. From 1993-2000, he worked for the RAND Corporation’s Science and Technology Policy Institute, and from 1990-1993, he served as the Deputy Director and Acting Director of the Office of Space Commerce, in the Office of the Deputy Secretary of the Department of Commerce. In 1980, he received a Bachelor of Science degree in Physics from Harvey Mudd College; in 1982, Masters degrees in Aeronautics & Astronautics and Technology & Policy from the Massachusetts Institute of Technology; and in 1989, a Doctorate in Policy Analysis from the RAND Graduate School.)-rahulpenu recut amrita

Finally, **section 8** of the bill **requires** the Secretary of the Interior to submit the Apollo 11 lunar landing site to the United Nations Educational, Scientifi c, and Cultural Organization (UNESCO) for **designation as a World Heritage Site**. This violates Article II of the OST. All current World Heritage Sites are located on sovereign territory of nations. The only exception is a separate treaty that allows UNESCO to designate underwater sites (such as sunken ships) as protected cultural sites ( 7). **These designations are** very **limited**, and although the convention has been ratifi ed by 43 nations, the United States, Russia, and China are not among them. Thus, **any** new **treaty of this type** specifi cally for outer space **would have little chance of being ratifi ed** by the major space-faring nations.

#### Solves the aff- their evidence.

Hertzfeld and Pace 13 (, H. and Pace, S., 2013. International Cooperation on Human Lunar Heritage. [online] Cpb-us-e1.wpmucdn.com. Available at: <https://cpb-us-e1.wpmucdn.com/blogs.gwu.edu/dist/7/314/files/2018/10/Hertzfeld-and-Pace-International-Cooperation-on-Human-Lunar-Heritage-t984sx.pdf> [Accessed 18 January 2022] Dr. Hertzfeld is an expert in the economic, legal, and policy issues of space and advanced technological development. Dr. Hertzfeld holds a B.A. from the University of Pennsylvania, an M.A. from Washington University, and a Ph.D. degree in economics from Temple University. He also holds a J.D. degree from the George Washington University and is a member of the Bar in Pennsylvania and the District of Columbia. Dr. Hertzfeld joined the Space Policy Institute in 1992. His research projects have included studies on the privatization of the Space Shuttle, the economic benefits of NASA R&D expenditures, and the socioeconomic impacts of earth observation technologies. He teaches a course in Space Law and a course in microeconomics through the Economics Department at G.W. Dr. Hertzfeld has served as a Senior Economist and Policy Analyst at both NASA and the National Science Foundation, and has been a consultant to many U.S. and international organizations, including a recent project on space applications with the OECD. He is the co-editor of Space Economics (AIAA 1992). Selected other publications include a study of the issues for privatizing the Space Shuttle (2000), an analysis of the value of information from better weather forecasts, an analysis of sovereignty and property rights published in the Journal of International Law (University of Chicago, 2005), and an economic analysis of the space launch vehicle industry (2005). Dr. Hertzfeld has also edited and prepared a new edition of the Study Guide and Case Book for Managerial Economics (Sixth Edition, W.W. Norton & Co.). Dr. Scott N. Pace is the Deputy Assistant to the President and Executive Secretary of the National Space Council (NSpC). He joined the NSpC in August 2017. From 2008-2017, he was the Director of the Space Policy Institute and a Professor of the Practice of International Affairs at George Washington University’s Elliott School of International Affairs. From 2005-2008, he served as the Associate Administrator for Program Analysis and Evaluation at NASA. Prior to NASA, he was the Assistant Director for Space and Aeronautics in the White House Office of Science and Technology Policy. From 1993-2000, he worked for the RAND Corporation’s Science and Technology Policy Institute, and from 1990-1993, he served as the Deputy Director and Acting Director of the Office of Space Commerce, in the Office of the Deputy Secretary of the Department of Commerce. In 1980, he received a Bachelor of Science degree in Physics from Harvey Mudd College; in 1982, Masters degrees in Aeronautics & Astronautics and Technology & Policy from the Massachusetts Institute of Technology; and in 1989, a Doctorate in Policy Analysis from the RAND Graduate School.)-rahulpenu recut amrita

Our suggested **alternative is to create a bilateral agreement between the United States and Russia, offered as a multilateral agreement to other nations with artifacts on the Moon.** This would be more legally expedient, politically sustainable, and would more likely meet and exceed the stated goals of the bill. It would also emphasize the important role of national laws to implement and enforce these international space agreements.

### 5

#### The plan requires clarifying international space law---causes strategic bargaining to extract concessions

Alexander William Salter 16, Assistant Professor of Economics, Rawls College of Business, Texas Tech University, "SPACE DEBRIS: A LAW AND ECONOMICS ANALYSIS OF THE ORBITAL COMMONS", 19 STAN. TECH. L. REV. 221 (2016), https://law.stanford.edu/wp-content/uploads/2017/11/19-2-2-salter-final\_0.pdf

V. MITIGATION VS. REMOVAL

Relying on international law to create an environment conducive to space debris removal initially seems promising. The Virginia school of political economy has convincingly shown the importance of political-legal institutions in creating the incentives that determine whether those who act within those institutions behave cooperatively or predatorily.47 In the context of space debris, the role of nation-states, or their space agencies, would be to create an international legal framework that clearly specifies the rules that will govern space debris removal and the interactions in space more generally. The certainty afforded by clear and nondiscriminatory48 rules would enable the parties of the space debris “social contract” to use efficient strategies for coping with space debris. However, this ideal result is, in practice, far from certain. To borrow a concept from Buchanan and Tullock’s framework,49 the costs of amending the rules in the case of international space law are exceptionally high. Although a social contract is beneficial in that it prevents stronger nation-states from imposing their will on weaker nation-states, it also creates incentives for the main spacefaring nations to block reforms that are overall welfare-enhancing but that do not sufficiently or directly benefit the stronger nations.

The 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (more commonly known as the Outer Space Treaty) is the foundation for current international space law.50 All major spacefaring nations are signatories. Article VIII of this treaty is the largest legal barrier to space debris removal efforts. This article stipulates that parties to the treaty retain jurisdiction over objects they launch into space, whether in orbit or on a celestial body such as the Moon. This article means that American organizations, whether private firms or the government, cannot remove pieces of Chinese or Russian debris without the permission of their respective governments. Perhaps contrary to intuition, consent will probably not be easy to secure.

A major difficulty lies in the realization that much debris is valuable scrap material that is already in orbit. A significant fraction of the costs associated with putting spacecraft in orbit comes from escaping Earth’s gravity well. The presence of valuable material already in space can justifiably be claimed as a valuable resource for repairs to current spacecraft and eventual manufacturing in space. As an example, approximately 1,000 tons of aluminum orbit as debris from the upper stages of launch vehicles alone. Launching those materials into orbit could cost between $5 billion and $10 billion and would take several years.51 Another difficulty lies in the fact that no definition of space debris is currently accepted internationally. This could prove problematic for removal efforts, if there is disagreement as to whether a given object is useless space junk, or a potentially useful space asset. Although this ambiguity may appear purely semantic, resolving it does pose some legal difficulties. Doing so would require consensus among the spacefaring nations. The negotiation process for obtaining consent would be costly.

Less obvious, but still important, is the 1972 Convention on International Liability for Damage Caused by Space Objects, normally referred to as the Liability Convention. The Liability Convention expanded on the issue of liability in Article VII of the Outer Space Treaty. Under the Liability Convention, any government “shall be absolutely liable to pay compensation for damage caused by its space objects on the surface of the Earth or to aircraft, and liable for damage due to its faults in space.”52 In other words, if a US party attempts to remove debris and accidentally damages another nation’s space objects, the US government would be liable for damages. More generally, because launching states would bear costs associated with accidents during debris removal, those states may be unwilling to participate in or permit such efforts. In theory, insurance can partly remediate the costs, but that remediation would still make debris removal engagement less appealing.

A global effort to remediate debris would, by necessity, involve the three major spacefaring nations: the United States, Russia, and China.53 However, any effort would also require—at a minimum—a significant clarification and—at most —a complete overhaul of existing space law.54 One cannot assume that parties to the necessary political bargains would limit parleying to space-related issues. Agreements between sovereign nation-states must be self-enforcing.55 To secure consent, various parties to the change in the international legal-institutional framework may bargain strategically and may hold out for unrelated concessions as a way of maximizing private surplus. The costs, especially the decision-making costs, of changing the legal framework to secure a global response to a global commons problem are potentially quite high.

