## 1AC NDCA R5

### 1AC – Plan

#### Plan – The appropriation of outer space through the production of space debris by private entities is unjust. We’ll defend the resolution as a value statement.

### 1AC – Adv – Debris

#### The space sector is trending towards privatization – that drives feedback loops of technology creating cascading collisions.

BERNAT 20. Pawel @ Military University of Aviation. 11/4/20. [SAFETY ENGINEERING OF ANTHROPOGENIC OBJECTS, “ORBITAL SATELLITE CONSTELLATIONS AND THE GROWING THREAT OF KESSLER SYNDROME IN THE LOWER EARTH ORBIT,” Volume 4, PDF] Justin

The second decade of the 21st century has brought a dynamic and somewhat surprising development of the space industry. Since 1972 – the Apollo 17 crew mission to the Moon, the humankind has not left the safe environment of Earth’s orbit, and for years the global space sector has been progressing in slow but steady pace run by a few largest space agencies like American NASA, European ESA, Japanese JAXA, and Chinese CNSA. The most significant achievement of the “old ways” of managing outer space exploration is the International Space Stations (ISS) that has facilitated more than 20 years of continuous crewed operations.

The situation started to change at the turn of the century when new generations of private entrepreneurs began to invest in and develop space technologies like rocket boosters, spaceships, and what most important for the subject of the paper – satellites and their constellations. This new shift is known among the space industry as “Space 2.0”, and its emergence is dated around 2000-2002 when the companies like SpaceX, Blue Origin, and Virgin Galactic were established. (Pyle, 2019). The real change, however, came in 2012 when the first SpaceX commercial mission was successfully launched to the ISS (NASA, 2012).

Since then, the participation of the private sector in the space industry has skyrocketed, especially in the United States. Today, SpaceX is the only entity that provides reusable rockets (first stage and fairings) that is capable of vertical launch and landing. Their current flagship rocket – Falcon 9 has carried out 23 successful missions in 2020 (SpaceX, 2020) and another four are planned for December of that year (Weitering, 2020). Moreover, thanks to Crew Dragon spaceship developed by the company, Americans have regained this year the capacity of sending astronauts from their own soil after nine years of buying the seats on Russian Soyuz capsule. SpaceX is now in the process of building a communication satellites constellation that will be addressed and analyzed in the paper.

Nowadays, in the space industry, we witness a very productive cybernetic feedback look between the development of space technologies, the democratization of those technologies, and a substantial reduction of prices. The latter is even more significant if we compare the cost of launching cargo into orbit now and 20 years ago – Falcon 9 is over ten times cheaper than Space Shuttle (Jones, 2018). This, of course, directly translates into the mass and number of objects that we are able to put in the orbit viably. Once the constellations consisting of thousands of satellites were unthinkable, but in the current environment, they become a reality.

Space 2.0 also has brought new threats and challenges in the sphere of national and international security. The increase in launch capacity, among other factors, has led to progressive militarization and weaponization of space and new arms race (Bernat, 2019), which has also contributed to the growing numbers of orbiting objects.

The goal of the paper is to present the argumentation that the threat posed by the cascading collisions in the Earth’s orbit (Kessler syndrome) is becoming more severe due to the construction of orbital satellite constellations; the threat that presents a real danger for people during their EVAs and orbital infrastructure, which may bare immediate consequences for safety and security systems on Earth. In order to provide the theoretical context for the above claim, the following issues will be presented and discussed: (1) space debris, (2) the Kessler syndrome, (3) orbital debris models, (4) the legal issues related to space debris and mitigation actions against their proliferation, and (5) the planned and being currently developed orbital satellite constellations and how they contribute to the growing threat of the Kessler syndrome.

#### Privatization exponentially increases debris – lack of regulations spikes it – models.

BERNAT 20. Pawel @ Military University of Aviation. 11/4/20. [SAFETY ENGINEERING OF ANTHROPOGENIC OBJECTS, “ORBITAL SATELLITE CONSTELLATIONS AND THE GROWING THREAT OF KESSLER SYNDROME IN THE LOWER EARTH ORBIT,” Volume 4, PDF] Justin

5. Orbital satellite constellations and the growing threat of the Kessler syndrome

Space 2.0 – the new era of space exploration that we witness now in the 21st century means, in words of Buzz Aldrin, “moving human enterprise into space” (Pyle, 2019, p. xiv). The process of commercialization of outer space has already begun and is not limited to private companies providing technologies and services for national or international space agencies, as it was in the past. On the contrary, private companies from the space sector have now matured to carry out their own independent projects.

As for 2020, SpaceX is a company that serves as the best example – it launches satellites to the orbit, both for state and private contractors, it successfully realized two crew missions to the International Space Station, and is in the process of constructing Starlink satellite constellation that will provide high-speed internet access across the planet.

Each satellite weighs around 260 kg, is equipped with an ion propulsion system, autonomous collision avoidance system, and orbits Earth at approximately 540-560 km altitude (Starlink, 2020). At the beginning of November 2020, more than 860 Starlink satellites were orbiting the Earth (Jewett, 2020). Immediate plans include launching 12,000 satellites, but they assume a potential later extension to 42,000 (Henry, 2019a). Of course, SpaceX has employed, at least declaratively, all necessary measures to keep the space clean – the satellites are equipped with the deorbiting system, and in the event of inoperability of the propulsion system (Starlink, 2020). The orbital collisions are, however, inevitable. As it was shown before, the possibility of collisions grows with the number of orbital objects. Bastida Virgili with the team compared (2016, p. 154-155) orbital debris environment development without and with a large hypothetical constellation consisting of merely 1080 satellites, distributed across 20 orbital planes at 1,100 km altitude (Fig. 5).

Chart, line chart

Description automatically generated

Figure 5. Comparison of long term evolution of the number of objects in LEO with and without the constellation (Virgili et al., 2016, p. 155)

It has to be noted that although SpaceX’s Starlink is the only constellation that is being built in orbit, it is not the only one planned. There are at least a few initiatives aiming at the same goal – to construct internet infrastructure at the Earth’s orbit. The planned Kuiper Systems LLC, which is a subsidiary of Amazon and intends to place 3,236 broadband satellites in the LEO, is one of Starlink’s biggest competitors (Henry, 2019b). Now, there is even a rivalry between the two companies because Kuiper’s lowest orbital shell is planned to be 590 km, with a tolerance of 9 km either above or below (Cao, 2020), which is the altitude of Starlink satellites. Moreover, the race for space in orbit is now at the beginning.

The outer space is vast. It increasingly becomes more cluttered with both operational satellites and space debris. The threat of collisions increases and no institution or body has enough power to license, coordinate and regulate what is sent to the orbit. The UNOOSA has not such power. National states decide what the companies from the space industry can launch to space. In the United States, which is most advanced in the area of private constellations, it is the Federal Aviation Administration (FAA) that issues the appropriate approvals. The race to put broadband internet satellites bears similarities to the gold rush – there are no rules, at the global level, apart from first-come, first-served.

#### Models are rigorous.

Virgili et al. 16 – Bastida, J.C. Dolado, H.G. Lewis, J. Radtke, H. Krag, B. Revelin, C. Cazaux b , C. Colombo, R. Crowther, M. Metz. 4/26/16. [Act Astranautica “Risk to space sustainability from large constellations of satellites,” <https://sci-hub.se/10.1016/j.actaastro.2016.03.034>.] Justin

1.3. Simulation approach and result analysis A Monte Carlo (MC) approach was used to simulate the evolution of the object population over a period of 200 years under different post-mission disposal requirements, with four different tools (MEDEE – Modelling the Evolution of Debris on Earth's Environment [9], LUCA – Long Term Utility for Collision Analysis [10], DAMAGE – Debris Analysis and Monitoring Architecture to the Geosynchronous Environment [11] and DELTA – Debris Environment Long Term Analysis [12]). For analysis purposes, the effective number of objects was used where the contribution to the population by each object was weighted by the proportion of the orbital period spent in LEO. In a first step, four different evolutionary models performed an analysis of two reference scenarios. One scenario considered only the evolution of the background population and non-constellation traffic. The second scenario augmented the first with the addition of the representative constellation, with the requirement that 90% of the constellation satellites achieved post-mission disposal to orbits with remaining lifetimes of 25 years. The manoeuvres performed at the mission end to meet the disposal requirement are assumed to be impulsive (i.e. instantaneous) and result in an eccentric orbit with the apogee near the original (constellation) altitude and the perigee at an altitude such that the effects of atmospheric drag would cause the orbit to decay within 25 years. Two of the models considered an apogee remaining at the operational constellation altitude, while the other two reduced the apogee by 50 km. The purpose of these scenarios is to provide a cross-comparison of the models in terms of their predictions of the total object population, which take into account the effects of the constellation. As the distribution of the MC results for the models is of the same nature and the results are independent, a bootstrapping [20] approach is used to derive the mean, the standard deviation and the confidence levels at 95% of the combined results of all the MC runs from the four models (cf. Fig. 1), although not all the models performed the same number of MC runs (see Table 1). The main source of variation inside a particular model's MC runs included the randomness in collision activity, while the different models used their own solar activity forecast.

#### Debris shreds ozone.

Josy O’Donnell 18, creator of Conservation Institute, “WHAT HAPPENS TO THE “SPACE JUNK” THAT FALLS BACK TO EARTH?,” https://ourplnt.com/space-junk-earth/#axzz5xRXia1uD

Second, as the orbits of man-made debris degrade, and they re-enter the earth’s atmosphere, a shock wave occurs in the upper reaches of the layer of ozone. This physical stress on the area can be damaging to the protective buffer. Researchers have discovered that the impact of objects entering the atmosphere at high speed can produce nitric oxide during the rapid cooling that follows the splitting of oxygen and nitrogen. Nitric oxide is very destructive to the ozone layer. Finally, though most of the debris that re-enters the earth’s atmosphere is vaporized due to the build- up of intense heat, the chemical residue of this material can also react with the ozone and deplete it. Some scientists fear that erosion of the ozone layer may cause global climate change. They predict that these altered weather patterns could transform fertile farmland into deserts and threaten human life on the planet. Thus, the environmental effect of space debris upon the ozone is of great concern to these experts.

#### **Ozone collapse causes extinction.**

Simmons 20 [Carla Simmons,, The Science Times, "A Repeat of One of the Biggest Extinctions Caused by Ozone Layer Erosion 359M Years Ago Possible, Warn Scientists | Science Times", May 27, 2020, https://www.sciencetimes.com/articles/25838/20200527/repeat-one-biggest-extinctions-caused-ozone-layer-erosion-359m-years.htm] BD

University of Southampton researchers have delved deeper into an extinction event that occurred about 360 million years ago. According to their research, the ozone layer's breakdown caused by ultraviolet (UV) radiation vanquished much of the Earth's marine life and greenery. Moreover, their discovery led to weighty indications for today's continually warming Earth.

Numerous episodes of mass extinction occurred in the geological past. One of the most notorious ones caused the extinction of dinosaurs about 66 million years ago. Their destruction was believed to have been caused by an asteroid hitting the Earth.

Additionally, two chapters were caused by large-scale volcanic eruptions that created the imbalance of oceans and atmospheres in the planets. Another one happened during the end of Permian Great Dying, which, according to Stanford, wiped out 96% of the Earth's aquatic species.

Scientists have discovered evidence pointing to high levels of UV radiation responsible for collapsing forest ecosystems and killing off water animal species during the Devonian geological period about 359 million years ago.

Their research revealed that warming temperatures after an intense ice age could have caused the ozone to collapse. The researchers suggest that the Earth might possibly reach comparable temperatures, thus might face the same consequences that occurred in the past.

The findings of their study are published in the journal Science Advances. Additionally, the research was partly funded by a grant from the National Geographic Society. It was also regulated in collaboration with The Sedgwick Museum of Earth Sciences at the University of Cambridge.

The team collected various rock samples during expeditions in locations in South America. They formed clues as to what was happening at the edge of the melting Devonian ice sheet, which allowed them to compare between the extinction event close to the pole and near the equator.

The rocks were then dissolved in hydrofluoric acid back in the laboratory. The dissolved rocks released microscopic plant spores, which were preserved for hundreds of millions of years. On microscopic examination, the scientists found many of the spores had bizarrely formed spines on their surface.

According to the researchers, the spikes were due to UV radiation damaging their DNA. Furthermore, they found that many spores had dark pigmented walls. These walls were thought to be a protective 'shield' against the increasing and damaging UV levels.

From their findings, the scientists have concluded that during a time of expeditious global warming, the ozone layer collapsed for a short while. Moreover, the ozone collapse exposed life on Earth to harmful UV radiation levels and, therefore, triggered a mass extinction event. This affected life on land and in shallow water at the Devonian-Carboniferous boundary.

From Climate Change to Climate Emergency

Professor John Marshall, the lead researcher from the University of Southampton's School of Ocean and Earth Science, said that our ozone layer is currently in a state of alteration. He adds that they have seen this pattern in the past, where a stimulant or impetus was unnecessary for the phenomenon to kick in.

He also says that current approximate calculations suggest that the Earth will reach similar global temperatures to those of 360 million years ago. Furthermore, they say it is possible that a similar collapse of the ozone layer could occur again, dangerously exposing surface and shallow sea life to harmful radiation.

#### Satellites are an impact multiplier – specifically solves the grid.

Pellegrino & Stang 16. Massimo Pellegrino, Master’s Degree in Space Studies from ISU, with Gerald Stang, Senior Associate Analyst at the EUISS, holds BSc and MSc degrees in chemical engineering from the University of Saskatchewan and an MA in international affairs from the School of International and Public Affairs at Columbia University (“Space Security for Europe”, *EU Institute for Security Studies*, published July 2016, <https://www.iss.europa.eu/content/space-security-europe>, accessed 7-10-2019) bm

Modern societies are highly dependent on the continuous operation of critical infrastructure to ensure the provision of basic goods and services. They consist of assets, systems or parts thereof which are so vital, that their disruption would significantly impact the economy, national security, public health, safety, or social well-being. Examples of critical infrastructure include energy, water, food supply, communication, transportation, and waste processing systems. Space assets are so deeply embedded in developed economies that a day without fully functioning space capabilities would severely restrict or even endanger our lives.

