## 1

#### Interpretation: “Appropriation of outer space” by private entities refers to the exercise of exclusive control of space.

TIMOTHY JUSTIN TRAPP, JD Candidate @ UIUC Law, ’13, TAKING UP SPACE BY ANY OTHER MEANS: COMING TO TERMS WITH THE NONAPPROPRIATION ARTICLE OF THE OUTER SPACE TREATY UNIVERSITY OF ILLINOIS LAW REVIEW [Vol. 2013 No. 4]

The issues presented in relation to the nonappropriation article of the Outer Space Treaty should be clear.214 The ITU has, quite blatantly, created something akin to “property interests in outer space.”215 It allows nations to exclude others from their orbital slots, even when the nation is not currently using that slot.216 This is directly in line with at least one definition of outer-space appropriation.217 [\*\*Start Footnote 217\*\*Id. at 236 (“Appropriation of outer space, therefore, is ‘the exercise of exclusive control or exclusive use’ with a sense of permanence, which limits other nations’ access to it.”) (quoting Milton L. Smith, The Role of the ITU in the Development of Space Law, 17 ANNALS AIR & SPACE L. 157, 165 (1992)). \*\*End Footnote 217\*\*]The ITU even allows nations with unused slots to devise them to other entities, creating a market for the property rights set up by this regulation.218 In some aspects, this seems to effect exactly what those signatory nations of the Bogotá Declaration were trying to accomplish, albeit through different means.219

#### Violation: debris isn’t exclusive control of property

#### Standards:

#### Limits and ground: the aff interpretation explodes the topic to allow any aff about something harmful in space which structurally alters the neg research burden because there’s a qualitative difference between property rights and things in space being bad. That alters neg ground because it means the aff can defend trivial middle grounds that go beyond just exclusive appropriation unbalancing the topic.

#### Use competing interps - Topicality is a binary question, you can’t be reasonably topical and it invites a race to the bottom of intervention

#### Drop the debater – dropping the argument doesn’t rectify abuse since winning T proves why we don’t have the burden of rejoinder against their aff.

#### No RVIS – it’s your burden to be topical

## 2

#### Xi is tightening control over the PLA but completing goals are critical.

Krishnan 21 – Ananth, 11/18/21, [‘Xi tightened control over the PLA’, TheHindu, <https://www.thehindu.com/news/international/xi-tightened-control-over-the-pla/article37549460.ece>] Justin

The new resolution on history passed last week by China’s ruling Communist Party has said that President Xi Jinping had tightened control over the military to address the party’s “obviously lacking” leadership of the armed forces under his predecessors.

The full text of the resolution, released on Tuesday evening, listed some of the actions taken by the People’s Liberation Army (PLA) under Mr. Xi, who is also the chairman of the Central Military Commission. These included what the document described as “major operations related to border defence”.

No specifics

It did not specify what those major operations were. China has unresolved land borders with India and Bhutan. In April 2020, the PLA mobilised two divisions and carried out multiple transgressions across the Line of Actual Control (LAC) in Eastern Ladakh, sparking the worst crisis along the border in many years. Talks to resolve the tensions are still on-going.

“The armed forces have remained committed to carrying out military struggles in a flexible manner to counter military provocations by external forces, and they have created a strong deterrent against separatist activities seeking ‘Taiwan independence,’” the resolution said.

“They have conducted major operations related to border defence, protecting China’s maritime rights, countering terrorism and maintaining stability, disaster rescue and relief, fighting COVID-19, peacekeeping and escort services, humanitarian assistance, and international military cooperation.”

Last week’s resolution on history was only third such document putting forth the official view on party history, following resolutions passed by Mao Zedong in 1945 and Deng Xiaoping in 1981.

The new resolution dealt more with the future than the past. It essentially reaffirmed the official view on history, saying that the “basic points and conclusions” of past resolutions “remain valid to this day.”

It repeated the conclusion reached in 1981 on Mao’s errors noting that “mistakes were made” and that “Mao Zedong’s theoretical and practical errors concerning class struggle in a socialist society became increasingly serious” leading to the disasters of the Cultural Revolution.

Criticism of predecessors

Much of the new resolution focuses on emphasising Mr. Xi’s leadership and calling for the party to support his “core” status. It only briefly mentioned Mr. Xi’s predecessors Jiang Zemin and Hu Jintao, and implicitly critcised some aspects of their leadership including on military matters.

“For a period of time, the party’s leadership over the military was obviously lacking,” it noted. “If this problem had not been completely solved, it would not only have diminished the military’s combat capacity, but also undermined the key political principle that the party commands the gun.”

The document said Mr. Xi’s leadership had tightened supervision on the military including boosting “troop training and battle preparedness”, and it repeated China’s stated goals of completing the modernisation of its armed forces by 2035 and building a “world class” military by 2050, which observers see as meaning on par with the U.S.

‘Working vigorously’

“To build strong people’s armed forces, it is of paramount importance to uphold the fundamental principle and system of absolute party leadership over the military, to ensure that supreme leadership and command authority rest with the party Central Committee and the Central Military Commission (CMC), and to fully enforce the system of the CMC chairman assuming overall responsibility,” the resolution said, adding that “setting their sights on this problem, the Central Committee and the CMC have worked vigorously to govern the military with strict discipline in every respect.”

#### The commercial space sector is one of the PLAs central goals – the plan is a 180.

Bartholomew & Cleveland 19 – Carolyn and Robin, 4/25/19, Chairmen and Vice Chairmen. Section is written from Michael A. McDevitt, US Congressperson, [“HEARING ON CHINA IN SPACE: A STRATEGIC COMPETITION?,” <https://www.uscc.gov/sites/default/files/transcripts/April%2025%2C%202019%20Hearing%20Transcript%20%282%29.pdf>] Justin

As the Chairman said, China is determined to become a leading space power, which requires continuing to boost its innovation capabilities, both in its civilian and military sectors. The People’s Liberation Army is closely involved in most if not every aspect of China’s space program, from helping formulate and execute national space goals to overseeing China’s human spaceflight program. Coverage of China’s space program must treat seriously the implications of the reality that in many cases the boundaries between the military and civil silos of China’s program are thin, if they exist at all.

Our second panel today will address the application of what China calls its “military-civil fusion” strategy to its space sector. Military-civil fusion, a strategic concept designed to harness civilian sector innovation to power China’s military and technological modernization with the goal of leapfrogging the United States and becoming a technological powerhouse. Space has been designated as an especially important sector for military-civil fusion, and the impacts of this campaign on China’s burgeoning commercial space sector—itself a recipient of generous government support and protection—will be crucial as Chinese companies increasingly seek to compete in the international marketplace. Military-civil fusion is especially worthy of attention due to its continued reliance on technology transfer, by hook or by crook, to fuel China’s industrial and military growth.

