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### 1: Agreement CP

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

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.

### 2: Compliance CP

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

#### Prevents exploitation of lunar landing sites 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.

### 3: Mining

#### 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.

### Case

#### Offense:

#### 1] Moon basing causes US-China war due to competing property claims

Copp 21 If China and the US Claim the Same Moon-Base Site, Who Wins? TARA COPP [SENIOR PENTAGON REPORTER, DEFENSE ONE] AUGUST 8, 2021 <https://www.defenseone.com/technology/2021/08/if-china-and-us-claim-same-moon-base-site-who-wins/184352/> SM

If China and the US Claim the Same Moon-Base Site, Who Wins?

Relatively few craters are attractive, and there’s no consensus about avoiding conflict over them.

There’s a not-so-quiet race back to the moon underway, but the two largest factions, with China and Russia on one side, and the United States and its partners on the other, are not recognizing each others’ proposed rules on what’s allowed once they get there.

Lawmakers and space policy analysts are concerned: How do you avoid conflict in space if the international laws and policies on Earth no longer apply?

“Many terrestrial military doctrines are not applicable in space, or at least not as applicable. If you get beyond 50 miles, or at least 62 miles, suddenly different rules apply. We need to start being aware of that,” says Rep. Jim Cooper, D-Tenn.

There’s already some aggressive international elbowing over the rules of satellite operations. As with the moon, there’s no consensus yet on how to respond to aggression in Earth orbit, the head of U.S. Space Command Gen. James Dickinson told attendees at last week’s Sea Air Space conference.

“The behavior of some of our adversaries in space may surprise you,” Dickinson said. “If similar actions have been taken in other domains, they'd likely be considered provocative, aggressive, or maybe even irresponsible. And in response, the U.S. government would take corresponding actions using all levers of national power, a demarche, or a sanction or something to indicate we won't tolerate that type of behavior, but we're not quite there yet in space policy.”

In 1967, the U.N. General Assembly adopted a treaty on the use of outer space that promised cooperation and banned nuclear weapons, military maneuvers, and military installations off-planet. The agreement also requires countries to take “appropriate international consultations” before making any moves that would “cause potentially harmful interference” with other space programs, and allows countries to “request consultation” if they believe such interference is likely.

This treaty “forecasted very well” the issues that that might arise as space exploration expanded, said James Lake, a senior associate at Canyon Consulting who co-wrote an article on lunar security issues in this month’s Space Force Journal. “The question remains: is that text sufficient? That’s something we are going to find out fairly soon.”

Notably, a treaty annex that prohibits military activity on the moon went unratified by Russia, China, and the United States. It’s likely both the China-Russia and U.S.-led partnerships will begin their moon bases without any sort of agreement between them in place.

In June, the China National Space Agency and Russia’s Roscosmos announced they would begin surveying locations for their International Lunar Research Station this year, and pick a site by 2025.

In 2020, NASA, together with the nations partnering with the U.S. under the Artemis Accords, outlined its Artemis Base Camp project. The Artemis nations aim to to send astronauts back to the moon by 2024.

In addition to those two major alliances, private firms such as Blue Origin are also working on private moon bases.

But there may be only a few locations on the moon where it would make economic sense to build a base, said Bleddyn Bowen, a professor at the University of Leicester and author of War in Space: Strategy, Spacepower, Geopolitics.

“Water ice, for example, might be in limited pockets, for example, making the territories around certain craters on the polar regions, perhaps more desirable,” Bowen said.

So what happens if each decides on the same crater as the best spot to begin moon operations?

“If you have a situation like that, where you're trying to do something in the exact same spot, it’s essentially who gets there first,” said Alex Gilbert, a researcher and space resources doctoral student at the Payne Institute at the Colorado School of Mines. “And if you're not first, then the only alternative is to forcibly remove the current occupant.”

The Artemis nations have endorsed the idea of “safety zones” on the moon, to require communication between two space operations that want to operate in the same area.

“Even if you set up a base and you declare a safety zone, people can still go into that safety zone. It's just something that it's really to be used as a tool to get parties to talk to each other,” he said.

But there’s already a risk those zones will instead be used as a way to rope off sites from competitors, he said.

“One thing that is really kind of important to understand about safety zones is that everyone kind of has their own definition,” Gilbert said.