#### The US will use that opportunity to push Artemis Accords and bilateralization – undermines multilateral space law.

Wall 20 – Senior Space Writer with Space.com, former herpetologist and wildlife biologist, Ph.D. in evolutionary biology from the University of Sydney, Australia; citing Boley (Department of Physics and Astronomy, University of British Columbia, Vancouver) and Byers (Department of Political Science, University of British Columbia, Vancouver)

Mike Wall, 10-8-2020, “US policy could thwart sustainable space development, researchers say,” Space.com, https://www.space.com/us-space-policy-mining-artemis-accords DD

The United States' space policy threatens the safe and sustainable development of the final frontier, two researchers argue.

The U.S. is pushing national rather than multilateral regulation of space mining, an approach that could have serious negative consequences, astronomer Aaron Boley and political scientist Michael Byers, both of the University of British Columbia in Vancouver, write in a "Policy Forum" piece that was published online today (Oct. 8) in the journal Science.

Boley and Byers cite the 2015 passage of the Commercial Space Launch Competitiveness Act, which explicitly granted American companies and citizens the right to mine and sell space resources. That right was affirmed this past April in an executive order signed by President Donald Trump, they note.

The researchers also point to NASA's announcement last month that it intends to buy moon dirt and soil collected by private companies, and its plan to sign bilateral agreements with international partners that want to participate in the agency's Artemis program of crewed lunar exploration.

Artemis, one of NASA's highest-profile projects, aims to return astronauts to the moon in 2024 and establish a long-term, sustainable human presence on and around Earth's nearest neighbor by the end of the decade. Making all of this happen will require the extensive use of lunar resources, such as the water ice that lurks on the permanently shadowed floors of polar craters, NASA officials have said.

Boley and Byers take special aim at the planned bilateral agreements, known as the Artemis Accords. In promoting them, the U.S. "is overlooking best practice with regard to the sustainable development of space," the researchers write.

"Instead of pressing ahead unilaterally and bilaterally, the United States should support negotiations on space mining within the UN [United Nations] Committee on the Peaceful Uses of Outer Space, the same multilateral body that drafted the five major space treaties of the 1960s and '70s," they write in the Science piece. (The most important of the five is the 1967 Outer Space Treaty, which forms the basis of international space law.)

"Meanwhile, NASA’s actions must be seen for what they are — a concerted, strategic effort to redirect international space cooperation in favor of short-term U.S. commercial interests, with little regard for the risks involved," Boley and Byers add.

The researchers worry that the U.S. is setting an unfortunate precedent for other countries to follow, and that space mining and other exploration activities may therefore proceed in a somewhat careless and chaotic fashion in the not-too-distant future.

#### That returns space to might-makes-right imperial conflict.

O’Brien 20 – member of the International Institute of Space Law and founder of The Space Treaty Project, retired attorney and former member of the NASA-Hastings Law Project

Dennis O’Brien, 6-29-2020, “The Artemis Accords: repeating the mistakes of the Age of Exploration,” *The Space Review*, https://www.thespacereview.com/article/3975/1 DD

In the spring of 1493, the King and Queen of Spain sent an envoy to the Pope in Rome. Along with Portugal, Spain had just used its advanced sailing and navigation technology to reach “new worlds,” areas of the Earth that had not been previously discovered by Europeans. But they had a problem: they wanted to establish sovereign property rights in the lands they had discovered, but they weren’t sure they could do so under their own authority. So, they turned to the only international authority in Europe at that time, the Catholic Church, which held sway over governments from Portugal to Poland, from the Arctic to the Mediterranean. If the Church would establish a legal framework that granted them sovereignty, then those nations would be bound to recognize it.[2]

This is the first lesson that the current governments of the world can learn from the Age of Exploration & Empire that began five centuries ago. Even then, the most powerful nation in Europe, with the largest army and most advanced technology, realized that it could not unilaterally establish property rights or any other kind of sovereignty without the approval of an international authority. After the Church granted that authority, Spain was able to create one of the greatest empires in history. Spain and Portugal formalized the arrangement with a binding international agreement, the Treaty of Tordesillas, whose purpose was to ensure peaceful cooperation between their nations, primarily by establishing a line of demarcation that separated their areas of activity.[3]

Unfortunately, the legal framework so established was based on national dominance, not multilateral international cooperation. The grant of sovereignty was exclusive, made only to Spain and Portugal, and it required them to subjugate the “savages” in the lands they discovered by taking along Church missionaries. This exclusivity did not sit well with other nations as they also developed the technologies of exploration; it was one of the reasons many northern European nations joined the Protestant Reformation and rejected the authority of the Pope in Rome. Without a fair and equitable international agreement that honored the interests of emerging states, the Church lost its ability to act as an arbiter between nations.

Even worse, the dominance model set up centuries of conflict among the major powers in Europe. Militant nationalism and economic colonialism became the principles guiding national policy. The result was centuries of war, suffering, and neglect among the major powers and the nations they subjugated. This pattern did not end until the 20th century, when the major powers fought two world wars and finally dismantled their colonial empires: sometimes peacefully, sometimes by force.

By the mid-1960s, most countries on Earth were independent or on their way to becoming so. But a new conflict had started, one that threatened to repeat the mistakes of five centuries earlier. The great powers were once again using their advanced technology to explore new worlds, and the race was on to plant their flag on the Moon first. Under the ancient traditions, the country that did so would have a claim against all others for possession and use of the territory. The Cold War was about to expand into outer space.

But then something wonderful happened. In 1967, the United Nations proposed, and the world’s space powers accepted, an international agreement known as the Outer Space Treaty.[4] The treaty was an intentional effort to avoid the mistakes of the Age of Exploration & Empire. Article I states, “The exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind.” Article II is even more specific: “Outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.” Because of this treaty, the United States carried a plaque to the Moon that said, “We came in peace for all mankind.”[5] When the Apollo 11 astronauts planted the US flag, they did so out of pride, but did not establish any claim or national priority.

This legal framework worked well initially, but people soon started wondering about what to do when countries or private entities wanted to start commercial activity on the Moon, or build settlements. The solution was the Moon Treaty, proposed by the United Nations and adopted by enough nations to come into force in 1984.[6] But it has not yet been adopted by any major spacefaring nation. The United States, by a recent executive order, has specifically renounced the treaty and stated its intentions to extract materials from the Moon without any international agreement.[7]

The newly announced Artemis Accords go even further. Although the actual Accords have not been released pending consultation with possible partners, the summary provided by NASA[8] indicates that the United States will unilaterally interpret the Outer Space Treaty to allow “space resource extraction,” despite the prohibition against appropriation in Article II of the Treaty. There will also be “safety zones” to avoid “harmful interference” with such operations. The effect is to establish exclusive economic zones, especially if “harmful interference” is defined to include economic harm, not just safety. Will the new Space Force be used to protect such economic interests? Will other nations be excluded if they support the Moon Treaty?[9] Will private actors be required to follow the same rules as states, as recommended in the recently drafted Moon Village Principles?[10] This is the slippery slope of using unilateral action to establish economic rights rather than an international agreement.

The Artemis Accords acknowledge many beneficial agreements and policies: The Outer Space Treaty, Rescue Agreement, and Registration Convention (though not the Liability Convention); peace, transparency, interoperability, protecting heritage sites and sharing scientific information. But its unilateral authorization of space mining is a continuation of the Trump Administration’s underlying foreign policy strategy: unilateral dominance over international cooperation. The United States has withdrawn from the Paris Accords, the Iranian nuclear deal, and, in the middle of a pandemic, the World Health Organization. Dominance has even become the theme of the administration’s domestic policy, with President Trump recently telling governors, “If you don't dominate, you're wasting your time… You have to dominate.”[11] That core philosophy is now being applied to outer space, as Vice President Mike Pence proudly announced in 2018. Despite the lessons of history, the United States is going full speed ahead with the “dominance” model of space development rather than working with the nations of the world to develop a “cooperation” model. Outer space, which so far has been preserved for peace and cooperation, is about to be spoiled, perhaps forever.