Our third and final panel today will examine China’s military space and counterspace activities. Since its direct-ascent kinetic antisatellite test in 2007, which was responsible for a large amount of all space debris currently in Earth’s orbit, China has continued to invest in a variety of offensive antisatellite capabilities. Indeed, China’s counterspace arsenal contains many options: earlier this month, Acting Secretary of Defense Patrick Shanahan said China “has exercised and continues to develop” jamming capabilities; is deploying directed-energy counterspace weapons; has deployed an operational ground-based antisatellite missile system; and is prepared to use cyberattacks against U.S. space systems.

#### 1AC evidence makes it clear this is a huge PLA investment –

Chow ’17 - independent policy analyst with over 25 years as a senior physical scientist specializing in space and national security. He holds a PhD in physics from Case Western Reserve University and an MBA with distinction and PhD in finance from the University of Michigan. Brian G Chow, “Stalkers in Space:  Defeating the Threat,” Strategic Studies Quarterly 11, no. 2 (Summer 2017): 82-116, <https://www.airuniversity.af.edu/Portals/10/SSQ/documents/Volume-11_Issue-2/Chow.pdf>.

The United States has 554 operational satellites, the largest number of satellites among all countries and organizations in the world (see table 1).1 While these space capabilities offer great advantages for the US military, they simultaneously create great vulnerabilities. The Department of Defense (DOD) is increasingly concerned, particularly about the space threat from China. In its annual reports to Congress, Military and Security Developments Involving the People’s Republic of China for 2013,2 2014,3 2015,4 and 2016,5 the DOD has warned repeatedly: “PLA [People’s Liberation Army] writings emphasize the necessity of ‘destroying, damaging, and interfering with the enemy’s reconnaissance . . . and communications satellites,’ suggesting that such systems, as well as navigation and early warning satellites, could be among the targets of attacks designed to ‘blind and deafen the enemy.’ ” Gen John Hyten, the former head of Air Force Space Command, said without space assets, the United States would be forced to revert to industrial age warfare: “It’s Vietnam, Korea and World War II”—no more precision missiles and smart bombs.6 Hyten was also quoted as saying that “China will soon be able to threaten US satellites in every orbital regime, from low Earth orbit a few hundred miles above the Earth, to geosynchronous orbit more than 20,000 miles up—where some of the military’s most important satellites circle the Earth. . . . Now we have to figure out how to defend those satellites.”7

#### That triggers backlash – they don’t support restrictions on the space sector and will do everything to convince leaders not to do the plan.

Cheng 14 [Dean Cheng, Senior Research Fellow in the Asia Studies Center at the Heritage Foundation, Former Senior Analyst at the China Studies Division of the Center for Naval Analyses, Former Senior Analyst with Science Applications International Corporation, “Prospects for U.S.-China Space Cooperation”, Testimony before the Committee on Commerce, Science, and Transportation, United States Senate, 4/9/2014, https://www.heritage.org/testimony/prospects-us-china-space-cooperation]

At the same time, space is now a sector that enjoys significant political support within the Chinese political system. Based on their writings, the PLA is clearly intent upon developing the ability to establish “space dominance,” in order to fight and win “local wars under informationized conditions.”[8] The two SOEs are seen as key parts of the larger military-industrial complex, providing the opportunities to expose a large workforce to such areas as systems engineering and systems integration. It is no accident that China’s commercial airliner development effort tapped the top leadership of China’s aerospace corporations for managerial and design talent.[9] From a bureaucratic perspective, this is a powerful lobby, intent on preserving its interests. China’s space efforts should therefore be seen as political, as much as military or economic, statements, directed at both domestic and foreign audiences. Insofar as the PRC has scored major achievements in space, these reflect positively on both China’s growing power and respect (internationally) and the CCP’s legitimacy (internally). Efforts at inducing Chinese cooperation in space, then, are likely to be viewed in terms of whether they promote one or both objectives. As China has progressed to the point of being the world’s second-largest economy (in gross domestic product terms), it becomes less clear as to why China would necessarily want to cooperate with other countries on anything other than its own terms. Prospects for Cooperation Within this context, then, the prospects for meaningful cooperation with the PRC in the area of space would seem to be extremely limited. China’s past experience of major high-technology cooperative ventures (Sino–Soviet cooperation in the 1950s, U.S.–China cooperation in the 1980s until Tiananmen, and Sino–European space cooperation on the Galileo satellite program) is an unhappy one, at best. The failure of the joint Russian–Chinese Phobos–Grunt mission is likely seen in Beijing as further evidence that a “go-it-alone” approach is preferable. Nor is it clear that, bureaucratically, there is significant interest from key players such as the PLA or the military industrial complex in expanding cooperation.[10] Moreover, as long as China’s economy continues to expand, and the top political leadership values space efforts, there is little prospect of a reduction in space expenditures—making international cooperation far less urgent for the PRC than most other spacefaring states. [FOOTNOTE] [10]It is worth noting here that the Chinese Ministry of Foreign Affairs is not a part of the CCP Politburo, a key power center in China. Thus, the voice of the Ministry of Foreign Affairs is muted, at best, in any internal debate on policy. [END FOOTNOTE] If there is likely to be limited enthusiasm for cooperation in Chinese circles, there should also be skepticism in American ones. China’s space program is arguably one of the most opaque in the world. Even such basic data as China’s annual space expenditures is lacking—with little prospect of Beijing being forthcoming. As important, China’s decision-making processes are little understood, especially in the context of space. Seven years after the Chinese anti-satellite (ASAT) test, exactly which organizations were party to that decision, and why it was undertaken, remains unclear. Consequently, any effort at cooperation would raise questions about the identity of the partners and ultimate beneficiaries—with a real likelihood that the PLA would be one of them.