Space systems are critical for running energy grids and telecommunication networks, border and maritime surveillance, crisis management and humanitarian operations, environmental and climate monitoring, verification of international treaties and arms control agreements, and the fight against organised crime and terrorism. Space assets also provide the technological backbone for other critical infrastructures. The synchronisation of power grids and telecommunication networks, for example, is heavily dependent on GNSS timing signals and any disruption would create a domino effect on other critical infrastructures (see Figure 5).

Satellites also play a central role in supporting defence systems and military operations. They are force multipliers that provide intelligence, surveillance, and reconnaissance (ISR) capabilities, as well as communication, navigation, positioning and timing signals. Armed forces do not only use their own space systems, but are also significant consumers of space services provided by private operators. In fact, about 90% of US military communications traffic passes through civilian satellites, many of which privately owned, rather than through dedicated systems designed to withstand attempted interruptions.1 The reliance of both civilian and military users on space systems therefore places them firmly in the area of critical infrastructure. Some critical space systems, such as the American GPS, are under foreign control, and the governments controlling those systems retain the authority to disrupt services, even for allies, in case of a national emergency. While the United States announced that it has no intention of ever intentionally degrading public GPS signals (also known as ‘Selective Availability’) and that the next generation of GPS satellites will not include this feature, other governments might still do so.2

These dependences engender new and growing vulnerabilities. Reliance on space is likely to increase further as space capabilities and services improve in diversity, quality and affordability. Close to 1,500 satellites with a launch mass of over 50 kg are expected to be launched over the next decade; an increase of 50% compared to 2005-2014. This estimate excludes both the expected proliferation of smaller satellites (such as CubeSats), but also the planned OneWeb and Steam mega-constellations for global internet broadband service. Advances in small satellite capabilities and in launch technology (e.g. SpaceX’s Falcon rocket family) have already lowered the cost of access to space. About 45% more CubeSats were launched in 2014 than in 2013 (130 vs. 91), accounting for 63% of all satellites launched3 . However, just as the reliance on space increases, so too do threats and vulnerabilities. Therefore, in order to realise the full potential of investments in space, critical space systems need to be adequately protected and the space environment properly managed.

#### Grid security is an existential risk factor.

Denkenberger 21 – David Denkenberger, Anders Sandberg, Ross John Tieman, and Joshua M. Pearce, \*Assistant professor of mechanical engineering at University of Alaska Fairbanks, “Long-term cost-effectiveness of interventions for loss of electricity/industry compared to artificial general intelligence safety,” 2021, *European Journal of Futures Research*, Vol. 9, Issue 1, https://doi.org/10.1186/s40309-021-00178-z, EA Recut Justin

Civilization relies on a network of highly interdependent critical infrastructure (CI) to provide basic necessities (water, food, shelter, basic goods), as well as complex items (computers, cars, space shuttles) and services (the internet, cloud computing, global supply chains), henceforth referred to as industry. Electricity and the electrical infrastructure that distributes it plays an important role within industry, providing a convenient means to distribute energy able to be converted into various forms of useful work. Electricity is one component of industry albeit a critical one. Industry provides the means to sustain advanced civilization structures and the citizens that inhabit them. These structures play a critical role in realizing various futures by allowing humanity to discover and utilize new resources, adapt to various environments, and resist natural stressors.

Though industry is capable of resisting small stressors, a sufficiently large event can precipitate cascading failure of CI systems, resulting in a collapse of industry. If one does not temporally discount the value of future people, the long-term future (thousands, millions, or even billions of years) could contain an astronomically large amount of value [18]. Events capable of curtailing the potential of civilization (existential risks, such as human extinction or an unrecoverable collapse) would prevent such futures from being achieved, implying reducing the likelihood of such events is of the utmost importance [100]. Reducing the prevalence of existential risks factors; events, systemic structures, or biases which increase the likelihood of extinction but do not cause extinction by themselves is also highly valuable. Complete collapse or degraded function of industry would drastically reduce humanity’s capacity to coordinate and deploy technology to prevent existential risks, representing an existential risk factor. Consequently, interventions preventing loss of industry, reducing the magnitude of impacts, or increasing speed of recovery could be extremely valuable.

Existential risk research is, by nature, future focused, requiring the investigation of events that have not yet occurred. Futures studies methodologies are often applied to uncover salient trends or events, and explore potential causal structures [54, 123]. Probabilistic modeling techniques can then be used to determine the likelihood of such events occurring, including adequate treatment of uncertainty [101]. The cost-effectiveness modeling approach outlined in this paper is an example of this, attempting to assess the marginal utility of losing industry interventions on improving the long-term future. This approach could guide future efforts to assess the relative cost-effectiveness of interventions for different risks, existential or otherwise. More practically, this research can inform prioritization efforts of industrialized countries by providing estimates of the cost of global industrial collapse, and the utility of resilience interventions. This is relevant to the European Union which has a highly industrialized economy, providing $2.3 Trillion USD of the $13.7 Trillion USD global total of value add manufacturing [122]. The EU has shifted toward a more proactive foresight approach about natural and man-made disasters, noting the importance of rare high-impact events, systemic risks, and converging trends requiring better data and forecasting to drive a more ambitious crisis management system [47]. Still, it is clear that most academic and institutional emphasis has been on “ordinary” rather than extreme disasters, and risks from industry to the public and environment rather than widespread failures of industrial services causing harm. The integrated nature of the electric grid, which is based on centralized generation makes the entire system vulnerable to disruption.1 There are a number of anthropogenic and natural catastrophes that could result in regional-scale electrical grid failure, which would be expected to halt the majority of industries and machines in that area. A high-altitude electromagnetic pulse (HEMP) caused by a nuclear weapon could disable electricity over part of a continent [16, 48, 66, 93]. This could destroy the majority of electrical grid infrastructure, and as fossil fuel extraction and industry is reliant on electricity [49], industry would be disabled. Similarly, solar storms have destroyed electrical transformers connected to long transmission lines in the past [117]. The Carrington event in 1859 damaged telegraph lines, which was the only electrical infrastructure in existence at the time. It also caused Aurora Borealis that was visible in Cuba and Jamaica [70]. This could potentially disable electrical systems at high latitudes, which could represent 10% of electricity/industry globally. Though solar storms may last less than the 12 h that would be required to expose the entire earth with direct line of sight, the earth’s magnetic field lines redirect the storm to affect the opposite side of the earth [117]. Lastly, both physical [6, 8, 69, 89, 111] and cyber attacks [3, 63, 90, 96, 118, 128, 130] could also compromise electric grids. Physical attacks include traditional acts of terrorism such as bombing or sabotage [130] in addition to EMP attacks. Significant actors could scale up physical attacks, for example by using drones. A scenario could include terrorist groups hindering individual power plants [126], while a large adversary could undertake a similar operation physically to all plants and electrical grids in a region. Unfortunately, the traditional power grid infrastructure is simply incapable of withstanding intentional physical attacks [91]. Damage to the electric grid resulting in physical attack could be long lasting, as most traditional power plants operate with large transformers that are difficult to move and source. Custom rebuilt transformers require time for replacement ranging from months and even up to years [91]. For example, a relatively mild 2013 sniper attack on California’s Pacific Gas and Electric (PG&E) substation, which injured no one directly, was able to disable 17 transformers supplying power to Silicon Valley. Repairs and improvements cost PG&E roughly $100 million and lasted about a month [10, 102]. A coordinated attack with relatively simple technology (e.g., guns) could cause a regional electricity disruption. However, a high-tech attack could be even further widespread. The Pentagon reports spending roughly $100 million to repair cyber-related damages to the electric grid in 2009 [57]. There is also evidence that a computer virus caused an electrical outage in the Ukraine [56]. Unlike simplistic physical attacks, cyber attackers are capable of penetrating critical electric infrastructure from remote regions of the world, needing only communication pathways (e.g., the Internet or infected memory sticks) to install malware into the control systems of the electric power grid. For example, Stuxnet was a computer worm that destroyed Iranian centrifuges [73] to disable their nuclear industry. Many efforts are underway to harden the grid from such attacks [51, 63]. The U.S. Department of Homeland Security responded to ~ 200 cyber incidents in 2012 and 41% involved the electrical grid [103]. Nations routinely have made attempts to map current critical infrastructure for future navigation and control of the U.S. electrical system [57]. The electric grid in general is growing increasingly dependent upon the Internet and other network connections for data communication and monitoring systems [17, 112, 118, 127, 135]. Although this conveniently allows electrical suppliers management of systems, it increases the susceptibility of the grid to cyber-attack, through denial of webpage services to consumers, disruption to supervisory control and data acquisition (SCADA) operating systems, or sustained widespread power outages [3, 72, 118, 120]. Thus global or regional loss of the Internet could have similar implications. A less obvious potential cause is a pandemic that disrupts global trade. Countries may ban trade for fear of the disease entering their country, but many countries are dependent on imports for the functioning of their industry. If the region over which electricity is disrupted had significant agricultural production, the catastrophe could be accompanied by a ~ 10% food production shortfall as well. It is uncertain whether countries outside the affected region would help the affected countries, do nothing, or conquer the affected countries. Larger versions of these catastrophes could disrupt electricity/industry globally. For instance, it is possible that multiple HEMPs could be detonated around the world, due to a world nuclear war [105] or due to terrorists gaining control of nuclear weapons. There is evidence that, in the last 2000 years, two solar storms occurred that were much stronger than the Carrington event [85]. Therefore, it is possible that an extreme solar storm could disable electricity and therefore industry globally. It is conceivable that a coordinated cyber or physical attack (or a combination) on many electric grids could also disrupt industry globally. Many of the techniques to harden the electric grid could help with this vulnerability as well as moving to more distributed generation and microgrids [23, 29, 75, 76, 103, 114]. An extreme pandemic could cause enough people to not show up to work such that industrial functioning could not be maintained. Though this could be mitigated by directing military personnel to fill vacant positions, if the pandemic were severe enough, it could be rational to retreat from high human contact industrial civilization in order to limit disease mortality. The global loss of electricity could even be self-inflicted as a way of stopping rogue artificial general intelligence (AGI) [124]. As the current high agricultural productivity depends on industry (e.g., for fertilizers), it has been assumed that there would be mass starvation in these scenarios [107].

Repairing these systems and re-establishing electrical infrastructure would be a goal of the long term and work should ideally start on it immediately after a catastrophe. However, human needs would need to be met immediately (and continually) and since there is only a few months of stored food, it would likely run out before industry is restored with the current state of preparedness. In some of the less challenging scenarios, it may be possible to continue running some machines on the fossil fuels that had previously been brought to the surface or from the use microgrids or shielded electrical systems. In addition, it may be feasible to run some machines on gasified wood [31]. However, in the worst-case scenario, all unshielded electronics would be destroyed.

#### Debris triggers miscalculated war.

Robert Farley 22, Now a 1945 Contributing Editor, Dr. Robert Farley is a Senior Lecturer at the Patterson School at the University of Kentucky. Dr. Farley is the author of Grounded: The Case for Abolishing the United States Air Force (University Press of Kentucky, 2014), the Battleship Book (Wildside, 2016), and Patents for Power: Intellectual Property Law and the Diffusion of Military Technology (University of Chicago, 2020). 1/9/22. [19 Fourty Five, “Does A Space War Mean A Nuclear War?,” <https://www.19fortyfive.com/2022/01/does-a-space-war-mean-a-nuclear-war/>] Justin

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

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

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

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

#### **No checks on escalation.**

MacDonald 18. Bruce W. MacDonald, professor at the Johns Hopkins University School of Advanced International Studies (SAIS), ("Outer Space; Earthly Escalation? Chinese Perspectives on Space Operations and Escalation," August 2018, *NSI* white paper, <https://nsiteam.com/social/wp-content/uploads/2018/08/SMA-White-Paper_Chinese-Persepectives-on-Space_-Aug-2018.pdf>, accessed 7-14-2019) bm

Challenges across all five phases: Another escalation threat is the inexperience that nations share in the space and cyber domains, unlike in conventional domains of conflict and in the nuclear domain to a lesser extent. This inexperience gives rise to a “sorcerer’s apprentice” problem, placing leaders at risk of making potentially unwise judgment calls without a full grasp of their implications. The space and cyber domains are sufficiently new and dynamic that such decisions are highly likely. Adding to this uncertainty is the ever-growing interdependence of infrastructures within and among advanced countries, making the impact of major attacks against a country’s space and/or cyber infrastructures inherently unknowable. In considering all these factors, it is important to keep in mind that events in space do not happen in isolation. Any space conflict would likely be part of a multidimensional field of play, with space being important because of the effects it has on the earth. Significant instability in space is unlikely to lead to war if there is stability in other domains and in the larger geopolitical relationship between participants, while conflict could easily spread to a stable space domain if war in other domains appeared preferable to the alternative. While any use of nuclear weapons would pose a serious threat of escalation to full-scale nuclear war, any use of space or cyber offense would not pose a comparable escalation threat. That said, a series of reciprocal escalations could easily become unstable. No clear-cut escalation barrier exists in the space and cyber domains, and given the short-term tactical benefits of escalating ahead of an adversary, each additional escalation could create incentives for further escalation that an adversary would not always anticipate. Escalation in space, then, is a slippery slope with few off-ramps.

