# 1NC Offs

## Off

#### Interpretation: Appropriation means use, exploitation, or occupation that is permanent and to the exclusion of others

Babcock 19 Professor of Law, Georgetown University Law Cente. Babcock, Hope M. "The Public Trust Doctrine, Outer Space, and the Global Commons: Time to Call Home ET." Syracuse L. Rev. 69 (2019): 191.

Article II is one of those succeeding provisions that curtails “the freedom of use outlined in Article [I] by declaring that outer space, including the [m]oon and other celestial bodies, is not subject to national appropriation.”147 It flatly prohibits national appropriation of any celestial body in outer space “by means of use or occupation, or by any other means.”148 However, “many types of ‘use’ or ‘exploitation’. . . are inconceivable without appropriation of some degree at least of any materials taken,” like ore or water.149 If this view of Article II’s prohibitory language is correct, then “it is not at all farfetched to say that the OST actually installs a blanket prohibition on many beneficial forms of development.”150 However, the OST only prohibits an appropriation that constitutes a “long-term use and permanent occupation, to the exclusion of all others.”151

#### Violation: Space tourism is, by definition, temporary – people briefly go to space in a rocket ship and then return to Earth

#### 1] Precision – if we win definitions the aff doesn’t defend a shift from the squo or solve their advantages – so at best vote negative on presumption. The resolution is the only predictable stasis point for dividing ground—any deviation justifies the aff arbitrarily jettisoning words in the resolution at their whim which decks negative ground and preparation because the aff is no longer bounded by the resolution.

#### 2] Predictable limits—Letting temporary occupation be appropriation is a limits diaster - any aff about a single space ship, satellite, or weapon would be T because they temporarily occupy space. Limits explodes neg prep burden and draws un-reciprocal lines of debate, where the aff is always ahead, turns their pragmatics offense

#### Topicality is a voting issue that should be evaluated through competing interpretations – it tells the negative what they do and do not have to prepare for—there’s no way for the negative to know what constitutes a “reasonable interpretation” when we do prep – reasonability is arbitrary and causes a race to the bottom, proliferating abuse

#### No RVIs—it’s your burden to be topical.

## Off

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

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

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

#### Short innovation cycles mean every contract counts

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

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

#### The government will rely on overly restrictive policies to enforce regulations – that kills commercial space

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

Regulations, if found to be necessary, should be consistent, unambiguous, and specific. The process for rulings on decisions should be transparent and consistently applied. The government should avoid using catch-all categories and should instead specifically draft the rules for individual activities in space if needed. The government should also remember that the OST is not self-executing. Although there could be international consequences for decisions made about whether to regulate an activity in space or not, the United States has leeway in determining what needs authorization and how intensive “continuing supervision” needs to be. The United States also should not try to guess what 213 commercial uses of outer space may become viable or not. It is important to remember the lesson of AT&T’s 1960 license application: the commercial sector may surprise the government in what the latter believes to be viable.214 Because of Article VI mandate in the OST and the complexity of the issues at play, avoiding burdensome regulation is the hardest policy suggestion. The mere presence of complexity, however, does not mean that the government should err on the side of overly restrictive policies, especially when the benefits to liberalizing the regulations in this industry are so pronounced.

#### Fiat means the plan circumvents normal procedures for industry dialogue---that wrecks certainty and confidence, even if the substance of the plan is pro-business

Jeff Foust 18. Editor and publisher of The Space Review, and a senior staff writer with SpaceNews. 11-5-2018. "The Space Review: Turning space policy into space regulation." The Space Review. http://www.thespacereview.com/article/3598/1

More than five months ago, President Trump signed Space Policy Directive (SPD) 2, a policy document directing a series of regulatory reforms related to commercial space activities. That document, largely incorporating recommendations made at a February meeting of the National Space Council, was hailed by the space industry as a key step towards streamlining regulations and cutting red tape. “While many details have yet to be worked out, we are a committed and constructive partner in revising and reducing cumbersome space regulations,” said Frank Slazer, vice president for space and workforce at the Aerospace Industries Association, in a statement after the signing of SPD-2 (see “A step towards a ‘one-stop shop’ for commercial space regulations”, The Space Review, May 29, 2018). Now, though, is the time to work out those details. SPD-2 set schedules for some of those regulatory reform efforts, most notably reforms to launch licensing. The directive requires the Department of Transportation (through the FAA) to develop a formal, public draft of revised regulations for commercial launch and reentry regulations. Those changes, the directive states, would include unifying launch licenses and the use of “performance-based criteria” for licensing versus prescriptive requirements. Industry had long sought streamlining of such regulations, such as the requirement that a vehicle have a separate launch license for each site it operates from. “I think it requires heroics when you make any changes to those launch licenses. When you have to change a launch pad from [Space Launch Complex] 40 to [Launch Complex] 39A or back to 40, you have to basically apply for a new license,” said Gwynne Shotwell, president of SpaceX, at the first National Space Council meeting in October 2017. That’s a reference to the two launch sites the company has several kilometers apart in Florida, but in separate jurisdictions: LC-39A at the Kennedy Space Center and SLC-40 at Cape Canaveral Air Force station. Vice President Mike Pence picked up on that issue at the council’s second meeting in February. “You know, the government’s figured out how to honor driver’s licenses across state lines,” he said. “There’s no reason we can’t do the same for rockets.” While the government and industry might be on the same page when it comes to the broad goals of the regulatory changes, how that gets converted into actual regulations is an ongoing process. It’s one that’s taking place at rapid speed—from a bureaucratic point of view—in order to meet the deadline in SPD-2. “We’re moving at a rocket pace. We’re going as fast as we possibly can,” said Kelvin Coleman, the acting associate administrator for commercial space transportation at the FAA, during an October 31 meeting of the FAA’s Commercial Space Transportation Advisory Committee (COMSTAC) in Washington. A typical “rulemaking” process at the FAA can take four to five years to complete, he said. “It usually takes us a year or two, maybe three, even to get to a draft.” “I think, frankly, after repeated calls for that engagement, it is of concern to me, and to a number of other members, that the FAA has decided not to do that,” said Alexander. Both Coleman and his deputy, Dorothy Reimold, said at the COMSTAC meeting that they intended to stick to the schedule in SPD-2. That would require the formal publication of the draft revised regulations, known as a notice of proposed rulemaking (NPRM), in less than three months. “The target and intent—and we view it not as anything less than an obligation to follow the requirements under SPD-2—is to publish an NPRM on February 1,” said Reimold. That’s created some concerns in industry, though, that the process might actually be going too fast. For example, to support the development of the draft rule, the FAA established an Aviation Rulemaking Committee, or ARC, earlier this year to solicit industry input on how to revise existing launch and reentry regulations. That committee, though, hasn’t been given the opportunity to meet again with the FAA to follow up on its earlier input. “Frankly, as we’ve said many times to individuals and to groups, time has not been on our side,” Reimold said. “We have not been able to bring the ARC back together to have the kind of venue that I think was being sought, not for lack of wanting to but simply because time has not allowed us to do that.” Some on COMSTAC, whose members include representatives of major commercial launch providers and related companies, said they’re [they are] concerned about not knowing more about the development of the proposed rule. They said they’re worried that the FAA might release a draft rule next February with language that doesn’t match the intent of the regulatory reform. “I want to really register a strong concern with how the FAA is approaching the upcoming NPRM,” said Brett Alexander, director of business development for Blue Origin, citing what he said was a “lack of dialogue, insight, transparency and engagement” by the FAA. “I think, frankly, after repeated calls for that engagement, it is of concern to me, and to a number of other members, that the FAA has decided not to do that.” Reimold said there had been “internal discussions” about ways discuss the development of the rule and get additional industry input. “The pace that we’re at right now to pull this off is just extraordinary,” she said. “It frankly just didn't allow any kind of natural opportunities” for discussion. “It is not a lack of good intent or willingness. We’re not trying to hide anything,” she added. “We’re simply trying to get the job done.” “The balance that we have to be careful of here is that we certainly want to get these out as quickly as humanly possible, and we don’t want to do anything that would delay that process,” said Mike Gold, chairman of COMSTAC. “At the same time, we want to get industry feedback in.” Industry—and everyone else—will have a chance to comment once the NPRM is released in February. The details of how long the comment period would be, and how those comments will be incorporated into development of a final rule, haven’t been announced.

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

Dylan **Matthews 18**. Co-founder of Vox, citing Nick Beckstead @ Rutgers University. 10-26-2018. "How to help people millions of years from now." Vox. https://www.vox.com/future-perfect/2018/10/26/18023366/far-future-effective-altruism-existential-risk-doing-good

