### 1NC---OFF

#### **Scientifically outer space excludes celestial bodies**

Science Daily ND [ScienceDaily, "Outer space," https://www.sciencedaily.com/terms/outer\_space.htm]/ISEE

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 don’t; the moon is a celestial bodies

Villanueva 10 [John Carl Villanueva, 3-19-2010, "What Is A Moon?," Universe Today, https://www.universetoday.com/60072/what-is-a-moon/]/ISEE

A moon is defined to be a celestial body that makes an orbit around a planet, including the eight major planets, dwarf planets, and minor planets. A moon may also be referred to as a natural satellite, although to differentiate it from other astronomical bodies orbiting another body, e.g. a planet orbiting a star, the term moon is used exclusively to make a reference to a planet’s natural satellite.

#### Limits: Allowing celestial bodies creates an unpredictable research burden – the neg not only has to familiarize themselves with the privatization of outer space but also every planet ever – this kills limits on an already large topic

#### Predictability: science concludes neg – most people define outer space as in between atmospheres– including earth guts predictability for topic lit

#### Voter for fairness and education

#### No RVI’s – you shouldn’t win just for provitng you are T Default to competing intepretations – any other interp creates a moving target

### 1NC---OFF

#### **Lunar heritage sites key to mining --- complete ban prevents mining of most of the moon – buffer zones**

Gorman 20[Alice Gorman,23 NOVEMBER 2020 , "Who is responsible for heritage in outer space?," Apollo Magazine, https://www.apollo-magazine.com/artemis-accords-heritage-outer-space/]/ISEE

It is easy to list the reasons why the Apollo sites have historic, social, spiritual, and scientific significance. (We may laugh at lunar conspiracy theorists, but their strongly held belief that humans have never left Earth is a form of spiritual significance.) Aesthetic significance is a bit harder. People are used to thinking of the Moon as a grey, dead rock, devoid of colour and life; and spacecraft as cold industrial robots, unfeeling and hard. This is a view I have been resisting for years. When I started thinking about how lunar mining activities might affect heritage sites, I looked at the buffer zones in NASA’s 2011 guidelines to see if they really did encompass the sites they were intended to protect. It seemed some things were missing. The views seen by the astronauts as they roamed around on the surface were also part of the site. They looked out over a landscape strewn with boulders and craters and a black sky that met the horizon in a brutal line. And yet the landscape was bright with the full light of the Sun. Reading astronauts’ accounts of stepping into deep dark shadows cast by the landing modules and observing their striped boot prints to gauge the depth of the dust, I realised that another critical factor had been omitted in thinking about lunar heritage (and indeed terrestrial heritage): the aesthetic environment created by light and shade – or chiaroscuro.

#### 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]/ISEE

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)”.

#### **Lunar mining key to colonization**

Conca 13[James Conca,am a Trustee of the Herbert M. Parker Foundation, Adjunct at WSU, an Affiliate Scientist at LANL and consult on strategic planning for the DOE, EPA/State environmental agencies, and industry including companies that own nuclear, hydro, wind farms, large solar arrays, coal and gas plants. 5-5-2013, "Beyond Earth's Atmosphere: Energy Needs For Space Colonization," Forbes, https://www.forbes.com/sites/jamesconca/2013/05/05/beyond-earths-atmosphere-energy-needs-for-space-colonization/?sh=42d7fb121e3b]/ISEE

We are going to return to the Moon. No question. And long-term human settlement will follow at some point, mainly to develop mineral and energy resources available on the Moon, but also to emplace protective systems aimed at avoiding large asteroid impacts of the type we were all recently made aware with that grazing meteor strike in Chelyabinsk and the simultaneous near-miss by big-rock DA14. Growing shortages of key inorganic elements, such as rare earth elements for all our electronic gadgets and renewable energy systems, platinum and other related metals, and even helium for medical equipment (yes, and balloons!), suggest that we may need more non-renwable resources than Earth can provide (He shortage; REE shortage). So it is with perfect timing that a long-awaited Special Publication from the Energy Minerals Division and Astrogeology Committee of the American Association of Petroleum Geologists has been published. And it has to do with outer space - AAPG Memoir 101: Energy Resources for Human Settlement in the Solar System and Earth’s Future in Space (full disclosure, I am an author on one of the chapters). Off-world settlements will provide fuel and life support materials for space missions and planetary operations, and for return of goods to Earth. In the U.S., such dreams are being pursued by entrepreneurs and private entities working both independently and with NASA (Elon Musk is the best example of that). In other countries, they are still nationalized, but the industry will eventually emerge on its own. Energy resources that can be harvested in space for the benefit of Earth include helium-3 that occurs in abundance on both the Moon and asteroids and is ideal for new small fusion plants, as well as solar energy that can be collected and transmitted in concentrated form to Earth. Hydrocarbons, helium, hydrogen, and volatiles in the solar system are important for human exploration and habitation because they will provide essential high-energy, high-density fuels and feedstock for off-world manufactured goods and materials for construction. Metals, platinum-group elements, rare earth elements, and other volatiles, like H, H2O, and carbon compounds, are abundant on asteroids, many of which are relatively accessible from Earth. We could even use the asteroids that come too close as a way to remove them as dangers since we’re going to have to deal with them anyway. Lest you think this is science fiction and that no one would ever fund this from a business standpoint, consider the Class M asteroid pictured below. Class M asteroids are chunks of old planetary cores left over from the Late heavy Bombardment period in the Solar System’s early days when the thousands of small planets that were accreting fought it out for who would survive the orbiting slugfest (Space Invaders). Class M asteroids are composed of iron with large amounts of nickel, cobalt, and platinum group metals. The asteroid 3554 Amun-NEA pictured here is about 1.3 mi (~2 km) in diameter, similar in size to typical metallic ore bodies on Earth. Its ore zone mass is about 30 billion tons, and with 20 oz/ton of nickel, contains almost 17 million tons of nickel alone (34 billion pounds) and is worth US$600 billion in today’s market. A small class M asteroid named 3554 Amun-NEA containing over 17 million tons of nickel, about $600... [+] billion in today’s market. Similarly for cobalt and platinum group elements (click on the Chapter 9 link below). Courtesy of William Ambrose and Astronaut Jack Schmitt. A small class M asteroid named 3554 Amun-NEA containing over 17 million tons of nickel, about $600... [+] Together with the need to protect sensitive environments on Earth from mining operations, this will eventually become a reasonable alternative to digging up the Earth to extract every last ounce of precious metal in our own crust. Memoir 101 is an integrated review of energy resources in the Solar System and of technologies that can be used to implement them, like the Space Elevator, megasolar reflectors, or the lunar He-3 nuclear reactor. Solar energy presents a good example of how systems in space differ from the same ones on Earth. One of the chapters offers a case for developing space-based solar energy from a lunar array. Although the Earth intercepts 175,000 terawatts (TW) of solar power continually, it is impractical and costly to gather high-yield solar power on Earth because of adsorption from the atmosphere and reflection from clouds back to space. Even the biosphere captures only a small fraction (<0.03%) in the form of atmospheric carbon and the oxygen separated from water. Currently, a stand-alone solar array on Earth provides an average energy output of 3W per square meter (W/m2) of ground area. Earthbound power storage, conversion systems, and long-distance transmission lines greatly decrease the effective output of solar cells or concentrators. For example, 20 TW of Earth-based electric power requires approximately 2.7 million square miles (7 million km2) of collector area, representing approximately 5% of the landmass of Earth. This is unlikely to change in this century. On the Moon, which has no atmosphere, a lunar solar-power (LSP) system can capture hundreds of times the energy per area than on Earth. An LSP system can economically gather solar power and convert it into streams of electromagnetic waves that are designed to dependably and safely deliver power efficiently to inexpensive receivers (rectennas) on Earth when power is needed. Operating at 2.5 GHz to pass through Earth’s clouds and atmosphere, 20 TW from lunar-based electric power requires only 40,000 square miles (100,000 km2) of rectenna area on Earth. Moreover, materials for the collection of solar energy can be manufactured in situ on the Moon for less than on Earth. The economics are weirdly advantageous, even with technologies existing today, and can be bootstrapped without huge initial costs. The environmental savings to the Earth cannot be overstated. Concept of a nuclear-powered robotic gravity tractor moving an asteroid into a new orbit, either to... [+] mine or to remove from impacting earth (click on the Chapter 9 link in the text). Image courtesy of Dan Durda and the B612 Foundation. Concept of a nuclear-powered robotic gravity tractor moving an asteroid into a new orbit, either to... [+] Therefore, any long-range program of human exploration and settlement of the solar system must consider in situ resource utilization and the vital role that extraterrestrial energy minerals and related resources will play to support human habitation of near-Earth Space as well as on the nearby worlds of the Moon, Mars and the near-Earth Asteroids.