#### No limited nuclear wars – extinction.

Webber 19 – Dr Philip Webber has written widely on nuclear issues and is Chair of Scientists for Global Responsibility (SGR) – a membership organisation promoting responsible science and technology. We will all end up killing each other and one nuclear blast could do it. 5/18/19. [METRO.UK “We will all end up killing each other and one nuclear blast could do it,” <https://metro.co.uk/2019/05/18/we-will-all-end-up-killing-each-other-and-one-nuclear-blast-could-do-it-9370115/>] Recut Justin

The nuclear armed nations have inadvertently created a global Doomsday machine, built with 15,000 nuclear weapons.

Most (93%) have been built by Russia and in the US, 3,100 of them are ready to fire within hours.

Pre-programmed targets include main cities as well as a range of military and civilian targets across the world primarily in the UK, Europe, US, Russia and China but also in Japan, Australia and South America.

One nuclear blast, one mistake, one cyber attack could trigger it.

But first a reminder about the incredible destructive power of a nuclear weapon. Modern nuclear warheads are typically 20 times larger than either of the two bombs that obliterated Hiroshima and Nagasaki at the end of the Second World War. What just one nuclear warhead can do is unimaginable. We’ve drawn some of the key features to scale against cityscapes in the UK for a Russian SS-18 RS 20V (NATO designation ‘Satan’) 500kT warhead. US submarines deploy a similar weapon – the Trident II Mk5, 475kT warhead. A deafening, terrifying noise will be created, like an intense thunder that lasts for 10 seconds or longer.

After a blinding flash of light bright destroying the retina of anyone looking, and a violent electromagnetic pulse (EMP) knocking out electrical equipment several miles away, a bomb of this size quickly forms an incandescent fireball 850 metres across.

This is about the same height as the world’s tallest building, the Burj Khalifa. Drawn against the London Canary Wharf financial district or the Manchester skyline, the huge fireball dwarfs one Canary Sq. (240m), the South Tower Deansgate (201m) and the Beetham Tower Hilton, (170m). The fireball engulfs both city centres completely, melting glass and steel and forms an intensely radioactive 60m deep crater zone of molten earth and debris. A devastating supersonic blast wave flattens everything within a radius of two to three km, the entire Manchester centre, an area larger than the City of London, with lighter damage out to eight km. Most people in these areas would be killed or very seriously injured.

The fireball quickly rises forming an enormous characteristic mushroom shaped cloud raining highly radioactive particles (fallout). It rises to 60,000 ft (18,000m) – twice the altitude of Everest – and is 15 miles, 24km across.

This is one warhead. There are 10 such warheads on each of Russia’s 46 missiles (460 in total) and 48 on each of eight US Trident submarines (384 in total). In reality, in a nuclear conflict all of these warheads and a further 956 ready-to-fire are likely to be launched.

Whilst this scale of destruction is horrific and hundreds of millions of people would be killed in a few hours from a combination of blast, radiation and huge fires, there are also terrible longer-term effects.

Scientists predict that huge city-wide firestorms combined with very the high-altitude debris clouds would severely reduce sunlight levels and disrupt the world’s climate for a decade causing drought, a prolonged winter, global famine and catastrophic impacts for all life on earth and in the seas due to intense levels of UV with the destruction of the ozone layer.

But even at the level of a few hundred nuclear warheads, the consequences of a nuclear war would be extremely severe across the world far beyond the areas hit directly. A nuclear conflict between India and Pakistan with ‘only’ 100 small warheads would kill hundreds of millions and cause climate damage leading to a global famine. The sheer destructive nature of nuclear explosions combined with long lasting radiation, means that nuclear weapons are of no military use. ‘Enemy’ territory would be unusable for years because of intense radiation – especially when nuclear power stations and reprocessing plants are hit.

Even if your own country is not hit, radiation and climate damage will spread across the globe. No one escapes the consequences.

But the nuclear nations argue that they build and keep nuclear weapons to make sure that they are never used. After all no one would be stupid enough to actually launch a nuclear weapon facing such terrible retaliation? It sounds obvious. If you threaten any attacker with terrible nuclear devastation of course they won’t attack you. That might be true most of the time. It is very unlikely that any country would launch a nuclear attack deliberately. But there are two very major problems. First, a terrorist organisation with a nuclear weapon cannot be deterred in this way. Secondly, there are several ways in which a nuclear war can start by mistake. A report by the prestigious Chatham House in 2014 documents 30 instances between 1962 and 2002 when nuclear weapons came within minutes of being launched due to miscalculation, miscommunication, or technical errors. What prevented their use on many of these occasions was the intervention of individuals who, against military orders, either refused to authorise a nuclear strike or relay information that would have led to launch. Examples include a weather rocket launch mistaken for an attack on Russia, a US satellite misinterpreting sunlight reflecting off clouds as multiple missiles firings, a 42c chip fault creating a false warning of 220 missiles launched at the United States. Such risks are heightened during political crises.

The risk of mistake is very high because, in a hangover from the Cold War, the USA and Russia each keep 900 warheads ready to fire in a few minutes, in a ‘launch on warning’ status, should a warning of nuclear attack come in.

These nuclear weapons form a dangerous nuclear stand-off – rather like two people holding guns to each other’s heads.

With only a few minutes to evaluate a warning of nuclear attack before warheads would strike, one mistake can trigger disaster. A similar nuclear stand-off exists between India and Pakistan.

### 1AC – Framing

#### The standard is maximizing expected well-being.

#### Death is bad and o/w—ontologically destroys the subject.

Paterson 1 – Department of Philosophy, Providence College, Rhode Island. (Craig, “A Life Not Worth Living?”, Studies in Christian Ethics, <http://sce.sagepub.com>)

Contrary to those accounts, I would argue that it is death per se that is really the objective evil for us, not because it deprives us of a prospective future of overall good judged better than the alter- native of non-being. It cannot be about harm to a former person who has ceased to exist, for no person actually suffers from the sub-sequent non-participation. Rather, death in itself is an evil to us because it ontologically destroys the current existent subject — it is the ultimate in metaphysical lightening strikes.80 The evil of death is truly an ontological evil borne by the person who already exists, independently of calculations about better or worse possible lives. Such an evil need not be consciously experienced in order to be an evil for the kind of being a human person is. Death is an evil because of the change in kind it brings about, a change that is destructive of the type of entity that we essentially are. Anything, whether caused naturally or caused by human intervention (intentional or unintentional) that drastically interferes in the process of maintaining the person in existence is an objective evil for the person. What is crucially at stake here, and is dialectically supportive of the self-evidency of the basic good of human life, is that death is a radical interference with the current life process of the kind of being that we are. In consequence, death itself can be credibly thought of as a ‘primitive evil’ for all persons, regardless of the extent to which they are currently or prospectively capable of participating in a full array of the goods of life.81  In conclusion, concerning willed human actions, it is justifiable to state that any intentional rejection of human life itself cannot therefore be warranted since it is an expression of an ultimate disvalue for the subject, namely, the destruction of the present person; a radical ontological good that we cannot begin to weigh objectively against the travails of life in a rational manner. To deal with the sources of disvalue (pain, suffering, etc.) we should not seek to irrationally destroy the person, the very source and condition of all human possibility.82

#### Extinction outweighs:

#### A] Structural violence- death causes suffering because people can’t get access to resources and basic necessities

#### B] Comes before value-to-life.

Tännsjö 11 (Torbjörn, the Kristian Claëson Professor of Practical Philosophy at Stockholm University, “Shalt Thou Sometimes Murder? On the Ethics of Killing,” <http://people.su.se/~jolso/HS-texter/shaltthou.pdf>) //BS 1-27-2018

\*\*Bracketed to avoid triggers

I suppose it is correct to say that, if Schopenhauer is right, if life is never worth living, then according to utilitarianism we should all [die] commit suicide and put an end to humanity. But this does not mean that, each of us should commit suicide. I commented on this in chapter two when I presented the idea that utilitarianism should be applied, not only to individual actions, but to collective actions as well.¶ It is a well-known fact that people rarely commit suicide. Some even claim that no one who is mentally sound commits suicide. Could that be taken as evidence for the claim that people live lives worth living? That would be rash. Many people are not utilitarians. They may avoid suicide because they believe that it is morally wrong to kill oneself. It is also a possibility that, even if people lead lives not worth living, they believe they do. And even if some may believe that their lives, up to now, have not been worth living, their future lives will be better. They may be mistaken about this. They may hold false expectations about the future.¶ From the point of view of evolutionary biology, it is natural to assume that people should rarely commit suicide. If we set old age to one side, it has poor survival value (of one’s genes) to kill oneself. So it should be expected that it is difficult for ordinary people to kill themselves. But then theories about cognitive dissonance, known from psychology, should warn us that we may come to believe that we live better lives than we do.¶ My strong belief is that most of us live lives worth living. However, I do believe that our lives are close to the point where they stop being worth living. But then it is at least not very far-fetched to think that they may be worth not living, after all. My assessment may be too optimistic.¶ Let us just for the sake of the argument assume that our lives are not worth living, and let us accept that, if this is so, we should all kill ourselves. As I noted above, this does not answer the question what we should do, each one of us. My conjecture is that we should not [die] commit suicide. The explanation is simple. If I [die] kill myself, many people will suffer. Here is a rough explanation of how this will happen: ¶ ... suicide “survivors” confront a complex array of feelings. Various forms of guilt are quite common, such as that arising from (a) the belief that one contributed to the suicidal person's anguish, or (b) the failure to recognize that anguish, or (c) the inability to prevent the suicidal act itself. Suicide also leads to rage, loneliness, and awareness of vulnerability in those left behind. Indeed, the sense that suicide is an essentially selfish act dominates many popular perceptions of suicide. ¶ The fact that all our lives lack meaning, if they do, does not mean that others will follow my example. They will go on with their lives and their false expectations — at least for a while devastated because of my suicide. But then I have an obligation, for their sake, to go on with my life. It is highly likely that, by committing suicide, I create more suffering (in their lives) than I avoid (in my life).

#### C] Mathematically outweighs.

MacAskill 14 [William, Oxford Philosopher and youngest tenured philosopher in the world, Normative Uncertainty, 2014]

The human race might go extinct from a number of causes: asteroids, supervolcanoes, runaway climate change, pandemics, nuclear war, and the development and use of dangerous new technologies such as synthetic biology, all pose risks (even if very small) to the continued survival of the human race.184 And different moral views give opposing answers to question of whether this would be a good or a bad thing. It might seem obvious that human extinction would be a very bad thing, both because of the loss of potential future lives, and because of the loss of the scientific and artistic progress that we would make in the future. But the issue is at least unclear. The continuation of the human race would be a mixed bag: inevitably, it would involve both upsides and downsides. And if one regards it as much more important to avoid bad things happening than to promote good things happening then one could plausibly regard human extinction as a good thing.For example, one might regard the prevention of bads as being in general more important that the promotion of goods, as defended historically by G. E. Moore,185 and more recently by Thomas Hurka.186 One could weight the prevention of suffering as being much more important that the promotion of happiness. Or one could weight the prevention of objective bads, such as war and genocide, as being much more important than the promotion of objective goods, such as scientific and artistic progress. If the human race continues its future will inevitably involve suffering as well as happiness, and objective bads as well as objective goods. So, if one weights the bads sufficiently heavily against the goods, or if one is sufficiently pessimistic about humanity’s ability to achieve good outcomes, then one will regard human extinction as a good thing.187 However, even if we believe in a moral view according to which human extinction would be a good thing, we still have strong reason to prevent near-term human extinction. To see this, we must note three points. First, we should note that the extinction of the human race is an extremely high stakes moral issue. Humanity could be around for a very long time: if humans survive as long as the median mammal species, we will last another two million years. On this estimate, the number of humans in existence in the The future, given that we don’t go extinct any time soon, would be 2×10^14. So if it is good to bring new people into existence, then it’s very good to prevent human extinction. Second, human extinction is by its nature an irreversible scenario. If we continue to exist, then we always have the option of letting ourselves go extinct in the future (or, perhaps more realistically, of considerably reducing population size). But if we go extinct, then we can’t magically bring ourselves back into existence at a later date. Third, we should expect ourselves to progress, morally, over the next few centuries, as we have progressed in the past. So we should expect that in a few centuries’ time we will have better evidence about how to evaluate human extinction than we currently have. Given these three factors, it would be better to prevent the near-term extinction of the human race, even if we thought that the extinction of the human race would actually be a very good thing. To make this concrete, I’ll give the following simple but illustrative model. Suppose that we have 0.8 credence that it is a bad thing to produce new people, and 0.2 certain that it’s a good thing to produce new people; and the degree to which it is good to produce new people, if it is good, is the same as the degree to which it is bad to produce new people, if it is bad. That is, I’m supposing, for simplicity, that we know that one new life has one unit of value; we just don’t know whether that unit is positive or negative. And let’s use our estimate of 2×10^14 people who would exist in the future, if we avoid near-term human extinction. Given our stipulated credences, the expected benefit of letting the human race go extinct now would be (.8-.2)×(2×10^14) = 1.2×(10^14). Suppose that, if we let the human race continue and did research for 300 years, we would know for certain whether or not additional people are of positive or negative value. If so, then with the credences above we should think it 80% likely that we will find out that it is a bad thing to produce new people, and 20% likely that we will find out that it’s a good thing to produce new people. So there’s an 80% chance of a loss of 3×(10^10) (because of the delay of letting the human race go extinct), the expected value of which is 2.4×(10^10). But there’s also a 20% chance of a gain of 2×(10^14), the expected value of which is 4×(10^13). That is, in expected value terms, the cost of waiting for a few hundred years is vanishingly small compared with the benefit of keeping one’s options open while one gains new information.

#### Existential risks are non-linear and irreversible – peer-reviewed science proves they’re probable – psychological and social biases skew impact calculus to threat deflation.