“Whoever gets there first can use the resources, but no nation can ‘claim’ the territory,” said Laura Duffy, a space systems engineer with Canyon Consulting who co-wrote “Cislunar Spacepower, The New Frontier,” with Lake with Lake in this month’s Space Force Journal.

It’s not just water, but rare earth metals and helium-3 that will be up for grabs on the moon, making a treaty for its peaceful use critical, Duffy said.

“The Moon must be available for open and free use, according to the Artemis Accords and Outer Space Treaty,” she said.

But neither Russia nor China are expected to join the Artemis Accords.

Until now, U.S. space defense has largely concentrated around the objects orbiting Earth. That changed this year, when the U.S. Space Force and U.S. Space Command were tasked with protecting U.S. assets up to 272,000 miles away, a volume called “cislunar space” that extends slightly beyond the Moon’s orbit.

They have some catching up to do, said Rep. Frank Lucas, R-Okla., the ranking member of the Science, Space and Technology Committee. Lucas believes the 2019 landing of China’s Chang'e-4 spacecraft on the far side of the moon should have been this generation’s Sputnik moment.

“But with all of the chaos in the world, and COVID-19, and all of this environment we're working in, we missed it,” he said.

Those far-side moon operations meant China had developed the technology to operate and communicate with its landed rover out of line of sight—and out of view of almost all of the U.S. ability to see what they’re doing.

The achievement allows China “to accomplish scientific, military, or other endeavors without observation or repercussion,” Duffy and Lake wrote. The authors urged that the U.S. needs to speed its monitoring efforts, such as the Cislunar Highway Patrol System, or CHPS, that is being developed by the Air Force Research Laboratory.

#### US-China war goes nuclear

Talmadge 18, Caitlin [**PoliSci PhD from MIT**, Government BA from Harvard, Prof of Security Studies at Georgetown’s Walsh School of Foreign Service.] “Beijing’s Nuclear Option.” Foreign Affairs. October 15, 2018. <https://www.foreignaffairs.com/articles/china/2018-10-15/beijings-nuclear-option> TG

As China’s power has grown in recent years, so, too, has the risk of war with the United States. Under President Xi Jinping, China has increased its political and economic pressure on Taiwan and built military installations on coral reefs in the South China Sea, fueling Washington’s fears that Chinese expansionism will threaten U.S. allies and influence in the region. U.S. destroyers have transited the Taiwan Strait, to loud protests from Beijing. American policymakers have wondered aloud whether they should send an aircraft carrier through the strait as well. Chinese fighter jets have intercepted U.S. aircraft in the skies above the South China Sea. Meanwhile, U.S. President Donald Trump has brought long-simmering economic disputes to a rolling boil. A war between the two countries remains unlikely, but the prospect of a military confrontation—resulting, for example, from a Chinese campaign against Taiwan—no longer seems as implausible as it once did. And the odds of such a confrontation going nuclear are higher than most policymakers and analysts think. Members of China’s strategic com­munity tend to dismiss such concerns. Likewise, U.S. studies of a potential war with China often exclude nuclear weapons from the analysis entirely, treating them as basically irrelevant to the course of a conflict. Asked about the issue in 2015, Dennis Blair, the former commander of U.S. forces in the Indo-Pacific, estimated the likelihood of a U.S.-Chinese nuclear crisis as “somewhere between nil and zero.” This assurance is misguided. If deployed against China, the Pentagon’s preferred style of conventional warfare would be a potential recipe for nuclear escalation. Since the end of the Cold War, the United States’ signature approach to war has been simple: punch deep into enemy territory in order to rapidly knock out the opponent’s key military assets at minimal cost. But the Pentagon developed this formula in wars against Afghanistan, Iraq, Libya, and Serbia, none of which was a nuclear power. China, by contrast, not only has nuclear weapons; it has also intermingled them with its conventional military forces, making it difficult to attack one without attacking the other. This means that a major U.S. military campaign targeting China’s conventional forces would likely also threaten its nuclear arsenal. Faced with such a threat, Chinese leaders could decide to use their nuclear weapons while they were still able to. As U.S. and Chinese leaders navigate a relationship fraught with mutual suspicion, they must come to grips with the fact that a conventional war could skid into a nuclear confrontation. Although this risk is not high in absolute terms, its consequences for the region and the world would be devastating. As long as the United States and China continue to pursue their current grand strategies, the risk is likely to endure. This means that leaders on both sides should dispense with the illusion that they can easily fight a limited war. They should focus instead on managing or resolving the political, economic, and military tensions that might lead to a conflict in the first place.