#### Extinction’s inevitable –colonization can solve.

**Skran 16** [Dale Skran is Executive Vice President of the National Space Society and a member of the Board of Directors of the Alliance for Space Development. “Settling space is the only sustainable reason for humans to be in space,” <http://www.thespacereview.com/article/2915/1>]

As robotic and artificial intelligence technologies improve and enable increasingly robust exploration without a human presence, eventually there will be only one sustainable reason for humans to be in space: settlement. Research into the recycling technology required for long-term off-Earth settlements will directly benefit terrestrial sustainability. Actively working toward developing and settling space will make available mineral and energy resources for use on Earth on a vast scale. Finally, space settlement offers the hope of long-term species survival that remaining on Earth does not. There are more than seven billion people on the Earth today. No rational space settlement advocate suggests that any significant portion of that population, or even of those who are rich, will be moving to Mars or anywhere else in space. However, a recent essay by Astro Teller, head of Google X Labs, and his wife Danielle, a physician and researcher takes the bold position that “It’s completely ridiculous to think that humans could live on Mars.” This essay, published by Quartz, repeats with little examination some of the hoariest arguments against space settlement. To support this view, the Tellers quote their 12-year-old daughter: “I can’t stand that people think we’re all going to live on Mars after we destroy our own planet.” This quote contains two mischaracterizations that demand refutation: that “we are all” going to live in space and that we are going to live in space after we destroy Earth. Another canard that has long floated about was given form by the recent film Elysium starring Matt Damon: the rich will leave the poor on the Earth and escape to space settlements. Upon examination, all three of these ideas are strawmen. There are more than seven billion people on the Earth today. No rational space settlement advocate suggests that any significant portion of that population, or even of those who are rich, will be moving to Mars or anywhere else in space. Instead, we expect that relatively small numbers of highly qualified individuals, or those who are deeply dedicated to living in space, would form the first settlements. Over a significant period of time, thousands more from the Earth would join those settlements as they become increasingly self-sufficient. Over more time, various possible niches for settlement (Moon, Mars, asteroids, free space, etc.) will be occupied, and eventually the population in space will total many millions, most of whom will have been born in space. So why then do Elon Musk, Stephen Hawking, and many others, including organizations like the National Space Society (NSS) and Alliance for Space Development, believe strongly that space settlement is essential to human survival? Although this may seem surprising, the Earth is not a “safe space.” The destiny of virtually all species on Earth is extinction in a relatively short span of geologic time. The Tellers claim that “we live on a planet that is perfect for us.” This statement is both completely true and total nonsense. We fit well on the Earth because we have evolved over millions of years to become creatures that are both adapted to live here and to like living here. It is truer to say that we are perfect for the Earth than the reverse. In fact, the Earth is not such a commodious place. It is subject to periodic calamities of various sorts, ranging from massive asteroid and comet impacts to titanic volcanic eruptions, and from periodic ice ages to disastrous solar flares. In the short run, the Earth seems balmy and comfortable. Viewed from the perspective of deep time, it starts to look more like a death trap, bedeviled by regular mass extinctions. However, things are actually quite a bit worse. Although there are many potentially bad things that might happen to the human race on the Earth from natural sources, there are many more from unnatural sources. We have been dancing with nuclear disaster for a long time. An apocalyptic atomic war is not inevitable, but it is possible. Add to this scenario the genetically engineered killer virus, “gray goo,” a robot revolt, and other horrors as yet undreamt, and the odds against human survival get longer. Hence, the need to abandon the fiction of Earth as our eternal and unchanging perfect home and to appreciate both the need for, and promise of, space settlement. Not so the rich can escape to an Elysium in the sky, or so we can all leave behind a polluted and overheated Earth, but simply so that the human species and human culture has a chance at surviving and flourishing in the long term. The Tellers believe that sustainability on the Earth has no relationship to what we do in space, but the same technologies that enable deep space settlement will have a profound impact on terrestrial sustainability. The Tellers write, “We haven’t even colonized the Sahara desert, the bottom of the oceans… because it makes no economic sense.” This may be true, but it also makes no sense to settle the Sahara desert, the bottom of the oceans, or Antarctica since these locations are on the Earth, and humans living there will not increase the probability of species survival. Near-Earth free space settlements and lunar bases are just stepping stones to ones much further out that are quarantined from Earth by millions of kilometers of vacuum. Once the motivation of species survival is put front and center, it becomes clear that a settlement in low Earth orbit, on the Moon, at L5, or on the Martian surface is not nearly sufficient. What is needed is a large set of thriving communities distributed throughout the solar system, and even ultimately in the Oort Cloud surrounding the solar system proper. This vision is not a small thing. It will be the work of many generations, just as was the settling of the New World or, even earlier in history, the human diaspora out of Africa along the Asian coast to Australia and beyond. The Tellers believe that sustainability on the Earth has no relationship to what we do in space, but the same technologies that enable deep space settlement will have a profound impact on terrestrial sustainability. Space settlements, of necessity, push the limits of food production per square meter and per liter of water. Space settlement agricultural methods can also be applied to growing food in parched California or in vertical farms in crowded urban areas. Space settlements require humans and