Pamlin and Armstrong 15 (Dennis, Executive Project Manager of Global Risks @ Global Challenges Foundation, and Stuart, James Martin Research Fellow @ Oxford, “Global Challenges: 12 Risks that threaten human civilization: The case for a new risk category,” <https://api.globalchallenges.org/static/wp-content/uploads/12-Risks-with-infinite-impact.pdf>) //BS 4-1-2018 [brackets for] ~~ableist language~~

2. Risks with infinite impact: A new category of risks “Most risk management is really just advanced contingency planning and disciplining yourself to realise that, given enough time, very low probability events not only can happen, but they absolutely will happen.” Lloyd Blankfein, Goldman Sachs CEO, July 2013 1 Risk = Probability × Impact Impacts where civilisation collapses to a state of great suffering and do not recover, or a situation where all human life end, are defined as infinite as the result is irreversible and lasts forever. A new group of global risks This is a report about a limited number of global risks – that can be identified through a scientific and transparent process – with impacts of a magnitude that pose a threat to human civilisation, or even possibly to all human life. With such a focus it may surprise some readers to find that the report’s essential aim is to inspire action and dialogue as well as an increased use of the methodologies used for risk assessment. The real focus is not on the almost unimaginable impacts of the risks the report outlines. Its fundamental purpose is to encourage global collaboration and to use this new category of risk as a driver for innovation. The idea that we face a number of global challenges threatening the very basis of our civilisation at the beginning of the 21st century is well accepted in the scientific community, and is studied at a number of leading universities.2 But there is still no coordinated approach to address this group of challenges and turn them into opportunities for a new generation of global cooperation and the creation of a global governance system capable of addressing the greatest challenges of our time. This report has, to the best of our knowledge, created the first science-based list of global risks with a potentially infinite impact and has made the first attempt to provide an initial overview of the uncertainties related to these risks as well as rough quantifications for the probabilities of these impacts. What is risk? Risk is the potential of losing something of value, weighed against the potential to gain something of value. Every day we make different kinds of risk assessments, in more or less rational ways, when we weigh different options against each other. The basic idea of risk is that an uncertainty exists regarding the outcome and that we must find a way to take the best possible decision based on our understanding of this uncertainty.3 To calculate risk the probability of an outcome is often multiplied by the impact. The impact is in most cases measured in economic terms, but it can also be measured in anything we want to avoid, such as suffering. At the heart of a risk assessment is a probability distribution, often described by a probability density function4; see figure X for a graphic illustration. The slightly tilted bell curve is a common probability distribution, but the shape differs and in reality is seldom as smooth as the example. The total area under the curve always represents 100 percent, i.e. all the possible outcomes fit under the curve. In this case (A) represents the most probable impact. With a much lower probability it will be a close to zero impact, illustrated by (B). In the same way as in case B there is also a low probability that the situation will be very significant, illustrated by (C). Figure 1: Probability density function The impacts (A), (B) and (C) all belong to the same category, normal [common] impacts: the impacts may be more or less serious, but they can be dealt with within the current system. The impacts in this report are however of a special kind. These are impacts where everything will be lost and the situation will not be reversible, i.e challenges with potentially infinite impact. In insurance and finance this kind of risk is called “risk of ruin”, an impact where all capital is lost.5 This impact is however only infinite for the company that is losing the money. From society’s perspective, that is not a special category of risk. In this report the focus is on the “risk of ruin” on a global scale and on a human level, in the worst case this is when we risk the extinction of our own species. On a probability curve the impacts in this report are usually at the very far right with a relatively low probability compared with other impacts, illustrated by (D) in Figure 2. Often they are so far out on the tail of the curve that they are not even included in studies. For each risk in this report the probability of an infinite impact is very low compared to the most likely outcome. Some studies even indicate that not all risks in this report can result in an infinite impact. But a significant number of peer-reviewed reports indicate that those impacts not only can happen, but that their probability is increasing due to unsustainable trends. The assumption for this report is that by creating a better understanding of our scientific knowledge regarding risks with a potentially infinite impact, we can inspire initiatives that can turn these risks into drivers for innovation. Not only could a better understanding of the unique magnitude of these risks help address the risks we face, it could also help to create a path towards more sustainable development. The group of global risks discussed in this report are so different from most of the challenges we face that they are hard to comprehend. But that is also why they can help us to build the collaboration we need and drive the development of further solutions that benefit both people and the planet. As noted above, none of the risks in this report is likely to result directly in an infinite impact, and some are probably even physically incapable of doing so. But all are so significant that they could reach a threshold impact able to create social and ecological instability that could trigger a process which could lead to an infinite impact. For several reasons the potentially infinite impacts of the risks in this report are not as well known as they should be. One reason is the way that extreme impacts are often masked by most of the theories and models used by governments and business today. For example, the probability of extreme impacts is often below what is included in studies and strategies. The tendency to exclude impacts below a probability of five percent is one reason for the relative “invisibility” of infinite impacts. The almost standard use of a 95% confidence interval is one reason why low-probability high-impact events are often ignored.6 Figure 2: Probability density function with tail highlighted Climate change is a good example, where almost all of the focus is on the most likely scenarios and there are few studies that include the low-probability high-impact scenarios. In most reports about climate impacts, the impacts caused by warming beyond five or six degrees Celsius are even omitted from tables and graphs even though the IPCC’s own research indicates that the probability of these impacts are often between one and five percent, and sometimes even higher.7 Other aspects that contribute to this relative invisibility include the fact that extreme impacts are difficult to translate into monetary terms, they have a global scope, and they often require a time-horizon of a century or more. They cannot be understood simply by linear extrapolation of current trends, and they lack historical precedents. There is also the fact that the measures required to significantly reduce the probability of infinite impacts will be radical compared to a business-as-usual scenario with a focus on incremental changes. The exact probability of a specific impact is difficult or impossible to estimate.8 However, the important thing is to establish the current magnitude of the probabilities and compare them with the probabilities for such impacts we cannot accept. A failure to provide any estimate for these risks often results in strategies and priorities defined as though the probability of a totally unacceptable outcome is zero. An approximate number for a best estimate also makes it easier to understand that a great uncertainty means the actual probability can be both much higher and much lower than the best estimate. It should also be stressed that uncertainty is not a weakness in science; it always exists in scientific work. It is a systematic way of understanding the limitations of the methodology, data, etc.9 Uncertainty is not a reason to wait to take action if the impacts are serious. Increased uncertainty is something that risk experts, e.g. insurance experts and security policy experts, interpret as a signal for action. A contrasting challenge is that our cultural references to the threat of infinite impacts have been dominated throughout history by religious groups seeking to scare society without any scientific backing, often as a way to discipline people and implement unpopular measures. It should not have to be said, but this report is obviously fundamentally different as it focuses on scientific evidence from peer-reviewed sources. Infinite impact The concept infinite impact refers to two aspects in particular; the terminology is not meant to imply a literally infinite impact (with all the mathematical subtleties that would imply) but to serve as a reminder that these risks are of a different nature. Ethical These are impacts that threaten the very survival of humanity and life on Earth – and therefore can be seen as being infinitely negative from an ethical perspective. No positive gain can outweigh even a small probability for an infinite negative impact. Such risks require society to ensure that we eliminate these risks by reducing the impact below an infinite impact as a top priority, or at least do everything we can to reduce the probability of these risks. As some of these risks are impossible to eliminate today it is also important to discuss what probability can right now be accepted for risks with a possible infinite impact. Economic Infinite impacts are beyond what most traditional economic models today are able to cope with. The impacts are irreversible in the most fundamental way, so tools like cost-benefit assessment seldom make sense. To use discounting that makes infinite impacts (which could take place 100 years or more from now and affect all future generations) close to invisible in economic assessments, is another example of a challenge with current tools. So while tools like cost-benefit models and discounting can help us in some areas, they are seldom applicable in the context of infinite impacts. New tools are needed to guide the global economy in an age of potential infinite impacts. See chapter 2.2.2 for a more detailed iscussion. Roulette and Russian roulette When probability and normal risks are discussed the example of a casino and roulette is often used. You bet something, then spin the wheel and with a certain probability you win or lose. You can use different odds to discuss different kinds of risk taking. These kinds of thought experiment can be very useful, but when it comes to infinite risks these gaming analogies become problematic. For infinite impact a more appropriate analogy is probably Russian roulette. But instead of “normal” Russian roulette where you only bet your own life you are now also betting everyone you know and everyone you don’t know. Everyone alive will die if you lose. There will be no second chance for anyone as there will be no future generations; humanity will end with your loss. What probability would you accept for different sums of money if you played this version of Russian roulette? Most people would say that it is stupid and – no matter how low the probability is and no matter how big the potential win is – this kind of game should not be played, as it is unethical. Many would also say that no person should be allowed to make such a judgment, as those who are affected do not have a say. You could add that most of those who will lose from it cannot say anything as they are not born and will never exist if you lose. The difference between ordinary roulette and “allhumanity Russian roulette” is one way of illustrating the difference in nature between a “normal” risk that is reversible, and a risk with an infinite impact. An additional challenge in acknowledging the risks outlined in this report is that many of the traditional risks including wars and violence have decreased, even though it might not always looks that way in media.10 So a significant number of experts today spend a substantial amount of time trying to explain that much of what is discussed as dangerous trends might not be as dangerous as we think. For policy makers listening only to experts in traditional risk areas it is therefore easy to get the impression that global risks are becoming less of a problem. The chain of events that could result in infinite impacts in this report also differ from most of the traditional risks, as most of them are not triggered by wilful acts, but accidents/mistakes. Even the probabilities related to nuclear war in this report are to a large degree related to inadvertent escalation. As many of the tools to analyse and address risks have been developed to protect nations and states from attacks, risks involving accidents tend to get less attention. This report emphasises the need for an open and democratic process in addressing global challenges with potentially infinite impact. Hence, this is a scientifically based invitation to discuss how we as a global community can address what could be considered the greatest challenges of our time. The difficulty for individual scientists to communicate a scientific risk approach should however not be underestimated. Scientists who today talk about low-probability impacts, that are serious but still far from infinite, are often accused of pessimism and scaremongering, even if they do nothing but highlight scientific findings.11 To highlight infinite impacts with even lower probability can therefore be something that a scientist who cares about his/her reputation would want to avoid. In the media it is still common to contrast the most probable climate impact with the probability that nothing, or almost nothing, will happen. The fact that almost nothing could happen is not wrong in most cases, but it is unscientific and dangerous if different levels of probability are presented as equal. The tendency to compare the most probable climate impact with the possibility of a low or no impact also results in a situation where low-probability high-impact outcomes are often totally ignored. An honest and scientific approach is to, whenever possible, present the whole probability distribution and pay special attention to unacceptable outcomes. The fact that we have challenges that with some probability might be infinite and therefore fundamentally irreversible is difficult to comprehend, and physiologically they are something our brains are poorly equipped to respond to, according to evolutionary psychologists.12 It is hard for us as individuals to grasp that humanity for the first time in its history now has the capacity to create such catastrophic outcomes. Professor Marianne Frankenhaeuser, former head of the psychology division, Karolinska Institute, Stockholm, put it this way: “Part of the answer is to be found in psychological defence mechanisms. The nuclear threat is collectively denied, because to face it would force us to face some aspects of the world’s situation which we do not want to recognise.” 13 This psychological denial may be one reason why there is a tendency among some stakeholders to confuse “being optimistic” with denying what science is telling us, and ignoring parts of the probability curve.14 Ignoring the fact that there is strong scientific evidence for serious impacts in different areas, and focusing only on selected sources which suggest that the problem may not be so serious, is not optimistic. It is both unscientific and dangerous.15 A scientific approach requires us to base our decisions on the whole probability distribution. Whether it is possible to address the challenge or not is the area where optimism and pessimism can make people look at the same set of data and come to different conclusions. Two things are important to keep in mind: first, that there is always a probability distribution when it comes to risk; second, that there are two different kinds of impacts that are of interest for this report. The probability distribution can have different shapes but in simplified cases the shape tends to look like a slightly modified clock (remember figure 1). In the media it can sound as though experts argue whether an impact, for example a climate impact or a pandemic, will be dangerous or not. But what serious experts discuss is the probability of different oucomes. They can disagree on the shape of the curve or what curves should be studied, but not that a probability curve exists. With climate change this includes discussions about how sensitive the climate is, how much greenhouse gas will be emitted, and what impacts that different warmings will result in. Just as it is important not to ignore challenges with potentially infinite impacts, it is also important not to use them to scare people. Dramatic images and strong language are best avoided whenever possible, as this group of risks require sophisticated strategies that benefit from rational arguments. Throughout history we have seen too many examples when threats of danger have been damagingly used to undermine important values. The history of infinite impacts: The LA-602 document The understanding of infinite impacts is very recent compared with most of our institutions and laws. It is only 70 years ago that Edward Teller, one of the greatest physicists of his time, with his back-of-the-envelope calculations, produced results that differed drastically from all that had gone before. His calculations indicated that the explosion of a nuclear bomb – a creation of some of the brightest minds on the planet, including Teller himself – could result in a chain reaction so powerful that it would ignite the world’s atmosphere, thereby ending human life on Earth.16 Robert Oppenheimer, who led the Manhattan Project to develop the nuclear bomb, halted the project to see whether Teller’s calculations were correct.17 The resulting document, LA- 602: Ignition of the Atmosphere with Nuclear Bombs, concluded that Teller was wrong, But the sheer complexity drove them to end their assessment by writing that “further work on the subject [is] highly desirable”.18 The LA-602 document can be seen as the first scientific global risk report addressing a category of risks where the worst possible impact in all practical senses is infinite.19 Since the atomic bomb more challenges have emerged with potentially infinite impact. Allmost all of these new challenges are linked to the increased knowledge, economic and technical development that has brought so many benefits. For example, climate change is the result of the industrial revolution and development that was, and still is, based heavily on fossil fuel. The increased potential for global pandemics is the result of an integrated global economy where goods and services move quickly around the world, combined with rapid urbanisation and high population density. In parallel with the increased number of risks with possible infinite impact, our capacity to analyse and solve them has greatly increased too. Science and technology today provides us with knowledge and tools that can radically reduce the risks that historically have been behind major extinctions, such as pandemics and asteroids. Recent challenges like climate change, and emerging challenges like synthetic biology and nanotechnology, can to a large degree be addressed by smart use of new technologies, new lifestyles and institutional structures. It will be hard as it will require collaboration of a kind that we have not seen before. It will also require us to create systems that can deal with the problems before they occur. The fact that the same knowledge and tools can be both a problem and a solution is important to understand in order to avoid polarisation. Within a few decades, or even sooner, many of the tools that can help us solve the global challenges of today will come from fields likely to provide us with the most powerful instruments we have ever had – resulting in their own sets of challenges. Synthetic biology, nanotechnology and artificial intelligence (AI) are all rapidly evolving fields with great potential. They may help solve many of today’s main challenges or, if not guided in a benign direction, may result in catastrophic outcomes. The point of departure of this report is the fact that we now have the knowledge, economic resources and technological ability to reduce most of the greatest risks of our time. Conversely, the infinite impacts we face are almost all unintended results of human ingenuity. The reason we are in this situation is that we have made progress in many areas without addressing unintended low-probability high-impact consequences. Creating innovative and resilient systems rather