#### An unhinged PLA triggers Himalayan war – goes global

Chellaney 17 [Dr. Brahma Chellaney, Professor of Strategic Studies at the Center for Policy Research and Fellow at the Robert Bosch Academy, PhD in International Studies from Jawaharlal Nehru University, “Why the Chinese Military’s Rising Clout Troubles Xi Jinping”, The National, 9/9/2017, https://www.thenational.ae/opinion/why-the-chinese-military-s-rising-clout-troubles-xi-jinping-1.626815?videoId=5754807360001]

China’s president Xi Jinping has stepped up his domestic political moves in the run-up to the critical 19th national congress of the Chinese Communist Party next month, but he is still struggling to keep the People’s Liberation Army (PLA) in line. China’s political system makes it hard to get a clear picture, yet Mr Xi’s actions underscore the troublesome civil-military relations in the country. Take the recent standoff with India that raised the spectre of a Himalayan war, with China threatening reprisals if New Delhi did not unconditionally withdraw its forces from a small Bhutanese plateau, which Beijing claims is Chinese territory. After 10 weeks, the face-off on the Doklam Plateau ended with both sides pulling back troops and equipment from the site on the same day, signalling that Beijing, not New Delhi, had blinked. The mutual-withdrawal deal was struck just after Mr Xi replaced the chief of the PLA’s joint staff department. This key position, equivalent to the chairman of the US joint chiefs of staff, was created only last year as part of Mr Xi’s military reforms to turn the PLA into a force “able to fight and win wars”. The Doklam pullback suggests that the removed chief, Gen Fang Fenghui, who has since been detained for alleged corruption, was an obstacle to clinching a deal with India. To be sure, this was not the first time that the PLA’s belligerent actions in the Himalayas imposed diplomatic costs on China. A classic case happened when Mr Xi reached India on a state visit in September 2014. He arrived on Indian prime minister Narendra Modi’s birthday with a strange gift for his host, a predawn Chinese military encroachment deep into India’s northern region of Ladakh. The encroachment, the worst in many years in terms of the number of intruding troops, overshadowed Mr Xi’s visit. It appeared bizarre that the military of an important power would seek to mar the visit of its own head of state to a key neighbouring country. Yet Chinese premier Li Keqiang’s earlier visit to New Delhi in 2013 was similarly preceded by a PLA incursion into another part of Ladakh that lasted three weeks. Such provocations might suggest that they are intentional, with the Chinese government in the know, thus reflecting a preference for blending soft and hard tactics. But it is also possible that these actions underscore the continuing “disconnect between the military and the civilian leadership” in China that then US defence secretary Robert Gates warned about in 2011. During his 2014 India trip, Mr Xi appeared embarrassed by the accompanying PLA encroachment and assured Mr Modi that he would sort it out upon his return. Soon after he returned, the Chinese defence ministry quoted Mr Xi as telling a closed-door meeting with PLA commanders that “all PLA forces should follow the president’s instructions” and that the military must display “absolute loyalty and firm faith in the party”. Recently Xi conveyed that same message yet again when he addressed a parade marking the 90th anniversary of the PLA’s creation on August 1, 1927. Donning military fatigues, Mr Xi exhorted members of his 2.3-million-strong armed forces to “unswervingly follow the absolute leadership of the party.” Had civilian control of the PLA been working well, would Mr Xi repeatedly be demanding “absolute loyalty” from the military or asking it to “follow his instructions”? China does not have a national army; rather the party has an army. So the PLA has traditionally sworn fealty to the party, not the nation. Under Mr Xi’s two immediate predecessors, Hu Jintao and Jiang Zemin, the PLA gradually became stronger at the expense of the party. The military’s rising clout has troubled Mr Xi because it hampers his larger ambition. As part of his effort to reassert party control over the military, Mr Xi has used his anti-corruption campaign to ensnare a number of top PLA officers. He has also cut the size of the ground force and established a new command-and-control structure. But just as a dog’s tail cannot be straightened, asserting full civil control over a politically ascendant PLA is proving unachievable. After all, the party depends on the PLA to ensure domestic order and sustain its own political monopoly. The regime’s legitimacy increasingly relies on an appeal to nationalism. But the PLA, with its soaring budgets and expanding role to safeguard China’s overseas interests, sees itself as the ultimate arbiter of nationalism. To make matters worse, Mr Xi has made many enemies at home in his effort to concentrate power in himself, including through corruption purges. It is not known whether the PLA’s upper echelon respects him to the extent to be fully guided by his instructions. In the past decade, the PLA’s increasing clout has led China to stake out a more muscular role. This includes resurrecting territorial and maritime disputes, asserting new sovereignty claims, and using construction activity to change the status quo. China’s cut-throat internal politics and troubled civil-military relations clearly have a bearing on its external policy. The risks of China’s rise as a praetorian state are real and carry major implications for international security.

#### Extinction.

Caldicott 17 – Helen, 2017, Founder of Physicians for Social Responsibility [“The new nuclear danger: George W. Bush's military-industrial complex,” The New Press]//Elmer

The use of Pakistani nuclear weapons could trigger a chain reac­tion. **Nuclear-armed India, an ancient enemy, could respond** in kind. China, India's hated foe, could react if India used her nuclear weapons, triggering a nuclear [war] ~~holocaust~~ on the subcontinent. If any of either **Russia** or **America**'s 2,250 strategic weapons on hair-trigger alert were launched either **accidentally** or **purposefully** in response, **nuclear winter** would ensue, meaning the **end of most life on earth**.

## 3

#### CP text: The United States federal government ought:

#### Substantially increase direct military-to-military communications and regular formal dialogue on strategic stability with Russia and China.

#### Hotlines and dialogue prevent escalation and miscalculation – polarity control isn’t key and won’t solve

Trenin 19 [Dr. Dmitri Vitalyevich Trenin, PhD is the director of the Carnegie Moscow Center, a think tank and regional affiliate of the Carnegie Endowment for International Peace. Strategic Stability in the Changing World. March 2019. https://carnegieendowment.org/files/3-15\_Trenin\_StrategicStability.pdf]

To maintain the minimum degree of strategic stability, it’s essential to prevent a direct military collision between the United States and Russia or the United States and China. With that goal in mind, there are already around-the-clock communication lines between the top military leaderships: ministers of defense, chiefs of general staff, and key U.S./NATO and Russian military personnel. Direct communication lines make it possible to prevent or neutralize incidents in the air, at sea, or on land that involve Russian and U.S./ NATO armed forces, thus avoiding any uncontrollable escalation. Communication channels between the leadership of the U.S. armed forces and the top brass of the Chinese People’s Liberation Army serve a similar purpose. A communication channel between the respective heads of U.S. and Russian intelligence, and between the U.S. and Chinese services, could play an important role as well. Direct contacts at the top political level are also critically important as a means of de-escalation in the most dangerous situations.

In addition to constantly functioning lines of communication, U.S., Russian, and Chinese heads of national security, foreign affairs, and defense should engage in regular dialogue on strategic stability issues. Such dialogue allows parties to better understand each other’s strategic logic, the contents of military doctrines, and the rationale behind approaches to global and regional security programs. However, broader U.S.-Russian dialogue on strategic issues will likely remain blocked for a long time due to political reasons.