If you care about improving human lives, you should overwhelmingly care about those quadrillions of lives rather than the comparatively small number of people alive today. The 7.6 billion people now living, after all, amount to less than 0.003 percent of the population that will live in the future. It’s reasonable to suggest that those quadrillions of future people have, accordingly, hundreds of thousands of times more moral weight than those of us living here today do. That’s the basic argument behind Nick Beckstead’s 2013 Rutgers philosophy dissertation, “On the overwhelming importance of shaping the far future.” It’s a glorious mindfuck of a thesis, not least because Beckstead shows very convincingly that this is a conclusion any plausible moral view would reach. It’s not just something that weird utilitarians have to deal with. And Beckstead, to his considerable credit, walks the walk on this. He works at the Open Philanthropy Project on grants relating to the far future and runs a charitable fund for donors who want to prioritize the far future. And arguments from him and others have turned “long-termism” into a very vibrant, important strand of the effective altruism community. But what does prioritizing the far future even mean? The most literal thing it could mean is preventing human extinction, to ensure that the species persists as long as possible. For the long-term-focused effective altruists I know, that typically means identifying concrete threats to humanity’s continued existence — like unfriendly artificial intelligence, or a pandemic, or global warming/out of control geoengineering — and engaging in activities to prevent that specific eventuality. But in a set of slides he made in 2013, Beckstead makes a compelling case that while that’s certainly part of what caring about the far future entails, approaches that address specific threats to humanity (which he calls “targeted” approaches to the far future) have to complement “broad” approaches, where instead of trying to predict what’s going to kill us all, you just generally try to keep civilization running as best it can, so that it is, as a whole, well-equipped to deal with potential extinction events in the future, not just in 2030 or 2040 but in 3500 or 95000 or even 37 million. In other words, caring about the far future doesn’t mean just paying attention to low-probability risks of total annihilation; it also means acting on pressing needs now. For example: We’re going to be better prepared to prevent extinction from AI or a supervirus or global warming if society as a whole makes a lot of scientific progress. And a significant bottleneck there is that the vast majority of humanity doesn’t get high-enough-quality education to engage in scientific research, if they want to, which reduces the odds that we have enough trained scientists to come up with the breakthroughs we need as a civilization to survive and thrive. So maybe one of the best things we can do for the far future is to improve school systems — here and now — to harness the group economist Raj Chetty calls “lost Einsteins” (potential innovators who are thwarted by poverty and inequality in rich countries) and, more importantly, the hundreds of millions of kids in developing countries dealing with even worse education systems than those in depressed communities in the rich world. What if living ethically for the far future means living ethically now? Beckstead mentions some other broad, or very broad, ideas (these are all his descriptions): Help make computers faster so that people everywhere can work more efficiently Change intellectual property law so that technological innovation can happen more quickly Advocate for open borders so that people from poorly governed countries can move to better-governed countries and be more productive Meta-research: improve incentives and norms in academic work to better advance human knowledge Improve education Advocate for political party X to make future people have values more like political party X ”If you look at these areas (economic growth and technological progress, access to information, individual capability, social coordination, motives) a lot of everyday good works contribute,” Beckstead writes. “An implication of this is that a lot of everyday good works are good from a broad perspective, even though hardly anyone thinks explicitly in terms of far future standards.” Look at those examples again: It’s just a list of what normal altruistically motivated people, not effective altruism folks, generally do. Charities in the US love talking about the lost opportunities for innovation that poverty creates. Lots of smart people who want to make a difference become scientists, or try to work as teachers or on improving education policy, and lord knows there are plenty of people who become political party operatives out of a conviction that the moral consequences of the party’s platform are good. All of which is to say: Maybe effective altruists aren’t that special, or at least maybe we don’t have access to that many specific and weird conclusions about how best to help the world. If the far future is what matters, and generally trying to make the world work better is among the best ways to help the far future, then effective altruism just becomes plain ol’ do-goodery.\*

#### Commercial space is key to tourism---that solves aerospace competitiveness.

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Introduction and formulation of the study’s problema tic. Spaceflight is expensive, especially given that the cost of building rockets and spacecraft are high due to the engineering and materials involved. It is clear here that there is a need of democratisation of the spaceflight, the relationship between the cost reduction of the access to space and a rise of interests of more potential customers is an actual trend. A relationship that is being redefined by the rapidly advancing fields of commercial spaceflight and space tourism. A greater attention to space tourism and commercial spaceflights is required in order to develop a coherent, long-term conceptualization of the implications of modern mobility for sustainability. With the rise of the tourism in the aerospace industry, new technological approaches have been explored to reduce considerably the costs of access to space and may lead to the improvement of spaceflight technology. To understand this fact, in section 1 we will see how the space tourism can bring some improvements in the standards of the aerospace industry, afterwards in section 2 we will see which kind of economic models and marketing approaches can be put in place in order to have a better management of assets and an increase in the interest of the public in this new branch of tourism. Analysis of recent research and publications The economy of the aeronautics and space industry is based on the traditional trading model of selling products at a price above its costs. The final customer buys a good, which the supplier produces and delivers. Manufacturers of aircraft purchase engines and equipment and sell a directly assembled product to armies, airlines, and rental companies. They do not sell to passengers, who buy the service from the airlines. This classical model knows certain specificities here. This industry has a mastery of technologies that are directly exploitable by the military. As a result, States are heavily involved in its research and development work and many of its projects are under the cover of “Secret-Defence”. It requires heavy investment in the production tool. That is why it is financed in part by state military programs and purchasing options for its clients. The aeronautics and space sector is driven by different demands. These of the States, which wish to dispose of the armaments furnished by this industry. These of people who travel by plane for business or leisure. These of companies that ship goods through the air. And finally, these of organizations of all types that work to conquer space. History has demonstrated that as technology has evolved and states have increasingly recognized the potential of outer space, the range of activities planned for outer space has proliferated. In addition, the commercial prospects offered by outer space have led to significant participation by private enterprises. If its state anchor refers to the concept of “industry of sovereignty”, it has progressively internationalized to rest on markets and processes today globalized. If companies are granted access in space, this will create opportunities for diversification, which will ease the tension between companies, and pressure on companies to encourage wasteful practices like persuading the consumer to consume more than what is necessary. The development of space tourism will benefit people socially. This will help to break down the tension that many people feel about the future due to projections of the limited resources of the earth. The cost of outer space travel is steep and wasteful from an economic point of view. But space tourism will also make a potentially critical contribution in overcoming the pressures of deflation in the world that is caused by the oversupply in traditional industries and the slow development of new industries. The fundamental misconception by economists about the future role of commercial space travel is essential because of the relation to the present condition of the global economy in order to further understand this; it is required to first understand the basic pattern of business development all around the world. As the name implies, space tourism is travelling to space as a destination for recreational, leisure or business purposes. Faced with the environmental challenge, companies operating in this sector will have to renew themselves and respond to the new challenges in terms of technical innovation imposed by the establishment of assets promoting the emergence of space tourism. The space tourism market is a niche market with a limited number of vendors. The market is still in its development stage where companies are trying to enhance their spaceflight technology. Growing competition, rapid advances in technology, frequent changes in government policies, public consequence, and environmental regulations are currently the major factors that challenge the growth of the players in this global market. Space enthusiasts are delighted at this flurry of renewed interest, and the fact that China has succeeded in sending a person into orbit merely heightens the stakes and intensifies the competition. In recent years, some private enterprises have been approaching Space flight with a relatively low-cost philosophy, in great contrast with the one followed by government agencies in past years. In fact, some examples of small reusable airplane-like vehicles have been developed to perform sub-orbital missions, which could represent a first step towards a safer, more comfortable and less expensive access to Space in the near future. The main idea is to merge part of technological solutions developed for aeronautical and atmospheric re-entry purposes in order to design such vehicles. But to see in these initiatives the dawn of a space tourism age would be making a leap of faith. True, space’s return to the top of the international policy agenda has to be welcomed, not least for its commercial potential. The recent growth of activities towards developing passenger space travel services is very promising; however, there is a widespread but mistaken idea that space tourism will remain a small-scale activity of the very wealthy. The truth is that having been delayed for over three decades by government space agencies’ failure to develop more than a small fraction of the commercial potential of space, the start of space travel services is long overdue, and so they are capable of growing rapidly into a major new industry. That is, the technical and business know-how exists to enable space tourism to grow to a turnover of 100 billion Euros/year within a few decades if it receives the public support of even 10% of space agencies budgets. This development would sharply reduce the cost of accessing the resources of space, which could prevent the spread of the “resource wars” which have begun so ominously. No activity, therefore, offers greater economic benefits than the rapid development of low-cost space tourism services. A range of government policies should be revised to reflect this.

#### Aerospace decline causes global nuclear war

Pfaltzgraff 10 – Robert L, Shelby Cullom Davis Professor of International Security Studies at. The Fletcher School of Law and Diplomacy and President of the Institute for Foreign Policy Analysis, et al., Final Report of the IFPA-Fletcher Conference on National Security Strategy and Policy, “Air, Space, & Cyberspace Power in the 21st-Century”, p. xiii-9