#### Goes nuclear – space conflict is uniquely escalatory.

Farley 22 – PhD, Senior Lecturer at the Patterson School at the University of Kentucky

Robert Farley, 1-9-2022, “Does A Space War Mean A Nuclear War?” 1945, https://www.19fortyfive.com/2022/01/does-a-space-war-mean-a-nuclear-war/ DD

The recent Russian anti-satellite test didn’t tell the world anything new, but it did reaffirm the peril posed by warfare in space. Debris from explosions could make some earth orbits remarkably risky to use for both civilian and military purposes. But the test also highlighted a less visible danger; attacks on nuclear command and control satellites could rapidly produce an extremely dangerous escalatory situation in a war between nuclear powers. James Acton and Thomas Macdonald drew attention to this problem in a recent article at Inside Defense. As Acton and MacDonald point out, nuclear command and control satellites are the connective tissue of nuclear deterrence, assuring countries that they’re not being attacked and that they’ll be able to respond quickly if they are.

For a long time, these strategic early-warning satellites were akin to a center of gravity in ICBM warfare. Nuclear deterrence requires awareness that an attack is underway. Attacks on the monitoring system could easily be read as an attempt to blind an opponent in preparation for general war, and could themselves incur nuclear retaliation. Thus, the nuclear command and control satellites are critical to the maintenance of nuclear deterrence. They make it possible to distribute an order from the chief of government to the nuclear delivery systems themselves. Consequently, their destruction might lead to hesitation or delay in performing a nuclear launch order.

It was only later that the relevance of satellites for conventional warfare became clear. Satellites could reconnoiter enemy positions and, more importantly, provide communications for friendly forces. Indeed, the expansion of the role of satellites in conventional warfare has complicated the prospect of space warfare. States have a clear reason for targeting enemy satellites which support conventional warfare, as those satellites enable the most lethal part of the kill chain, the communications and recon networks that link targets with shooters. Thus, we now have a situation in which space military assets have both nuclear and conventional roles. In a conflict confusion and misperception could rapidly become lethal. If one combatant views an attack against nuclear command and control as a prelude to a general nuclear attack, it might choose to pre-empt.

Nuclear powers have dealt with problems in this general category for a good long while; would a conventional attack against tactical nuclear staging areas represent an escalation, for example? Would the use of ballistic missiles that can carry either conventional or nuclear weapons trigger a nuclear response? Do attacks against air defense networks that have both strategic and tactical responsibilities run the risk of triggering a nuclear response? There’s also the danger that damage to communications networks designated for conventional combat could force traffic onto the nuclear control systems, further confusing the issue.

No one has ever fought a nuclear war, and no two nuclear powers have engaged in a prolonged, high-intensity conventional conflict. Now that conventional systems have become implicated in space technologies for reconnaissance, targeting, and communications, leaders will have to make very difficult, very careful decisions on what enemy capabilities they want to disrupt. Acton and MacDonald propose a straightforward ban on attacks against nuclear satellite infrastructure, which would also require agreement to keep nuclear and conventional communications networks separate. This is the little ask; countries should plan to fight more carefully. The big ask is for a multilateral ban to prevent future anti-satellite weapons tests in space. This would reduce the danger that debris could close off, temporarily or permanently, human access to certain locations in earth orbit. But given that countries use satellites for the conduct of conventional military operations, it’s a lot to ask for warfighters to consider critical military infrastructure off-limits in any particular conflict.

### 6

#### Private companies are set to mine in space – new tech and profit motives make space lucrative

Gilbert 21, (Alex Gilbert is a complex systems researcher and PhD student in Space Resources at the Colorado School of Mines, “Mining in Space is Coming”), 4-26-21, Milken Institute Review, https://www.milkenreview.org/articles/mining-in-space-is-coming // MNHS NL

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](https://payneinstitute.mines.edu/wp-content/uploads/sites/149/2020/09/Payne-Institute-Commentary-The-Era-of-Commercial-Space-Mining-Begins.pdf). 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](https://www.fastcompany.com/90347364/jeff-bezos-wants-to-save-earth-by-moving-industry-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](https://issues.org/new-policies-needed-to-advance-space-mining/) to facilitate private investment and ensure international cooperation.

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 valuabl**e**. Of these, water may be the most attractive in the near-term, because — with assistance from solar energy or nuclear fission — H2O can be split into hydrogen and oxygen to make rocket propellant, facilitating in-space refueling. So-called “rare earth” metals are also potential targets of asteroid miners intending to service Earth markets. Consisting of 17 elements, including lanthanum, neodymium, and yttrium, these critical materials (most of which are today mined in China at great environmental cost) are required for electronics. And they loom as bottlenecks in making the transition from fossil fuels to renewables backed up by battery storage. The Moon is a prime space mining target. Boosted by NASA’s mining solicitation, it is likely the first location for commercial mining. The Moon has several advantages. It is relatively close, requiring a journey of only several days by rocket and creating communication lags of only a couple seconds — a delay small enough to allow remote operation of robots from Earth. Its low gravity implies that relatively little energy expenditure will be needed to deliver mined resources to Earth orbit. The Moon may look parched — and by comparison to Earth, it is. But recent probes have confirmed substantial amounts of water ice lurking in [permanently shadowed craters](http://lroc.sese.asu.edu/posts/1105) at the lunar poles. Further, it seems that solar winds have implanted significant deposits of helium-3 (a light stable isotope of helium) across the equatorial regions of the Moon. Helium-3 is a potential fuel source for second and third-generation fusion reactors that one hopes will be in service later in the century. The isotope is packed with energy (admittedly hard to unleash in a controlled manner) that might augment sunlight as a source of clean, safe energy on Earth or to power fast spaceships in this century. Between its water and helium-3 deposits, the Moon could be the resource stepping-stone for further solar system exploration. Asteroids are another near-term [mining target](https://foreignpolicy.com/2016/04/28/the-asteroid-miners-guide-to-the-galaxy-space-race-mining-asteroids-planetary-research-deep-space-industries/). There are all sorts of space rocks hurtling through the solar system, with varying amounts of water, rare earth metals and other materials on board. The asteroid belt between the orbits of Mars and Jupiter contains most of them, many of which are greater than a kilometer in diameter. Although the potential water and mineral wealth of the asteroid belt is vast, the long distance from Earth and requisite travel times and energy consumption rule them out as targets in the near term. The prospects for space mining are being driven by technological advances across the space industry. The rise of reusable rocket components and the now-widespread use of off-the-shelf parts are lowering both launch and operations costs. Once limited to government contract missions and the delivery of telecom satellites to orbit, private firms are now emerging as leaders in developing “NewSpace” activities — a catch-all term for endeavors including orbital tourism, orbital manufacturing and mini-satellites providing specialized services. The space sector, with a market capitalization of $400 billion, could grow to as much as $1 trillion by 2040 as private investment soars.

#### Private entities on the moon key to lunar mining

Dreier 20[Casey Dreier, chief advocate & senior space policy adviser at the Planetary Society, wrote on Twitter that the importance of Nasa’s announcement is “not so much the financial incentive (which is tiny) but in establishing the legal precedent that private companies can collect and sell celestial materials (with the explicit blessing of NASA/U.S. gov)”. 9-11-2020, "Nasa is looking for private companies to help mine the moon," https://www.theguardian.com/science/2020/sep/11/nasa-moon-mining-private-companies]

Nasa has announced it is looking for private companies to go to the moon and collect dust and rocks from the surface and bring them back to Earth. The American space agency would then buy the moon samples in amounts between 50 to 500 grams for between $15,000 to $25,000. The Nasa administrator, Jim Bridenstine, announced on Thursday that the moon material collection would become part of a technology development program that would help astronauts “live off the land” for crewed missions in the future to the moon or elsewhere. Bridenstine wrote that the agency “is buying lunar soil from a commercial provider. It’s time to establish the regulatory certainty to extract and trade space resources.” The sun emitting a stream of particles Nasa to study impact of 'space weather' on Earth Read more The collection is part of Nasa’s Artemis lunar exploration program established last year to land US astronauts, including the first woman and the next man, on the moon by 2024. The agency has indicated that missions further afield, to Mars for instance, will require the use of locally mined resources. “We will use what we learn on and around the moon to take the next giant leap – sending astronauts to Mars,” Bridenstine wrote. In a blogpost, Bridenstine said the effort would comply with the Outer Space Treaty of 1967, which says that no country may lay sovereign claim to the moon or other celestial bodies in much the same way that the Antarctic continent is off-limits for territorial conquest. In May, Nasa unveiled a legal framework that would govern the behavior of countries and companies in space and on the moon. The legal framework, known as the Artemis Accords, include the creation of “safety zones” around sites where mining and exploration would take place on the lunar surface. Nasa’s top administrator also told a forum held by the Secure World Foundation that the policies that will govern mining from celestial bodies would be much the same as those that currently exist for the world’s oceans. “We do believe we can extract and utilize the resources of the moon, just as we can extract and utilize tuna from the ocean,” he said, without referring to overfishing and pollution that is rapidly destroying fish stocks in many regions. Unlike fisheries, however, participating celestial mining companies would be required to provide imagery of the material and the location from which it was recovered. Nasa already has a separate program to contract companies to fly science experiments and cargo to the moon ahead of a human landing. Those include Astrobotic, SpaceX, Blue Origin, Sierra Nevada Corp and Lockheed Martin. Bridenstine said he anticipated some of those might also be interested in lunar mining. Casey Dreier, chief advocate & senior space policy adviser at the Planetary Society, wrote on Twitter that the importance of Nasa’s announcement is “not so much the financial incentive (which is tiny) but in establishing the legal precedent that private companies can collect and sell celestial materials (with the explicit blessing of NASA/U.S. gov)”.