## 4

#### China’s capitalizing on US vulnerabilities and ramping up ASAT development now – that emboldens Xi to invade Taiwan

Chow and Kelley 8/21 [(Brian G., policy analyst for the Institute of World Politics, Ph.D in physics from Case Western Reserve University, MBA and Ph.D in finance from the University of Michigan,and Brandon, graduate of Georgetown’s School of Foreign Service ) “China’s Anti-Satellite Weapons Could Conquer Taiwan—Or Start a War,” National Interest, 8/21/2021] JL

If current trends hold, then China’s Strategic Support Force will be capable by the late 2020s of holding key U.S. space assets at risk. Chinese military doctrine, statements by senior officials, and past behavior all suggest that China may well believe threatening such assets to be an effective means of deterring U.S. intervention. If so, then the United States would face a type of “Sophie’s Choice”: decline to intervene, potentially leading allies to follow suit and Taiwan to succumb without a fight, thereby enabling Xi to achieve his goal of “peacefully” snuffing out Taiwanese independence; or start a war that would at best be long and bloody and might well even cross the nuclear threshold.

This emerging crisis has been three decades in the making. In 1991, China watched from afar as the United States used space-enabled capabilities to obliterate the Iraqi military from a distance in the first Gulf War. The People’s Liberation Army quickly set to work developing capabilities targeted at a perceived Achilles’ heel of this new American way of war: reliance on vulnerable space systems.

This project came to fruition with a direct ascent ASAT weapons test in 2007, but the test was limited in two key respects. First, it only reached low Earth orbit. Second, it generated thousands of pieces of long-lasting space junk, provoking immense international ire. This backlash appears to have taken China by surprise, driving it to seek new, more usable ASAT types with minimal debris production. Now, one such ASAT is nearing operational status: spacecraft capable of rendezvous and proximity operations (RPOs).

Such spacecraft are inevitable and cannot realistically be limited. The United States, European Union, China, and others are developing them to provide a range of satellite services essential to the new space economy, such as in situ repairs and refueling of satellites and active removal of space debris. But RPO capabilities are dual-use: if a satellite can grapple space objects for servicing, then it might well be capable of grappling an adversary’s satellite to move it out of its servicing orbit. Perhaps it could degrade or disable it by bending or disconnecting its solar panels and antennas all while producing minimal debris.

This is a serious threat, primarily because no international rules presently exist to limit close approaches in space. Left unaddressed, this lacuna in international law and space policy could enable a prospective attacker to pre-position, during peacetime, as many spacecraft as they wish as close as they wish to as many high-value targets as they wish. The result would be an ever-present possibility of sudden, bolt-from-the-blue attacks on vital space assets—and worse, on many of them at once.

China has conducted at least half a dozen tests of RPO capabilities in space since 2008, two of which went on for years. Influential space experts have noted that these tests have plausible peaceful purposes and are in many cases similar to those conducted by the United States. This, however, does not make it any less important to establish effective legal, policy, and technical counters to their offensive use. Even if it were certain that these capabilities are intended purely for peaceful applications—and it is not at all clear that that is the case—China (or any other country) could at any time decide to repurpose these capabilities for ASAT use.

There is still time to get out ahead of this threat, but likely not for much longer. China’s RPO capabilities have, thus far, lagged about five years behind those of the United States. There are reasons to believe this gap may close, but even assuming that it holds, we should expect to see China demonstrate an operational dual-use rendezvous spacecraft by around 2025. (The first instance of a U.S. commercial satellite docking with another satellite to change its orbit occurred in February 2020.)

At the same time, China is expanding its capacity for rapid spacecraft manufacturing. The Global Times reported in January that China’s first intelligent mass production line is set to produce 240 small satellites per year. In April, Andrew Jones at SpaceNews reported that China is developing plans to quickly produce and loft a thirteen thousand-satellite national internet megaconstellation. It is not unreasonable to assume that China could manufacture two hundred small rendezvous ASAT spacecraft by 2029, possibly more.

If this happens, and Beijing was to decide in 2029 to launch these two hundred small RPO spacecraft and position them in close proximity to strategically vital assets, then China would be able to simultaneously threaten disablement of the entire constellations of U.S. satellites for missile early warning (about a dozen satellites with spares included); communications in a nuclear-disrupted environment (about a dozen); and positioning, navigation, and timing (about three dozen); along with several dozen key communications, imagery, and meteorology satellites. Losing these assets would severely degrade U.S. deterrence and warfighting capabilities, yet once close pre-positioning has occurred such losses become almost impossible to prevent. For this reason, such pre-positioning could conceivably deter the United States from coming to Taiwan’s aid due to the prospect that intervention would spur China to disable these critical space systems. Without their support, the war would be much bloodier and costlier—a daunting proposition for any president.

Should the United States fail to intervene, the consequences would be disastrous for both Washington and its allies in East Asia, and potentially the credibility of U.S. defense commitments around the globe. Worse yet, however, might be what could happen if China believes that such a threat will succeed but proves to be wrong. History is rife with examples of major wars arising from miscalculations such as this, and there are many pathways by which such a situation could easily escalate out of control to a full-scale conventional conflict or even to nuclear use.

#### Starlink development solves – mega-constellations are unjammable and accurate

Harris 20 [(Mark, Knight Science Journalism Fellow at MIT in 2013, writes about technology, science, business, the environment, and travel, internally cites Todd Humphreys, Professor of Aerospace Engineering at UT Austin, and Peter Iannucci,, Postdoctoral Research Fellow in Aerospace Engineering and Engineering Mechanics at UT Austin) “SpaceX’s Starlink satellites could make US Army navigation hard to jam,” MIT Technology Review, 9/28/2020] JL

Now, research funded by the US Army has concluded that the growing mega-constellation could have a secondary purpose: doubling as a low-cost, highly accurate, and almost unjammable alternative to GPS. The new method would use existing Starlink satellites in low Earth orbit (LEO) to provide near-global navigation services.

In a non-peer-reviewed paper, Todd Humphreys and Peter Iannucci of the Radionavigation Laboratory at the University of Texas at Austin claim to have devised a system that uses the same satellites, piggybacking on traditional GPS signals, to deliver location precision up to 10 times as good as GPS, in a system much less prone to interference.

The Global Positioning System consists of a constellation of around 30 satellites orbiting 20,000 kilometers above Earth. Each satellite continuously broadcasts a radio signal containing its position and the exact time from a very precise atomic clock on board. Receivers on the ground can then compare how long signals from multiple satellites take to arrive and calculate their position, typically to within a few meters.