than simply managing risk would let us focus more on opportunities. But the resilience needed require moving away from legacy systems is likely to be disruptive, so an open and transparent discussion is needed regarding the transformative solutions required. Figure 3: Probability density function with tail and threshold highlighted [FIGURE 3 OMITTED] 2.1 Report structure The first part of the report is an introduction where the global risks with potential infinite impact are introduced and defined. This part also includes the methodology for selecting these risks, and presents the twelve risks that meet this definition. Four goals of the report are also presented, under the headings “acknowledge”, “inspire”, “connect” and “deliver”. The second part is an overview of the twelve global risks and key events that illustrate some of the work around the world to address them. For each challenge five important factors that influence the probability or impact are also listed. The risks are divided into four different categories depending on their characteristics. “Current challenges” is the first category and includes the risks that currently threaten humanity due to our economic and technological development - extreme climate change, for example, which depends on how much greenhouse gas we emit. “Exogenic challenges” includes risks where the basic probability of an event is beyond human control, but where the probability and magnitude of the impact can be influenced - asteroid impacts, for example, where the asteroids’ paths are beyond human control but an impact can be moderated by either changing the direction of the asteroid or preparing for an impact. “Emerging challenges” includes areas where technological development and scientific assessment indicate that they could both be a very important contribution to human welfare and help reduce the risks associated with current challenges, but could also result in new infinite impacts.20 AI, nanotechnology and synthetic biology are examples. “Global policy challenge” is a different kind of risk. It is a probable threat arising from future global governance as it resorts to destructive policies, possibly in response to the other challenges listed above. The third part of the report discusses the relationship between the different risks. Action to reduce one risk can increase another, unless their possible links are understood. Many solutions are also able to address multiple risks, so there are significant benefits from understanding how one relates to others. Investigating these correlations could be a start, but correlation is a linear measure and non-linear techniques may be more helpful for assessing the aggregate risk. The fourth part is an overview, the first ever to our knowledge, of the uncertainties and probabilities of global risks with potentially infinite impacts. The numbers are only rough estimates and are meant to be a first step in a dialogue where methodologies are developed and estimates refined. The fifth part presents some of the most important underlying trends that influence the global challenges, which often build up slowly until they reach a threshold and very rapid changes ensue. The sixth and final part presents an overview of possible ways forward. 2.2 Goals Goal 1: Acknowledge That key stakeholders, influencing global challenges, acknowledge the existence of the category of risks that could result in infinite impact. They should also recognice that the list of risks that belong to this category should be revised as new technologies are developed and our knowledge increases. Regardless of the risks included, the category should be given special attention in all processes and decisions of relevance. The report also seeks to demonstrate to all key stakeholders that we have the capacity to reduce, or even eliminate, most of the risks in this category. Establish a category of risks with potentially infinite impact. Before anything significant can happen regarding global risks with potentially infinite impacts, their existence must be acknowledged. Rapid technological development and economic growth have delivered unprecedented material welfare to billions of people in a veritable tide of utopias.21 But we now face the possibility that even tools created with the best of intentions can have a darker side too, a side that may threaten human civilisation, and conceivably the continuation of human life. This is what all decision-makers need to recognise. Rather than succumbing to terror, we need to acknowledge that we can let the prospect inspire and drive us forward. Goal 2: Inspire That policy makers inspire action by explaining how the probabilities and impacts can be reduced and turned into opportunities. Concrete examples of initiatives should be communicated in different networks in order to create ripple effects, with the long-term goal that all key stakeholders should be inspired to turn these risks into opportunities for positive action. Show concrete action that is taking place today. This report seeks to show that it is not only possible to contribute to reducing these risks, but that it is perhaps the most important thing anyone can spend their time on. It does so by combining information about the risks with information about individuals and groups who has made a significant contribution by turning challenges into opportunities. By highlighting concrete examples the report hopes to inspire a new generation of leaders. Goal 3: Connect That leaders in different sectors connect with each other to encourage collaboration. A specific focus on financial and security policy where significant risks combine to demand action beyond the incremental is required. Support new meetings between interested stakeholders. The nature of these risks spans countries and continents; they require action by governments and politicians, but also by companies, academics, NGOs, and many other groups. The magnitude of the possible impacts requires not only leaders to act but above all new models for global cooperation and decision-making to ensure delivery. The need for political leadership is therefore crucial. Even with those risks where many groups are involved, such as climate change and pandemics, very few today address the possibility of infinite impact aspects. Even fewer groups address the links between the different risks. There is also a need to connect different levels of work, so that local, regional, national and international efforts can support each other when it comes to risks with potentially infinite impacts. Goal 4: Deliver That concrete strategies are developed that allow key stakeholders to identify, quantify and address global challenges as well as gather support for concrete steps towards a wellfunctioning global governance system. This would include tools and initiatives that can help identify, quantify and reduce risks with potentially infinite impacts. Identify and implement strategies and initiatives. Reports can acknowledge, inspire and connect, but only people can deliver actual results. The main focus of the report is to show that actual initiatives need to be taken that deliver actual results. Only when the probability of an infinite impact becomes acceptably low, very close to zero, and/or when the maximum impact is significantly reduced, should we talk about real progress. In order to deliver results it is important to remember that global governance to tackle these risks is the way we organise society in order to address our greatest challenges. It is not a question of establishing a “world government”, it is about the way we organise ourselves on all levels, from the local to the global. The report is a first step and should be seen as an invitation to all responsible parties that can affect the probability and impact of risks with potentially infinite impacts. But its success will ultimately be measured only on how it contributes to concrete results. 2.3 Global challenges and infinite impact This chapter first introduces the concept of infinite impact. It then describes the methodology used to identify challenges with an infinite impact. It then presents risks with potentially infinite impact that the methodology results in. 2.3.1 Definition of infinite impact The specific criterion for including a risk in this report is that well-sourced science shows the challenge can have the following consequences: 22 1. Infinite impact: When civilisation collapses to a state of great suffering and does not recover, or a situation where all human life ends. The existence of such threats is well attested by science.23 2. Infinite impact threshold – an impact that can trigger a chain of events that could result first in a civilisation collapse, and then later result in an infinite impact. Such thresholds are especially important to recognise in a complex and interconnected society where resilience is decreasing.24 A collapse of civilisation is defined as a drastic decrease in human population size and political/economic/social complexity, globally for an extended time.25 The above definition means the list of challenges is not static. When new challenges emerge, or current ones fade away, the list will change. An additional criterion for including risks in this report is “human influence”. Only risks where humans can influence either the probability, the impact, or both, are included. For most risks both impact and probability can be affected, for example with nuclear war, where the number/size of weapons influences the impact and tensions between countries affects the probability. Other risks, such as a supervolcano, are included as it is possible to affect the impact through various mitigation methods, even if we currently cannot affect the probability. Risks that are susceptible to human influence are indirectly linked, because efforts to address one of them may increase or decrease the likelihood of another. 2.3.2 Why use “infinite impact” as a concept? The concept of infinity was chosen as it reflects many of the challenges, especially in economic theory, to addressing these risks as well as the need to question much of our current way of thinking. The concept of a category of risks based on their extreme impact is meant to provide a tool to distinguish one particular kind of risk from others. The benefit of this new concept should be assessed based on two things. First, does the category exist, and second, is the concept helpful in addressing these risks? The report has found ample evidence that there are risks with an impact that can end human civilisation and even all human life. The report further concludes that a new category of risk is not only meaningful but also timely. We live in a society where global risks with potentially infinite impacts increase in both number and probability according to multiple studies. Looking ahead, many emerging technologies which will certainly provide beneficial results, might also result in an increased probability of infinite impacts.26 Over the last few years a greater understanding of low probability or unknown probability events has helped more people to understand the importance of looking beyond the most probable scenarios. Concepts like “black swans” and “perfect storms” are now part of mainstream policy and business language.27 Greater understanding of the technology and science of complex systems has also resulted in a new understanding of potentially disruptive events. Humans now have such an impact on the planet that the term “the anthropocene” is being used, even by mainstream media like The Economist.28 The term was introduced in the 90s by the Nobel Prize winner Paul Crutzen to describe how humans are now the dominant force changing the Earth’s ecosystems.29 The idea to establish a well defined category of risks that focus on risks with a potentially infinite impact that can be used as a practical tool by policy makers is partly inspired by Nick Bostrom’s philosophical work and his introduction of a risk taxonomy that includes an academic category called “existential risks”.30 Introducing a category with risks that have a potentially infinite impact is not meant to be a mathematical definition; infinity is a thorny mathematical concept and nothing in reality can be infinite.31 It is meant to illustrate a singularity, when humanity is threatened, when many of the tools used to approach most challenges today become problematic, meaningless, or even counterproductive. The concept of an infinite impact highlights a unique situation where humanity itself is threatened and the very idea of value and price collapses from a human perspective, as the price of the last humans also can be seen to be infinite. This is not to say that those traditional tools cannot still be useful, but with infinite impacts we need to add an additional set of analytical tools. Life Value The following estimates have been applied to the value of life in the US. The estimates are either for one year of additional life or for the statistical value of a single life. – $50,000 per year of quality life (international standard most private and government-run health insurance plans worldwide use to determine whether to cover a new medical procedure) – $129,000 per year of quality life (based on analysis of kidney dialysis procedures by Stefanos Zenios and colleagues at Stanford Graduate School of Business) – $7.4 million (Environmental Protection Agency) – $7.9 million (Food and Drug Administration) – $6 million (Transportation Department) – $28 million (Richard Posner based on the willingness to pay for avoiding a plane crash) Source: Wikipedia: Value of life http://en.wikipedia.org/wiki/Value\_of\_life US EPA: Frequently Asked Questions on Mortality Risk Valuation http://yosemite.epa.gov/EE%5Cepa%5Ceed.nsf/webpages/MortalityRiskValuation.html Posner, Richard A. Catastrophe: risk and response. Oxford University Press, 2004 Some of the risks, including nuclear war, climate change and pandemics, are often included in current risk overviews, but in many cases their possible infinite impacts are excluded. The impacts which are included are in most cases still very serious, but only the more probable parts of the probability distributions are included, and the last part of the long tail – where the infinite impact is found – is excluded.32 Most risk reports do not differentiate between challenges with a limited impact and those with a potential for infinite impact. This is dangerous, as it can mean resources are spent in ways that increase the probability of an infinite impact. Ethical aspects of infinite impact The basic ethical aspect of infinite impact is this: a very small group alive today can take decisions that will fundamentally affect all future generations. “All future generations” is not a concept that is often discussed, and for good reason. All through human history we have had no tools with a measurable global impact for more than a few generations. Only in the last few decades has our potential impact reached a level where all future generations can be affected, for the simple reason that we now have the technological capacity to end human civilisation. If we count human history from the time when we began to practice settled agriculture, that gives us about 12,000 years.33 If we make a moderate assumption that humanity will live for at least 50 million more years34 our 12,000-year history so far represents 1/4200, or 0.024%, of our potential history. So our generation has the option of risking everything and annulling 99.976% of our potential history. Comparing 0.024% with the days of a person living to 100 years from the day of conception, this would equal less than nine days and is the first stage of human embryogenesis, the germinal stage.35 Two additional arguments to treat potentially infinite impacts as a separate category are: 36 1. An approach to infinite impacts cannot be one of trial-and-error, because there is no opportunity to learn from errors. The reactive approach – see what happens, limit damage, and learn from experience – is unworkable. Instead society must be proactive. This requires foresight to foresee new types of threat and willingness to take decisive preventative action and to bear the costs (moral and economic) of such actions. 2. We cannot necessarily rely on the institutions, morality, social attitudes or national security policies that developed from our experience of other sorts of risk. Infinite impacts are in a different category. Institutions and individuals may find it hard to take these risks seriously simply because they lie outside our experience. Our collective fear-response will probably be ill-calibrated to the magnitude of threat. Economic aspects of infinite impact and discounting In today’s society a monetary value is sometimes ascribed to human life. Some experts use this method to estimate risk by assigning a monetary value to human extinction.37 We have to remember that the monetary values placed on a human life in most cases are not meant to suggest that we have actually assigned a specific value to a life. Assigning a value to a human life is a tool used in a society with a limited supply of resources or infrastructure (ambulances, perhaps) or skills. In such a society it is impossible to save every life, so some trade-off must be made.38 The US Environmental Protection Agency explains its use like this: “The EPA does not place a dollar value on individual lives. Rather, when conducting a benefit-cost analysis of new environmental policies, the Agency uses estimates of how much people are willing to pay for small reductions in their risks of dying from adverse health conditions that may be caused by environmental pollution.” 39 The fact that monetary values for human lives can help to define priorities when it comes to smaller risks does not mean that they are suitable for quite different uses. Applying a monetary value to the whole human race makes little sense to most people, and from an economic perspective it makes no sense. Money helps us to prioritise, but with no humans there would be no economy and no need for priorities. Ignoring, or discounting, future generations is actually the only way to avoid astronomical numbers for impacts that may seriously affect every generation to come. In Catastrophe: Risk and Response, Richard Posner provides a cost estimate, based on the assumption that a human life is worth $50,000, resulting in a $300 tn cost for the whole of humanity, assuming a population of six billion. He then doubles the population number to include the value of all future generations, ending up with $600 tn, while acknowledging that “without discounting, the present value of the benefits of risk-avoidance measures would often approach infinity for the type of catastrophic risk with which this book is concerned.” 40 Discounting for risks that include the possibility of an infinite impact differs from risk discounting for less serious impacts. For example the Stern Review41 prompted a discussion between its chief author, Nicholas Stern, and William Nordhaus,42 each of whom argued for different discount levels using different arguments. But neither discussed a possible infinite climate impact. An overview of the discussion by David Evans of Oxford Brookes University highlighted some of the differing assumptions.43 Two things make infinite impacts special from a discounting perspective. First, there is no way that future generations can compensate for the impact, as they will not exist. Second, the impact is something that is beyond an individual preference, as society will no longer exist. Discounting is undertaken to allocate resources in the most productive way. In cases that do not include infinite impacts, discounting “reflects the fact that there are many high-yield investments that would improve the quality of life for future generations. The discount rate should be set so that our investable funds are devoted to the most productive uses.” 44 When there is a potentially infinite impact, the focus is no longer on what investments have the best rate of return, it is about avoiding the ultimate end. While many economists shy away from infinite impacts, those exploring the potentially extreme impacts of global challenges often assume infinite numbers to make their point. Nordhaus for example writes that “the sum of undiscounted anxieties would be infinite (i.e. equal to 1 + 1 +1 + … = ∞). In this situation, most of us would dissolve in a sea of anxiety about all the things that could go wrong for distant generations from asteroids, wars, out-of-control robots, fat tails, smart dust and other disasters.” 45 It is interesting that Nordhaus himself provides very good graphs that show why the most important factor when determining actions is a possible threshold (see below Figure 4 and 5). Nordhaus was discussing climate change, but the role of thresholds is similar for most infinite impacts. The first figure is based on traditional economic approaches which assume that Nature has no thresholds; the second graph illustrates what happens with the curve when a threshold exists. As Nordhaus also notes, it is hard to establish thresholds, but if they are significant all other assumptions become secondary. The challenge that Nordhaus does not address, and which is important especially with climate change, is that thresholds become invisible in economic calculations if they occur far into the future, even if it is current actions that unbalance the system and eventually push it over the threshold.