technology to co-exist in close proximity. This implies an absolute minimization of pollution and sustained recycling of all waste. Such technologies seem highly applicable to sustainability on Earth as well. We will need to provide the best possible medical care for remote space settlements, which will be far from hospitals on Earth. The technologies that make such medicine effective—“tricorders”, telemedicine, and so on—can also bring medical care to underdeveloped and underserved areas of the Earth. The Tellers raise the specter of “winter-over syndrome” in the Antarctic, writing that “living on Mars would be way, way more miserable than living in Antarctica,” and concluding, “Nobody wants to live there.” Although it is clear that the Tellers will not be going, the large numbers who signed up for Mars One’s sketchy settlement plans suggest that a lot of people do want to live on Mars. There are real challenges to constructing space settlements, but current Antarctic bases are not true settlements. Nobody lives there with their families, with the exception of the coastal Esperanza Base, where about ten families routinely winter over. No real effort is made to create any kind of human environment that is comfortable over a long period of time. Conditions in Antarctica might be better compared to living in a campground than a self-sustaining settlement. Additionally, the current Antarctic Treaty essentially prevents any extraction or use of the natural resources found there, thus making economically independent settlements infeasible. The Tellers think that, from an economic perspective, “Mars has nothing to offer in return.” Here, at least in the short run, they have a point. Let us not shy from the truth. Conditions in the early settlements in the New World were difficult at best, and the casualty rate was high. We should expect the same to hold true for early space settlements. However, Jamestown and Plymouth gave rise to vast cities and a tamed landscape on a scale of hundreds of years. We now bring to the table technological means that would seem magical to the Jamestown settlers. Even as difficult an environment as the Moon can be developed and settled using technology that either exists currently or is an engineering project, as one book suggests. The Tellers think that, from an economic perspective, “Mars has nothing to offer in return.” Here, at least in the short run, they have a point. Although Mars may have more of the natural resources a settlement will need than, say, the Moon, it is at the bottom of a fairly steep gravity well and, for the time being, it is not likely that there will be many Mars-to-Earth exports. However, this is like looking at the resources of the New World via a keyhole, seeing a swamp, and reporting back that there is no point in going there. It is worth keeping in mind the example of “Seward’s Folly.” The purchase of Alaska from Russia was mocked as “Seward’s icebox” and a “polar bear garden.” At the time, the oil and mineral riches of Alaska were undiscovered and undreamt of. Space itself teems with valuable resources, including continuous and abundant solar energy and mineral wealth on a scale beyond imagination just in the near Earth asteroids. Just as the Tellers were dismissing space resources as irrelevant, the US Congress was laying the legal groundwork for asteroid and lunar mining with the passage of the Commercial Space Launch Competitiveness Act, signed by President Obama on November 23, 2015. The Tellers also seem unaware that their leadership at Google, Larry Page and Eric Schmidt, are investors in the asteroid mining firm Planetary Resources. The Tellers say that “we won’t survive [on Earth] unless we learn to live in a resource neutral way.” This statement assumes that that Earth is a closed system, which it is not. The Earth is flooded daily with vast amounts of solar energy that, if exploited, could power just about any civilization we wish to maintain. There is no technical limitation to providing continuous, carbon-free power from space solar power satellites beaming power back to the surface of the Earth anywhere it might be needed. The main opposition to this idea derives from an unwillingness to consider centralized power systems on ideological grounds, combined with the unexpected reality of very cheap natural gas today. Even the most conservative consideration of near-Earth asteroid resources suggests that there is no reason to view the Earth as a closed system to which nothing can be added. The time for the settlement of Mars will come, but first we need to build on our success in developing the resources of Earth orbit, in the form of navigation, Earth observation, communication, and weather satellites, by fully developing the economic potential of the Earth-Moon system. Space settlements must flow out of the development of the economic resources of space if they are to be sustainable in the long term. The NSS has developed a complete description of milestones toward the development of space settlements. In view of the above, Astro Teller was probably right to turn down the “space cadet” who wanted Google X to spend money on Mars settlement. But wait—Google is doing exactly that. A key first step toward space settlement is ensuring a gapless transition from the existing International Space Station to commercially owned and operated LEO space stations as described in the NSS position paper “Next Generation Space Stations.” Next will come the development of the resources of the Moon and neaby asteroids leading to the creation of a self-sustaining Earth-Moon economy. Once we have established an asteroid-Earth-Moon economy that makes the resources found in this region fully available for projects ranging from the construction of solar power satellites to fueling future Mars missions, trips to Mars will be far less of a reach than they are today. In view of the above, Astro Teller was probably right to turn down the “space cadet” who wanted Google X to spend money on Mars settlement. Currently Google’s money would be better spent in low Earth orbit, among the asteroids, and on the Moon, joining forces with the growing number of entrepreneurs seeking their fortunes in space. But wait—Google is doing exactly that by sponsoring the Google Lunar X PRIZE to encourage private groups to send landers to the Moon, and investing $900 million in Elon Musk’s SpaceX. Given that corporate Google (now Alphabet) has just made a massive investment in a company founded to settle Mars, the Tellers’ essay sounds a bit like sour grapes. In any case, the Tellers are completely wrong in their disregard of the potential economic benefits of space development and the underlying motivation for space settlement.