The problem with GPS is that those signals are extremely weak by the time they reach Earth, and are easily overwhelmed by either accidental interference or electronic warfare. In China, mysterious GPS attacks have successfully “spoofed” ships in fake locations, while GPS signals are regularly jammed in the eastern Mediterranean.

The US military relies heavily on GPS. Last year, the US Army Futures Command, a new unit dedicated to modernizing its forces, visited Humphreys’s lab to talk about a startup called Coherent Navigation he had cofounded in 2008. Coherent, which aimed to use signals from Iridium satellites as a rough alternative to GPS, was acquired by Apple in 2015.

“They told me the Army has a relationship with SpaceX [it signed an agreement to test Starlink to move data across military networks in May] and would I be interested in talking to SpaceX about using their Starlink satellites the same way that I used these old Iridium satellites?” Humphreys says. “That got us an audience with people at SpaceX, who liked it, and the Army gave us a year to look into the problem.” Futures Command also provided several million dollars in funding.

The concept of using LEO satellites for navigation isn't new. In fact, some of the first US spacecraft launched in the 1960s were Transit satellites orbiting at 1,100 kilometers, providing location information for Navy ships and submarines. The advantage of an LEO constellation is that the signals can be a thousand times stronger than GPS. The disadvantage is that each satellite can serve only a small area beneath it, so that reliable global coverage requires hundreds or even thousands of satellites.

Building a whole new network of LEO satellites with ultra-accurate clocks would be an expensive undertaking. Bay Area startup Xona Space Systems plans to do just that, aiming to launch a constellation of at least 300 Pulsar satellites over the next six years.

Humphreys and Iannucci’s idea is different: they would use a simple software upgrade to modify Starlink’s satellites so their communications abilities and existing GPS signals could provide position and navigation services .

They claim their new system can even, counterintuitively, deliver better accuracy for most users than the GPS technology it relies upon. That is because the GPS receiver on each Starlink satellite uses algorithms that are rarely found in consumer products, to pinpoint its location within just a few centimeters. These technologies exploit physical properties of the GPS radio signal, and its encoding, to improve the accuracy of location calculations. Essentially, the Starlink satellites can do the heavy computational lifting for their users below.

The Starlink satellites are also essentially internet routers in space, capable of achieving 100 megabits per second. GPS satellites, on the other hand, communicate at fewer than 100 bits per second.

“There are so few bits per second available for GPS transmissions that they can’t afford to include fresh, highly accurate data about where the satellites actually are,” says Iannucci. “If you have a million times more opportunity to send information down from your satellite, the data can be much closer to the truth.”

The new system, which Humphreys calls fused LEO navigation, will use instant orbit and clock calculations to locate users to within 70 centimeters, he estimates. Most GPS systems in smartphones, watches, and cars, for comparison, are only accurate to a few meters.

But the key advantage for the Pentagon is that fused LEO navigation should be significantly more difficult to jam or spoof. Not only are its signals much stronger at ground level, but the antennas for its microwave frequencies are about 10 times more directional than GPS antennas. That means it should be easier to pick up the true satellite signals rather than those from a jammer.  “At least that’s the hope,” says Humphreys.

According to Humphreys and Iannucci’s calculations, their fused LEO navigation system could provide continuous navigation service to 99.8% of the world’s population, using less than 1% of Starlink’s downlink capacity and less than 0.5% of its energy capacity.

“I do think this could lead to a more robust and accurate solution than GPS alone,” says Todd Walter of Stanford University’s GPS Lab, who was not involved with the research. “And if you don’t have to modify Starlink’s satellites, it certainly is a fast, simple way to go.”

#### Taiwan goes nuclear – the US gets drawn in

The Week 1/4 [(The Week Staff, weekly news magazine with editions in the United Kingdom and United States) “What would happen if China tried to invade Taiwan?” The Week Staff, 1/4/2022] JL

If a conflict were to break out between the two neighbours it would be “a catastrophe”, reported The Economist. This is first because of “the bloodshed in Taiwan” but also because of the risk of “escalation between two nuclear powers”, namely the US and China.

Beijing massively outguns Taiwan, with estimates from the Stockholm International Peace Research Institute showing that China spends about 25 times more on its military. However, Taiwan has a defence pact with the US dating back to the 1954 Sino-American Mutual Defence Treaty, meaning the US could, in theory, be drawn into the conflict.

“Beijing’s optimistic version of events” after the decision to invade would see “cyber and electronic warfare units target Taiwan’s financial system and key infrastructure, as well as US satellites to reduce notice of impending ballistic missiles”, Bloomberg said.

“Chinese vessels could also harass ships around Taiwan, restricting vital supplies of fuel and food,” the news site continued, while “airstrikes would quickly aim to kill Taiwan’s top political and military leaders, while also immobilising local defences”.

This would be followed by “warships and submarines traversing some 130 kilometres [80 miles] across the Taiwan Strait”, before “thousands of paratroopers would appear above Taiwan’s coastlines, looking to penetrate defences [and] capture strategic buildings”.

According to satellite imagery seen by military news site The Drive, China has also begun “beefing up its combat aviation infrastructure across from Taiwan as invasion fears grow”.

Beijing “is upgrading three air bases located opposite” the island, “boosting its air power capability in an already tense region that is flush with air combat capabilities.”

“Construction of the new infrastructure began in early 2020 and continued uninterrupted through the pandemic, underlining its priority,” the site added.

Taiwan would be reliant on “natural defences” – its rugged coastline and rough sea – with plans to “throw a thousand tanks at the beachhead” in the event of a Chinese invasion that could result in “brutal tank battles” that “decide the outcome”, according to Forbes.

The island’s top military leadership has also “warned China that the closer its aircraft and ships get to the island the harder Taipei will respond”, Bloomberg reported, with “a multi-pronged approach that utilises aircraft, ships and its air defence systems to counter Chinese military incursions” in the works.

“Chinese state media has dismissed the idea of Taiwan retaliating,” the news agency added. But a report by the island’s defence ministry sent to legislators shows the island is preparing to “take tougher measures” should they be necessary.

This would all be complicated by the US pledge to defend its ally in what The Economist called a “test of America’s military might and its diplomatic and political resolve”.

Asked last week during a CNN town hall meeting whether the US would mount a military response if Beijing attempted to take the island by force, Biden responded: “Yes, we have a commitment to do that.”

The Guardian said that Biden “made a similar pledge in August”, when he told ABC News that the US has a “sacred commitment” to defend its Nato allies in Canada and Europe and it was the “same with Japan, same with South Korea, same with Taiwan”.