Deterrence Strategy In stark contrast to the bipolar Cold War nuclear setting, today’s security environment includes multiple, independent nuclear actors. Some of these independent nuclear weapons states are potential adversaries, some are rivals, and some are friends, but the initial decision for action by any one of them may lie beyond U.S. control. The United States may need to influence, signal, and restrain enemies, and it may need to continue to provide security guarantees to non-nuclear friends and allies. America may also face catalytic warfare, where, for example, a U.S. ally such as Israel or a third party such as China could initiate action that might escalate to a nuclear exchange. Although the United States would not be a party to the nuclear escalation decision process, it could be drawn into the conflict. Compared to a bipolar world, very little is known about strategic nuclear interaction and escalation in a multipolar world. The U.S. nuclear deterrent must restrain a wider variety of actors today than during the Cold War. This requires a range of capabilities and the capacity to address specific challenges. The deterrent must provide security guarantees and assurance sufficient to prevent the initiation of catalytic warfare by an ally, while deterring an adversary from resorting to nuclear escalation. America may also need simultaneously to deter more than one other nuclear state. Deterrence requirements include four critical elements: early warning, C2, delivery systems, and weapons. The Air Force plays an indispensable role in furnishing the U.S. early warning system in its entirety through satellites and radar networks. In command and control, infrastructure is provided by the Air Force, including Milstar satellites and, in the future, advanced extremely high frequency (AEHF) satellites. In the area of delivery systems and weapons, two-thirds of the strategic triad – intercontinental ballistic missiles (ICBMs) and bombers – is furnished by the Air Force and its Global Strike Command. U.S. Overseas Basing and the Anti-Access/Area-Denial Threat The increased availability of anti-access/area-denial assets coupled with growing threats to the sea, air, space, and cyberspace commons are challenging the power projection capabilities of the United States. These threats, in the form of aircraft and long-range missiles carrying conventional or nuclear munitions, present problems for our overseas bases. States such as North Korea, China, and Iran jeopardize the notion that forward-deployed U.S. forces and bases will be safe from enemy attack. Consequently, the United States must create a more flexible basing structure encompassing a passive and active defense posture that includes these features: dispersal, hardening, increased warning time of attack, and air defenses. Simultaneously, the United States must continue to develop long-range, offensive systems such as low-observable manned and remotely piloted strike aircraft, precision missiles, and intelligence, surveillance, and reconnaissance (ISR) platforms to penetrate heavily defended A2/AD environments. This approach will increase the survivability of U.S. forward-deployed assets and power projection capabilities and thus bolster deterrence and U.S. guarantees to America’s allies and friends. Asymmetric Challenges The increasing number of actors gaining access to advanced and dual-use technologies augments the potential for asymmetric attacks against the United States and its allies by those who are unable to match U.S. military capabilities. Those actors pose increasing challenges to the ability of the United States to project power through the global commons. Such attacks could target specific U.S. vulnerabilities, ranging from space assets to the financial, transportation, communications, and/or energy infrastructures, and to the food and water supply, to mention only the most obvious. Asymmetric attacks denying access to critical networks and capabilities may be the most cost-effective approach to circumventing traditional U.S. force advantages. The USAF and DoD must develop systems and technologies that can offset and defend against asymmetric capabilities. This will require a robust R&D program and enhanced USAF cooperation with its sister services and international partners and allies. Space Dominance Space is increasingly a contested domain where U.S. dominance is no longer assured given the growing number of actors in space and the potential for kinetic and non-kinetic attacks, including ASAT weapons, EMP, and jamming. As a result, the United States must protect vital space-based platforms and networks by reducing their vulnerability to attack or disruption and increasing the country’s resilience if an attack does occur. Required steps include hardening and incorporating stealth into next generation space systems and developing rapid replenishment capacity (including micro-satellite technologies and systems and new launch capabilities). At the same time, America must reduce its dependence on space capabilities with air-based substitutes such as high altitude, long endurance, and penetrating ISR platforms. Increased cooperation among the services and with U.S. allies to develop such capabilities will also be paramount. Cyber Security Cyber operations are vital to conducting USAF and joint land, sea, air, and space missions. Given the significance of the cyber threat (private, public, and DoD cyber and information networks are routinely under attack), the United States is attempting to construct a layered and robust capability to detect and mitigate cyber intrusions and attacks. The USAF’s cyber operations must be capable of operating in a contested cyber domain to support vital land, sea, air, and space missions. USAF cyberspace priorities include developing capabilities to protect essential military cyber systems and to speed their recovery if an attack does occur; enhancing the Air Force’s capacity to provide USAF personnel with the resolution of technical questions; and training/recruitment of personnel with cyber skills. In addition, the USAF and DoD need to develop technologies that quickly and precisely attribute attacks in cyberspace. Cyber attacks can spread quickly among networks, making it extremely difficult to attribute their perpetrator, and therefore to develop a deterrence strategy based on retaliation. In addition, some cyber issues are in the legal arena, including questions about civil liberties. It is likely that the trend of increased military support to civil authorities (for example, in disaster relief operations) will develop in the cyber arena as well. These efforts will entail greater service, interagency, international, and private-sector collaboration. Organizational Change and Joint Force Operations To address growing national security challenges and increasing fiscal constraints, and to become more effective, the joint force needs to adapt its organizations and processes to the exigencies of the information age and the security setting of the second decade of the twenty-first century. This entails developing a strategy that places increased emphasis on joint operations in which each service acts in greater concert with the others, leverages capacities across the services (two land services, three naval services, and five air services) without duplicating efforts, and encourages interoperability. This would provide combatant commanders (CCDRs) with a greater range of capabilities, allowing heightened flexibility to use force. A good example of this approach is the Air-Sea Battle concept being developed jointly by the Air Force and Navy, which envisions heightened cooperation between the two services and potentially with allies and coalition partners. Intelligence, Surveillance, and Reconnaissance Capabilities There is an increasing demand for ISR capabilities able to access and persist in contested airspace in order to track a range of high-value mobile and hard-to-find targets, such as missile launchers and underground bunkers. This increases the need for stealthy, survivable systems and the development of next-generation unmanned platforms. The USAF must continue to emphasize precision targeting, both for strike and close-air-support missions. High-fidelity target identification and discrimination enabled by advanced radars and directed-energy systems, including the ability to find, track, and target individuals within a crowd, will provide battlefield commanders with improved options and new opportunities for leveraging joint assets. Engagement and International Security Cooperation Allies and coalition partners bring important capabilities from which the USAF and other services have long benefited. For example, allies and coalition partners can provide enhanced situational awareness and early warning of impending crises as well as assist in understanding the interests, motivations, traditions, and cultures of potential adversaries and prospective coalition partners. Moreover, foreign partner engagement and outreach are an avenue to influence partner and adversary perspectives, thus shaping the environment in ways favorable to U.S. national security interests. Engagement also may be a key to realizing another Air Force and joint priority: to sustain or gain access to forward operating bases and logistical infrastructure. This is particularly important given the growing availability of A2/AD assets and their ability to impede U.S. power projection capabilities. Procurement Choices and Affordability The USAF needs to field capabilities to support current operations and pressing missions while at the same time pursuing promising technologies to build the force of the future. Affordability, effectiveness, time urgency, and industrial base issues inevitably shape procurement choices and reform. The Air Force must maintain today’s critical assets while also allocating resources to meet future needs. Given the long lifespan anticipated for many weapon systems, planners need to make the most reliable cost estimates and identify problems at the outset of a weapons system’s development phase so that they can be corrected as early and cost-effectively as possible. Support to Civil Authorities As evidenced in the aftermath of the 2010 earthquakes in Haiti and Chile (the Chile earthquake hit after this conference), the USAF has a vital role to play in the U.S. response to international relief operations and support to civil authorities. In Haiti, the USAF reopened the airport and deployed contingency response elements, while also providing ISR support for the joint forces in the theater. In Chile, USAF satellite communication capabilities were critical to the recovery and relief efforts. USAF civil support roles are likely to grow to include greater use of the Reserve Components. Consequently, USAF planners should reassess the active and reserve component mix of forces and capabilities to identify potential mobilization and requirement shortfalls. CLOSING CONFERENCE THOUGHTS A recurring conference theme was the need for the USAF to continue to examine specific issues of opportunity and vulnerability more closely. For example, a future initiative could include focused working groups that would examine such questions and issues as: • How can air, space, and cyberspace capabilities best support deterrence, preserve U.S. freedom of action, and support national objectives? • How should the USAF leadership reconceptualize its vision, institutional identity, and force posture to align as closely as possible with the future national security setting? • What is the appropriate balance between high-end and low-end air and space capabilities that will maximize military options for national decision makers, given emerging threats and fiscal constraints? • What are the opportunities, options, and tradeoffs for investment and divestment in science and technology, infrastructure, and programmed capabilities? • What are additional interdependent concepts, similar to Air-Sea Battle, that leverage cross-service investments to identify and foster the development of new joint capabilities? • What are alternative approaches to officer accessions and development to support shifting and emerging Air Force missions, operations, and force structure, including cyber warfare? • How can the USAF best interact with Congress to help preserve or refocus the defense-industrial base as well as to minimize mandates and restrictions that weigh on future Air Force investments? Finally, the USAF must continue to be an organization that views debate, as the Chief of Staff of the Air Force put it in his opening conference address, “…as the whetstone upon which we sharpen our strategic thinking.” This debate must also be used in pursuit of political support and to ensure that the USAF maintains and develops critical capabilities to support U.S. national security priorities. The 38th IFPA-Fletcher Conference on National Security Strategy and Policy was conceived as a contribution to that debate. Almost a century has passed since the advent of airpower and Billy Mitchell’s demonstration of its operational potential with the sinking of the Ostfriesland on July 21, 1921. For most of that time, the United States has benefitted from the rapid development of air and space power projection capabilities, and, as a result, it has prevailed in successive conflicts, contributed to war deterrence and crisis management, and provided essential humanitarian relief to allies and friends around the world. As we move into the second decade of the twenty-first century, the U.S. Air Force (USAF), like its service counterparts, is re-assessing strategies, operational concepts, and force structure. Across the conflict spectrum, security challenges are evolving, and potential adversaries–state and non-state actors–are developing anti-access and other asymmetric capabilities, and irregular warfare challenges are becoming more prevalent. The potential exists for “hybrid” warfare in which state adversaries and/or non-state actors use a mix of conventional and unconventional capabilities against the United States, a possibility made more feasible by the diffusion of such capabilities to a larger number of actors. Furthermore, twenty-first-century security challenges and threats may emanate from highly adaptive adversaries who ignore the Geneva Conventions of war and use military and/or civilian technologies to offset our military superiority. As it develops strategy and force structure in this global setting, the Air Force confronts constraints that will have important implications for budget and procurement programs, basic research and development (R&D), and the maintenance of critical skills, as well as recruitment, education, training, and retention. Given the dynamic nature of the security setting and looming defense budget constraints, questions of where to assume risk will demand bold, innovative, and decisive leadership. The imperative for joint operations and U.S. military-civilian partnerships is clear, underscoring the need for a whole-of-government and whole-of-society approach that encompasses international and non-governmental organizations (NGOs). THE UNITED