#### Squo private companies are willing to invest, but the plan crosses a perception barrier which destroys investment

Shaw 13 - Lauren E, J.D. from Chapman University School of Law, ”Asteroids, the New Western Frontier: Applying Principles of the General Mining Law of 1872 to Incentive Asteroid Mining”, JOURNAL OF AIR LAW AND COMMERCE, Volume 78, Issue 1, Article 2, <https://scholar.smu.edu/cgi/viewcontent.cgi?article=1307&context=jalc> // recut MNHS NL

To some, the mining of asteroids might sound like the premise of a science fiction novel' or the solution to the heartwrenching, fictional scenario depicted in the film Armageddon.2 To others, it evokes a fantastical idea that may come to fruition in a distant reality. However, impressively funded companies have plans to send spacecraft to begin prospecting on asteroids within the next two years.' The issues associated with the mining of asteroids should be addressed before these plans are set in motion. Much has been written about the issues that might arise from allowing nations to own these space bodies and the minerals they contain; one such issue is the impact on international treaties.4 However, little has been written about the applicability of preexisting mining laws-which provide a basic property right scheme for the private sector-such as the General Mining Law of 1872 (Mining Law) to the management of asteroid mining.' The literature to date on how to legally address asteroid mining is minimal.' The articles that do address it propose the creation of different systems, such as a "property rights-based system that relies on the doctrine of first possession"7 or an international authority that would regulate mining operations.' Implementing a scheme that offers ownership of extracted resources without bestowing complete sovereignty is necessary to avoid an impending legal limbo-that is, an outer space "Wild West" equivalent where there is neither certainty nor security in who owns what.9 If private sector miners of asteroids know this right already exists, they will have more incentive to extract resources.' 0 This, in turn, would increase the chances of successful missions, resulting in numerous scientific and explorative benefits, along with the potential replenishment of key elements that are becoming increasingly depleted on Earth yet are still needed for modern industry. Scientists speculate that key elements needed for modern industry, including platinum, zinc, copper, phosphorus, lead, gold, and indium, could become depleted on Earth within the next fifty to sixty years." Many of these metals, such as platinum, are chemical elements that, unlike oil or diamonds, have no synthetic alternative.12 Once the reserves on Earth are mined to complete depletion, industries will be forced to recycle the existing supply of minerals, which will result in increased costs due to increased scarcity.' 3 However, evidence is accumulating that asteroids only a few hundred thousand miles away from Earth may be composed of an abundance of natural resources-including many of the minerals being mined to depletion on Earth-that could lead to vast profits." Most of the minerals being mined on Earth, including gold, iron, platinum, and palladium, originally came from the many asteroids that hit the Earth after the crust cooled during the planet's formation.'

#### Space mining is the only way to solve climate change

Duran 21, (Paloma Duran is a journalist and industry analyst at Mexico Business News, “Is Space Mining the Best Option to Face Climate Change?”), 11-03-21, Mexico Business News, https://mexicobusiness.news/mining/news/space-mining-best-option-face-climate-change // MNHS NL

Going to net zero means that more mining is needed. Experts have said that the current supply cannot support the necessary metals demand for the green transition. As a result, new mining alternatives have gained greater relevance, among them is space mining. Several countries, including Mexico, have shown their interest in this alternative, creating a new space race. “The solar system can support a billion times greater industry than we have on Earth. When you go to vastly larger scales of civilization, beyond the scale that a planet can support, then the types of things that civilization can do are incomprehensible to us … We would be able to promote healthy societies all over the world at the same time that we would be reducing the environmental burden on the Earth,” said Dr. Phil Metzger, Planetary Scientist at the University of Central Florida. Currently, there are several attempts to address global warming and transition to a net zero carbon economy. There has been an increasing interest in renewable energy and infrastructure, which has increased demand for various minerals, especially lithium, cobalt, nickel, copper and rare earth elements. However, according to experts, the world is close to entering a metals supercycle, where demand will exceed available supply, causing prices to skyrocket. Consequently, the mining industry has sought alternatives to achieve the required supply. Options include recycling and improved mine waste management, sea mining and space mining. The latter is considered one of the alternatives with the greatest potential. However, a regulatory framework is still lacking and there is almost no experience in this regard. Despite the lack of knowledge regarding space mining, it has become a very attractive option since the planet is running out of resources. While some people believe that land-based mining is cheaper than space mining, experts believe this may change in the long term. Furthermore, within the solar system there are countless bodies rich in minerals, ores and elements that will accelerate the fight against climate change. “There will come a point when there is nothing left to mine on the surface, prompting mines to reach even further below. But even those resources are destined to run out and so we will aim toward ocean mining, which already has specific technologies that are being developed. Nevertheless, even those mines are limited as well. The mine of the future, which today may seem unlikely, will no longer be on our planet. There will be a time when space mining will be as common as an open leach mine,” Eder Lugo, Minerals Head at Siemens, told MBN. More than 150 million asteroids measuring approximately 100m are believed to be in the inner solar system alone. In addition, astronomers have also identified abundant minerals near the Earth’s space and the Main Asteroid Belt. There are three main groups into which asteroids are divided: C- type, S- type, and M- type. The last two groups are the most abundant in minerals such as gold, platinum, cobalt, zinc, tin, lead, indium, silver, copper and rare earth metals. "Energy is limited here. Within just a few hundred years, you will have to cover all of the landmass of Earth in solar cells. So, what are you going to do? Well, what I think you are going to do is you are going to move out in space … all of our heavy industry will be moved off-planet and Earth will be zoned residential and light-industrial,” said Jeff Bezos, Founder of Amazon and the Space Launch Provider Blue Origin.

#### Anthropogenic warming causes extinction --- mitigation efforts now are key

Griffin, 2015 (David, Professor of Philosophy at Claremont, “The climate is ruined. So can civilization even survive?”, CNN, 4/14/2015, <http://www.cnn.com/2015/01/14/opinion/co2-crisis-griffin/> )