### 1NC --- OFF

#### Private entities ought to

#### ---significantly increase moon dust research.

#### ---self-regulate moon dust production

#### 1AC Smith -

#### Counter inerp – we can use prep against the aff

#### Impact turn critical thinking --- using prep allows for more indepth response

#### No warrant for why the aff using prep is diff then the neg

#### Then bias flows aff – why are the judges being biased against me bad????

#### Cameraas on --- no warrant for why not taking prep solves

#### Rounds starting on time solves—prevents the tournament

#### Turn education --- prep increases edicatopm

#### Not DTD context dependent

#### Aff theory not first ---- CD

#### If you win one layer --- obviously dependent to the rest of the debate 7 mins of offense to uplayer means you don’t have to respond – it’s a question of models of debate

#### Debaters can negate --- takes away the only education w get from debate which oqw

#### No === anything else skews the aff to the point where the neg can never win === terrible model for debate --- 2A isn’t impossible

#### No reasonability --- causes judge intervention, terrible models for the topics

#### Do eval debate after the 1ac that mak2

#### 4] Reasonability on 1NC shells – the 1AR is too short to line by line every argument, make a counter interpretation, and go for substance – key to check arbitrary interps. Evaluate the debate after the 1ac because pressure of a winning 2ar while being timecrunched makes me nervous and can cause panic attacks which ows on accessibility

## Case

Solvency ---

#### Squo solves --- new tech means dust isn’t a problem

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]/ISEE

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.

No warrant for why heritage sites are key --- proves alt causes aka the rest of the move

They say warming ---

#### No climate impact

Amber Kerr et al. 19 (Amber Kerr is an agroecologist with a PhD from UC Berkeley, and was the coordinator of the USDA California Climate Hub, based at the University of California, Davis, Daniel Swain is a Climate Scientist at UCLA, Andrew King is a lecturer in Climate Science and ARC DECRA fellow at the School of Earth Sciences and ARC Centre of Excellence for Climate Extremes, University of Melbourne, Peter Kalmus is an American climate scientist and data scientist at NASA's Jet Propulsion Laboratory, Richard Bettis is Chair in Climate Impacts at the University of Exeter and Head of Climate Impacts in the Met Office Hadley Centre, 6/4/19, accessed 11/17/21, “Claim that human civilization could end in 30 years is speculative, not supported with evidence”, https://climatefeedback.org/evaluation/iflscience-story-on-speculative-report-provides-little-scientific-context-james-felton/)AGabay

There is no scientific basis to suggest that climate **breakdown will** “annihilate intelligent **life**” (by which I assume the report authors mean **human** **extinction**) by 2050. However, climate breakdown does pose a grave threat to civilization as we know it, and the potential for mass suffering on a scale perhaps never before encountered by humankind. This should be enough reason for action without any need for exaggeration or misrepresentation! A “Hothouse Earth” scenario plays out that sees Earth’s temperatures doomed to rise by a further 1°C (1.8°F) even if we stopped emissions immediately. Peter Kalmus, Data Scientist, Jet Propulsion Laboratory This word choice perhaps reveals a bias on the part of the author of the article. A temperature can’t be doomed. And while I certainly do not encourage false optimism, assuming that humanity is doomed is **lazy** and counterproductive. Fifty-five percent of the global population are subject to more than 20 days a year of lethal heat conditions beyond that which humans can **survive** Richard Betts, Professor, Met Office Hadley Centre & University of Exeter: This is clearly from Mora et al (2017) although the report does not include a citation of the paper as the source of that statement. The way it is written here (and in the report) is misleading because it gives the impression that everyone dies in those conditions. That is not actually how Mora et al define “deadly heat” – they merely looked for heatwaves when somebody died (not everybody) and then used that as the definition of a “deadly” heatwave. North America suffers extreme weather events including wildfires, drought, and heatwaves. Monsoons in China fail, the great rivers of Asia virtually dry up, and rainfall in central America falls by half. Andrew King, Research fellow, University of Melbourne: Projections of extreme events such as these are very difficult to make and **vary greatly** between differentclimate **models**. Deadly heat conditions across West Africa persist for over **100 days a year** Peter Kalmus, Data Scientist, Jet Propulsion Laboratory: The deadly heat projections (this, and the one from the previous paragraph) come from Mora et al (2017)1. It should be clarified that “deadly heat” here means heat and humidity beyond a two-dimension threshold where at least one person in the region subject to that heat and humidity dies (i.e., not everyone instantly dies). That said, in my opinion, the projections in Mora et al are conservative and the methods of Mora et al are sound. I did not check the claims in this report against Mora et al but I have no reason to think they are in error. 1- Mora et al (2017) Global risk of deadly heat, Nature Climate Change The knock-on consequences affect national security, as the scale of the challenges involved, such as pandemic disease outbreaks, are overwhelming. Armed conflicts over resources may become a reality, and have the potential to escalate into nuclear war. In the worst case scenario, a scale of destruction the authors say is beyond their capacity to model, there is a ‘high likelihood of human civilization coming to an end’. Willem Huiskamp, Postdoctoral research fellow, Potsdam Institute for Climate Impact Research: This is a highly questionable conclusion. The reference provided in the report is for the “Global Catastrophic Risks 2018” report from the “Global Challenges Foundation” and not peer-reviewed literature. (It is worth noting that this latter report also provides no peer-reviewed evidence to support this claim). Furthermore, if it is apparently beyond our capability to model these impacts, how can they assign a ‘high likelihood’ to this outcome? While it is true that warming of this magnitude would be catastrophic, making claims such as this without evidence serves only to undermine the trust the public will have in the science. Daniel Swain, Climate Scientist, University of California, Los Angeles: It seems that the eye-catching headline-level claims in the report stem almost entirely from these **knock-on effects**, which the authors themselves admit are “beyond their **capacity** to **model**.” Thus, from a scientific perspective, the purported “high likelihood of civilization coming to an end by 2050” is essentially personal **speculation** on the part of the report’s authors, rather than a clear conclusion drawn from **rigorous assessment** of the available **evidence**.