STATES AS AN AEROSPACE NATION: CHALLENGES AND OPPORTUNITIES In his address opening the conference, General Norton A. Schwartz, Chief of Staff of the Air Force (CSAF), pointed out how, with its inherent characteristics of speed, range, and flexibility, airpower has forever changed warfare. Its advent rendered land and maritime forces vulnerable from the air, thus adding an important new dimension to warfare. Control of the air has become indispensable to national security because it allows the United States and friendly forces to maneuver and operate free from enemy air attack. With control of the air the United States can leverage the advantages of air and space as well as cyberspace. In these interdependent domains the Air Force possesses unique capabilities for ensuring global mobility, long-range strike, and intelligence, surveillance, and reconnaissance (ISR). The benefits of airpower extend beyond the air domain, and operations among the air, land, maritime, space, and cyber domains are increasingly interdependent. General Schwartz stated that the Air Force’s challenge is to succeed in a protracted struggle against elements of violent extremism and irreconcilable actors while confronting peer and near-peer rivals. The Air Force must be able to operate with great precision and lethality across a broad spectrum of conflict that has high and low ends but that defies an orderly taxonomy. Warfare in the twenty-first century takes on a hybrid complexity, with regular and irregular elements using myriad tools and tactics. Technology can be an enabler but can also create weaknesses: adversaries with increased access to space and cyberspace can use emerging technologies against the United States and/or its allies. In addition, the United States faces the prospect of the proliferation of precision weapons, including ballistic and cruise missiles as well as increasingly accurate mortars, rockets, and artillery, which will put U.S. and allied/coalition forces at risk. In response to mounting irregular warfare challenges American leaders have to adopt innovative and creative strategies. For its part, the USAF must develop airmen who have the creativity to anticipate and plan for this challenging environment. Leadership, intellectual creativity, capacity, and ingenuity, together with innovative technology, will be crucial to addressing these challenges in a constrained fiscal environment. System Versatility In meeting the broad range of contingencies – high, low, regular, irregular, and hybrid – the Air Force must maintain and develop systems that are versatile, both functionally (including strike or ISR) and in terms of various employment modes, such as manned versus remotely piloted, and penetrating versus stand-off systems. General Schwartz emphasized the need to be able to operate in conflict settings where there will be demands for persistent ISR systems able to gain access to, and then loiter in, contested or denied airspace. The targets to be identified and tracked may be mobile or deeply buried, of high value, and difficult to locate without penetrating systems. General Schwartz also called attention to the need for what he described as a “family of systems” that could be deployed in multiple ways with maximum versatility depending on requirements. Few systems will remain inherently single purpose. Indeed, he emphasized that the Air Force must purposefully design versatility into its new systems, with the majority of future systems being able to operate in various threat environments. As part of this effort further joint integration and inter-service cooperation to achieve greater air-land and air-sea interoperability will continue to be a strategic necessity. Space Access and Control Space access, control, and situational awareness remain essential to U.S. national security. As potential rivals develop their own space programs, the United States faces challenges to its unrestricted access to space. Ensuring continuing access to the four global commons – maritime, air, space, and cyberspace – will be a major challenge in which the USAF has a key role. The Air Force has long recognized the importance of space and is endeavoring to make certain that U.S. requirements in and for space are met and anticipated. Space situational awareness is vital to America’s ability to help evaluate and attribute attacks. Attribution, of course, is essential to deterrence. The USAF is exploring options to reduce U.S. dependence on the Global Positioning System (GPS), which could become vulnerable to jamming. Promising new technologies, such as “cold atoms,” pseudolites, and imaging inertial navigation systems that use laser radar are being investigated as means to reduce our vulnerability. Cyber Capabilities The USAF continues to develop cyber capabilities to address opportunities and challenges. Cyber threats present challenges to homeland security and other national security interests. Key civilian and military networks are vulnerable to cyber attacks. Preparing for cyber warfare and refining critical infrastructure protection and consequence management will require new capabilities, focused training, and greater interagency, international, and private sector collaboration. Challenges for the Air Force General Schwartz set forth a series of challenges for the Air Force, which he urged conference participants to address. They included: • How can the Air Force better address the growing demand for real-time ISR from remotely piloted systems, which are providing unprecedented and unmatched situational awareness? • How can the USAF better guarantee the credibility and viability of the nation’s nuclear forces for the complex and uncertain security environment of this century? • What is the way ahead for the next generation of long-range strike and ISR platforms? What trade-offs, especially between manned and unmanned platforms, should the USAF consider? How can the USAF improve acquisition of such systems? How can the USAF better exploit the advantage of low-observables? • How can the Air Force better prepare itself to operate in an opposed network environment in which communications and data links will be challenged, including how to assure command and control (C2) in bandwidth-constrained environments? • In counter-land operations, how can the USAF achieve improved target discrimination in high collateral damage situations? • How should the USAF posture its overseas forces to ensure access? What basing structure, logistical considerations, andprotection measures are required to mitigate emerging anti-access threats? • How can the Air Force reduce its reliance on GPS to ensure operations in a GPS-denied environment? • How can the USAF lessen its vulnerability to petroleum shortages, rising energy prices, and resulting logistical and operational challenges? • How can the Air Force enhance partnerships with its sister services and the interagency community? How can it better collaborate with allies and coalition partners to improve support of national security interests? These issues were addressed in subsequent conference sessions. The opening session focused on the multidimensional and dynamic security setting in which the Air Force will operate in the years ahead. The session included a discussion of the need to prioritize necessary capabilities and to gauge “acceptable risks.” Previous Quadrennial Defense Reviews (QDRs) rested on the basic assumption that the United States would be able to support operations simultaneously or nearly simultaneously in two major regional contingencies, with the additional capacity to respond to smaller disaster-relief and/or stability operations missions. However, while the 2010 QDR1 maintains the need for U.S. forces to operate in two nearly simultaneous major wars, it places far greater emphasis on the need to address irregular warfare challenges. Its focus is maintaining and rebalancing U.S. force structure to fight the wars in which the United States is engaged today while looking ahead to the emerging security setting. The QDR further seeks to develop flexible and tailored capabilities to confront an array of smaller-scale contingencies, including natural disasters, perhaps simultaneously, as was the case with the war in Afghanistan, stability operations in Iraq, and the Haiti relief effort. The 2010 QDR highlights important trends in the global security environment, especially unconventional threats and asymmetric challenges. It suggests that a conflict with a near-peer competitor such as China, or a conflict with Iran, would involve a mix, or hybrid, of capabilities that would test U.S. forces in very different ways. Although predicting the future security setting is a very difficult if not an impossible exercise, the 2010 QDR outlines major challenges for the United States and its allies, including technology proliferation and diffusion; anti-access threats and the shrinking global basing infrastructure; the possibility of weapons of mass destruction (WMD) use against the U.S. homeland and/or against U.S. forces abroad; critical infrastructure protection and the massed effects of a cyber or space attack; unconventional warfare and irregular challenges; and the emergence of new issue areas such as Arctic security, U.S. energy dependence, demographic shifts and urbanization, the potential for resource wars (particularly over access to water), and the erosion or collapse of governance in weak or failing states. TECHNOLOGY DIFFUSION Technology proliferation is accelerating. Compounding the problem is the reality that existing multilateral and/or international export regimes and controls have not kept pace with technology, and efforts to constrain access are complicated by dual-use technologies and chemical/biological agents. The battlefields of the future are likely to be more lethal as combatants take advantage of commercially based navigation aids for precision guidance and advanced weapons systems and as global and theater boundaries disappear with longer-range missile systems becoming more common in enemy arsenals. Non-state entities such as Hezbollah have already used more advanced missile systems to target state adversaries. The proliferation of precision technologies and longer-range delivery platforms puts the United States and its partners increasingly at risk. This proliferation also is likely to affect U.S. operations from forward operating locations, placing additional constraints on American force deployments within the territories of allies. Moreover, as longer-range ballistic and cruise missiles become more widespread, U.S. forces will find it increasingly difficult to operate in conflicts ranging from irregular warfare to high-intensity combat. As highlighted throughout the conference, this will require that the United States develop and field new-generation low-observable penetration assets and related capabilities to operate in non-permissive environments. PROLIFERATION TRENDS The twenty-first-century security setting features several proliferation trends that were discussed in the opening session. These trends, six of which were outlined by Dr. Robert L. Pfaltzgraff, Jr., President of the Institute for Foreign Policy Analysis, and Shelby Cullom Davis Professor of International Security Studies, The Fletcher School, Tufts University, framed subsequent discussions. First, the number of actors–states and armed non-state groups–is growing, together with strategies and capabilities based on more widely available technologies, including WMD and conventional weapons. This is leading to a blurring of categories of warfare that may include state and non-state actors and encompass intra-state, trans-state, and inter-state armed conflict as well as hybrid threats. Second, some of these actors subscribe to ideologies and goals that welcome martyrdom. This raises many questions about dissuasion and deterrence and the need to think of twenty-first-century deterrence based on offensive and defensive strategies and capabilities. Third, given the sheer numbers of actors capable of challenging the United States and their unprecedented capabilities, the opportunity for asymmetric operations against the United States and its allies will grow. The United States will need to work to reduce key areas of vulnerability, including its financial systems, transportation, communications, and energy infrastructures, its food and water supply, and its space assets. Fourth, the twenty-first-century world contains flashpoints for state-to-state conflict. This includes North Korea, which possesses nuclear weapons, and Iran, which is developing them. In addition, China is developing an impressive array of weaponry which, as the Commander of U.S. Pacific Command stated in congressional testimony, appears “designed to challenge U.S. freedom of action in the region and, if necessary, enforce China’s influence over its neighbors – including our regional allies and partners’ weaponry.”2 These threats include ballistic missiles, aircraft, naval forces, cyber capabilities, anti-satellite (ASAT) weapons, and other power-projection capabilities. The global paradigm of the twenty-first century is further complicated by state actors who may supply advanced arms to non-state actors and terrorist organizations. Fifth, the potential for irregular warfare is rising dramatically with the growth of armed non-state actors. The proliferation of more lethal capabilities, including WMD, to armed non-state actors is a logical projection of present trends. Substantial numbers of fractured, unstable, and ungoverned states serve as breeding grounds of armed non-state actors who will resort to various forms of violence and coercion based on irregular tactics and formations and who will increasingly have the capabilities to do so. Sixth, the twenty-first-century security setting contains yet another obvious dimension: the permeability of the frontiers of the nation state, rendering domestic populations highly vulnerable to destruction not only by states that can launch missiles but also by terrorists and other transnational groups. As we have seen in recent years, these entities can attack U.S. information systems, creating the possibility of a digital Pearl Harbor. Taken together, these trends show an unprecedented proliferation of actors and advanced capabilities confronting the United States; the resulting need to prepare for high-end and low-end conflict; and the requirement to think of a seamless web of threats and other security challenges extending from overseas to domestic locales. Another way to think about the twenty-first-century security setting, Dr. Pfaltzgraff pointed out, is to develop scenarios such as the following, which are more illustrative than comprehensive: • A nuclear Iran that engages in or supports terrorist operations in a more assertive foreign policy • An unstable Pakistan that loses control of its nuclear weapons, which fall into the hands of extremists • A Taiwan Straits crisis that escalates to war • A nuclear North Korea that escalates tensions on the Korean peninsula What all of these have in common is the indispensable role that airpower would play in U.S. strategy and crisis management.