If the US had decided against intervention, “China would overnight become the dominant power in Asia” and “America’s allies around the world would know that they could not count on it”, the paper added. In other words, “Pax Americana would collapse”.

That would be unacceptable in Washington, especially as “Joe Biden pivots US foreign policy towards a focus on the Indo-Pacific as the main arena for 21st-century superpower competition”, The Guardian said.

Biden’s comments during the CNN event were “at odds with the long-held US policy” of “strategic ambiguity”, The Telegraph said. Historically, Washington has helped “build Taiwan’s defences” but has “not explicitly promised to come to the island’s aid”.

US manoeuvres have so far consisted of building up “large amounts of lethal military hardware”, The Guardian added, with “the steady buildup of troops and equipment and the proliferation of war games” meaning there is “more of a chance of conflict triggered by miscalculation or accident”.

The primary danger that comes with US involvement lies in the fact that both Washington and Beijing possess nuclear weapons.

Leaked documents published by The New York Times earlier this year revealed the extent of Washington’s discussions about using nuclear weapons to deter a Chinese invasion of Taiwan in the 1950s.

Provided to the paper by Daniel Ellsberg, the whistleblower behind the 1971 Pentagon Papers, the documents appeared to show an “acceptance by some US military leaders of possible retaliatory nuclear strikes on US bases”, CNN noted, raising the spectre of how the nuclear powers would square off in a 21st-century conflict.

## Case

### Adv 1

#### Collision risk is tiny

Wein 9 [Lawrence M. Wein, Professor & Senior Fellow at Stanford’s Center for International Security and Cooperation Jeffrey S. Skoll Professor of Management Science at Stanford University and Senior Fellow at Stanford’s Center for International Security and Cooperation, former DEC Leaders for Manufacturing Professor of Management Science at MIT, and Andrew M. Bradley, PhD-Institute for Computational and Mathematical Engineering at Stanford University, Space debris: Assessing risk and responsibility, Advances in Space Research 43 (2009) 1372–1390]

More importantly, while our numerical results mimic earlier results (Liou and Johnson, 2005; Walker and Martin, 2004) that stressed the importance of postmission deorbiting, we do not necessarily agree with the claim that the only way to prevent future problems is to remove existing large intacts from space (Liou and Johnson, 2006, 2008). The divergence between our views and those in Liou and Johnson (2006, 2008) is perhaps due to the different performance metrics used. The root causes for alarm in Liou and Johnson (2006, 2008) appear to be the growth rate of fragments and the small increase in the rate of catastrophic collisions over the next 200 years (Liou and Johnson, 2008, Fig. 2). However, the great majority of catastrophic collisions in the SOI do not involve operational spacecraft, and are hazardous only in the sense that the fragments generated from such a collision could subsequently damage or destroy operational spacecraft. Therefore, we introduced the notion of the lifetime risk of an operational spacecraft as the primary performance metric. Our model predicts that the lifetime risk is <5x10^-4 [less than .0005%] over the next two centuries, and always stays <10^-3 [less than .001%] than if there is very high (>98%) spacecraft deorbiting compliance. These risks appear to be low relative to the immense cost and considerable technological uncertainty involved in removing large objects from space, are dwarfed by the ~20% historical mission-impacting (but not necessarily mission-ending) failure rate of spacecraft (Frost and Sullivan, 2004), and could be overestimated if improved traffic management techniques lower future collision risks (Johnson, 2004). Hence, the need to bring large objects down from space does not appear to be as clear cut as suggested in Liou and Johnson (2006, 2008). Nonetheless, our model does not incorporate the possibility of intentional catastrophic collisions (ASAT tests, space wars) that could conceivably occur in the future. In addition, Fig. 5 considers only catastrophic collisions, whereas noncatastrophic intact-fragment collisions could easily disable an operational spacecraft. If the operational lifetime risk is modified to include noncatastrophic collisions with fragments >= 10cm, then the sustainable risk rises by ~50%: it increases from 2.19x10^-2 [.0219%] to 3.09x10^-2 in the base case, and increases from 4.91x10^-4 [.000491%] to 7.94x10^-4 in the full compliance case. Moreover, if fragments >= 1 cm (rather than >= 10 cm) are harmful to spacecraft (Johnson, 2004), then we (as well as other researchers) could be underestimating the risk.

#### Low risk of collisions – it’s overhyped

Albrecht 16 [Mark Albrecht, chairman of the board of USSpace LLC, head of the White House National Space Council from 1989 to 1992, and Paul Graziani, CEO and founder of Analytical Graphics, a company that develops software and provides mission assurance through the Commercial Space Operations Center (ComSpOC), Congested space is a serious problem solved by hard work, not hysteria, 2016, https://spacenews.com/op-ed-congested-space-is-a-serious-problem-solved-by-hard-work-not-hysteria/]

Popular culture has embraced the risks of collisions in space in films like Gravity. Some participants have dramatized the issue by producing graphics of Earth and its satellites, which make our planet look like a fuzzy marble, almost obscured by a dense cloud of white pellets meant to conceptualize space congestion.

Unfortunately, for the sake of a good visual, satellites are depicted as if they were hundreds of miles wide, like the state of Pennsylvania (for the record, there are no space objects the size of Pennsylvania in orbit). Unfortunately, this is the rule, not the exception, and almost all of these articles, movies, graphics, and simulations are exaggerated and misleading. Space debris and collision risk is real, but it certainly is not a crisis.

So what are the facts?

On the positive side, space is empty and it is vast. At the altitude of the International Space Station, one half a degree of Earth longitude is almost 40 miles long. That same one half a degree at geostationary orbit, some 22,000 miles up is over 230 miles long. Generally, we don’t intentionally put satellites closer together than one-half degree. That means at geostationary orbit, they are no closer than 11 times as far as the eye can see on flat ground or on the sea: That’s the horizon over the horizon 10 times over. In addition, other than minute forces like solar winds and sparse bits of atmosphere that still exist 500 miles up, nothing gets in the way of orbiting objects and they behave quite predictably. The location of the smallest spacecraft can be predicated within a 1,000 feet, 24 hours in advance.

#### But if they’re right, threshold’s too low to solve

Kurt 15 [Joseph Kurt, JD- William & Mary School of Law, BA-Marquette University, NOTE: TRIUMPH OF THE SPACE COMMONS: ADDRESSING THE IMPENDING SPACE DEBRIS CRISIS WITHOUT AN INTERNATIONAL TREATY, 40 Wm. & Mary Envtl. L. & Pol'y Rev. 305 (2015)]

With respect to some common resource problems, the prospect of continued cooperation may be enough to suggest a successful resolution to the issue. Say, for example, that the farmers from Hardin's pasture recognize the threat of overgrazing and, after some negotiation, agree to slow the introduction of new cattle to sustainable levels. This would seem to resolve the issue. As long as farmers abide by that agreement, they will avoid the tragedy of the commons.