#### Co2 emissions stop an impending ice age

Doyle 16 (Alister, formerly a Knight Science Journalism Fellow at MIT, environmental correspondent for Reuters since 2004 where he covers climate science and the UN, “Global Warming Could Stave Off Next Ice Age For 100,000 Years”, http://www.reuters.com/article/us-climatechange-iceage-idUSKCN0UR2G320160113)

OSLO — Global warming is likely to disrupt a natural cycle of ice ages and contribute to delaying the onset of the next big freeze until about 100,000 years from now, scientists said on Wednesday. In the past million years, the world has had about 10 ice ages before swinging back to warmer conditions like the present. In the last ice age that ended 12,000 years ago, ice sheets blanketed what is now Canada, northern Europe and Siberia. In a new explanation for the long-lasting plunges in global temperatures that cause ice ages, scientists pointed to a combination of long-term shifts in the Earth's orbit around the sun, together with levels of carbon dioxide in the atmosphere. They said the planet seemed naturally on track to escape an ice age for the next 50,000 years, an unusually long period of warmth, according to the study led by the Potsdam Institute for Climate Impact Research. But rising man-made greenhouse gas emissions since the Industrial Revolution began in the 18th century could mean the balmy period will last for 100,000 years, they wrote in the journal Nature. The findings suggest human influences "will make the initiation of the next ice age impossible over a time period comparable to the duration of previous glacial cycles," they wrote. "Humans have the power to change the climate on geological timescales," lead author Andrey Ganopolski told Reuters.

#### Extinction – we’re on the brink now – timeframe is fast

Duke 15 (Selwyn, New American, citing S. Fred Singer, professor emeritus at the University of Virginia and a founding director of the Science & Environmental Policy Project, “Climate Change: Is a Deadly Ice Age on the Horizon?”, http://www.thenewamerican.com/tech/environment/item/21177-climate-change-is-a-deadly-ice-age-on-the-horizon)

The last ice age ended approximately 12,000 years ago, and since then we’ve been enjoying a pleasantly warm “interglacial period.” But given that an interglacial may last only 12,000 years, we’re confronted with a scary prospect: Another ice age may be nigh. And this could have devastating effects on mankind. So says atmospheric and space physics expert S. Fred Singer, professor emeritus at the University of Virginia and a founding director of the Science & Environmental Policy Project. While he has never been worried about global warming — emphasizing that climate alarmists’ predictions have been consistently wrong — he writes at American Thinker today that he has “recently become quite concerned about ice ages and the dangers they pose to humans on our planet — and indeed to most of terrestrial ecology.” In fact, he’s so concerned that he proposes we try to mitigate any cooling that may occur. Professor Singer cites a manuscript written by a co-author of his, Dennis Avery, which documents the historic causes of civilizational collapse. Its conclusion, Singer reports, is that “cold periods and droughts appear to be the main dangers to agriculturally based societies in all regions of the world.” Of course, this is just common sense. Plants don’t grow very well in deserts or during Northeast winters. But what if it were winter year 'round? The effects would be striking. As Singer tells us, there have been nearly 20 major glaciations “in the past two to three million years. The coolings are quite severe: the most recent one, ending only about 12,000 years ago, covered much of North America and Europe with miles-thick continental ice sheets and led to the disappearance of (barely) surviving bands of Neanderthalers; they were displaced by the more adaptable Homo Sapiens.” While Singer says that most experts believe the next glacial period lies just on the horizon, the exact timing is unknown; one scientist claims it may be delayed by another 40,000 years. It’s more than just major ice ages that imperil us, however. As Singer also informs, “There are two kinds of ice ages; they are fundamentally different…: (i) Major (Milankovich-style) glaciations occur on a 100,000-year time-scale and are controlled astronomically. (ii) “Little” ice ages were discovered in ice cores; they have been occurring on an approx. 1000-1500-yr cycle and are likely controlled by the Sun. The current cycle’s cooling phase may be imminent.” And while such a period may be called “little,” its effects are anything but. Describing the consequences of the last such age, occurring between 1400 and 1830 A.D., Singer writes, “The Norse settlements were abandoned; indeed, Scandinavia was hardest hit. Climatology pioneer Hubert Lamb documents crop failures, starvation, and disease in Europe, together with ice fairs on the frozen Thames.” Further illustrating the dangers of global cooling, some researchers believe that an earlier period of cold and dry weather might have contributed to one of history’s major events: the Western Roman Empire’s fall. As the Daily Need wrote in 2011 citing a study published in the journal Science, “Climate variability, with other factors, brought about a period of agricultural instability that affected both the Romans and militant migrant populations to the northeast — the ‘barbarians.’ These migrants then fought their way south, toward the warmer Mediterranean weather — and toward an already weakened Rome.”