## Off

#### CP: States should ban rocket propellants that produce alumina particles in the stratosphere or deposit black soot in the stratosphere.

#### There are empirical alternatives, and the CP solves ozone depletion

Mortillaro 21 (Nicole Mortillaro, Senior Reporter, Science, She is the editor of the Journal of the Royal Astronomical Society of Canada and the author of several books., 4/22/21, Canadian Broadcasting Corporation, “Rocket launches could be affecting our ozone layer, say experts”, <https://www.cbc.ca/news/science/rocket-launches-environment-1.5995252>, Accessed 1/27/22, HKR-RKT)

Black soot in the atmosphere The stratosphere is an important weather driver for Earth's systems, and that's where some particles from rocket launches are ending up. The ozone layer, which helps protect us from the sun's harmful ultraviolet rays, is also located in the stratosphere. In 1990, the Montreal Protocol was signed into law, banning harmful ozone-depleting substances, such as chlorofluorocarbons (CFCs), used in things like refrigerators and air conditioners, after it was revealed that the ozone layer was being stripped away by these chemicals. While the protocol touched on airlines, there was no mention of the aerospace industry. But now some industry experts are concerned that with no oversight, we could be in for a problem. There are different types of rocket propellants. Some, like liquid oxygen and liquid hydrogen, produce mainly water vapour and have little environmental impact. These were used in past shuttle launches and even in the Apollo-era Saturn V vehicles. Then there are those that produce alumina particles in the stratosphere, such as those in solid rocket boosters, which were also used in past shuttle launches, and are still being used today by some launch companies. Finally, there are those that deposit black soot in the stratosphere, such as kerosene used in SpaceX's Falcon 9 and Russia's Soyuz rockets. It's the alumina and black soot that is most concerning to experts.

# Case

## T/l

#### Frame the advantage for specificity – all of the cards that mention space tourism simply don’t make any brink / tipping point arguments and don't warrant why space tourism uniquely key - maybe there is some more soot in the stratosphere or a marginal increase in debris - hold the 1AR and the 2AR to a high degree of explanation and force them to warrant why tourism is key identify which evidence actually makes a reverse causal claim about tourism in particular

## ADV 1

#### Ozone shot now, Chemicals take Decades to dissipate, and the major problem is agricultural copper not space

Sanders 1-14 [Robert Sanders,, 1-14-2022, "Copper-based chemicals may be contributing to ozone depletion," phys.org, https://phys.org/news/2022-01-copper-based-chemicals-contributing-ozone-depletion.html]

Earth's ozone layer is critical to protecting us from cancer-causing ultraviolet light from the sun, but chemicals containing chlorine and bromine—such as CFCs and halons—were found in the 1980s to destroy the ozone, creating thinner layers in the stratosphere that let in more of the dangerous radiation. Despite a ban on production of CFCs and halons, the major sources of halogens, the ozone layer has yet to repair itself. Last year, the hole in the ozone over Antarctica was about as bad as it's ever been, Rhew said.

Ozone-destroying chemicals take decades to dissipate

The persistence of the ozone hole is, for the most part, due to the persistence of banned ozone-depleting compounds, which take decades to dissipate in the stratosphere. But some ozone-depleting chemicals are still being emitted. Even some replacements for banned refrigerants are coming under scrutiny.

Among the major contributors today are methyl chloride and methyl bromide. One atom of bromine is 50 times more destructive to ozone than one atom of chlorine.

Though methyl bromide is banned for use as an agricultural soil fumigant, it is still used as a pesticide for quarantine and pre-shipment of agricultural products. And methyl chloride is used as a chemical feedstock, although most of its emissions are believed to be from biomass burning or natural in origin. But the total amount of these methyl halides produced each year still do not add up to the observed yearly addition of these chemicals to the atmosphere, a fact that has puzzled scientists for more than 20 years.

About one-third of the methyl bromide and methyl chloride in the atmosphere comes from unknown sources, Rhew said. The new findings suggest that copper is an important, if not the major, source of the missing methyl bromide and methyl chloride.

"We've banned methyl bromide, but are other changes that we're making in the environment causing large emissions of this compound into the atmosphere? With the increase in the use of copper, it appears that copper-catalyzed production is an increasing source, as well," Rhew said.

First author and former UC Berkeley doctoral student Yi Jiao, now a postdoctoral fellow at the University of Copenhagen in Denmark, noted that copper compounds are allowed on organic crops, a legacy of its use in farming since the 1700s, including as a major antifungal agent in the Bourdeax mixture used since the 1880s in France to prevent downy mildew on grapes. Copper contamination of soils is a major issue today in Europe because of this history. The ozone-depleting power of copper is another cause for concern, the authors said.

"Please note that organic agriculture is not a major cause for ozone depletion. However, copper-based fungicides appear to have atmospheric side effects that might be considered in terms of overall environmental impact," Jiao tweeted this week. "With widespread use of copper in the environment, this potentially growing impact should be considered when predicting future halogen load and ozone recovery."

#### Warming goes the other way -blue

Loren 1AC Grush 18. Senior reporter. "Why it’s time to study how rocket emissions change the atmosphere". The Verge. 5-31-2018. https://www.theverge.com/2018/5/31/17287062/rocket-emissions-black-carbon-alumina-particles-ozone-layer-stratosphere

Every time a rocket launches, it produces a plume of exhaust in its wake that leaves a mark on the environment. These plumes are filled with materials that can collect in the air over time, potentially altering the atmosphere in dangerous ways. It’s a phenomenon that’s not well-understood, and some scientists say we need to start studying these emissions now before the number of rocket launches increases significantly. It’s not the gas in these plumes that’s most concerning. Some rockets do produce heat-trapping greenhouse gases, like carbon dioxide, but those emissions are negligible, according to experts. “The rocket business could grow by a factor of 1,000 and the carbon dioxide and water vapor emissions would still be small compared to other industrial sources,” Martin Ross, a senior project engineer at the Aerospace Corporation who studies the effects of rockets on the atmosphere, tells The Verge. Instead, it’s tiny particles that are produced inside the trail that we need to watch out for, Ross says. Small pieces of soot and a chemical called alumina are created in the wakes of rocket launches. They then get injected into the stratosphere, the layer of Earth’s atmosphere that begins six miles up and ends around 32 miles high. Research shows that this material may build up in the stratosphere over time and slowly lead to the depletion of a layer of oxygen known as the ozone. The ozone acts like a big shield, protecting Earth against the Sun’s harmful ultraviolet radiation. However, the magnitude of this ozone depletion isn’t totally known, says Ross. That’s why he and others at the Aerospace Corporation, a nonprofit that provides research and guidance on space missions, are calling for more studies. They say it’s especially important now since the private space industry is at the early stages of a launch revolution. Currently, the number of launches each year is relatively small, around 80 to 90, so the aerospace industry’s impact on the atmosphere is not much of a concern. But in a new paper published in April, Ross and his colleague Jim Vedda argue that as launches increase, policymakers will eventually want to know what kind of damage these vehicles are causing to the environment and if regulations are necessary. When that time comes, it will be better to have as much data as possible to make the best decisions. “It’s a call for more research in this area to know exactly what we’re putting into the upper atmosphere and in what quantities,” Vedda, a senior policy analyst at the Aerospace Corporation, tells The Verge. “So when the debates start, we have the good hard data that says, ‘Here’s a well-defined model of what’s actually happening.’” So far, the research we have about these emissions mostly comes from lab experiments, modeling, and some direct detections of rocket plumes. At the turn of the century, a few high-altitude planes equipped with sensors flew through plumes created by the Space Shuttle and other vehicles to figure out what was inside. Drifting plumes created by the Space Shuttle Atlantis. Image: NASA It turns out that all kinds of rockets produce these emissions, but some types of vehicles produce more than others. Rockets that run on solid propellants produce a higher amount of alumina particles, a combination of aluminum and oxygen that is white and reflective. Most orbital rockets don’t run on solid propellants these days, though some launch companies like the United Launch Alliance do add solid rocket boosters to vehicles to give them extra thrust. Meanwhile, rockets that run on liquid kerosene, a type of refined oil, produce more of the dark soot particles, what is known as black carbon. Kerosene is used as a propellant for rockets such as ULA’s Atlas V and SpaceX’s Falcon 9. Alumina and black carbon from rockets can stick around in the stratosphere for three to five years, according to Ross. As these materials collect high above the Earth, they can have interesting effects on the air. Black carbon forms a thin layer that intercepts and absorbs the sunlight that hits Earth. “It would act as a thin, black umbrella,” says Ross. That may help keep the lower atmosphere cool, but the intercepted energy from the Sun doesn’t just go away; it gets deposited into the stratosphere, warming it up. This warming ultimately causes chemical reactions that could lead to the depletion of the ozone layer. The reflective alumina particles can also affect the ozone but in a different way. Whereas the soot acts like a black umbrella, the alumina acts like a white one, reflecting sunlight back into space. However, chemical reactions occur on the surface of these white particles, which, in turn, destroy the ozone layer, Ross says. Black carbon and alumina have actually been proposed by scientists as possible geoengineering agents or tools for cooling down our warming climate. But while they may keep the lower atmosphere cool, geoengineering agents may have other unwanted side effects, too. They might interact with jet streams, causing droughts or more tropical storms. That’s why many scientists have criticized the idea of geoengineering to combat climate change. However, rockets are putting these particles into the air no matter what, and this byproduct of ozone loss is particularly concerning for Ross and Vedda. As the ozone diminishes, more of the Sun’s harmful radiation could reach the ground. These UVB rays can cause skin cancer and cataracts. “That’s what we need to understand — the ozone depletion aspect of this because protection of the ozone layer is an international imperative,” says Ross. The 1987 Montreal Protocol, for example, is an international agreement to phase out materials that deplete the ozone. Right now, Ross estimates that rocket launches around the world inject 10 gigagrams, or 11,000 tons, of soot and alumina particles into the atmosphere each year. But that number could be going up. SpaceX has vowed to increase the number of launches it does each year, and numerous other companies are going to start launching their own vehicles soon. What kind of impact that will have on the atmosphere is unclear. That’s why Ross and Vedda suggest the government and universities invest in a series of research programs, in which scientists collect more data on rocket particles from aircraft and satellites. “All of this plays into the scenario in which we’re envisioning a very significant increase in the number of launches, as these very large satellite constellations are deployed and as more nations get involved in space activities,” says Vedda. “Rocket emissions have been a pretty minuscule part of the emissions into the atmosphere, but this is going to change as the activity accelerates.” Vedda and Ross argue we should get ahead of the pollution issue before it has more drastic consequences, as we should have done with space debris. In the early days of spaceflight, no one was really concerned with how many spacecraft were put into space. But soon, experts recognized that this space debris could collide and build up over time, making low Earth orbit unusable someday. So now, there are regulations in place to prevent the problem from getting worse, but a lot of the damage had already been done. The researchers hope to be much more prepared about these rocket emissions: study as much as we can now, so we can make the best policy decisions in the future. “At some point, there will be a tipping point where all of a sudden, everybody says, ‘Wait a minute we need to understand this better,’” says Ross. “We want to be proactive before this tipping point occurs.”