Although most of us worry about other things, climate scientists have become increasingly worried about the survival of civilization. For example, Lonnie Thompson, who received the U.S. National Medal of Science in 2010, said that virtually all climatologists "are now convinced that global warming poses a clear and present danger to civilization." Informed journalists share this concern. The climate crisis "threatens the survival of our civilization," said Pulitzer Prize-winner Ross Gelbspan. Mark Hertsgaard agrees, saying that the continuation of global warming "would create planetary conditions all but certain to end civilization as we know it." These scientists and journalists, moreover, are worried not only about the distant future but about the condition of the planet for their own children and grandchildren. James Hansen, often considered the world's leading climate scientist, entitled his book "Storms of My Grandchildren." The threat to civilization comes primarily from the increase of the level of carbon dioxide (CO2) in the atmosphere, due largely to the burning of fossil fuels. Before the rise of the industrial age, CO2 constituted only 275 ppm (parts per million) of the atmosphere. But it is now above 400 and rising about 2.5 ppm per year. Because of the CO2 increase, the planet's average temperature has increased 0.85 degrees Celsius (1.5 degrees Fahrenheit). Although this increase may not seem much, it has already brought about serious changes. The idea that we will be safe from "dangerous climate change" if we do not exceed a temperature rise of 2C (3.6F) has been widely accepted. But many informed people have rejected this assumption. In the opinion of journalist-turned-activist Bill McKibben, "the one degree we've raised the temperature already has melted the Arctic, so we're fools to find out what two will do." His warning is supported by James Hansen, who declared that "a target of two degrees (Celsius) is actually a prescription for long-term disaster." The burning of coal, oil, and natural gas has made the planet warmer than it had been since the rise of civilization 10,000 years ago. Civilization was made possible by the emergence about 12,000 years ago of the "Holocene" epoch, which turned out to be the Goldilocks zone - not too hot, not too cold. But now, says physicist Stefan Rahmstorf, "We are catapulting ourselves way out of the Holocene." This catapult is dangerous, because we have no evidence civilization can long survive with significantly higher temperatures. And yet, the world is on a trajectory that would lead to an increase of 4C (7F) in this century. In the opinion of many scientists and the World Bank, this could happen as early as the 2060s. What would "a 4C world" be like? According to Kevin Anderson of the Tyndall Centre for Climate Change Research (at the University of East Anglia), "during New York's summer heat waves the warmest days would be around 10-12C (18-21.6F) hotter [than today's]." Moreover, he has said, above an increase of 4C only about 10% of the human population will survive. Believe it or not, some scientists consider Anderson overly optimistic. The main reason for pessimism is the fear that the planet's temperature may be close to a tipping point that would initiate a "low-end runaway greenhouse," involving "out-of-control amplifying feedbacks." This condition would result, says Hansen, if all fossil fuels are burned (which is the intention of all fossil-fuel corporations and many governments). This result "would make most of the planet uninhabitable by humans." Moreover, many scientists believe that runaway global warming could occur much more quickly, because the rising temperature caused by CO2 could release massive amounts of methane (CH4), which is, during its first 20 years, 86 times more powerful than CO2. Warmer weather induces this release from carbon that has been stored in methane hydrates, in which enormous amounts of carbon -- four times as much as that emitted from fossil fuels since 1850 -- has been frozen in the Arctic's permafrost. And yet now the Arctic's temperature is warmer than it had been for 120,000 years -- in other words, more than 10 times longer than civilization has existed. According to Joe Romm, a physicist who created the Climate Progress website, methane release from thawing permafrost in the Arctic "is the most dangerous amplifying feedback in the entire carbon cycle." The amplifying feedback works like this: The warmer temperature releases millions of tons of methane, which then further raise the temperature, which in turn releases more methane. The resulting threat of runaway global warming may not be merely theoretical. Scientists have long been convinced that methane was central to the fastest period of global warming in geological history, which occurred 55 million years ago. Now a group of scientists have accumulated evidence that methane was also central to the greatest extinction of life thus far: the end-Permian extinction about 252 million years ago. Worse yet, whereas it was previously thought that significant amounts of permafrost would not melt, releasing its methane, until the planet's temperature has risen several degrees Celsius, recent studies indicate that a rise of 1.5 degrees would be enough to start the melting. What can be done then? Given the failure of political leaders to deal with the CO2 problem, it is now too late to prevent terrible developments. But it may -- just may -- be possible to keep global warming from bringing about the destruction of civilization. To have a chance, we must, as Hansen says, do everything possible to "keep climate close to the Holocene range" -- which means, mobilize the whole world to replace dirty energy with clean as soon as possible.

### Case

#### 1] They conveniently forgot the last paragraph of this evidence that concludes that heritage can be bad.

1ac Sample 19 Ian Sample 7-19-2019 “Apollo 11 site should be granted heritage status, says space agency boss” <https://www.theguardian.com/science/2019/jul/19/apollo-11-site-heritage-status-space-agency-moon> (PhD at Queens Mary College 1-22-2022 amrita

But **Wörner believes heritage can go too far**. “I would say let’s limit it to the important ones,” he said. “**If** you define each and **everything** on Earth **as heritage**, you **cannot move** and it will be the same on the moon. We should not make heritage the brake for the future.”

#### 2] YOUR AUTHOR CONCLUDES WE SHOULD STILL ALLOW COMMERCIALIZATION OF THE MOON AND HERITAGE SITES – GG!

#amritaisthebest

OSTP 18 Office of Science and Technology Policy March 2018 “PROTECTING & PRESERVING APOLLO PROGRAM LUNAR LANDING SITES & ARTIFACTS” (The Office of Science and Technology Policy is a department of the United States government, part of the Executive Office of the President, established by United States Congress on May 11, 1976, with a broad mandate to advise the President on the effects of science and technology on domestic and international affairs.)//Elmer recut amrita

While **commercial** robotic **missions create risks** to the protection of lunar scientific and heritage sites, **the U.S. Gov**ernment fully **supports commercialization of the space sector and** commercial robotic missions to **the Moon**. Therefore, the risks to damage lunar heritage sites must be balanced against other national and international interests. The **lunar heritage sites can be protected**, at a reasonable cost, **while** still **fostering commercial space activities** and government-sponsored missions back **to the Moon**. There are approximately a dozen U.S. and foreign companies at various stages of planning lunar robotic missions. These include the five GLXP finalists and other companies from the United States, Japan, India, Israel Germany, and other countries.

#### 3] Status quo checks—private companies will work *with* NASA

Tillman 19 Nola Taylor Tillman 7-31-2019 "Will Private Companies Beat NASA to the Moon?" <https://www.space.com/nasa-private-companies-moon-race.html> (Science Journalist)//Elmer recut amrita

With private companies setting their sights on sending humans to the moon in the near future, it's possible that one could touch down on the lunar surface before NASA astronauts do. But **the resulting "public versus private" space race isn't one that NASA feels** overly competitive **about. The** space **agency's plans** to reach the moon involve **rely**ing **on private** corporations **rather than challenging** them. "The challenges differ for the public and private sector, though they all do come down to money," Wendy Whitman Cobb told Space.com by email. Whitman Cobb, an associate professor at the U.S. Air Force's School of Advanced Air and Space Studies, examines the institutional dynamics of the policymaking behind space exploration. She stressed that her views are her own and do not necessarily reflect those of the Air Force or Department of Defense. "Technology is not a problem for either sector — the ability to get to the moon has existed since the 1960s," Whitman-Cobb said. "What is different is the will to do it." A Worldwide Team NASA's current lunar push kicked into high gear in December 2017, when President Donald Trump signed a space-policy directive to send humans to the moon and establish a sustainable presence there. Earlier this year, Vice President Mike Pence told NASA to put boots on the moon by 2024, rather than the previous goal of 2028. NASA's Artemis program aims to reach that goal. (In Greek mythology, Artemis was the twin sister of Apollo and goddess of the moon.) The agency's Orion spacecraft will carry human explorers to the Gateway outpost, a small space station that NASA plans to start building in lunar orbit in the early 2020s. Landers will then carry astronauts from the Gateway to the lunar surface. The **space agency** won't be hitting these goals on its own. "We're already **partnering with** our **commercial** partners to build these systems, **and** later on we'll continue to work with our international partners to build up the Gateway," Marshall Smith, director of the human lunar exploration program at NASA's headquarters in Washington, told Space.com by email. The space agency is currently working with 11 companies on Gateway and its associated systems. In May 2019, NASA awarded a contract to Maxar Technologies to build, launch and demonstrate in space the first major Gateway piece — the Power and Propulsion Element. The space agency also announced then that it had signed contracts with three companies to carry experiments to the moon via small robotic landers (though one of those three recently dropped out). In June, NASA asked industry to figure out ways to deliver cargo to the Gateway — much like the companies SpaceX and Northrop Grumman make robotic resupply runs to the International Space Station. In addition to working with private companies, NASA is also cooperating with **other countries** on the Artemis program. "International partners are a vital part of our lunar plan and will contribute **to** the goal of **creating a sustainable lunar presence** by 2028," Smith said. But private industry isn't solely focused on helping NASA make it to the moon. Companies like SpaceX and Blue Origin have stated their intentions to design their own lunar exploration programs. Advertisement Elon Musk's SpaceX is currently working on a 100-passenger vehicle called Starship, which the company envisions carrying people to the moon and Mars. Starship will be lofted off Earth's surface by a huge rocket called Super Heavy. SpaceX already has one Starship-Super Heavy passenger flight planned for 2023. The company hopes to begin commercial operations of the pair as early as 2021, most likely with commercial satellite launches. Blue Origin, operated by Amazon founder Jeff Bezos, is working on a big lander called Blue Moon, which will deliver science instruments, lunar rovers and, eventually, astronauts to the lunar surface. Bezos sees many potential customers for Blue Moon other than NASA. "People are very excited about this capability to soft-land their cargo, their rovers, their science experiments on the surface of the moon in a precise way," Bezos said at the lander's unveiling in May 2019. "There is no capability to do that today." Then there's Florida-based company Moon Express, which is working to become the first private enterprise to reach the moon with robotic spacecraft systems. In 2016, it became the first company to receive U.S. government approval to send a robotic spacecraft to the lunar surface. "Our vision is really to expand Earth's economic and social sphere to include the moon," Alain Berinstain, Moon Express' vice president of global development, said last year at a lunar-science workshop at NASA's Ames Research Center in California. "We see the moon as the Earth's eighth continent to explore and to also mine for resources, like we have with every other continent on Earth." Pittsburgh-based Astrobotic planned to launch its Peregrine lander to the moon in 2019, but that date has since been since pushed back to 2020 or 2021. "We're really, at Astrobotic, trying to do this the right way, meaning that we're trying to be as technically rigorous as possible," Dan Hendrickson, vice president of business development at Astrobotic, said at a Washington Space Business Roundtable in February. "We're trying to be very upfront with the entire community about our current status." As with NASA, private industry has sufficient access to the technology to get to the moon, Whitman Cobb said. "They also have to demonstrate that their systems are fundamentally safe and reliable in order to attract paying customers — they are a business, after all," she said. Private companies also tend to have a leaner leadership structure than NASA's 60-year-old legacy brings with it. "NASA's bureaucracy has stagnated since the 1960s," Whitman Cobb said. That makes it "more difficult for NASA to contract, make changes and adapt to new circumstances." On the other hand, private companies have demonstrated the ability to move through technology development at a rapid rate, incorporating design and technology changes "almost immediately," she said. That brings its own advantages.