#### 2] Independently causes space militarization

O’Donnell 19 “The Political Realities behind Establishing a Moon Base” Wes O’Donnell [Managing Editor, Edge] 2/26/2019 <https://amuedge.com/the-political-realities-behind-establishing-a-moon-base/> SM

International Conflicts May Expand to Space

No nation has placed weapons in orbit, but some advanced military nations have become dependent on space-based systems for everything from weapons targeting and navigation to intelligence collection. As nations look to establish a semi-permanent presence on the moon, conflict will become inevitable with the lunar surface having a role in how events on Earth play out. In much the same way as the Wright brothers’ plane evolved into a strategic bomber, earthly conflict will expand to spacecraft and a manned presence on the moon. It seems far-fetched to think in these terms, but mankind has proven adept at turning many scientific achievements into weapons of war. For example, during the past 30 years, Internet access has become nearly omnipresent. But the Internet also serves as a venue for disinformation campaigns and cyberattacks. It’s also relevant to point out that the systems that maintain human life in space would work equally well for soldiers. All of these advancements to further scientific research and maintain life aboard the International Space Station can easily be adapted to military purposes. It’s now just a matter of funding to build military space systems based on established technology. In 1959, the U.S. Army conducted a study called Project Horizon that considered establishing a moon base with construction occurring throughout the 1960s. The formal establishment of NASA in February 1958 shelved the project. However, the study demonstrated the military’s long-held desire for a permanent space presence. Repairing and Protecting Technological Assets in Space With space-based systems now ubiquitous, there is a need for platforms in space to protect technological assets and repair them when necessary. That will mean having humans in space to manage these systems. The U.S., China and Russia have the capability to shoot down satellites. Replacing these satellites would require rocket launches with replacement equipment on board. With space-based systems, however, those assets could be repaired or replaced faster from orbiting stock or from a lunar base. From a U.S. perspective, this would save time and money. Also, it would lessen the potential impact of losing launch centers at Vandenberg AFB and Cape Canaveral in an international conflict involving missile attacks. Militarization of the Moon It is certainly a possibility that the moon will be militarized in some fashion. China’s questioning the limits of national sovereignty in space puts in doubt Beijing’s adherence to the 1967 Outer Space Treaty. That treaty defines the moon as the “province of all mankind” and reserves it for peaceful purposes. But the speed with which contemporary leaders have forsaken international treaties could throw this status into doubt. Some Chinese legal scholars, for instance, claim that the space above China, at least that which is in geosynchronous orbit, is sovereign Chinese territory. Clearly, by including anything within that geosynchronous orbit, these scholars are referring to the moon in much the same way that China makes claims to nearby territorial waters. Currently, there is no treaty that delineates the vertical extent of a nation’s sovereignty into space. However, the Chinese claim suggests that Beijing might ignore existing international norms if they conflict with China’s interests. The Unspoken Moon Race The first manned mission to the moon was for the benefit “of all mankind.” Today’s extension of military affairs into space suggests that the once-peaceful endeavor of a lunar landing will eventually take on a combat dimension. Scientific breakthroughs are currently taking the headlines and attention away from the pressing matter of preventing space-based military moves. The U.S., Russia and China have lunar missions planned into the 2030s. Whether those missions will actually take place largely depends on political will and national budgets. A conventional conflict involving the U.S., Russia or China would be an impetus for the expansion of space-based military assets. That would make the current ventures to the moon ever more pressing during peacetime. In essence, the current race to the moon certainly appears peaceful. But the potential to use the lunar body for war is certainly not lost on political or military leaders.

#### 3] Lunar basing uniquely causes collisions and space junk – independently turns the aff.

Mann 13 “Space: The Final Frontier of Environmental Disasters?” Adam Mann 7/15/2013 <https://www.wired.com/2013/07/space-environmentalism/> SM

Commercial or scientific bases on the lunar surface will need satellites for communication and navigation. Because of the moon’s size and mass, there aren’t stable orbits that hover above a certain spot analogous to the geostationary orbits around Earth. In order to provide a continuous link or GPS-like triangulation, there will need to be a constellation of satellites around the moon. Multiple satellites with multiple operators increase the chance of collision.