#### Innovation key and warming goes the other way -blue

Martin 1AC ross & James Vedda 18. Martin Ross, Ph.D. planetary science from UCLA, senior project engineer in civil and commercial launch programs at the Aerospace Corporation; James Vedda, Ph.D. political science from the University of Florida, senior policy analyst at the Aerospace Corporation’s Center for Space Policy & Strategy. "Time To Clear The Air About Launch Pollution". SpaceNews. 7-3-2018. https://spacenews.com/op-ed-time-to-clear-the-air-about-launch-pollution/

In recent years, governments, intergovernmental organizations, and businesses have begun to focus on the challenge posed by orbital debris. As often seems to be the case, we appear to be a decade or two too slow in coming to consensus on the risks. If we had foreseen a half-century ago the challenges that orbital debris presents today, what would we have done differently? Combustion emissions from launch vehicles present the space industry with a comparable concern that we can begin to address now, before it grows and becomes a potential impediment to space access. Most human-generated pollution is concentrated on or near the surface of the Earth, whether on land, sea, or in the troposphere, the lowest layer of the atmosphere. However, rockets emit a variety of gases and particles directly into all levels of the stratosphere, the only industrial activity to do so. The stratosphere extends roughly from 10 to 50 kilometers above the Earth’s surface and contains the Earth’s ozone layer. The global civil aviation fleet generally cruises in the troposphere, only occasionally polluting the stratosphere directly. Among the most consequential emissions are soot and alumina, which are long-lived and accumulate in the stratosphere. These accumulations promote chemical reactions and absorption and scattering of sunlight that modify the composition and flow of radiation in the stratosphere. Ultimately, these processes reduce stratospheric ozone, warm the stratosphere, and cool the Earth’s surface. Little is known about these particle accumulations and their contributions to stratospheric ozone depletion and thermal perturbations because of a lack of consistent and focused research. Since 1987, emissions of ozone-depleting pollutants are highly regulated by international agreement through the Montreal Protocol on Substances That Deplete the Ozone Layer. Even with recent advances in reusability and the introduction of large launch vehicles and new launch sites around the globe, rocket launches occur irregularly so that concerns about the damage done to the ozone layer by rocket emissions have not elicited regulation. But with projections that the global launch rate will at least double in the coming decade, increased scrutiny under the Montreal Protocol is likely. Increased concerns about the environmental impact of rocket launches, provoked by perceptions of a rapidly growing launch industry, could result in international calls for launch limitations or the phase-out of propellants that the launch industry has come to depend on. The timing and intensity of a regulatory backlash as launch rates increase is impossible to predict accurately, especially because the science of rocket emissions is still not well understood. Rather than allow a legal and regulatory process to unfold in the absence of high-quality, peer-reviewed data, governments and the launch industry should conduct the scientific research needed to fill the knowledge gaps. This will allow the launch community to engage in future far reaching discussions regarding the impacts of rocket emissions with the support of empirical data and computer models that carry the imprimatur of the rocket engineering and atmospheric science communities. The launch industry has enjoyed freedom of action with respect to rocket engine emissions since the start of the space age. Studies of future launch architectures, market demand, and lifecycle costs rarely consider regulation of emissions as a potential future risk factor. Even when emissions are considered, the impacts are examined on a system-by-system basis; the cumulative impact of the global launch fleet is not acknowledged. The net impacts of the global launch industry, across all propellant types, are the parameters of interest to international regulators and, therefore, the global impacts create the regulatory risk. In addition to acknowledging the risks and potential unintended consequences of launch emissions for ozone and the flow of radiation in the atmosphere, the space industry must recognize the extent that other emerging actors may interact with the stratosphere. For example, so-called “geoengineering” or “climate intervention” schemes propose to inject particles into the stratosphere to intercept sunlight and mitigate the warming effects of carbon dioxide and other greenhouse gases. Regulation of such geoengineering activity is already under discussion. Space launch operators, as contributors of stratospheric emissions, could get swept up into these discussions, which involve the same types of particulate matter associated with rocket emissions. Any resulting regulations or guidelines must include adequate consideration of launch activities, which will require a better understanding of rocket emissions than we have today. To improve that understanding, industry should encourage and support scientific research on rocket engine emissions and how they affect the atmosphere. There has been little research to date. The few research papers that have appeared in recent decades mostly point out the knowledge gaps rather than add to the knowledge base. The research has been unfocused, disorganized, and not suited to the needs of the launch industry. As it stands today, the scientific community can predict ozone depletion attributable to rocket emissions to no better than an order of magnitude. In an environment of growing launch rates, new propellants, larger, reusable launch vehicles, and the emergence of other stratospheric polluters, this is not sufficient. Lack of accurate information inevitably invites distorted competitive claims and unwarranted and overly restrictive regulation. A vigorous research program would be guided by the goal to collect high confidence information and data that describe rocket emissions as inputs into global atmosphere models and would include the following components: All of the instrumentation, models, and expertise to carry out this research already exists within the engineering and scientific communities. The in situ and test stand measurements would validate combustion and plume models. Validated models permit the development of emission profiles for particular rocket engine types. These profiles, with various growth assumptions, would be used to construct global emission projections. Finally, the global emissions scenarios would provide data to construct input profiles for modern three-dimensional whole atmospheric chemistry and climate models in order to estimate ozone loss, climate forcing, and a variety of secondary effects such as changes in the global circulation and cloud formation. A policy to promote objective and vigorous research, across the full range of propellant types, will provide the space industry with the information required to take ownership of the problem and exert strong influence on the future debate. By accepting the reality of the risk to freedom of action presented by rocket emissions, and promoting a full and complete scientific understanding of the global impacts, the industry can best inoculate itself from attempts to regulate or limit launch development and operations and disassociate itself from other polluters. There is historical precedent for such an approach. In order to promote supersonic civil aviation development, during the 1990s NASA partnered with the aviation industry to carry out the High Speed Research (HSR) program. One of the goals of HSR was to understand how High Speed Civil Transport (HSCT) aircraft would affect stratospheric ozone. Earlier HSCT efforts in the 1970s were severely and wrongly hampered by knowledge gaps with respect to ozone depletion. HSR demonstrated the airframe, engine, and operational combinations that would minimize ozone impacts and permit (if the economics had been convincing) unregulated development and deployment. The launch industry should organize around a similar approach and partner with the scientific and regulatory communities to determine how space launch can freely develop while minimizing the risks of regulatory intervention. As launch rates and launch vehicle sizes increase, the impact of rocket emissions approaches a “tipping point” when international regulation becomes likely, probably beginning with efforts to protect the ozone layer or limit stratospheric pollution to ward off geoengineering. If the launch industry moves quickly to support the necessary scientific research and fully understand these impacts – in concert with other private-sector and government stakeholders – it is more likely that future regulation will be well-informed and as limiting as possible. As with other large-scale ventures, the application of specialized expertise is essential to anticipating the risks and needs of the enterprise and to managing the impacts on society. With irrefutable data, modeling, and analyses, emissions-related regulations or limitations can be anticipated and configured to ensure that space-based capabilities and systems continue to enhance and improve human life and extend the space industry’s progress made over the past six decades.