### 1AC – Method

#### Empirical approaches to international relations are epistemologically valid — prefer quantitative analyses.

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The questions we ask in our articles require a more comprehensive approach to data collection. By collecting information about dozens (or hundreds) of cases rather than just one or two, we can gain insights into whether the patterns we observe in any individual case are representative of broader trends. The implicit question in our research is always ‘what would have happened if conditions had been different?’ Of course, it is impossible to answer this counterfactual with certainty since history happens only once, and we cannot repeat the ‘experiment’ in a laboratory. But that does not mean we should shrug our shoulders and abandon the enterprise.

Instead, we can gain insight by looking at cases in which conditions were, in fact, different. To illustrate, let’s return to the smoking example above. Studying a single smoker in depth might give us an accurate and textured understanding of the role of smoking in this person’s life, but it would be a poor way to learn about the broader health effects of smoking, because we could not make an informed guess about what would have happened had he not smoked. Our approach described earlier, in contrast, allows us to generalize about the effects of smoking on health. For precisely this reason, large-scale quantitative analysis is the primary method by which medical researchers have tackled the health effects of tobacco smoke. To be sure, some of the data in our hypothetical study would surely be inaccurate, and we would know comparatively little about the lives of each individual subject. But the loss in individual case knowledge would be more than compensated by the increase in information about the variables we hope to study.

So it is with nuclear weapons. To understand how nuclear weapons impact international crises, we must examine crises in which nuclear ‘conditions’ were different. For Kroenig, this means comparing the fortunes of crisis participants that enjoyed nuclear superiority to those that did not. For Sechser and Fuhrmann, it means comparing the effectiveness of coercive threats made by nuclear states to those made by nonnuclear states. By making these comparisons, we can begin to engage in informed and evidence-based speculation about how nuclear weapons change (or do not change) crisis dynamics. Indeed, the statistical models we employ require this comparison – they will return no results if all of our cases look the same.

Gavin argues that the Berlin/Cuba episode is sufficient for understanding the dynamics of nuclear weapons because it is the “most important and representative” case of nuclear deterrence and coercion.12 There are two distinct (and contradictory) claims here: that the case is the most important crisis episode for studying nuclear weapons, and that it is representative of the broader universe of such episodes. With respect to the first claim, Gavin offers no criteria for evaluating what an “important” case might be. What makes a case important – its profile among the general public? Its consequences? The availability of information about it? The countries involved? Moreover, for whom must the case be important? Gavin may view the 1958–1962 case as critical for understanding nuclear dynamics, but it is by no means clear that policymakers today look to this example for guidance about dealing with Iran or North Korea. This is not to say that we disagree with Gavin’s assessment – undoubtedly the 1958–1962 episode is important in many respects. But importance, like beauty, is in the eye of the beholder. The second claim is equally dubious: that the 1958–1962 episode is somehow representative of the ways in which nuclear weapons typically shape international politics. Without first examining other cases, Gavin simply has no grounds on which to base this claim. Moreover, there is tension between this claim and his previous assertion that the case is important: one key reason the Cuba/Berlin episode is often seen as important is because it was not like other Cold War crises: nuclear weapons were brandished more explicitly, and stoked more public anxiety about nuclear war, than any other crisis before or since. In the broader universe of crises, this episode actually may be quite anomalous. If so, then studying it to the exclusion of other cases would yield misleading conclusions about the role of nuclear weapons in world politics.

A key advantage of quantitative methods is that the researcher need not make questionable judgments about which cases are more or less important: unless explicitly instructed otherwise, statistical models assign equal weight to each case. Likewise, statistical models provide ways to identify – and exclude – anomalous cases that deviate markedly from dominant trends. Indeed, a quantitative analysis can be a useful precursor to the selection of individual cases for in-depth analysis, precisely because it allows us to locate cases that either represent or deviate from the overall pattern. These selections, however, are based on careful comparisons with other cases, not opaque judgments.

A second advantage is that quantitative analyses provide greater transparence about methods, judgments, and conclusions. One of Gavin’s central critiques is that various cases in our quantitative analyses have been miscoded. In other words, he argues, we have mismeasured important factors.13 This criticism – irrespective of its validity14 – is possible only because our coding decisions are unambiguous and easily ascertained from our datasets. Moreover, each of our studies sets forth clear rules for how each variable in our datasets was coded. This does not mean that our coding decisions are all correct and beyond dispute, but it does mean that they are clearly stated for outside scholars to evaluate. This degree of transparency is a key strength of quantitative research. Because each case in a quantitative analysis necessarily must be clearly coded,15 there is no ambiguity about how the researcher has classified each case. If other researchers believe a case should be coded differently, they can make that change and rerun the analysis.

By extension, quantitative research designs permit scholars to easily evaluate how much a study’s findings depend on individual coding decisions. Simply noting a few coding errors or differences of interpretation in a large quantitative dataset is of little consequence unless one can demonstrate that those differences are responsible for generating incorrect inferences. In a quantitative study, this typically amounts to recoding disputed cases and repeating the core statistical models to determine whether the results change substantially. 16 Not only are the original coding decisions laid bare, but it is also straightforward to determine whether the study’s inferences depend on them. This high level of transparency — and the external quality-control it enables – is one of the most attractive features of quantitative research designs. Transparency is useful not because it produces scholarly consensus, but because it allows opposing sides to identify the precise nature and implications of their disagreements.

Consider, for example, the 1990 exchange in World Politics between Paul Huth and Bruce Russett on one hand, and Richard Ned Lebow and Janice Gross Stein on the other. highlights the similarities between this debate and the present exchange, separated by almost twenty-five years, as evidence that quantitative analysis has made little progress in understanding nuclear issues. We see the issue differently. Both debates, in fact, illustrate a key strength of quantitative analysis: the ability to assess the importance of individual coding decisions. In the World Politics debate, Lebow and Stein objected that Huth and Russett had improperly coded many cases in their deterrence dataset, much as Gavin has disputed some of our classifications But Huth and Russett responded by noting that “even if Lebow and Stein’s recodings of our cases are accepted, the statistical and substantive findings of our past research remain fundamentally unchanged.”18 Similarly, as we report in our articles, our central findings do not change even if we accept Gavin’s arguments. In a quantitative study, simply showing that certain coding decisions can be contested is insufficient: one must also demonstrate that the core results depend on those decisions. While Gavin is correct to argue that coding cases is a tricky exercise, quantitative approaches allow us to evaluate the substantive importance of questionable coding decisions. Qualitative research, by contrast, is not always so amenable to external oversight. Whereas quantitative models demand clear coding decisions, qualitative research designs can be much more forgiving of ambiguous classifications. Gavin’s critique of our coding decisions illustrates this problem: while he criticizes the way we have coded particular cases in our datasets, he offers no clear alternative coding scheme. He raises questions about our coding decisions, but then declines to answer them. This ambiguity allows him to have his cake and eat it too: he can criticize our classifications without being liable for his own. Uncertainty, of course, is inherent to any scientific enterprise, and quantification is sometimes criticized for presenting a false illusion of certainty. To be clear, quantitative research cannot create certainty where the evidence is ambiguous. Just because a case is coded a certain way does not mean that the broader scholarly community (or even the researcher) has reached a consensus about that case. Likewise, the problem of ambiguity is not inherent to qualitative research: nothing intrinsic to historical research precludes scholars from laying their assumptions bare. But by compelling scholars to take a clear initial position on coding cases, the process of quantification allows scholars to debate each decision and evaluate whether potentially questionable choices are decisive in generating a study’s core results. This transparency is central to peer evaluation and, ultimately, scientific advancement.

A third advantage of statistical analysis is that it is designed to cope with probabilistic events. In the physical world, causal relationships are often deterministic: a certain amount of force imparted to an object will cause that object to move a certain distance. So long as conditions are kept constant, this result will obtain again and again, no matter how many times the experiment is repeated. In the social world, however, we are not blessed with such ironclad reliability. No two individual people are exactly identical, and even in carefully controlled environments it is rare to find a “force” that begets exactly the same effect on all people with perfect regularity. The causal relationships we observe are not deterministic – they are probabilistic, occurring with imperfect regularity.19

The ‘force’ of interest to us in our articles is, broadly, the possession of nuclear weapons. When this force is applied to crisis bargaining situations, what happens? Implicit in this question, however, is a question about probability: when nuclear weapons are inserted into a crisis bargaining situation, what is the likelihood of a particular outcome? Kroenig’s study, for example, asks: in a nuclear crisis, what is the likelihood that the nuclear-superior side will achieve its basic goals? Likewise, Sechser and Fuhrmann seek to discover the likelihood that a coercive demand made by a nuclear-armed state will be met. The central difficulty with posing our research questions in this way is that we cannot actually see the thing we care about: probability is inherently unobservable. We cannot examine a crisis and directly observe the probability of one side capitulating; we can only observe whether it actually capitulated.20 How, then, can we begin to answer our original research question?

Quantitative research is designed for precisely this sort of situation. If we cannot directly observe whether we are holding a loaded six-sided die, for example, we can throw it many times, observe the result, and infer the underlying probability from the results. Throwing the die just one time would tell us little, since all six numbers are theoretically possible even if the die were loaded. Only after observing the pattern of results across many events can we determine the underlying probabilities of each number turning up.

The single-case approach Gavin proposes cannot cope with probabilistic events as effectively. Knowing that one smoker happened to die of cancer does not tell us much about the broader health effects of tobacco. Based on this single data point, we might conclude that smoking leads to cancer 100 percent of the time. Yet we know this to be false: there are heavy smokers who remain cancer-free, just as there are nonsmokers who still get cancer. The true relationship between smoking and cancer emerges only after looking at a large number of cases. Similarly, even if we determine that nuclear weapons appeared to “matter” from 1958-1962, we cannot safely infer from this observation that nuclear weapons influence crisis outcomes in general. Any relationships observed during this particular period could have been due to any number of chance events that might be unlikely to recur. Studying just one episode allows us to say much about that episode but little about the underlying relationships.

Fourth, statistical analysis allows researchers to uncover causal relationships in social phenomena even if the participants themselves do not record, record accurately, or understand these relationships. Gavin’s approach, in contrast, requires finding primary source documents and learning what participants themselves believed to be the relevant causal factors at play. His essay conveys an exceptionally narrow conception of how one should gather knowledge about the effect of nuclear weapons on international politics. Gavin believes that if one wants to “really understand” the effect of nuclear weapons on international politics,21 archival research is “the only way to get real insight.”22 While we agree that studying primary documents has great value, we believe that there are many other ways to generate useful knowledge, and that a narrow focus on primary documents can often lead a scholar astray.