#### co2’s key to agriculture – extinction

Ferrara 14 (Peter, J.D. Harvard Law, contributor to Forbes on climate and public policy, Director of Entitlement and Budget Policy for the Heartland Institute, Senior Advisor for Entitlement Reform and Budget Policy at the National Tax Limitation Foundation, General Counsel for the American Civil Rights Union, and Senior Fellow at the National Center for Policy Analysis, served in the White House Office of Policy Development under President Reagan, and as Associate Deputy Attorney General of the United States under President George H.W. Bush, “The Period Of No Global Warming Will Soon Be Longer Than the Period of Actual Global Warming”, http://www.forbes.com/sites/peterferrara/2014/02/24/the-period-of-no-global-warming-will-soon-be-longer-than-the-period-of-actual-global-warming/#42cc9ebf8bf0)

In addition, CO2 is actually essential to all life on the planet. Plants need CO2 to grow and conduct photosynthesis, which is the natural process that creates food for animals and fish at the bottom of the food chain. The increase of CO2 in the atmosphere that has occurred due to human emissions has actually increased agricultural growth and output as a result, causing actually an increased greening of the planet. So has any warming caused by such human emissions, as minor warming increases agricultural growth. The report states, “CO2 is a vital nutrient used by plants in photosynthesis. Increasing CO2 in the atmosphere ‘greens’ the planet and helps feed the growing human population.

They say prolif ---

#### 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)AGabay

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

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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**.

#### No spread AND no impact

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Other analysts have sounded a much less alarmist tone, however. Some scholars even suggested that an Iranian bomb held great potential for stabilising an unbalanced and volatile Middle East (Waltz, 2012). Closer to the mainstream of Western strategic discourse, various experts have argued that despite the risks of proliferation, nuclear weapons, and the deterrent they provide should get (more) credit for contributing, in combination with other factors, to what has been labelled ‘the Long Peace’ among the great powers since 1945 (Gaddis, 1999, p. 268–271; Gavin, 2012a, p. 164; Acton 2010, pp. 16–17). Still others have contended that because nuclear proliferation is such a rare phenomenon, and since robust nonproliferation measures tend to be disruptive, the net destabilising effect of new nuclear countries is quite small and, therefore, manageable (Mueller 2010, pp. 95–99; Hymans 2013, pp. 293–296).

The question of whether nuclear proliferation has stabilising or destabilising effects is not just fascinating for scholars of the nuclear age, but also highly consequential for practical policy issues. For in order to debate the merits of particular policy choices – such as preventive military strikes against nuclear facilities, grand bargains with potential proliferators or complete nuclear disarmament – we need to understand first how the spread of nuclear weapons impacts regional and global security.

The chapter proceeds in three steps. The first section provides the foundation for the other parts by summarising what we know about empirical patterns of proliferation and the utility of nuclear weapons for statecraft. The second section then engages the literature on the consequences of proliferation, focusing in particular on how proliferation has influenced international stability. The final section explores whether some states have been more affected than others, and what measures these states have taken to prevent proliferation, or at least mitigate its negative consequences.

Patterns of nuclear proliferation and the utility of nuclear weapons

Nuclear proliferation is commonly defined as the spread of nuclear weapons to states that did not previously have them. Within a broader conceptual framework that is rarely used by scholars, yet popular in the arms control community, this diffusion of nuclear weapons to additional states is labelled horizontal proliferation. It is conceptually accompanied by the notion of vertical proliferation, which refers to qualitative improvements and increases in the number of nuclear weapons in the stockpiles of existing nuclear weapon states. In accordance with the typical usage of the term in the scholarly debate, this chapter focuses only on how the horizontal proliferation of nuclear weapons affects international stability.

One important empirical pattern that has shaped how nuclear proliferation is understood concerns the way in which nuclear weapons have spread. The word ‘spread’ appears to suggest that the established nuclear powers have provided other interested nations with (at least a few) operational nuclear warheads. Yet such transfers have never been undertaken. Certainly, states that sought nuclear weapons have often received significant assistance from other nations (Schofield, 2014; Fuhrmann, 2012), sometimes in the form of highly sensitive technologies (Kroenig, 2010). Nonetheless, since all these transfers remained well below the weapons threshold, nations seeking nuclear weapons always had to build them indigenously. Hence, in reality, the spread of nuclear weapons has meant that merely the ambition to possess a nuclear arsenal has spread to additional states, each of which then had to pursue that goal primarily through indigenous efforts.

Importantly, since a state’s national efforts to turn its desire for nuclear weapons into reality naturally span several (and sometimes many) years, nuclear proliferation must be conceived of as a process, as opposed to just a single step (Meyer, 1986). This point is reinforced by the fact that 29 out of 39 states that have embarked upon that path (Müller and Schmidt, 2010, p. 157; Mikoyan, 2012; Santoro, 2017) have not acquired a nuclear arsenal. Hence, a lot of nuclear proliferation activity has been undertaken by nations that did not ultimately become nuclear weapon states. Three patterns explain this situation.

First, owing not just to the technological, but also the institutional and managerial challenges of the task, some nations simply failed in their efforts to build the bomb (Hymans, 2012; Braut-Hegghammer, 2016). Second, a few countries have chosen a nuclear ‘hedging’ strategy, intentionally confining their efforts to developing the technological capability to build an arsenal quickly while refraining from exercising that option (Narang, 2016–17, p. 134). Third, several states have undertaken a ‘nuclear reversal’, abandoning their nuclear weapons activities before developing nuclear explosive devices (Müller and Schmidt, 2010).

#### Prolif stops conflicts

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)AGabay

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.

#### Horizontal & vertical prolif raises the threshold for conventional wars—those are more probable and deadly

Leah & Lowther 17 (Christine Leah, Former Chauncey Postdoctoral Fellow in Grand Strategy at Yale University and Adam B Lowther, Director, School of Advanced Nuclear Deterrence Studies Spring 2017. “Conventional Arms and Nuclear Peace,” Strategic Studies Quarterly. Volume 11. Issue 1. pg. 14-24. <http://www.airuniversity.af.mil/Portals/10/SSQ/documents/Volume-11_Issue-1/Leah.pdf>)