#### No extinction from ocean biod we'd only lose 5% of plankton and 30% of fish - still massive supply -blue

Michele M. 1AC Getsill 16. Professor in Residence and Chair of Political Science department at Colorado State University, Ph.D in Environmental Politics and Policy, “Impacts Of Stratospheric Ozone Depletion” http://www.climate-policy-watcher.org/hydrology/impacts-of-stratospheric-ozone-depletion.html

Stratospheric ozone depletion was recognized as an environmental problem in need of international attention because it impacts both humans and the natural environment. When stratospheric ozone levels decrease, the amount of UV-B reaching Earth's surface increases (WMO, 1995). The changes in UV-B radiation are highest at high and midlatitudes in both hemispheres while the increases are fairly small in the tropics (UNEP, 1994). Increased levels of UV-B affect human health, the productivity of plant and animal species, as well as the composition of ecosystems. Impacts on Human Health Ultraviolet exposure does have some benefits for humans. For example, it initiates the production of vitamin D3, which is believed to inhibit the growth of tumor cells (UNEP, 1996). However, the balance of evidence indicates that the effects of stratospheric ozone depletion on human health are negative. The major risks include increased incidence of eye diseases, skin cancer, and infectious diseases. When UV-B levels increase, two main organ systems are exposed: the eyes and the skin. The impacts of ozone depletion are mediated through these two systems (Longstreth et al„ 1995; UNEP, 1998). Evidence suggests that increased UV-B radiation exposure may be associated with an increase in the incidence of cataracts, a clouding of the lens of the eye (Longstreth et al, 1995; UNEP, 1998). One review of research on this problem reported that a 1% increase in stratospheric ozone depletion would result in a 0.6 to 0.8% increase in the incidence of cataracts (UNEP, 1994; see also UNEP, 1998). The most widely known impact of increased UV-B radiation on human health is skin cancer. UV-B radiation damages deoxyribonucleic acid (DNA), which may cause gene mutations and the formation of cancer cells. Some studies estimate that a sustained 10% decrease in average stratospheric ozone concentrations would result in 250,000 new cases of nonmelanoma skin cancer. This is in addition to the 1.2 million cases already reported each year (Longstreth et al., 1995; UNEP, 1996). Many animal species, such as cows, goats, sheep, cats, and dogs, are also at increased risk of developing skin cancer as a result of increased exposure to UV-B radiation (UNEP, 1998). In an assessment of the effect of the Montreal Protocol and its amendments in protecting the ozone layer, Slaper and his colleagues (1996) concluded these efforts will substantially decrease the growth rate of the incidence of skin cancer over the next century. They found that under a scenario where there were no limits on the production and consumption of ozone-depleting substances, there would be a quadrupling in the incidence of skin cancer by the year 2100. Under the provisions of the Montreal Protocol (a 50% reduction in the production of CFCs by 1999), a doubling in the incidence of skin cancer could be expected in that same period. In contrast, they found the Copenhagen Amendments scenario (a complete phase-out in the production of 21 ozone-depleting substances by January 1, 1996) would result in a 10% increase in skin cancer incidence, peaking in the year 2060. This study lends support to the importance of international efforts to combat stratospheric ozone depletion. Researchers believe that skin exposure to increased levels of UV-B radiation is also linked to modifications in the human immune system. As a result, the ability of the immune system to respond to certain infectious diseases, such as tuberculosis, leprosy, and Lyme disease, is impaired (UNEP, 1998). Longstreth and her colleagues (1995) predict that higher levels of UV-B will result in increased severity and duration of diseases such as lupus rather than an increase in their incidence. Impacts on Aquatic Systems The balance of evidence indicates that increased UV-B radiation can have harmful effects on many species of aquatic organisms and the aquatic systems in which they live (SCOPE, 1993; UNEP, 1998). For example, studies in the Antarctic have linked increased UV-B levels to reduced phytoplankton productivity. Phytoplankton are the basis for the oceanic food chain. UV-B radiation affects the DNA, photosynthesis, enzyme activity, and nitrogen incorporation of phytoplankton. Reduced phytoplankton productivity will likely lead to reduced productivity further up the food chain. It has been estimated that a 16% reduction in stratospheric ozone could lead to a 5% loss of phytoplankton causing a loss of 7 million tons of fish worldwide per year (Hader et al., 1995; UNEP, 1994, 1996). Figure 1 illustrates the effects of UV-B radiation on phytoplankton. Researchers have also found that enhanced UV-B radiation disrupts the early development of several species of fish, shrimp, and crabs, ultimately affecting their motility (Hader et al., 1995). In damaging aquatic organisms, stratospheric Effects of enhanced solar UV-B irradiation on phytoplai Motility Vertical distribution In the water column Global consequences Reduced carbon dioxide sink? Effects of enhanced solar UV-B irradiation on phytoplai Motility Vertical distribution In the water column Reduced biomass production? Competition between species? Temperature increase? Food web in the ocean? Figure 1 Effects of UV-B radiation on phytoplankton (from Hader et al, 1995, p. 178). ozone depletion has serious implications for the world food supply. Globally, 30% of the animal protein consumed by humans comes from the oceans. The percentage is much higher in developing countries (UNEP, 1998). These impacts are particularly worrisome in light of the growing world population. Impacts on Terrestrial Plants and Ecosystems Scientific understanding of the impact of enhanced UV-B on terrestrial plants and ecosystems is incomplete. The majority of studies have been conducted in growth chambers and greenhouses under controlled conditions, conditions that are often quite different from those experienced in the field. Thus, researchers contend it is necessary to use caution in making generalizations about the impacts of enhanced UV-B on terrestrial plants. The results of existing studies need to be verified under field conditions (Caldwell et al., 1995). Keeping the limitations of existing research in mind, it is still possible to make some statements about the effect of enhanced UV-B on terrestrial plants. It appears that increased UV-B radiation may have both direct and indirect effects on plants. Some plant species exhibit a reduction in leaf area and/or stem growth when exposed to higher levels of UV-B. In addition, UV-B may also inhibit photosynthesis, damage plant DNA, and alter the time of flowering as well as the number of flowers in some species. The latter has implication for the availability of pollinators and thus the reproductive capacity of plants (Caldwell et al., 1995; UNEP, 1998). The effects of UV-B on plants are not always straightforward but rather depend on the species, the cultivar, and developmental stage of the plants as well as mineral nutrition in the soil, drought, and local air pollutants (Caldwell et al., 1995; UNEP, 1998). In affecting plants, enhanced UV-B radiation may ultimately lead to changes in entire ecosystems. In nonagricultural ecosystems (e.g., forests and grasslands), the balance of plants may change as some species are less able to respond to increases in UV-B radiation and their productivity declines. At the same time, the productivity of more responsive species will likely increase. The overall species composition of ecosystems will change, as will species interactions and ecosystem dynamics (Caldwell et al., 1995; UNEP, 1998).

**Terrestrial activity triggers the impact anyway and this ev is 2 decades old -blue**

Robin Kundis 1AC Craig 3. Professor at Florida State University College of Law, leading environmental law scholar who has written important works on water and ocean and coastal issues, Winter 2003, “Taking Steps Toward Marine Wilderness Protection? Fishing and Coral Reef Marine Reserves in Florida and Hawaii,” 34 McGeorge L. Rev. 155, Lexis

The world’s oceans contain many resources and provide many services that humans consider valuable. “Occupying more than seventy percent of the Earth’s surface and ninety-five percent of the biosphere,” oceans provide food; marketable goods such as shells, aquarium fish, and pharmaceuticals; life support processes, including carbon sequestration, nutrient cycling, and weather mechanics; and quality of life, both aesthetic and economic, for millions of people worldwide. Indeed, it is difficult to overstate the importance of the ocean to humanity’s well-being: “The ocean is the cradle of life on our planet, and it remains the axis of existence, the locus of planetary biodiversity, and the engine of the chemical and hydrological cycles that create and maintain our atmosphere and climate.” Ocean and coastal ecosystem services have been calculated to be worth over twenty billion dollars per year, worldwide. In addition, many people assign heritage and existence value to the ocean and its creatures, viewing the world’s seas as a common legacy to be passed on relatively intact to future generations. (It continues…) More generally, “ocean ecosystems play a major role in the global geochemical cycling of all the elements that represent the basic building blocks of living organisms, carbon, nitrogen, oxygen, phosphorous, and sulfur, as well as other less abundant but necessary elements”. In a very real and direct sense, therefore, human degradation of marine ecosystems **impairs the planet’s ability to support life**. Maintaining biodiversity is often critical to maintaining the functions of marine ecosystems. Current evidence shows that, in general, an ecosystem’s ability to keep functioning in the face of disturbance is strongly dependent on its biodiversity, “indicating that more diverse ecosystems are more stable. Coral reef ecosystems are particularly dependent on their biodiversity. [\*265] Most ecologists agree that the complexity of interactions and degree of interrelatedness among component species is higher on coral reefs than in any other marine environment. This implies that the ecosystem functioning that produces the most highly valued components is also complex and that many otherwise insignificant species have strong effects on sustaining the rest of the reef system. n860 Thus, maintaining and restoring the biodiversity of marine ecosystems is critical to maintaining and restoring the ecosystem services that they provide. Non-use biodiversity values for marine ecosystems have been calculated in the wake of marine disasters, like the Exxon Valdez oil spill in Alaska. n861 Similar calculations could derive preservation values for marine wilderness. However, economic value, or economic value equivalents, should not be "the sole or even primary justification for conservation of ocean ecosystems. Ethical arguments also have considerable force and merit." n862 At the forefront of such arguments should be a recognition of how little we know about the sea - and about the actual effect of human activities on marine ecosystems. The United States has traditionally failed to protect marine ecosystems because it was difficult to detect anthropogenic harm to the oceans, but we now know that such harm is occurring - even though we are not completely sure about causation or about how to fix every problem. Ecosystems like the NWHI coral reef ecosystem should inspire lawmakers and policymakers to admit that most of the time we really do not know what we are doing to the sea and hence should be preserving marine wilderness whenever we can - especially when the United States has within its territory relatively pristine marine ecosystems that may be unique in the world.We may not know much about the sea, but we do know this much: **If we kill the ocean we kill ourselves, and** we will take most of **the biosphere** with us.