#### The critique of truth-telling destroys global politics – their politics forecloses truth commissions and protests across the Global South focused on exposing governmental lies and atrocities

Kivisto ‘14(Peter, Richard Swanson Prof. of Social Thought, Chair of Sociology, Anthropology and Social Welfare @ Augustana College, “Postmodernity as an Internal Critique of Modernity”, *Postmodernism in a Global Perspective*, pp. 105-108)

Because signs no longer refer to real referents, because the real has collapsed into the hyperreal, meaning has evaporated. In a rather notorious instance of applying this thinking to a concrete event, Baudrillard (1991) claimed that the Gulf War was nothing more than a television and computer graphics spectacle—the difference between this war and the war games in a video arcade presumably having essentially disappeared. Of course, there is an element of truth to this claim. Indeed, a similar claim was made by Slavoj Zizek (2002: 37) about the war in Afghanistan that took place in the aftermath of September 11, 2001, which he depicted as “a virtual war fought behind computer screens.” Lost in Baudrillard’s vision, however, as David Lyon (1994: 52) pointedly noted, is the fact that there really (i.e., not hyperreally) were “blood—stained sand and bereaved families.” Lost, too, are beliefs about patriotic duty, geopolitical realities, the economics of oil, and similar very real considerations that lead nations into war. In his book on terrorism, which is described in the subtitle as a “Requiem for the Twin Towers,” Baudrillard (2002) describes Al Qaeda’s attack on the United States in terms of the “symbolism of slaughter” and “sacriﬁcial death” as a mode of challenging American hegemony. Again, he treats a bloody event only as a spectacle and not as the consequence of a complex interplay of political, economic, and social forces that underlie the spectacle. Incidentally, and not noted by Baudrillard, the architect of the Twin Towers was Minoru Yamasaki, who had earlier designed the ill-fated Pruitt-Igoe. My criticism of Baudrillard revolves around the obvious point that there is a reality that people experience, emotionally respond to, and attempt in some fashion to shape. There is a life outside of the television set and outside of cyberspace. The emotionless and meaningless worlds depicted in ﬁlms such as David Lynch’s Blue Velvet and Quentin Tarantino’s ﬁlms from Pulp Fiction to his more recent offerings, Inglourious Basterds and Django Unchained, are not synonymous with our lived experiences, nor do most people convolute the two (Denby, 2009; Bauman, 1992: 149-55; Best and Kellner, 1991: 137-44). Although it is certainly true that the world of consumerism has changed considerably in recent years, little evidence can be mustered to claim that we have left modern culture for postmodern culture. The continued potency of religious belief, for example, calls into question the pervasiveness of meaninglessness Baudrillard envisions. The existence of the new social movements concerned with such issues as the environment, peace, feminism, civil rights, and poverty also calls into question the extent to which people in advanced industrial societies have opted for political passivism and escapism. By claiming that we have moved from production to consumption, this version of postmodernism shows evidence of a serious blind spot. It is obvious that goods continue to be produced, although in a global economy this might mean that they are being produced in poor countries, where workers are paid abysmal wages and are forced to work exploitatively long hours in unsafe and unsanitary factories. The clothes purchased at the shopping mall and online are the products of this darker side of our contemporary culture. Moreover, as Alex Callinicos (1989: 162) has pointedly noted, not only are most of the world’s inhabitants excluded from the consumerism Lyotard and Baudrillard describe but also poor people in the advanced industrial societies have only a limited involvement in this kind of consumption. In a generous assessment of Baudrillard that appeared shortly after his death in 2007, Robert Antonio (2007: 2) pointed out that Baudrillard’s abandonment of leftist politics was a reflection of his assessment of the failure of the 1968 student/worker protests. This event led to his the abandonment of the Marxist dream of a radiant future. Unlike Zizek (2008), who some continue to describe as a Marxist, Baudrillard was not inclined to argue “in defense of lost causes.” Nor was he prepared to endorse the anti-utopian pragmatism of liberal democracy. Rather, in relentlessly promoting his often contradictory but deeply pessimistic diagnoses of our times, he became a media star, which included homage to him in one of the Matrix ﬁlms and a US lecture tour that was part of the Institute of Contemporary Arts’ “Big Thinkers” series. He played a major role in creating and sustaining the postmodern moment, but near the end of his life he claimed that the term that best deﬁned him was nihilist. Liquid Modernity Baudrillard was the most explicit and insistent advocate for radical postmodernism (Lemert, 2005: 36-40). Other postmodemists have offered more tempered assessments of the postmodern condition, viewing it in many respects as a new phase of modernity rather than constituting a radical rupture between past and present. No one better exempliﬁes this position than the Polish-born sociologist, Zygmunt Bauman, who has published a series of books explicitly devoted to postmodern concerns (Bauman, 1993, 1995, and 1997). Of particular emphasis in these theoretical reflections is an appreciation of the signiﬁcance of ambivalence in postmodernity. Peter Bielharz (2009: 97) sees a parallel between Bauman’s thought and that of Simmel, contending that in both one ﬁnds a commitment “to the idea of ambivalence as a central orienting device and motif of modernity." By the turn of the century, Bauman (2000) opted to replace the term postmodern with the idea of “liquid modernity.” Perhaps to avoid the confusions and incessant debates about postmodernism and perhaps also to distance himself from postmodernism’s more radical proponents, this original term can be seen as useful in carving out an intellectual space in which to articulate his own position. Agreeing with the claim that grand narratives had ceased to be compelling, Bauman (2007) sees the present as an “age of uncertainty.” The preceding stage of modernity can be characterized as “solid.” In contrast, the current stage is “liquid” insofar as patterned social conduct and the social structures essential to making such forms of everyday social relations durable no longer exist. Instead, we live during times in which these structures no longer keep their shape for very long, “because they decompose and melt faster than the time it takes to cast them...” The consequence is that structured forms today “cannot serve as frames of reference for human actions and long-term life strategies because of their short life expectations" (Bauman, 2007: 1). In short, people in the contemporary world are consigned to living out their lives with a far greater focus on the present and immediate future rather than with the “open horizon of the future" that Wagner (2008: 1) associated with the early phase of modernity. What makes Bauman so dramatically different from someone like Baudrillard is that his assessment of our current condition does not lead him to nihilism. On the contrary, he thinks that today, more than ever before, ethical conduct must be grounded in a sense of personal responsibility. We may live in uncertain times, but we don’t live in amoral times. It’s for this reason that Bauman continues to deﬁne himself as a socialist. He would thus likely agree with Bielharz (2009: 140) that socialism today should be viewed, not so much as an alternative economic system to capitalism, but as its “alter ego.”

**Nuanced debates about the intricacies of space policy are key to preventing militarization – narrowing debates intellectual aperture to meta-theories for governmental behavior makes constructive advocacy impossible**

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Plus, there’s the **larger question** of whether a more **aggressive approach** is in the best interest of all of America’s space organizations, including the burgeoning **commercial space sector.** We live in an age of **proliferating anti-satellite capabilities.** There is a growing body of evidence that China is actively developing at least two hit-to-kill **ASAT** weapon systems. The development process has included at least **five tests** of these systems, including one that created thousands of pieces of space **debris**. Russia has fielded operational ASAT capabilities in the past, and Russian officials have recently stated that development work has started again on an **air-based ASAT** system. Not to be outdone, elements of the Indian government have also **signaled** interest in developing both missile defense and ASAT **capabilities** themselves. The United States and many of its allies in Europe and Asia are fielding missile defense capabilities that have significant ASAT capabilities, as demonstrated by the United States’ use of the same missile defense system to destroy a non-functioning satellite in 2008. The number of other countries that already possess ballistic missile and space launch technology—and could thus develop their own crude ASAT capabilities—is growing. The U.S. national security space community sees this shift towards a more “contested” space environment as a very worrisome trend. There are currently more than 150 U.S. military and intelligence satellites in orbit, providing important national security capabilities such as precision navigation and timing, global communications, missile warning, and intelligence, surveillance and reconnaissance. The proliferation of ASAT capabilities and the **threat** they are thought to pose to these space systems presents a **serious challenge** to the **U**nited **S**tates’ military and intelligence capabilities. The concern extends not only to the ability of the United States to defend its own national security interests, but also to its ability to continue to contribute to the defense of its **allies**. The United States announced a new National Security Space Strategy in early 2011 that detailed five strategic approaches for dealing with a more “congested, competitive and contested space environment.” The strategy includes a strong push for developing and promoting responsible norms of behavior in space, increased partnership and cooperation with allies and commercial firms and a shift toward making U.S. national security space capabilities more resilient to attacks. The strategy also includes preventing and deterring aggression on U.S. national security space systems, and, should deterrence fail, defeating attacks on said systems. Since the release of the strategy, the U.S. government has been relatively public about how it will implement the first three approaches, but less so about the last two. That has now changed. Congress has included language in the National Defense Authorization Act for the 2015 fiscal year, the primary piece of legislation that authorizes and directs the activities of the U.S. military, calling on the U.S. national security space community to report to Congress how it plans to deter and defeat adversary attacks on U.S. space systems. The NDAA language requires the Secretary of Defense and the Director of National Intelligence to produce a study on the role of offensive space operations, and specifies that the majority of the $32.3 million that Congress gave to the Space Security and Defense Program in 2015 must be used for “the development of offensive space control and active defensive strategies and capabilities.” The NDAA language does not stipulate what is meant by offensive or active defensive capabilities, but when combined with recent academic writings from within the U.S. military, it suggests that America’s strategy for protecting its satellites is taking a more aggressive turn. This essay discusses the evolution of U.S. national security space community’s approach to using space and protecting space assets over the last several decades, and explains why some in the community are now contemplating a more aggressive approach. It frames the discussion through four established schools of thought on the military uses of space: sanctuary, space control, high ground and survivability. These schools were first developed as potential space power doctrines by David Lupton in an article for Strategic Review in 1983, and more fully fleshed out in his 1988 book On Space Warfare: A Space Power Doctrine. They were re-conceptualized as schools of thought, rather than doctrine, by Peter Hays in his 1994 doctoral dissertation. In Hays’ view, the four schools of thought are less codified and have more overlap between them than a strict doctrinal definition. U.S. policy on national security space is a **conglomeration** of the **four schools of thought**, with one school of thought usually prioritized over the others. This conglomeration is a result of the interagency process for creating policy on national security issues, and the bargaining that takes place between the different agencies involved in the decision. The U.S. government is not a **unitary actor**, and the perspective of each of the **many agencies** within the **interagency decision-making process** usually reflects a preference for one of these **schools** over the other. As a result, **decisions** made by the U.S. government on national security space policy often reflect a **compromise** between **multiple schools of thought**, rather than a **strict adherence** to one **over all the others**. Why choose to contextualize this issue from the **perspective of the military** when space activities encompass much more than just the military? The **reason** is that in the realm of policy, and space policy in particular, **national security** has **dominated decision making** since the very beginning of the Space Age, and still holds a **privileged position** in space **policy debates**. This dominance is seen in the size of the U.S. national security space budget—nearly $27.5 billion compared to NASA’s $17.8 billion in 2012—but also in the use of the National Security Council process to make many space policy decisions. Finally, it is important to understand why the **focus** of this essay is on the policies and activities of the **U**nited **S**tates and not on the **other countries** involved. The intent is not to place **blame** for the current strategic instability in space solely on the **U**nited **S**tates. The situation is the result of the actions of **several** different **countries**, as well as the overarching **geopolitical dynamics** present in the world today. As a result of America’s **democratic** and **pluralistic nature**, its policies and actions are **subject** to more **scrutiny** and **debate than others**. That should be seen as a **virtue and not a defect**. The United States is still the world leader in space, in terms of both soft and hard power. The intent of this essay is to encourage **constructive debate** on this **important issue** in the hope that it leads to **policies** and **actions** that continue to enable the **U**nited **S**tates to be a **force for good** and a world leader for the foreseeable **future**.

#### Space policy scenario planning unsettles hegemonic perspectives more effectively than radically changing research agendas.

Adams, et al, 18—Lecturer in Urban Planning in the School of Geography, Earth and Environmental Sciences at the University of Birmingham (David, with Peter Larkham, Professor of Planning at Birmingham City University, and Dan Sage, Senior Lecturer in Human Resource Management and Organisational Behaviour at Loughborough University, “Planners in space?,” Town & Country Planning, 87 (8), pp.307-315, dml)