Achieving a more or less permanent solution to the space debris problem is not as straightforward. The reason is that even as the space debris problem is being redressed, the risk of space objects colliding remains as long as there are uncontrolled objects whizzing around the Earth's atmosphere. 214Link to the text of the note With millions of such objects now in orbit, this will indeed be the case for a very long time. 215Link to the text of the note

Improved tracking capabilities, avoidance maneuvers, and (eventually) ADR technologies all work together to make such collisions less likely. However, no remediation can remove the risk of accidents altogether, and some collisions could have devastating effects: the destruction of even one large satellite could double the amount of space debris in orbit. 216Link to the text of the note Of course, any such increase in the amount of debris in orbit then renders other collisions more likely to occur. 217Link to the text of the note It is thus possible that after a number of years making progress towards reaching a sustainable level of debris, a stroke of bad luck could rapidly undo such progress and unleash the dreaded Kessler Syndrome. 218Link to the text of the note

#### Long timeframe and squo solves

--Long timeframe – Kessler initially said debris would kill us by 2000 and recanted – now says a century

--tracking now helps avoid collisions – can see objects as small as a softball

--japan has a magnetic net, Australia a laser to remediate

--sufficiency – need to just remove 5 pieces a year to solve and we’re on cusp – solving it 100 yyrs early

Kurt 15 [Joseph Kurt, JD- William & Mary School of Law, BA-Marquette University, NOTE: TRIUMPH OF THE SPACE COMMONS: ADDRESSING THE IMPENDING SPACE DEBRIS CRISIS WITHOUT AN INTERNATIONAL TREATY, 40 Wm. & Mary Envtl. L. & Pol'y Rev. 305 (2015)]

A. Practical Considerations: Feasible Solutions to the Space Debris Problem Are on Their Way

One key question in assessing whether an international treaty is a requisite for solving the space debris problem is just how difficult it will be to fashion a remedy. The more complex and costly are feasible solutions, the more likely it is that a comprehensive regime is necessary to bind the various actors together. 93Link to the text of the note

A good place to begin is to determine just how imminent is the onset of the cascade of exponentially more frequent debris-creating collisions, known as the Kessler Syndrome. 94Link to the text of the note To be certain, no one can be sure--this phenomenon being subject to highly complex probabilities. 95Link to the text of the note Indeed, experts' estimates of when such a cascade will become irreversible vary [\*316] widely. 96Link to the text of the note The National Research Council produced a report in 2011 that suggested that "space might be just 10 or 20 years away from severe problems." 97Link to the text of the note In fact, the cascading effect has already begun, albeit at a modest pace. 98Link to the text of the note However, Donald Kessler, who first described the eponymous effect in 1978, has significantly recalibrated his own outlook over the years. 99Link to the text of the note Originally, Kessler predicted that catastrophe would result by the year 2000. 100Link to the text of the note That date long passed, Kessler now speaks of a century-long process that "we have time to deal with." 101Link to the text of the note

Nevertheless, few would disagree with Cristophe Bonnal of the Centre National d'Études Spatiales ("CNES"), the French space agency, who says that it is "not yet clear" how much time we have to act. 102Link to the text of the note None of this is to say that interested parties should not act with great dispatch to address the space debris problem. Even if catastrophe is not on the immediate horizon--as some have suggested--Heiner Klinkrad, the European Space Agency's leading authority on space debris points out that "[t]he longer you wait, the more difficult and far more expensive" any solution will be. 103Link to the text of the note

The additional slack in plausible timelines is cause for optimism when one considers the progress being made towards remediating the problem of space debris. Such remediation entails a three-pronged approach: preventive measures to reduce the creation of new debris, 104Link to the text of the note space debris tracking technologies, 105Link to the text of the note and active debris removal ("ADR"). 106Link to the text of the note

In an effort to address the first prong, the United Nations General Assembly in 2007 endorsed the COPUOS Space Debris Mitigation Guidelines. 107Link to the text of the note The recommended measures include design changes which would [\*317] avoid the previously common practice of releasing debris during standard operations, refraining from intentional destruction of space objects, and limiting the risk of collisions through avoidance maneuvers and delaying launch times. 108Link to the text of the note As the COPUOS document points out, many of these practices had already been adopted by spacefaring nations. 109Link to the text of the note

Compliance with the COPUOS Mitigation Guidelines is voluntary and has not been universal; 110Link to the text of the note however, many nations do take steps beyond those called for in the Mitigation Guidelines, recognizing the importance of redressing the issue. 111Link to the text of the note That said, even if no nation ever again launched a single object into outer space, the operation of the Kessler Syndrome would ensure that, over time, continuing collisions amongst already present objects would result in Earth's orbit being rendered unusable. 112Link to the text of the note

Improvements in space debris tracking technology are another partial solution that promises to help actors avoid collisions by identifying orbital debris in the path of satellites or spacecraft. 113Link to the text of the note There are limits on the effectiveness of such tracking, however, including the inability of some optical systems to track objects at night. 114Link to the text of the note Moreover, commonly employed systems cannot continually track objects smaller than thirty centimeters in diameter. 115Link to the text of the note New systems are being developed, however, that will use lasers that can track the location of objects as small as a softball--sometimes to within one meter. 116Link to the text of the note Such technology is still at the planning stage for NASA, 117Link to the text of the note but Lockheed Martin is teaming up with an Australian-based company on a laser-tracking project already in the works. 118Link to the text of the note Another promising development comes from scientists at the Massachusetts Institute of Technology, who are working on soccer-ball-sized robots [\*318] designed to travel alongside the ISS, investigating potentially harmful space debris along the way. 119Link to the text of the note

But while tracking space debris can help avoid specific accidents, and thus slow the machinations of the Kessler Syndrome, only ADR can stabilize the space environment. 120Link to the text of the note

Fortunately, the targets for ADR that scientists believe will allow us to forestall an irreversible cascade of collisions are relatively modest. 121Link to the text of the note The most common estimate is that removing five to ten large pieces of debris per year is enough to keep the Kessler Syndrome at bay. 122Link to the text of the note And even more encouraging is that a broad array of national and private actors are exploring a plethora of ADR methods. 123Link to the text of the note For example, the Japanese hope to deploy, by 2019, a magnetic net