#### 4] Empirically denied – all of these scenarios should have been triggered bc we don’t have lunar heritage sites being used right now, but they havent – at the very worst means their impacts take decades to happen and aren’t probable so DAs o/w on face

#### 5] Squo solves --- new tech means dust is being researched ayways

Rabie 21[Passant Rabie Passant is is an award-winning journalist from Cairo, Egypt, who relocated to New York to pursue a master's degree in science journalism at New York University., 6-22-2021, "NASA is trying to deal with its most annoying problem on the Moon," Inverse, <https://www.inverse.com/science/nasa-moon-dust-problem>] DD AG

In 2019, NASA created the Lunar Surface Innovation Initiative (LSII) to come up with new technologies needed for future exploration of the Moon, with dust mitigation being one of the main priorities. The initiative came up with active and passive mitigation technologies for different kinds of equipment like rovers, power systems, spacesuits, and other types of hardware that NASA would send to the Moon. Sharon Miller, the dust shedding material program’s principal investigator at NASA Glenn, says the combination of the passive and active techniques will allow the dust to be removed from the surface area while reducing the amount of power needed to remove it. “The equipment that we're using is a variety of things from the different NASA centers,” Miller tells Inverse. lunar dust seen under microscope You don’t want to breathe this stuff, truly. NASA Some of the ideas that are currently being developed include ion-beamed deposited coating or laser patterned surfaces. The team has started developing these materials and testing them in the lab, experimenting with different textures and combinations. NASA is then planning on testing these experimental solutions on the surface of the Moon starting in 2023. “The solutions that we're working on are ‘leave no damage behind’ type of solutions,” Montbach says. “These are things that will only affect the equipment and prevent the equipment from being damaged by the dust, but will not do anything specifically to change what is on the Moon.” The solutions are not only for missions like Apollo, but are designed for a longer, more sustainable stay on the Moon as NASA plans on building a lunar base on the Moon. “A lot of what has begun this interest in this need is to try and find solutions not only for shorter missions but potentially that would work for longer missions as well,” Montbach says.

#### 6] Neutrinos fail

#### A] Crawford concedes the tech is impossible and says that the moon requires high level infra that we don’t have right now

#### B] Wilson is way too old – that article was written 3 decades ago – crawford evidence contradicts it and proves we already have neutrino tech

#### C] Empirically denied – neutrinos haven’t existed and no escalation – this scenario is sci-fi bullshit

#### D] Game over – neutrinos don’t exist – most recent ev proves and assumes their evidence

The Conversation 21 Conversation, 11-1-2021, "Physicists have come back empty-handed after their search for ‘sterile neutrinos’ fails," TNW | Space, <https://thenextweb.com/news/physicists-empty-handed-search-for-sterile-neutrinos-fails-syndication> DD AG

Physicists searching for evidence of a “light sterile neutrino”, a hypothetical particle that could give clues to cosmic puzzles such as the nature of dark matter and why the Universe is made of matter at all, have announced their hunt has come back empty-handed.

The MicroBooNE experiment at Fermilab was designed to follow up on earlier hints of neutrinos behaving oddly, but the negative result deals a blow to the idea of such a new elementary particle.

Neutrinos are lightweight, elusive subatomic particles, and current theories recognize three different types. In 1995, however, the Liquid Scintillator Neutrino Detector (LSND) experiment in Los Alamos detected more of one type than anyone expected.

Most attempts to explain the anomaly proposed the existence of a fourth kind of neutrino that barely interacts with normal matter at all: a so-called “sterile” neutrino.

More recent experiments have also reported results broadly consistent with the sterile neutrino hypothesis, but the MicroBooNE result casts the whole idea into doubt.

Neutrinos are subatomic particles postulated by Austrian physicist Wolfgang Pauli in 1930 to explain how some radioactive atoms fire out electrons.

Their existence wasn’t confirmed until 1956 when Americans Clyde Cowan and Frederick Reines observed tiny flashes of light made by neutrinos crashing into the atoms in a tank of water.

Today, neutrinos are an integral part of the “Standard Model of particle physics”. This is our best theory of the Universe’s particles, describing the 17 known elementary particles and how they interact via three fundamental forces (electromagnetism and the strong and weak forces).

The Standard Model divides the 17 particles into two basic groups: 12 fermions, which make up matter, and five bosons, which carry the forces.

Not all fermions interact with all the forces. For example, neutrinos are only affected by the weak force (and gravity, which doesn’t fit into the Standard Model).

The fermions are split into three families, each of which has a neutrino: the electron, muon, and tau neutrinos.

All of these neutrinos are “left-handed” with respect to the weak force. It’s hard to explain simply what that means, but suffice to say left- and right-handed particles are mirror images of one another, and they are affected differently by the weak force.

All other known fermions come in both left- and right-handed versions. This encourages us to think that right-handed neutrinos should also exist in nature.

Being right-handed, these hypothetical neutrinos are blind even to the weak force and are in this sense “sterile”.

But like all known particles, they should still feel gravity. Sterile neutrinos are also predicted by “grand unified theories” that try to combine the three forces into one.

Hunting for sterile neutrinos

If sterile neutrinos exist, how would we find them? One way is to use a process called “neutrino oscillation”, in which the three known kinds of neutrinos can transform into one another.

Experiments measuring these oscillations usually look at either how many of a given kind of neutrino appear in some situation, or how many disappear.

The LSND experiment which originally inspired the sterile neutrino hypothesis was an “appearance” experiment, as are MicroBooNE (which produced the new negative result) and its predecessor MiniBooNE.

They fire a beam of muon-neutrinos over a relatively short distance (between 30 and 500 meters) and measure how many electron-neutrinos are detected at the other end.

At LSND and MiniBooNE, they saw more electron-neutrinos than expected. We know from other experiments that muon-neutrinos cannot oscillate directly into electron-neutrinos over these distances.

But if some of the muon-neutrinos turn into very light sterile neutrinos and then into electron-neutrinos, it could explain how those extra electron-neutrinos appeared.

This is the sterile neutrino hypothesis.

What if there are sterile neutrinos?

If experiments did confirm the existence of a light sterile neutrino, there would be a good chance that heavier sterile neutrinos exist as well.

These heavier cousins could answer several major puzzles in particle physics, such as the nature of the “dark matter” that seems to make up most of the Universe, why neutrinos have any mass at all, and why the Universe contains so much more matter than antimatter.

There is but one problem. The light sterile neutrino we started with is a headache for cosmologists.