Unlike our planet, the moon lacks an atmosphere and it isn’t covered in oceans. This means that nothing can burn up and there’s no good way to dispose of dead satellites. The atmospheric friction that naturally drags down objects around Earth doesn't exist around the moon. And anything that is commanded to fall down to the lunar surface will remain intact until it impacts the ground, potentially hitting an astronaut or Apollo-era artifact. Mars, with its very thin atmosphere, could have similar problems with orbital debris. If nothing is done, space junk might be exported beyond low-Earth orbit, potentially endangering our exploration of other worlds.

#### 4] Moon basing key to China-Russia counterbalancing – guts US space dominance.

Goswami 21 “The Strategic Implications of the China-Russia Lunar Base Cooperation Agreement” [Dr. Namrata Goswami is an independent scholar on space policy, great power politics, and ethnic conflicts.] March 19, 2021 <https://thediplomat.com/2021/03/the-strategic-implications-of-the-china-russia-lunar-base-cooperation-agreement/> SM

The Strategic Implications of the China-Russia Lunar Base Cooperation Agreement

With their agreement, the partners are signalling an alternative to a U.S.-led order in space.

On March 9, 2021, the China National Space Administration (CNSA) and Russian Space Agency (ROSCOSMOS) signed a Memorandum of Understanding (MoU) for the joint construction of an autonomous lunar permanent research base. Employing the language of the Outer Space Treaty of 1967, China and Russia emphasized that the MoU is about scientific discovery as well as the use of lunar terrain. The agreement describes the planned International Lunar Research Station (ILRS) as “a comprehensive scientific experiment base with the capability of long-term autonomous operations, built on the lunar surface and/or on the lunar orbit that will carry out multi-disciplinary and multi-objective scientific research activities such as the lunar exploration and utilization, lunar-based observation, basic scientific experiment, and technical verification.” These two major space faring nations have agreed to promote the ILRS to gain international partners for their joint lunar mission, especially by broadcasting China’s lunar South Pole environment and resource survey mission, the Chang’e 7 and Russia’s Luna-Resurs-1 Russian Orbital Spacecraft (OS) Mission.That China and Russia would cooperate on exploration and utilization of lunar resources comes as no surprise. Both countries, especially Russia, keenly watched as the United States announced the Artemis Accords for creating an international mechanism for lunar development led by the U.S. and partner nations. ROSCOSMOS, in reaction to the Artemis Accords and especially former President Donald Trump’s April 6, 2020 executive order on the utilization of space resources for international partnerships stated, via its deputy director for international cooperation, Sergei Savelyev, that “attempts to expropriate outer space and aggressive plans to actually take over other planets” go against the principle of international cooperation. The Kremlin likened Trump’s executive order to the colonization of space, with Kremlin spokesman Dmitry Peskov coming out strong, stating that it would be “unacceptable” for the U.S. to privatize and colonize space. While China officially did not respond to the Artemis Accords, the CNSA’s Space Law Center Deputy Director Guoyu Wang argued in an article in The Space Review that the accords cannot be viewed as an extension of the OST, but are instead an attempt to create norms outside of established international regulatory frameworks. The Moon Is Strategic The moon is no longer seen as a dead rock where humanity lands for a few days, shows off technology, and then journeys back to Earth. Today the discourse on the moon is about its resource potential, including the presence of water ice, solar power, and rare earth elements like platinum, titanium, scandium, and yttrium. Chinese space scientists and engineers have long recognized the economic potential of space resources to include a $10 trillion return on investments from the Earth-moon zone annually by 2050. All the way back in 2002, Ouyang Ziyuan, lead scientist and founder of China Lunar Exploration Program (CLEP) specified that “China’s long-term aim and task is to set up a base on the moon to tap and make use of its rich resources.” His perspective was supported at the highest level of CNSA leadership. China’s subsequent demonstrations of lunar capacity include a far side lunar landing in 2019 and an autonomous lunar sample return mission in 2020.Other benefits highlighted by Chinese scientists are the potential of lunar propellant made from water-ice lowering the cost of access and movement throughout the entire volume of cislunar space. Launching from the moon is 22 times more efficient than launching from Earth due to Earth’s gravity well. In order to access those lunar resources, a long-term permanent presence, first robotic, then human, will be necessary. This