The acquisition of nuclear weapons by a weaker state significantly complicates the decision-making calculus of a militarily superior state. For these reasons, power-projecting states fear nuclear proliferation to both allied and enemy states.5 This is a point worth underscoring and one that is often overlooked when nonproliferation is discussed and its rationale and purposes debated. These factors demonstrate that the “more may be better” view of nuclear weapons proffered by political scientist Kenneth Waltz is entirely relevant and accurate.6 Waltz famously argued that more nuclear weapons in the world would tend to increase deterrence among states. That logic is turned on its head in a world with far fewer nuclear weapons and a greater reliance on conventional systems, which may actually be destabilizing. This was true even before the advent of the atomic bomb. The awesome destructive power of nuclear weapons tended to overshadow the failure of conventional deterrence in the decades and centuries preceding the first use of nuclear weapons.7 Thomas Schelling, an economist and foreign policy scholar, also argued very specifically that more nuclear weapons might enhance strategic stability by increasing the survivability of a nation’s nuclear forces.8 Because states might be more risk acceptant with conventional forces and concepts of first and second strikes are much less well defined in the conventional realm, stability was much more fragile in the pre-nuclear age and would likely prove fragile in a world with fewer, or zero, nuclear weapons. Advocates of a world free of nuclear weapons often overlook this point. A world with fewer nuclear, but more conventional, forces is likely to bring forth new dynamics for arms races, which increase the likelihood of disputes and wars.9 Reducing or eliminating nuclear weapons does not remove proliferation problems from the agenda. Might we fear arms races in the second conventional age less because of the subnuclear consequences of an advanced conventional missile system, or should we fear it more because of the lower threshold to the use of armed force that might be involved? A world not anxious about nuclear proliferation is more likely to be anxious about the proliferation of advanced conventional systems. In that world, the knowledge that war might escalate to the use of an immediate and devastating nuclear strike is gone. This also raises new issues influencing the extent to which a conventional war may be more controllable than a nuclear one. As Lawrence Freedman, the doyen of British strategic studies, writes, “In principle, denial is a more reliable strategy than punishment because, if the threats have to be implemented, it offers control rather than continuing coercion. With punishment, the [adversary] is left to decide how much more to take. With denial, the choice is removed.”10 Nuclear Reductions, Nonproliferation, and Disarmament Nuclear abolitionists have very different views on the nature of deterrence. Their efforts are based largely on a fundamental ideological dislike of nuclear weapons rather than a deep understanding or appreciation of them. Global nuclear disarmament, if considered in a vacuum, would make the world safer for US conventional power projection but would not necessarily promote strategic stability. This observation is made repeatedly by Russian and Chinese analysts, who clearly understand American conventional superiority. On this basis an argument can indeed be made that global disarmament disproportionately benefits the United States, not regional or global competitors like Russia and China. The effects of conventional capabilities are certainly a neglected topic when compared to the focus on nuclear arms control over the past seven years. They are generally said to bear, or lack, significance in comparison to WMDs. But does this argument still hold in a world with no nuclear weapons? A great deal of analysis is still needed to assess whether and how reductions could be managed to the point that no nuclear-armed state has more than a minimum deterrent. For even further reductions to occur, the process would necessarily have to be multilateral, including China, India, and Pakistan. While China and other states have indicated that they would potentially be willing to enter into negotiations once the United States and Russia reduce their arsenals, they have not specified at what level of forces this might conceivably take place. In any case, the process would involve complex calculations of deterrence equations involving changing sets of multiple actors as well as conventional imbalances that are, again, a major source of concern for many countries that may find themselves at odds with the United States. For the “P5” nuclear weapons states (those with permanent seats on the United Nations’ Security Council) such as Russia and China who are members of the Nuclear Nonproliferation Treaty (NPT), the issue of conventional imbalance compounds the difficulty they face in shaping the perception of some states who suggest that the P5 failed to take significant steps toward nuclear disarmament. Pakistan, for instance, has recently accused the United States and other countries of nuclear hypocrisy, with the Pakistani ambassador to the United Nations saying that a handful of nuclear-weapon states advocate abstinence for others but are unwilling to give up their large inventories of nuclear weapons or cease modernization efforts. The ambassador also stressed that double standards were not only evident on nuclear issues but also in the area of conventional arms: “While professing strict adherence to responsible arms transfers, some powerful states continue to supply increasing numbers of conventional weapons in our region, thereby aggravating instability in South Asia.”11 Indeed, from the Pakistani perspective, the international community does not give enough attention to the issue of vertical proliferation (arms buildup). Certainly, it should come as no surprise that Pakistan continues to stress the importance of nuclear weapons in acting as a deterrent to perceived Indian conventional military superiority.12 Pakistan has made efforts at addressing issues of conventional force imbalances with India in the past, but New Delhi has traditionally dismissed these efforts, instead focusing on its larger regional competitor, China.13 The problem in South Asia is therefore at least a trilateral one. However, the issue speaks to a much larger problem, and that is multilateral conventional arms control. If the India-Pakistan strategic situation offers any lesson, it is that weaker states (such as Pakistan) may desire to develop a “great equalizer” to achieve the security that they cannot find through traditional (conventional) means. With the United States and Russia undertaking a 90 percent reduction in their nuclear arsenals since the end of the Cold War, it is fair to say that these efforts have promoted neither goodwill nor a peaceful posture in countries like China or North Korea. We are not suggesting that American nuclear force reductions have pushed Beijing to expand its antiship ballistic missile inventory, place multiple warheads on its DF-41 ballistic missiles, build artificial islands with deployed military capabilities, or build bases in northern Africa. Nevertheless, it does show that there is little evidence to suggest that nuclear cuts necessarily lead to a more peaceful security environment. If anything, regional and global security evolve independently of the size and shape of one country’s nuclear arsenal. North Korea, in particular, has pursued a nuclear weapons program as a means of countering American conventional superiority, paying little or no attention to the United States’ declining nuclear arsenal. Conventional Arsenals, Crisis Stability, and Arms Race Stability Nuclear reductions have important consequences for both crisis stability and arms race stability. Conventional forces differ tremendously from nuclear forces in the way they are organized and operate and in their destructiveness. These distinctions influence the way in which arms-control arrangements aimed at conventional arms-race stability and crisis stability must be conceptualized in a world free of nuclear weapons but safe for conventional conflict. To be highly destructive, conventional forces need to be used en masse. Their successful application requires well-organized cooperation between many military units, often between different