#### No impact to hacking – this evidence lists past examples from 2008 and 2018 that didn’t escalate and states like Iran have tried and failed which prove it is difficult and unlikely – also massively increases the severity of the hacking they need to win happens

#### No IL to escalation – their ev just says hackers would hack private entities’ sats, but they’re missing an internal between that and space wars when all of their ev is about kessler destroying military sats

#### The costs are so high nobody would use a kinetic ASAT – they’ll disable instead

Su 17 [Jinyuan Su, School of Law, Xi’an Jiaotong University, People’s Republic of China Institute of Air and Space Law, Faculty of Law, McGill University, Canada. "Space Arms Control: Lex Lata and Currently Active Proposals." Asian Journal of International Law, 7 (2017), pp. 61–93. https://www.cambridge.org/core/journals/asian-journal-of-international-law/article/space-arms-control-lex-lata-and-currently-active-proposals/33AEE2235DA44A208E96C66DB034B23D]

The potential serious environmental damages and the unprecedentedly overt dual-use nature of space assets raise the bar to a very high level for the necessity and proportionality of using kinetic ASATs against space assets in conflicts. Belligerents are more likely to use lower-degree force, such as interference and temporary disablement. It is also interesting to note that, during the 1991 Gulf War, both the coalition troops and Iraqi forces used channels for communication on ARABSAT, a satellite dedicated to Middle East communications and run by the Arab Satellite Communications Organization, raising questions as to the usefulness of designations such as “friendly” and “enemy” satellites.125 Whether a norm of armed conflict according a special status of space assets for passive military use may arise remains to be seen.

#### That’s uniquely seen as not escalatory – military planning proves

Wright et al 5 [David Wright is a nationally known expert on the technical aspects of nuclear weapons policy, missile defense systems, missile proliferation, and space weapons. Dr. Wright was a senior research analyst with the Federation of American Scientists and served as an SSRC-MacArthur fellow at Harvard’s Kennedy School of Government. PhD in Physics from Cornell. Laura Grego is a senior scientist in the Global Security Program at the Union of Concerned Scientists. Lisbeth Gronlund was an SSRC-MacArthur Foundation fellow in international peace and security at the University of Maryland. The Physics of Space Security. 2005. https://www.ucsusa.org/sites/default/files/legacy/assets/documents/nwgs/physics-space-security.pdf]

Temporary and reversible interference with a satellite system is likely to be less provocative than destructive attacks. Such interference can, in some cases, be plausibly deniable. And it would not damage the space environment by generating debris. These techniques seem to be favored by military planners in the United States and elsewhere. Moreover, temporary interference with a satellite’s mission, particularly over one’s own territory, is likely to be perceived as defensive and legitimate in a way that permanently disabling the satellite would not.

### Adv 2

#### No IL large enough to trigger the impact – it would cause small holes at best that just regenerate, and none of their ev warrants any brink or how big holes are

#### No extinction from Ozone.

Brian Martin 82 [Brian Martin (Professor of Social Sciences @ the University of Wollongong) December 1982 “The global health effects of nuclear war” Current Affairs Bulletin, Vol. 59, No. 7, pp. 14-26, online @ http://www.uow.edu.au/arts/sts/bmartin/pubs/82cab/index.html, loghry] Recut Justin

Another major threat to ozone comes from nuclear explosions. Nitric oxide is produced essentially by the 'burning' of nitrogen in the atmosphere, and this occurs whenever air temperatures are sufficiently hot: in automobile engines, in aircraft engines and in nuclear explosions. Studies of the creation of oxides of nitrogen by nuclear explosions were first undertaken as part of the SST debate, to determine whether the nuclear weapons tests in the 1950s and 1960s had reduced observed ozone levels.[28] It was only in 1974 that John Hampson made a point which had been overlooked, namely that large-scale nuclear war could cause a major and disastrous reduction in ozone levels.[29] Calculations made in the mid-1970s assuming large nuclear arsenals with many high-yield explosions concluded that reductions of ozone could reach 50 per cent or more in the northern hemisphere, with smaller reductions in the southern hemisphere.[30] But since the number of high-yield weapons in present nuclear arsenals is now smaller, much less oxides of nitrogen would be deposited in the stratosphere by nuclear war than assumed in earlier calculations, and so significant ozone reductions are unlikely.[31] This conclusion remains tentative. The actual behaviour of stratospheric ozone is quite complicated, involving many chemical compounds and numerous chemical reactions, the changing effects of temperature, the angle and intensity of sunlight, and the effect of air motions. Computer models of the effects of nuclear war on ozone are able to take into account only a part of this complexity, and new information about chemical reaction rates in particular have led in the past to periodic revisions in the calculated effects of added oxides of nitrogen. If significant ozone reduction did occur, the most important direct effect on humans would be an increase in skin cancer. However, this is seldom lethal, and could be avoided by reducing exposure to sunlight. Potentially more serious would be effects on crops.[32] Some of the important grains, for example, are sensitive to uv. Whether the net effects on crop yields would be significant is hard to estimate. But whatever the reduction in ozone, ozone levels would return pretty much to normal after a few years.[9] It seems unlikely that in the context of a major nuclear war the changes in uv alone would be of serious concern. In particular, the threat of human extinction raised by Jonathan Schell in The Fate of the Earth,[33] based mostly on effects of increased uv from ozone reduction, seems very small indeed. It is sometimes claimed that nuclear war could destroy ozone to such an extent that humans and animals would be blinded by excess uv. Even if large numbers of high-yield weapons were exploded, this possibility seems very unlikely except for a contribution to snow blindness in the far north. Stratospheric ozone can never be completely removed, but at most reduced greatly. Even if a 50 per cent or more reduction in ozone occurred - and as noted this seems improbable with present nuclear arsenals - protection from uv for humans could be obtained from sunglasses or just ordinary glasses, which absorb uv. For animals, the following considerations are relevant. Ozone levels vary considerably from place to place and from time to time, both seasonally and daily (sometimes by up to 50 per cent). Sunlight at the equator typically passes through only half as much ozone as at the mid-latitudes, yet animals at the equator are not known to go blind more often than elsewhere. Furthermore, most ozone reductions from a nuclear war would be in the mid and high latitudes, where ozone levels are higher to start with and where the 'path length' of sunlight through ozone is increased due to its oblique angle of incidence. But this does not mean complacency is warranted, as the concerns of John Hampson illustrate.

#### Their ev has no warrants for extinction – it just warrants plants dying and more UV rays leaking but says nothing more – hold the line on 1ar extrapolation because I premised my strat off of bad 1ac ev