Writing some 40 years ago and against a background of the ‘limits to growth’ debate of the 1970s, Millward called for geographers, planners and other social scientists to explore seriously the possibility of moving to off-Earth space settlements.35 Although there is now a growing social science perspective on the possibilities and limits of future space visions, there are further opportunities for planners, geographers, architects and others involved with the design and management of places to respond to these debates, assimilating them into existing approaches, or creating new research areas specifically relating to the space ‘frontier’. One practical suggestion is that planners and geographers – perhaps working alongside engineers and architects – might study the feasibility of designing new Earth-based space launch megastructures. This would involve working through the possibility of improved space launches, including the impact on the surrounding population and environment, the proximity to major industrial and population centres, and the capability of existing power networks. Moreover, and considering the bleak scenarios outlined above, there are obvious parallels with how architect-planners, engineers, politicians, industrialists and leading scientists saw the urgent need to rebuild as an opportunity to reform or improve cities that before the Second World War had been suffering from different urban ailments.36 Infused by the image of a tabula rasa, the prospect of large-scale rebuilding offered the possibility to architect-planners to transform war-damaged cities and project their sometimes-radical visions of future cities. Discussions around possible space futures could, for example, unpick the way in which the sometimes lavish mid-20th century reconstruction plans offered a vehicle to boost the personal and strategic ambitions of politicians and other key decisionmakers.37 Are there lessons for entrepreneurial space enterprises in the way that powerful elites had to wrestle with bureaucratic frameworks, financial constraints, the peculiarities of a particular site, the availability of materials, the talent of architects, the desires of landowners, and, of course, the perspectives of inhabitants? Some in the planning and design community are also beginning to raise concerns over recent plans for the human inhabitation of Mars (and exploration of space, in a more general sense). For example, some are anxious that the ambitions set out by organisations such as Mars City Design® for human habitation on the ‘red planet’ represent an opportunity for architects and designers to project their visions on to a ‘blank slate’.5 This is a familiar story for planners. Since the mid-to-late-20th century, it has become almost commonplace to blame the ‘metaphysical fancies’38 of prominent white, middle-class, male experts for creating ‘alien’ spatial and temporal circuits of production, exchange and consumption that did much to eliminate spontaneity from urban life. Efforts to plan were from ‘high and afar’, informed by the empirical-analytical approaches of scientists, bureaucrats and engineers involved in the creation of large-scale rebuilding projects, and helping to realise a capitalist city in full flow. But not all reconstruction plans projected capitalist visions of the future, and some reconstruction proposals were heavily idealistic but also pragmatic. The motivations among those potential space settlers will likely differ from those agencies and space advocates pushing for the creation of permanent off-Earth settlement. So exploring the ‘cracks in the concrete’ of earlier planning visions,7 as individuals subverted ‘utopian’ narratives of the future urban environment to suit their own ends, might help to develop any discussion about human settlement of space. Second, while there are flaws in the argument about the vital, innate need to travel, there is an opportunity to nurture the human desire to cultivate a sense of inquisitiveness and fulfilment. Or to paraphrase Alfred North Whitehead, ‘physical wandering is important’, but ‘greater still is the power of [humankind’s] adventures of thought’ into ‘uncharted seas of adventure’.39 Ancient human migration brought people into contact with different customs of various cultures, philosophies, and political and social systems.1 It is, therefore, valuable to consider these perspectives to gain further insight into our own beliefs, perspectives and actions. Increased exploration of space would present a clear opportunity to further knowledge about the universe, which would stimulate human curiosity and potentially lead to some unpredictable social, economic and environmental discoveries, but would also help humankind to reflect on current and near-future Earth-based practices. Moreover, it is often said that people act and live out the past in the present. And planning tools such as maps, images, diagrams and future scenarios can certainly influence present and future action; but they can also shape how we think about the past.40 At some indeterminate point beyond the future horizon, people may be living in outer space and on other worlds, and since differing cultures stem in part from environmental conditions, it is possible that these individuals will be greatly different from earlier cultures, planning efforts, contexts, perceptions and attitudes. Hence, if a new age of space exploration marks our opportunity to ‘start afresh’, then there is the obvious possibility of examining capitalism, along with other economic models, and legal frameworks. Given that there will be long communication delays that may make MarsEarth governance cumbersome, regulatory and administrative functions will need to hold authority over new lands, efficiently administer public policy and urban planning, and take responsibility to create a society in space – a theme much explored in popular science fiction.26 Changes to civilisation in terms of technology, culture and everyday life make a strict interpretation of history something of an unreliable guide to speculative spatial imaginaries. For instance, development in satellite technology and space probes may significantly advance our knowledge and understanding of the universe, thus limiting the need for physical human wanderings. Nevertheless, there are several fundamental questions that planners might explore regarding the purpose of the colony, the motivations of colony founders, the possible location of the settlement relative to the Earth and Sun, and the size and characteristics of the object on which colonists wish to settle. Various academic works, popular histories, films and novels detail the why, when and how of frontier development, while the location of settlements and the links between regions are well established areas of enquiry for social scientists. In this sense, an exploration of the processes, agents and agency that create, shape and reshape urban form would help inform wider discourse on future space trajectories.41 However, planners, geographers and urban historians, for example, could enrich discussions on space by drawing on earlier research into the conditions necessary for permanent human settlement, and the economic, social and environmental contexts in which human habitation thrives or fails (i.e. the functions of defence, shelter, trade, and community).42 Although the design of a space colony would have to work within engineering and technological constraints, there are concerns that an eclectic mix of architectural styles would result in a ‘Disney-like’ settlement.5 What key planning principles might guide development? Could ‘established’ planning concepts of visionary urbanists such as Howard and his Garden City, Burnham’s view on the rebuilding of Chicago, Le Corbusier’s radiant city, Frank Lloyd Wright and his suburban city, and Abercrombie and Forshaw’s plans for London’s city-region be brought into dialogue with emerging visions for life beyond Earth’s limits? At the micro-scale, investigation of the geometric properties of earlier urban forms would also contribute to any wider understanding of the processes shaping urban form. There are many studies of urban components (streets, blocks, plots, buildings, land uses, agriculture, public spaces, services, and infrastructure) that could inform debates about future colony design. Moreover, planners’ interpretation of computational approaches and big data would also allow modelling of future off-Earth urban patterns at different spatial and temporal scales. And, at some point in the future, following the establishment of a colony, how will the insertion of new structures or other features affect the characteristics of a settlement? How might we manage fragile ‘historic’ areas like the Apollo 11 landing site when there are pressures to develop?5 This may stimulate a careful analysis of past examples of how to achieve the organic arrangement of the urban fabric, land uses, densities and human interactions to create a rich, diverse urban experience. Perhaps the most enticing prospect is that any plans to colonise asteroids, planets or even stars may be led by genetically ‘improved’ humans, cyborgs, or forms of artificial intelligence. This then opens up a completely new set of ways to think about planning in ‘post-human’ worlds. Conclusion Countless others have sought to dampen some of the more excited claims made about increased human encounters with space. There is no unifying intellectual consensus around the feasibility of moving large numbers of people off Earth: there is a lack of safe, attractive, reliable and cheap modes of transport to break through Earth’s atmosphere; for many, potentially world-changing space visions belong in the realm of science fiction, or are best left to the work of cosmologists, engineers, or those in the natural sciences; and many feel that any economic case and the recent wave of enthusiasm will eventually subside. More fundamentally, the importance of these points to those in the planning community might seem a matter of debate: if there are flaws in the messages typically presented by supporters of space exploration, so what? Planning, like other social sciences, contains a vibrant and eclectic mix of different schools of thought, where competing ideas jostle for prominence. Consequently, any bold call for radical changes to research agendas that contribute more to contemporary or near-future debates about space would require significant adjustments in bureaucratic structures, the attitudes of educators, research councils, conference organisers, learned societies, and the editorial boards of prominent journals. Simply put, for many social scientists, the potential economic, environmental and human impact of space exploration remains outside the ambit of other more pressing Earthly matters. Although the idea of focusing on space might invoke feelings of indifference, resistance or even enmity in some, this article does at least set out potential areas that may provoke interest from planners. The key message, though, besides thinking through the practical implications and possibilities of developing new launch sites, new satellites and off-Earth trade links, is that thinking about space stimulates the enabling and motivational facets of the imagination.7 This involves a mental shift away from being immersed in the present in our perceptions, perspectives and views. It certainly offers an opportunity to review earlier planning ‘imaginaries’, to use these ideas to set out new kinds of places beyond Earth, but also as a way of reflecting on how off-Earth innovations might benefit the ways in which planners and others approach the task of tackling some of the sustainability challenges here on Earth. There may be some truth in deGrasse Tyson’s34 view that ‘nothing spurs cross-pollination of ideas like space exploration’; hence there is opportunity here for imaginative planning ideas to penetrate the discussions on space that might otherwise be reserved for entrepreneurs or cosmologists. Perhaps this needs to happen before the boarding gates open…

#### Student debates over responses to suffering are critical to effective politics and overcoming status quo apathy

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Inherent in the politics of pity in the modern period is the problem of dealing with suffering from a distance and the "massification of a collection of unfortunates who are not there in person" (p. 13). Although contemporary media may have "dramatized" the spectacle of distant suffering in the past 30 years, they neither invented nor caused this condition. Historical examples also bolster Boltanski's claim that the media did not inaugurate the politics of pity - rather, its logic was set out more than 200 years ago. Boltanski carefully examines this logic and the paradoxes it creates in the book's three sections. Part 1 lays out the argument. Part 2 relies heavily on literary sources to analyze the "topos," a term he borrows from rhetoric, of the idea of pity and suffering. The third section deals with the question of pity and misfortune, drawing primarily on historical and contemporary examples, such as the work of Doctors Without Borders and the clash in the late 1950s between Sartre and Merleau-Ponty. Each chapter is replete with insight, making this a difficult book to summarize. Every word and every argument is so intricately intertwined with the next that paraphrasing seems a travesty.¶ The third section should be of interest to those located in the disciplines of communications or media studies. Here it is important to recall the subtitle of the book, Morality, the Media and Politics. Boltanski returns to the question of the spectator and the anxieties of those who wish to do something about what they see unfolding on their screens. He asks: "[H]ow might the contemporary spectators' anxiety be reduced without averting their gaze from misfortune or by abandoning the project inherent in the modern definition of politics of facing up to unnecessary suffering and relieving it[?]" (p. 159). What could political action be, given the fact that suffering does occur at a distance and that not every struggle can be taken on with equal commitment? First, he argues that there is a political, technical, and moral necessity to open up a discussion of commitment and ideology, although what he means by ideology is not adequately explained. Second, he contends that witnessing suffering means that morally we are asked to act. Commitment is commitment to some kind of action. Third, he promotes the idea that speech is action. "One can commit oneself through speech; by taking a stance, even when alone, of someone who speaks to somebody else about what they have seen" (p. xv). By speaking - to others and even to oneself - we recognize and acknowledge that speech must be understood as a form of action (p. 154).¶ One of the conditions of Boltanski's argument is a clear distinction between the world of representation and the world of action. He writes: "Informed by representation, words must really be deployed in the world of action in order to be effective" (p. 154). He is critical of deconstructionist criticism, primarily meaning the writings of Jean Baudrillard, which blurs this distinction to too great an extreme, thereby "holding the order of action" at arm's length or making it illusionary (p. 154). He contends that this position makes the very intention to act nothing but a naïve illusion creating an "empire of suspicion" (p. 158). Boltanski does not claim that we remain without an emotional commitment to causes, but rather that "to prevent the unacceptable drift of emotions close towards the fictional we must maintain an orientation towards action, a disposition to act, even if this is only by speaking out in support of the unfortunate" (p. 153).¶ What then are the properties of effective speech? Boltanski turns to phenomenology and semantics, concluding that effective speech involves: (a) intentionality; (b) incorporation in bodily gestures and movements; (c) sacrifice of other possible actions; (d) the presence of others; and, (e) a commitment (p. 185). Intentionality involves an intention to speak meaningfully, not just engage in idle chatter. Action and intention are connected to each other in effective action realized in the world. Intention incorporated in action is "expression." This kind of expressive political speech must involve risk for spectators - they may be chastized, they may be contested, or they may be at physical risk in authoritarian regimes. Boltanski goes on to classify different types of action as strong and weak, collective and individual. He builds an argument for local chapters of groups supporting humanitarian movements, such as Amnesty International, for they enable one to avoid the alternative of either on-the-spot involvement or distant spectacle. They are one way to breach the schism between abstract universalism and communitarian withdrawal: "The humanitarian claim for more or less distant causes can thus avoid the alternative of abstract universalism - easily accused of being fired up for distant suffering the better to avert its eyes from those close at hand - or of communitarian withdrawal into itself - which only attends to misfortune when it affects those nearest - by being rooted in groups and thereby linked to preexisting solidarities and local interests" (p. 190). In other words, expression is most "authentic" for Boltanski when made manifest in actions, like participating in a demonstration or protest, which incarnates our beliefs and displays our commitments. By incorporating an action, the person communicates an observable tendency.¶ But is this enough? Boltanski is concerned by apathy and asks us to consider that we are doomed, inevitably, to imperfection in our politics. Despite this, we must make the attempt to be "moral subjects" - that is, committed and engaged subjects. Because he recognizes the difficulties of negotiating these contradictions, he avoids moralizing. He is no Habermasian trying to outline the conditions for an ideal-speech situation. In Boltanski's book, we live in imperfect worlds and we must contend with this. He asks that we resurrect compassion into our politics, which he says is always particular and practical, as it is oriented toward doing something about a situation. Unlike pity, it engages with the person suffering. But pity isn't always a bad thing in this analysis. Pity generalizes in order to deal with distance, and in so doing one may discover emotion and feeling for others that may translate into speech or action. A spectacle of suffering may end with a commitment to involvement.¶ Boltanski realizes the challenge, yet remains optimistic that humans are capable of such a move. There are, as he notes, an "excess of unfortunates" in our world. The problem remains to whom we extend aid or pity, given their great numbers (p. 155). This is true both in the realm of action, but also in the realm of representation. So many people are suffering and there is not enough media space for them all (p. 155). Boltanski does not prioritize causes or instances of grief. He does, however, suggest that the media represent any unfortunate groups taking action to confront and escape their distress. It is unethical to only depict them in the passive act of suffering (p. 190). He acknowledges that the mediatization of suffering may incite action. For example, it may protect populations against their own rulers, if only temporarily, for such depictions do not necessarily change the internal political situation. His analysis assumes that spectators, who are democratic citizens, have a role to play in lobbying and pressuring their own governments to take action (p. 184). Again, while aware that public opinion may be manipulated, he argues that public-opinion polls are powerful tools. Answering a poll is depicted as a potentially effective form of speech and an "adequate response to the call for action" (p. 185).¶ Distant Suffering thus describes, in sometimes painful detail, a wavering between selfish egoism and altruistic commitment to causes. Boltanski describes how we may, unfortunately, cultivate ourselves by becoming absorbed in our own pity when looking at the spectacle of someone else's suffering, a phenomenon that has been far too present since the September 11 bombing of the World Trade Center in New York. Boltanski tries to lead us out of this self-absorption into the world of effective political action by offering a range of involvement. While advocating commitment and debates about morality as part of the solution, this is no smug celebration of the "return to kindness" or an easy denunciation of the perverse delight of spectacles of suffering. In considering distant suffering as the "logical consequence" of the introduction of pity into politics over 200 years ago, we are asked to concern ourselves with the present.¶ Boltanski ends his fine treatise by exhorting us to quit looking to past injustices, to stop anticipating future injustice, and to stay focused on the present. "To be concerned with the present is no small matter. For over the past, ever gone by, and over the future, still non-existent, the present has an overwhelming privilege: that of being real" (p. 192). Naive? Perhaps. Boltanski does not provide simple or quick answers to the dilemma, but leaves one with the hope that pity might lead to compassion, commitment, and social change - even if such measures do not end all suffering once and for all. As such, this translation from the original French