aspect of first mastering autonomous robotic lunar basing capacities is highlighted in the China-Russia MoU. Similar to China’s long-term plans for a permanent presence on the moon and a lunar research base by 2036, Russia in 2018 announced its own lunar plan, which included resource extraction ambitions, backed by a three phase base construction plan between 2025 and 2040. The first stage is a lunar orbiter module (2025); the second phase will be the construction of a lunar base (2025-2034); and the third phase (2040) will involve the construction of an “integrated manned moon exploration system.” The former chief designer of Russia’s manned space programs, the late Yevgeny Mikrin, in an interview with state run RIA Novosti news in November 2018, specified that the construction of the moon colony was to begin in 2025. The strategic recognition of the critical role of the Earth-moon economic zone for future space development and utilization is the first peg on which the China-Russia MoU stands. Besides that, there are two other specific geopolitical and regime constriction considerations at play here. Geopolitical Considerations The future of space is its economy, with possible returns in the trillions of dollars. And robust economic growth leads to military and other power projection capacities. Both China and Russia understand the impact of space on the future of global leadership. China wants to become the foremost space power by 2045, in time for the centenary of the establishment of the People’s Republic in 2049. President Xi Jinping has repeatedly highlighted the intrinsic contribution of space to Chinese global leadership. The idea behind China’s space philosophy is to demonstrate high-end technology, including human missions, lunar soft landings (near and far side), lunar sample returns, and Mars missions, to be followed by construction of a permanent space station, space-based solar power satellites, and deep space probes. For China, the MoU with Russia came at the appropriate geopolitical moment, especially after it has successfully demonstrated high end indigenous space capacity like lunar far side landing, autonomous lunar sample return, and a Mars mission. China no longer has to worry about the age-old cliché that all Chinese space technology is reengineered Russian space technology.For Russia, joining in with China’s lunar base goal, even as a junior partner, means that the two nations can pool their joint international resources to register opposition to a U.S.-led space order, something both sides are uncomfortable with. For Russia and especially President Vladimir Putin, it is about taking back the space leadership position it enjoyed as the erstwhile Soviet Union. This lunar MoU is a continuation of the two nations’ geopolitical behavior on Earth, where China and Russia have established alternative security systems like the Shanghai Cooperation Organization and the Chinese-led Belt and Road Initiative (BRI), of which Russia is a participating country. By establishing an alternative lunar base development effort, China and Russia are questioning the legitimacy of the Artemis Accords and signaling that they do not view U.S. efforts, both public and private, as the only mechanism for cooperation in space . Basically, this is clear indication that leadership in space is contested. Once they draw in enough partners and signatories to their lunar research base, China and Russia will have the power and influence to create an alternative state-centric preamble and lunar accord crafting the regulatory regime around lunar exploration and development. Both wield enormous clout internationally via their U.N. Security Council permanent memberships and veto power as well as advocacy in U.N. space bodies. Signing an MoU for lunar development has several long-term strategic implications for both as well. First, Russia gets access to an international structure already in place under China’s BRI, in which nearly 140 countries are now participating. Both sides get access to launch sites, ground stations, and receiver stations in China and Russia, as well as access to a universal scientific talent pool, to include growing Chinese and Russian space expertise, and burgeoning employment opportunities in China where aerospace salaries are becoming globally competitive. They will also be able to divide the long-term costs of research and development. Finally, the MoU offers a rather flexible international partnership for countries. A decision on inclusion lies primarily with either Xi or Putin, unlike U.S. space partnerships, which have to pass through several interagency clearance processes and time-consuming bureaucratic procedures.Strategic Regime Constriction China and Russia have expressed opposition to the U.S. policy moves to enable the private sector and commercialization of space in Artemis Accords signatory countries, as well as national legislation like the U.S. Commercial Space Launch Competitive Act 2015 (CSLCA). Beijing and Moscow are especially worried by the prospect of the private space