If it exists, we should be able to observe traces of sterile neutrinos formed just after the Big Bang.

However, no recent surveys of the cosmic microwave background radiation or the distribution of galaxies and light elements in between them show any sign these sterile neutrinos existed.

This could mean the sterile neutrino hypothesis is incorrect. But it is also possible that something else in our understanding of the Universe is amiss.

#### 7] Aquaculture is plain wrong

#### A] Nothing about lunar basing in their Pryzbla evidence – it just says space would be a good place to rear new baby fish – great just bring them up on mars or an asteroid etc or on the ISS – it’s a question of space needed to do aquaculture, not specifically the moon

#### B] Aquaculture fails – it allows non native species to escape and kill biodiversity

Ting Ju et al 19 Rui-Ting Ju,Xiao Li,Jia-Jia Jiang,Jihua Wu,Jianguo Liu,Donald R. Strong,Bo Li., 10-9-2019, "Emerging risks of non‐native species escapes from aquaculture: Call for policy improvements in China and other developing countries," besjournals, <https://besjournals.onlinelibrary.wiley.com/doi/full/10.1111/1365-2664.13521> DD AG

Aquaculture—the farming of fish, mollusks, crustaceans and aquatic plants—is the fastest growing sector of the world food industry (FAO, 2016). This rapid growth relies heavily on the introduction of exotic species or domestic species outside of their natural ranges (hereafter, non-native aquatic species, NAS); a total of 5,612 records of NAS introduction have been collected by the FAO (2019). The farming of non-native fishes, for example, contributes 17% to global aquaculture production (FAO, 2012). In many developing countries, e.g., India, Philippines, Cuba and Brazil, aquaculture predominantly depends on the farming of NAS; yields of NAS represent 60%–95% of aquatic food production in those countries (Shelton & Rothbard, 2006). This situation is greatly affecting global environments, economies and even sociocultural arrangements (Lima-Junior et al., 2018; Lövei & Lewinsohn, 2012; Pelicice, Vitule, Lima-Junior, Orsi, & Agostinho, 2014).

The escape of NAS from aquaculture facilities has become a serious global problem (FAO, 2016). Although it is difficult to accurately assess the number and magnitude of escapes due to limited statistics, the trend is worrying because many escapes are known to have occurred world-wide (e.g. Thorvaldsen, Holmen, & Moe, 2015; Toledo-Guedes, Sanchez-Jerez, Benjumea, & Brito, 2014) and especially in developing countries (Gao et al., 2017; Sepúlveda, Arismendi, Soto, Jara, & Faria, 2013). In addition to economic loss, the escape of farmed NAS can generate multiple ecological outcomes. Not unlike invaders of terrestrial ecosystems, the escapees from aquaculture have resulted in aquatic bio-invasions that reduce the biodiversity and affect ecological functions of native ecosystems (Vitule, Freire, & Simberloff, 2009). The International Union for Conservation of Nature (IUCN) cites the impacts as ‘immense, insidious, and usually irreversible’ (IUCN, 2000). In the new framework of the Blue Growth Initiative issued by the FAO, NAS escapes and invasions are considered among the most important issues facing the global aquaculture industry (FAO, 2016).

In this paper, we briefly discuss aquaculture expansion and NAS escapes, illustrate emerging risks and propose a set of recommendations for aquaculture governance and management for developing countries. Although this topic has also been reviewed elsewhere (e.g. Lin, Gao, & Zhan, 2015; Pelicice et al., 2014), the policy direction for NAS management seems insufficiently clear and comprehensive. We focus here on NAS used for aquaculture and especially on those NAS that have escaped from aquaculture facilities. In addition, we mainly focus on China, which leads the world in aquaculture output and in NAS escapes. Because China's experiences and problems with NAS are not unique, it is hoped that the solutions recommended here can be also helpful to other developing countries.

2 EXPANSION AND ESCAPES IN AQUACULTURE

Global aquaculture has been rapidly increasing over the past five decades, with a doubling time of less than 10 years (Figure 1), and developing countries have contributed greatly to this rapid growth (FAO, 2016). China has been paralleling and dominating the global trend since the 1990s (Figure 1). In 2016, China accounted for 58% (63.7 million tons) of the global aquaculture volume and 63% (US$ 153.4 billion) of the global aquaculture value, making China the world's largest aquaculture producer (FAO, 2016). China's output of farmed NAS is also the largest in the world and represents more than 25% of the country's total aquaculture production (FAO, 2016; Shelton & Rothbard, 2006). These NAS include 252 species, which are mainly fish, mollusks, algae and crustaceans (see tables 1 and 2 in Lin et al., 2015). The most dominant species are the Nile tilapia Oreochromis niloticus, the channel catfish Ictalurus punctatus and several sturgeon species (Acipenser spp., Huso huso and Polyodon spathula), which contribute respectively 65%, 40% and 85% to the global production of these groups (Lin et al., 2015). Most of China's farmed NAS result from international introductions. Although the number of domestic transferred species is relatively small, their introduction frequency is high (Xiong, Sui, Liang, & Chen, 2015).

Like many other developing countries (e.g. Vietnam, Chile and Thailand) (Kernan, 2015), China's aquaculture industry is quite vulnerable to extreme weather. Since 2005, typhoons and floods have destroyed 6.4 million hectares of aquaculture facilities and have caused more than 8.4 million tonnes of loss in aquaculture production in China (see Figure S1); these losses have been associated with mass escapes of farmed NAS (Gao et al., 2017). Most escape events occur in southern China, which is the major NAS production region in the world (Xiong et al., 2015). Although the loss of fishery production during escape events is a serious problem, an even more serious problem is the possibility of biological invasion, i.e., the possibility that NAS become established in the wild and adversely affect native biodiversity and ecosystems. In China, more than 100 farmed NAS have escaped and entered natural waters (Xiong et al., 2015). In our view, the importance of the problem of NAS escapes has not been matched by the level of official oversight in China or in other developing countries.

3 EMERGING RISKS

Although many non-native species fail to establish in the wild if they lack sufficient propagule pressure (Simberloff, 2009), NAS that escape from artificial facilities have posed high risks to native aquatic ecosystems in China and beyond. About 68 NAS are known to have successfully established feral populations in China's natural habitats as a result of recurrent leakages or escapes (see Table S1), but this number is likely to rise substantially in the future. The extremely diverse habitats over the vast >18,000 km of coastline and 175,000 km2 of inland water bodies in the country can probably support almost all NAS. Among those 68 NAS that have established feral populations, 52 are thought to have potential effects on native ecosystems in China (Table S1); for nearly 80% of the total farmed NAS (252 species), risks associated with their escape are unexplored. Given that human activities under globalization and the ongoing ‘the Belt and Road’ initiated by China will likely increase the transfer of NAS among countries, and given that the frequency and intensity of extreme weather events are projected to increase under climate change, risks of NAS escape and invasion world-wide are likely to increase in the future (Wu & Ding, 2019). Because China and several neighbouring countries are connected by water areas, the escaped NAS can also affect aquatic ecosystems in other developing countries. In particular, many neighbours (e.g. Myanmar, Thailand and Cambodia) are located in global biodiversity hotspots, and the risks posed by escaped NAS to these neighbours require attention; shared rivers, such as the Mekong River, are of special concern (Kang et al., 2009).

Non-native aquatic species escapes can cause biodiversity loss, ecosystem degradation and even endemic species extinction through both direct competition or predation and indirect trophic cascades. These effects often occur in both developed and developing countries (e.g. Lima-Junior et al., 2018; Naylor, Williams, & Strong, 2001). Similar direct and indirect effects are possible for the 65% of the NAS (44 species) that have established feral populations in China (Table S1). These effects mainly result from intentional introductions of NAS, careless operations or extreme weather, as discussed earlier.

Farmed NAS also carry uninvited ‘hitch-hikers’, which have been a troublesome problem for the global aquaculture industry (FAO, 2016). Such hitch-hikers include free-living invertebrates, parasites, pathogens and fouling species; in addition to affecting the aquaculture industry itself, these hitch-hikers, if they escape from aquaculture facilities, can enter new water bodies and harm wild species and ecosystems. Seven NAS that carry hitch-hikers are known in China's aquaculture (Table S1). Unlike intentional introductions, the spread of hitch-hikers is usually unintentional, caused mainly by poor monitoring and the presence of suitable water environments.