types of military forces (land, air, naval, cyber, and space), and, due to the globalization of conflict, also the participation of several allied states granting military support and access. Conventional forces most often seek military victory, which requires they first defeat adversarial forces before the political objectives of the conflict can be achieved. Also, to be militarily effective, conventional forces need upto-date technology and well-trained troops that are capable of effectively employing weapons of war. Crisis stability is a term that was perfected in its use during the nuclear age. Crisis stability aims at developing incentives for using the lowest level of military force possible—all while seeking to prevent escalation. It also seeks to control the emotions that are prevalent in conflict, providing procedures to cope with a crisis. Nuclear reductions and disarmament may make a paradoxical and undesired contribution; reducing expected levels of death and destruction if war comes might actually increase the probability of the onset of war. Even if two states went to war, one would expect the nuclear sword of Damocles to incentivize them to end the conflict as soon as possible. In addition, the historical record clearly shows there is not the same taboo or norm against using conventional missiles and bombers as there is against using an atomic version.14 Not a single nuclear warhead has been delivered by any delivery system since 1945. By contrast, over the past 45 years, ballistic missiles were employed in at least six different conflicts: the Egyptian and Syrian missile attacks on Israel in the 1973 Yom Kippur War, the 1980–88 war between Iraq and Iran, the Afghan civil war of 1988–91, the 1991 Persian Gulf War, the Yemen civil war of 1994, and the 2003 US-led invasion of Iraq. Indeed the duration and controllability of a war becomes important here. As antinuclear advocate Randall Forsberg admits, The main role of nuclear weapons has always been to deter conventional war among the world’s “big powers” (the USA, the USSR, the UK, France, West Germany, China, and Japan) by posing a clear risk that such a war would escalate to nuclear war. If ballistic missiles were abolished, raising again the prime strategic question of the 1950s—could a conventional war be fought without going nuclear, and if it went nuclear, could it be won?—it would diminish nuclear deterrence of conventional war.15 (emphasis in original) The fog of war could become much thicker. Even if lower-yield nuclear weapons were used, they could still significantly disrupt command, control, communication, and intelligence. In the conventional world this would be less of an issue because of the smaller level of destruction, over a much more protracted amount of time, thus enabling more time to react. In the nuclear age, time becomes much more compressed. Moreover, assuming that deterrence was still desirable, states would have to rethink how to reorient their forces toward achieving a conventional second-strike capability. This might lead to a different type of arms race. This concept was already present before the advent of the bomb, in discussions about the importance of airpower and having enough aircraft to deter aggression among European states.16 All these issues raise the importance of focusing on conventional arms control as much as nuclear reductions, especially in the Asia-Pacific. Arms race stability aims at lowering incentives to further build up military forces. Thus we might conceivably ask: if the United States and Russia reduce their nuclear arsenals to a few hundred warheads each— and other nations to a few dozen—might we see a nonnuclear arms race to fill a nuclear void?17 As the 2010 Nuclear Posture Review states, “fundamental changes in the international security environment in recent years—including the growth of unrivaled US conventional military capabilities [and] major improvements in missile defenses . . . enable us to fulfill . . . objectives at significantly lower nuclear force levels and with reduced reliance on nuclear weapons . . . without jeopardizing our traditional deterrence and reassurance goals.18 If one accepts this statement, and if opponents of nuclear modernization are truly concerned about reducing global instability, they should be urging the administration to cancel and eliminate a number of conventional capabilities that are far more concerning to our adversaries. Granted, such a position is irrational, but if stability is the key then this is the logical position to hold. Indeed, even with successful elimination of nuclear weapons, the tasks of strategic deterrence, extended deterrence, and arms control do not go away. Instead, they become more difficult to manage. This is especially true for conventional arms control, because nuclear weapons tend to make deterrence much easier, or so the historical record would seem to indicate. If one argues for further nuclear reductions and nuclear disarmament, then one needs to be responsible and also think seriously about conventional arms control. Conventional imbalances and any remaining system of deterrence would increasingly become the focus of deterrence and would serve as the source of instability.19 This is especially true because, in many instances, the imbalance and insecurity of a conventional-only world have remained obscured during the nuclear age.20 With Article VI of the NPT obliging nuclear-weapon states to work toward general and complete disarmament of nuclear weapons, would such a treaty be required or feasible in a conventional world? This possibility raises an important question: to what extent should nuclearweapon states focus on reducing their arsenals as a precondition for conventional disarmament? We have tended to think that it would first be a good idea to reduce nuclear weapons before reducing conventional forces. However, nuclear weapons are but one component of the overall military balance among states. In an age without nuclear weapons, it is also conceivable that deterrence relationships will simply not work without boosting some aspects of conventional arsenals. The more-maybe-better logic that Schelling (and others) applied to nuclear weapons may also carry into an entirely conventional era. That is, fewer nuclear weapons in the world would likely entail more conventional forces to compensate, which would not necessarily be a stabilizing development. For advocates of “global zero,” the implications of a world free of nuclear weapons are assumed to be inherently positive. However, the reality of such a world may be far less positive because the psychological effect achieved by the understood destructive power of nuclear weapons will no longer push risk-acceptant national leaders to allow caution to prevail. Given that no current leader of a nuclear-weapon state was even alive prior to the development of the atomic bomb, the security and stability of a nuclear-free world should not be taken for granted. Instead, much more work is required to understand the implications of such a fundamental change to a proven and stable approach to constraining great-power conflict. Conclusion If the past offers any lessons for the future, it is not unreasonable to believe that a world free of nuclear weapons is a world in which standing armies grow larger, defense expenditures (as a percentage of gross domestic product) increase, and conflict becomes more frequent as the perceived risks to a nation and its leaders decline. National leaders are not always rational, because they do not effectively weigh costs and benefits or risks and rewards, which would lead them to overvalue the prospect of a loss and undervalue the prospect of a gain. The certain loss caused by any prospective use of nuclear weapons has caused decision makers to exercise great restraint when contemplating the prospective use of force.21 History appears to suggest that, to some degree, nuclear weapons do cause decision makers to see the use of nuclear weapons as ensuring losses, with few gains—causing restraint. Thus, eliminating nuclear weapons may well reduce perceived risks and increase perceived gains from fighting—making the world safe for conventional conflict. Such a state of affairs would not have the same absolute risk associated with it that nuclear warfare poses (that of total annihilation), but it would increase the risks of proliferating conflict, which may lead to a dramatic increase in conflict-related casualties.