#### No extinction—we’re immune to disease at a species level but the squo is key to effective depop.

Adalja 16

[Amesh Adalja, infectious-disease physician at University of Pittsburgh. "Why Hasn't Disease Wiped out the Human Race?," Atlantic, 6-17-2016, https://www.theatlantic.com/health/archive/2016/06/infectious-diseases-extinction/487514/ // wyo-cjh]

“You’ll tell us when you’re worried, right?” That was the question posed to me countless times at the height of the 2014 West African Ebola outbreak. As an infectious disease physician, I was interviewed on outlets such as CNN, NPR, and Fox News about the dangers of the virus, and the answer I gave was always the same: “Ebola is a deadly, scary disease, but it is not that contagious. It will not find the U.S. or other industrialized nations hospitable.” In other words, no, I wasn’t worried—and not because I have a rosy outlook on infectious diseases. I’m well-aware of the damage these diseases are causing around the world: HIV, malaria, tuberculosis; the influenza pandemic that took the world by surprise in 2009; the anti-vaccine movement bumping cases of measles to an all-time post-vaccine-era high; antibiotic-resistant bacteria threatening to collapse the entire structure of modern medicine—all these, like Ebola, are continuously placing an enormous number of lives at risk. But when people ask me if I’m worried about infectious diseases, they’re often not asking about the threat to human lives; they’re asking about the threat to human life. With each outbreak of a headline-grabbing emerging infectious disease comes a fear of extinction itself. The fear envisions a large proportion of humans succumbing to infection, leaving no survivors or so few that the species can’t be sustained. I’m not afraid of this apocalyptic scenario, but I do understand the impulse. Worry about the end is a quintessentially human trait. Thankfully, so is our resilience. For most of mankind’s history, infectious diseases were the existential threat to humanity—and for good reason. They were quite successful at killing people: The 6th century’s Plague of Justinian knocked out an estimated 17 percent of the world’s population; the 14th century Black Death decimated a third of Europe; the 1918 influenza pandemic killed 5 percent of the world; malaria is estimated to have killed half of all humans who have ever lived. Any yet, of course, humanity continued to flourish. Our species’ recent explosion in lifespan is almost exclusively the result of the control of infectious diseases through sanitation, vaccination, and antimicrobial therapies. Only in the modern era, in which many infectious diseases have been tamed in the industrial world, do people have the luxury of death from cancer, heart disease, or stroke in the 8th decade of life. Childhoods are free from watching siblings and friends die from outbreaks of typhoid, scarlet fever, smallpox, measles, and the like. So what would it take for a disease to wipe out humanity now? In Michael Crichton’s The Andromeda Strain, the canonical book in the disease-outbreak genre, an alien microbe threatens the human race with extinction, and humanity’s best minds are marshaled to combat the enemy organism. Fortunately, outside of fiction, there’s no reason to expect alien pathogens to wage war on the human race any time soon, and my analysis suggests that any real-life domestic microbe reaching an extinction level of threat probably is just as unlikely. When humans began to focus their minds on the problems posed by infectious disease, human life ceased being nasty, brutish, and short. Any apocalyptic pathogen would need to possess a very special combination of two attributes. First, it would have to be so unfamiliar that no existing therapy or vaccine could be applied to it. Second, it would need to have a high and surreptitious transmissibility before symptoms occur. The first is essential because any microbe from a known class of pathogens would, by definition, have family members that could serve as models for containment and countermeasures. The second would allow the hypothetical disease to spread without being detected by even the most astute clinicians. The three infectious diseases most likely to be considered extinction-level threats in the world today—influenza, HIV, and Ebola—don’t meet these two requirements. Influenza, for instance, despite its well-established ability to kill on a large scale, its contagiousness, and its unrivaled ability to shift and drift away from our vaccines, is still what I would call a “known unknown.” While there are many mysteries about how new flu strains emerge, from at least the time of Hippocrates, humans have been attuned to its risk. And in the modern era, a full-fledged industry of influenza preparedness exists, with effective vaccine strategies and antiviral therapies. HIV, which has killed 39 million people over several decades, is similarly limited due to several factors. Most importantly, HIV’s dependency on blood and body fluid for transmission (similar to Ebola) requires intimate human-to-human contact, which limits contagion. Highly potent antiviral therapy allows most people to live normally with the disease, and a substantial group of the population has genetic mutations that render them impervious to infection in the first place. Lastly, simple prevention strategies such as needle exchange for injection drug users and barrier contraceptives—when available—can curtail transmission risk. Ebola, for many of the same reasons as HIV as well as several others, also falls short of the mark. This is especially due to the fact that it spreads almost exclusively through people with easily recognizable symptoms, plus the taming of its once unfathomable 90 percent mortality rate by simple supportive care. Beyond those three, every other known disease falls short of what seems required to wipe out humans—which is, of course, why we’re still here. And it’s not that diseases are ineffective. On the contrary, diseases’ failure to knock us out is a testament to just how resilient humans are. Part of our evolutionary heritage is our immune system, one of the most complex on the planet, even without the benefit of vaccines or the helping hand of antimicrobial drugs. This system, when viewed at a species level, can adapt to almost any enemy imaginable. Coupled to genetic variations amongst humans—which open up the possibility for a range of advantages, from imperviousness to infection to a tendency for mild symptoms—this adaptability ensures that almost any infectious disease onslaught will leave a large proportion of the population alive to rebuild, in contrast to the fictional Hollywood versions. While the immune system’s role can never be understated, an even more powerful protector is the faculty of consciousness. Humans are not the most prolific, quickly evolving, or strongest organisms on the planet, but as Aristotle identified, humans are the rational animals—and it is this fundamental distinguishing characteristic that allows humans to form abstractions, think in principles, and plan long-range. These capacities, in turn, allow humans to modify, alter, and improve themselves and their environments. Consciousness equips us, at an individual and a species level, to make nature safe for the species through such technological marvels as antibiotics, antivirals, vaccines, and sanitation. When humans began to focus their minds on the problems posed by infectious disease, human life ceased being nasty, brutish, and short. In many ways, human consciousness became infectious diseases’ worthiest adversary. None of this is meant to allay all fears of infectious diseases. To totally adopt a Panglossian viewpoint would be foolish—and dangerous. Humans do face countless threats from infectious diseases: witness Zika. And if not handled appropriately, severe calamity could, and will, ensue. The West African Ebola outbreak, for instance, festered for months before major efforts to bring it under control were initiated. When it comes to infectious diseases, I’m worried about the failure of institutions to understand the full impact of outbreaks. I’m worried about countries that don’t have the infrastructure or resources to combat these outbreaks when they come. But as long as we can keep adapting, I’m not worried about the future of the human race.

**Food price increases won’t cause war – empirics**

**Pinker ’11** (Steven 2011; professor of psychology at Harvard; “Steven Pinker: Resource Scarcity Doesn’t Cause Wars,” <http://www.globalwarming.org/2011/11/28/steven-pinker-resource-scarcity-doesnt-cause-wars/>; Date Accessed: 3/25/2018)

Once again it seems to me that the appropriate response is “maybe, but maybe not.” **Though climate change can cause plenty of misery**… **it will not necessarily lead to armed conflict.** The **political scientists** who track war and peace, **such as** Halvard **Buhaug**, Idean **Salehyan**, Ole **Theisen**, and Nils **Gleditsch**, **are skeptical of the popular idea that people fight wars over scarce resources**. **Hunger and resource shortages** **are tragically common in sub-Saharan countries such as** **Malawi**, **Zambia**, **and** **Tanzania**, **but wars involving them are not. Hurricanes, floods, droughts, and tsunamis** (such as the disastrous one in the Indian Ocean in 2004) **do not generally lead to conflict.** **The** American **dust bowl in** the 1930s, to take another example, **caused plenty of deprivation but no civil war**. And **while temperatures have been rising steadily in Africa during the past fifteen years**, **civil wars and war deaths have been falling. Pressures on access to land** and water **can certainly cause local skirmishes**, **but a genuine war requires that hostile forces be organized and armed**, **and that depends more on the influence of bad governments,** **closed economies**, **and** **militant ideologies** **than on the sheer availability** of land and water. Certainly any connection to terrorism is in the imagination of the terror warriors: terrorists tend to be underemployed lower-middle-class men, not subsistence farmers. As for genocide, the Sudanese government finds it convenient to blame violence in Darfur on desertification, distracting the world from its own role in tolerating or encouraging the ethnic cleansing. **In a regression analysis on armed conflicts from 1980 to 1992**, **Theisen found that conflict was more likely if a country was poor**, **populous**, politically unstable, **and abundant in oil**, **but not if it had suffered from droughts**, **water shortages**, **or** mild **land degradation**. (Severe land degradation did have a small effect.) **Reviewing analyses that examined a large number** (N) **of countries rather than cherry-picking** one or toe, **he concluded**, **“Those who foresee doom, because of the relationship between resource scarcity and violent internal conflict, have very little support from the large-N literature.”**

#### Warming doesn’t trigger extinction

* peer-reviewed journal shows IPCC exaggeration
* history proves resilience
* no extinction- warming under Paris goals
* rock breaking strategy could offset warming

IBD 18 [Investors Business Daily, Citing Study from Peer reviewed journal by Lewis and Curry, “Here's One Global Warming Study Nobody Wants You To See”, 4/25/18, https://www.investors.com/politics/editorials/global-warming-computer-models-co2-emissions/]

Settled Science: A new study published in a peer-reviewed journal finds that climate models exaggerate the global warming from CO2 emissions by as much as 45%. If these findings hold true, it's huge news. No wonder the mainstream press is ignoring it.

In the study, authors Nic Lewis and Judith Curry looked at actual temperature records and compared them with climate change computer models. What they found is that the planet has shown itself to be far less sensitive to increases in CO2 than the climate models say. As a result, they say, the planet will warm less than the models predict, even if we continue pumping CO2 into the atmosphere.

As Lewis explains: "Our results imply that, for any future emissions scenario, future warming is likely to be substantially lower than the central computer model-simulated level projected by the (United Nations Intergovernmental Panel on Climate Change), and highly unlikely to exceed that level.

How much lower? Lewis and Curry say that their findings show temperature increases will be 30%-45% lower than the climate models say. If they are right, then there's little to worry about, even if we don't drastically reduce CO2 emissions.

The planet will warm from human activity, but not nearly enough to cause the sort of end-of-the-world calamities we keep hearing about. In fact, the resulting warming would be below the target set at the Paris agreement.

This would be tremendously good news.

The fact that the Lewis and Curry study appears in the peer-reviewed American Meteorological Society's Journal of Climate lends credibility to their findings. This is the same journal, after all, that recently published widely covered studies saying the Sahara has been growing and the climate boundary in central U.S. has shifted 140 miles to the east because of global warming.

The Lewis and Curry findings come after another study, published in the prestigious journal Nature, that found the long-held view that a doubling of CO2 would boost global temperatures as much as 4.5 degrees Celsius was wrong**.** The most temperatures would likely climb is 3.4 degrees.

It also follows a study published in Science, which found that rocks contain vast amounts of nitrogen that plants could use to grow and absorb more CO2, potentially offsetting at least some of the effects of CO2 emissions and reducing future temperature increases.