sector taking the lead in developing space technology breakthroughs. This implies fast enhancement of capability (think SpaceX and Blue Origin reusable rockets, lunar landers), truly democratizing space beyond just the state-owned institutions currently at the forefront of space policy, technology development, and missions. This has serious economic consequences in a globally competitive trillion-dollar space market. This aspect was evident in Kremlin spokesperson Dmitry Peskov’s vocal opposition to the U.S. focus on the privatization of space. China, and to a larger extent Russia, do not yet have a vibrant private space sector capable of competing with the U.S. private sector globally, even though China under Xi has created enormous financial and ideological incentives for Chinese private space startups since 2014. China has, however, excelled in and utilized state-based policies to rein in its own private space sector under its strict Civil-Military Fusion Strategy and its new National Defense Law 2021. The CSLCA, which supports U.S. private citizens’ ownership of space resources; the Artemis Accords’ emphasis on commercial activities on the moon, establishment of safety zones, and utilization of space resources; and the April 6, 2020 executive order calling for space resource utilization efforts based on international partnerships have galvanized the China-Russia MoU, an alternative lunar development mechanism led by authoritarian state-owned space agencies. Both China and Russia fear that with the Artemis Accords, the private space sector has been strengthened legally to invest in lunar breakthroughs that would take their own state-owned space agencies years to compete with or catch up to. They also fear that the Cold War-based space governance mechanisms that limit private development of space might be unraveling, especially if today’s leading space-faring states become flexible on the regulatory mechanisms set up during the Cold War that have stifled private innovation in space by creating incentives for state funded and owned space activities. Innovation in technology will be a game changer in space going forward, and both China and Russia realize the impact of, say, SpaceX’s reusable heavy lift rocket, Starship, scheduled for launch by 2023, with plans for crewed missions to the moon and Mars (with orbital refueling). Starship will be the world’s most advanced reusable rocket, with a lift capacity of 100 metric tonnes to low earth orbit (LEO). In comparison, China has plans for a reusable Long March 8 rocket (with a lift capacity of 8.4 metric tonnes to LEO) designed by the state-owned China Academy of Launch Vehicle Technology (CALT), but this is clearly not in the same class of rockets like Starship. Their vocal oppositions to the entry of the U.S. private space sector buys time for China and Russia to catch up over the next decade or so. By 2030, China has its own plans for a heavy lift rocket, the Long March 9, which will have a lift capacity of 140 metric tonnes to LEO, and also aspires to master reusability in the next 20 years. However, time is of the essence in space power projection and a single technology can change the game, as reusability has done for launch infrastructure. A Changed Reality China and Russia’s lunar base MoU has changed the alignment structures around space cooperation and sends a clear signal to the United States and the seven other Artemis Accords partners that space is contested. China and Russia are offering avenues for alternate partnership, especially to encourage countries like Saudi Arabia and Turkey to join, both of whom have aspirations to develop their space sector. Turkish President Recep Tayyip Erdogan recently announced Turkish ambitions to make first contact with the moon by 2023 (the 100th year celebration of the establishment of the Turkish republic) with the help of international partnerships. Despite the U.S. private space sector advantages identified above, the U.S. suffers from a lack of continuity and emphasis in its space sector at the policy level due to changing space priorities across presidential administrations. We saw such uncertainty creep in with regard to its Artemis Accords (established under the Trump administration), the Space Force, and the reconstitution of the National Space Council after President Joe Biden was sworn in. Biden has offered little insight into his administration’s space priorities, including on critical concepts like space resource utilization and development. Such uncertainties can stifle international partnerships and technology development.In contrast, despite lacking a similarly vibrant private sector, China’s clear articulation of its long-term steady lunar missions, and its ability to commit resources without having to worry about a change in missions with a change in administrations, showcases its long-term assurance that it can meet its goal of establishing a lunar base, now in partnership with Russia. While technology is a game changer, a nation cannot succeed in space without long-term strategic vision.