Non-native escapees can also destroy the genetic integrity of native species through genetic pollution, which can reduce genetic diversity, alter population structure and cause species extinctions in native ecosystems. In China, about 10 NAS have the potential to cause genetic pollution (Table S1), and at least four species, including the Pacific abalone Haliotis discus discus and three carp species (Cyprinus spp.), have been confirmed to infiltrate their genetic materials into native gene pools (Li, Dong, Li, & Wang, 2007). Risks of genetic pollution depend on whether there are kin species with NAS escapees in water bodies. Because genetic pollution is not readily observed by the human eye, its evolutionary and ecological consequences can be underestimated. The ecological risks of genetic pollution may, however, exceed those of direct competition and predation. A typical case concerning these risks to the endangered Chinese sturgeon Acipenser sinensis (Figure 2) in the Yangtze River by the escape of non-native sturgeons is illustrated in Appendix S1.

#### C] Aquaculture impact takes too long to solve – impending biod loss from warming tips the brink before they can solve – makes the DAs try or die

#### D] Food insecurity is empirically denied – impact shoulda been triggered already

#### 8] Prolif solves a shift to bioweapons

Neil Narang 16 (Neil Narang is Associate Professor in the Department of Political Science at the University of California, Santa Barbara, 4/6/16, accessed 11/12/21, “All Together Now? Questioning WMDs as a Useful Analytical Unit for Understanding Chemical and Biological Weapons Proliferation”, T&F)

The first inference that one may be tempted to draw from past findings is that a policy focused on achieving reductions in the global nuclear stockpile could cause a rise in **chemical and biological weapons prolif**eration as more states view them as a “poor man’s **atomic** **bomb**.” As noted above, our findings suggested that states appear to seek chemical and biological weapons for many of the **same reasons** as they pursue nuclear weapons. Furthermore, our findings also indicate that states that do not possess nuclear weapons appear to be systematically more likely to pursue **chemical** and **biological** **weapons** than states that do **possess them**. When combined, it may seem reasonable to suppose that, conditional on some level of demand for one of these types of weapons, reductions in the global supply of **nuclear weapons** could cause some states to pursue chemical and biological weapons as “**imperfect substitutes**” for the deterrence and compellence benefits of nuclear weapons. A second inference that one may be tempted to draw is that a strengthened NPT may increase the risk of chemical and biological weapons proliferation. Understood in the terms of our study, policies and institutions designed to monitor and sanction the unilateral pursuit or dissemination of **nuclear** **weapons** material and technical expertise—like the NPT or the Nuclear Suppliers Group—might be understood as **supply constraints** that effectively increase the **transaction costs** of nuclear weapons acquisition. Furthermore, previous research has shown that the supply of sensitive nuclear assistance and civilian nuclear assistance are both positively associated with the risk of nuclear weapons pursuit and acquisition across states and over time.17 When combined, it may seem reasonable to suppose that, given some demand for a “weapon of mass destruction,” **chemical** and **biological** **weapons** could seem like relatively **cheaper pursuits** under a more robust global nuclear **nonproliferation** **regime** that further regulates the supply of nuclear weapons. A third inference that one may be tempted to draw is that reductions in the global supply of **nuclear** **weapons** and a strengthening of the nuclear nonproliferation regime could increase the risk of chemical and biological weapons pursuit by **terrorist** **groups**. If one is willing to assume terrorist groups aim to influence governments by threatening to impose costs in order to achieve concessions— whether this be through strategies like coercion, provocation, spoiling, or outbidding—then it may seem reasonable to suppose that limiting the availability of nuclear weapons might shift the demand to other **coercive** **instruments** such as chemical or biological weapons.18

#### Causes extinction

Owen Cotton-Barret et al. 17 (Owen Cotton-Barratt has a DPhil in pure mathematics. He has previously worked as an academic mathematician and as Director of Research at the Centre for Effective Altruism. Sebastian Farquhar is a PhD student in Computer Science at Oxford. John Halstead has a DPhil in Political Philosophy from Oxford, former Research Fellow at the Global Priorities Project. Stefan Schubert has a Ph.D. in philosophy from Lund University, former postdoc at London School of Economics. Haydn Belfield is a Academic Project Manager at the Centre for the Study of Existential Risk, BA in PPE from Oxford. Andrew Snyder-Beattie leads Open Philanthropy's work on biosecurity and pandemic preparedness, and is the former Director of Research at the Future of Humanity Institute, PhD/DPhil in Zoology from the University of Oxford. 1/23/17, accessed 12/24/20. “Existential Risk Diplomacy and Governance”, https://www.fhi.ox.ac.uk/wp-content/uploads/Existential-Risks-2017-01-23.pdf)

For most of human history, natural pandemics have posed the greatest risk of mass global fatalities.37 However, there are some reasons to believe that natural pandemics are very unlikely to cause human extinction. Analysis of the International Union for Conservation of Nature (IUCN) red list database has shown that of the 833 recorded plant and animal species extinctions known to have occurred since 1500, less than 4% (31 species) were ascribed to infectious disease.38 None of the mammals and amphibians on this list were globally dispersed, and other factors aside from infectious disease also contributed to their extinction. It therefore seems that our own species, which is very numerous, globally dispersed, and capable of a rational response to problems, is very unlikely to be killed off by a natural pandemic. One underlying explanation for this is that highly lethal pathogens can **kill** their **hosts** before they have a **chance to spread**, so there is a selective pressure for pathogens not to be highly lethal. Therefore, pathogens are likely to co-evolve with their hosts rather than kill all possible hosts.39 Recent developments in **biotechnology** may, however, give people the **capability** to **design pathogens** which overcome this **trade-off**. Some gain-of-function research has demonstrated the **feasibility** of **altering pathogens** to create strains with dangerous new features, such as vaccine-resistant smallpox40 and human-transmissible avian flu,41 with the potential to kill millions or even **billions**

of people. For an engineered pathogen to derail humanity’s long-term future, it would probably have to have extremely high fatality rates or destroy reproductive capability (so that it killed or prevented reproduction by all or nearly all of its victims), be extremely infectious (so that it had global reach), and have delayed onset of symptoms (so that we would fail to notice the problem and mount a response in time).42 Making such a pathogen would be close to impossible at present. However, the cost of the technology is **falling** rapidly,43 and adequate **expertise** and modern laboratories are becoming more available. Consequently, **states** and perhaps even terrorist groups could eventually gain the **capacity** to create pathogens which could deliberately or accidentally cause an **existential catastrophe**.

#### 9] Prolif stops conflicts – basic concept of MAD

Akisato Suzuki 15 (Akisato Suzuki is a Adjunct Research Fellow at the School of Politics and International Relations, University College Dublin, April-June 2015, accessed 11/12/21, “Is more better or worse? New empirics on nuclear proliferation and interstate conflict by Random Forests”, SagePub)

The main findings reveal that the optimist expectation of the relationship between nuclear proliferation and interstate conflict is **empirically** **supported**:9 first, a larger number of **nuclear states** on average decreases the **systemic propensity** for **interstate** **conflict**; and second, there is no clear **evidence** that the emergence of new **nuclear states** increases the **systemic** **propensity** for interstate **conflict**. Gartzke and Jo (2009) argue that nuclear weapons themselves have no exogenous effect on the probability of **conflict**, because when a state is engaged in or expects to engage in conflict, it may develop nuclear weapons to keep fighting, or to prepare for, that conflict. If this selection effect existed, the analysis should overestimate the conflict-provoking effect of nuclear proliferation in the above model. Still, the results indicate that a larger number of nuclear states are associated with **fewer disputes** in the **system**. This conclusion, however, raises questions about how to reconcile this study’s findings with those of a recent quantitative dyadic-level study (Bell and Miller, 2015). The current paper finds that nuclear proliferation decreases the systemic propensity for interstate conflict, while Bell and Miller (2015) find that nuclear symmetry has no significant effect on dyadic conflict, but that nuclear asymmetry is associated with a higher probability of dyadic conflict. It is possible that nuclear proliferation **decreases conflict** through the conflict-mitigating effects of extended nuclear **deterrence** and/or **fear** of nuclear states’ intervention, to the extent that these effects overwhelm the conflict-provoking effect of nuclear–asymmetrical dyads. Thus, dyadic-level empirics cannot solely be relied on to infer causal links between **nuclear** **proliferation** and a **systemic propensity** for **conflict**. The systemic-level empirics deserve attention.