#### US space dominance prevents global war

**Zubrin 15** [(Robert Zubrin, president of Pioneer Energy, a senior fellow with the Center for Security Policy) “US Space Supremacy is Now Critical,” Space News, 1/22/15, https://spacenews.com/op-ed-u-s-space-supremacy-now-critical/] TDI

The United States needs a new national security policy. For the first time in more than 60 years, we face the real possibility of a large-scale conventional war, and we are woefully unprepared. Eastern and Central Europe is now so weakly defended as to virtually invite invasion. The United States is not about to go to nuclear war to defend any foreign country. So deterrence is dead, and, with the German army cut from 12 divisions to three, the British gone from the continent, and American forces down to a 30,000-troop tankless remnant, the only serious and committed ground force that stands between Russia and the Rhine is the Polish army. It’s not enough. Meanwhile, in Asia, the powerful growth of the Chinese economy promises that nation eventual overwhelming numerical force superiority in the region. How can we restore the balance, creating a sufficiently powerful conventional force to deter aggression? It won’t be by matching potential adversaries tank for tank, division for division, replacement for replacement. Rather, the United States must seek to totally outgun them by obtaining a radical technological advantage. This can be done by achieving space supremacy.To grasp the importance of space power, some historical perspective is required. Wars are fought for control of territory. Yet for thousands of years, victory on land has frequently been determined by dominance at sea. In the 20th century, victory on both land and sea almost invariably went to the power that controlled the air. In the 21st century, victory on land, sea or in the air will go to the power that controls space. The critical military importance of space has been obscured by the fact that in the period since the United States has had space assets, all of our wars have been fought against minor powers that we could have defeated without them. Desert Storm has been called the first space war, because the allied forces made extensive use of GPS navigation satellites. However, if they had no such technology at their disposal, the end result would have been just the same. This has given some the impression that space forces are just a frill to real military power — a useful and convenient frill perhaps, but a frill nevertheless. But consider how history might have changed had the Axis of World War II possessed reconnaissance satellites — merely one of many of today’s space-based assets — without the Allies having a matching capability. In that case, the Battle of the Atlantic would have gone to the U-boats, as they would have had infallible intelligence on the location of every convoy. Cut off from oil and other supplies, Britain would have fallen. On the Eastern front, every Soviet tank concentration would have been spotted in advance and wiped out by German air power, as would any surviving British ships or tanks in the Mediterranean and North Africa. In the Pacific, the battle of Midway would have gone very much the other way, as the Japanese would not have wasted their first deadly airstrike on the unsinkable island, but sunk the American carriers instead. With these gone, the remaining cruisers and destroyers in Adm. Frank Jack Fletcher’s fleet would have lacked air cover, and every one of them would have been hunted down and sunk by unopposed and omniscient Japanese air power. With the same certain fate awaiting any American ships that dared venture forth from the West Coast, Hawaii, Australia and New Zealand would then have fallen, and eventually China and India as well. With a monopoly of just one element of space power, the Axis would have won the war. But modern space power involves far more than just reconnaissance satellites. The use of space-based GPS can endow munitions with 100 times greater accuracy, while space-based communications provide an unmatched capability of command and control of forces. Knock out the enemy’s reconnaissance satellites and he is effectively blind. Knock out his comsats and he is deaf. Knock out his navsats and he loses his aim. In any serious future conventional conflict, even between opponents as mismatched as Japan was against the United States — or Poland (with 1,000 tanks) is currently against Russia (with 12,000) — it is space power that will prove decisive. Not only Europe, but the defense of the entire free world hangs upon this matter. For the past 70 years, U.S. Navy carrier task forces have controlled the world’s oceans, first making and then keeping the Pax Americana, which has done so much to secure and advance the human condition over the postwar period. But should there ever be another major conflict, an adversary possessing the ability to locate and target those carriers from space would be able to wipe them out with the push of a button. For this reason, it is imperative that the United States possess space capabilities that are so robust as to not only assure our own ability to operate in and through space, but also be able to comprehensively deny it to others. Space superiority means having better space assets than an opponent. Space supremacy means being able to assert a complete monopoly of such capabilities. The latter is what we must have. If the United States can gain space supremacy, then the capability of any American ally can be multiplied by orders of magnitude, and with the support of the similarly multiplied striking power of our own land- and sea-based air and missile forces be made so formidable as to render any conventional attack unthinkable. On the other hand, should we fail to do so, we will remain so vulnerable as to increasingly invite aggression by ever-more-emboldened revanchist powers. This battle for space supremacy is one we can win. Neither Russia nor China, nor any other potential adversary, can match us in this area if we put our minds to it. We can and must develop ever-more-advanced satellite systems, anti-satellite systems and truly robust space launch and logistics capabilities. Then the next time an aggressor commits an act of war against the United States or a country we are pledged to defend, instead of impotently threatening to limit his tourist visas, we can respond by taking out his satellites, effectively informing him in advance the certainty of defeat should he persist. If we desire peace on Earth, we need to prepare for war in space.

#### 1] The last paragraph of their own evidence 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] Their own author says we should still allow commercialization of the space sector- uhhhh

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] The aff solves 0 of the adv—scientists can just moonbase on other spots. There are the same scientific values of all of the parts of the moon

#### 4] 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.

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

#### 6] Squo solves --- new tech means dust is being researched anyways

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.

#### 7] Neutrinos fail- if they’re not winning even base level links you should disregard scenario

#### 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 bs

#### 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.