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Waging Peace on the Final Frontier 64th Academy Assembly Proceedings

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64th Academy Assembly Proceedings

**In October 2022, the 64th annual Academy Assembly at the U.S. Air Force Academy took up the theme of "Waging Peace on the Final Frontier." The following are proceedings of roundtables held by select undergraduates from around the country on questions of space policy & strategy.*

Workshop I: Space Crisis Simulation—Norms

Executive Summary: In the modern age, the outer space domain is of critical importance to the national security and commercial/economic development of States. State action in space is governed by a number of long- standing treaties (the Outer Space Treaty (1967), Rescue and Return Agreement (1968), Liability Convention (1971), and Registration Convention (1973)). However, there are few meaningful limitations on State action in space, especially as new State and commercial actors enter the space domain. The development of "norms"—largely non-binding principles that States mutually agree to follow, frequently for safety-related or practical purposes— is one method by which States could further develop the principles, concepts, and enforcement mechanisms of existing treaty responsibilities. This simulation provided a model of how norm development, and responses to norm violation, can work in a limited scenario involving only four (4) countries and limited norm subject-matters.

Takeaways and Recommendations:
Limitations on available information (particularly in a "crisis" scenario) and lack of transparency from state actors makes decision-making difficult—and can lead to significant escalation of a situation!

- It was easier to gauge states' motivations when meeting personally and discussing particular issues (i.e., the difference between the summit *developing* the mock-norms vs. the crisis scenario in which states were largely constrained to their own "teams" and relied largely on passed messages and public pronouncements to understand other states' perspectives).
- By the beginning of the second crisis scenario, states seemed to be more willing to make *public* statements in an apparent effort to *increase* the amount of information communicated to other actors.
- However, during the second crisis scenario, we also saw how state activity—even initially covert activity—could lead to escalating situations that were ultimately harmful for all space actors. Worst assumptions by state actors and attempts to protect national interests through harmful/dangerous countermeasures can lead to catastrophe.

- Further, assumptions about what other states know or don't know, and assumptions about what your own state can/can't do or has/hasn't done can complicate crisis resolution.
- Prior to crisis, there is a need for building trust and establishing common ground.

Workshop II: Commercial Space War

Executive Summary: In the age of growing technology, the use of commercialized industries has become ever more present, especially within the military. For years, the military has contracted out to commercial industries. With the war in Ukraine, commercial space industries are ever present and take a surprising level of active roles in the conflict. This roundtable sought to determine the appropriate capabilities and how involved commercial space companies should be with regards to the military. Additionally, the roundtable sought to find the extent to which the government should support these commercial space industries. In this current age of technological expansion, space related activities of the government have been expanded upon by the relationship with commercial industries and the relationship is necessary to further achieve the goals sought in space.

Main Discussion Points: This discussion began by determining the capabilities of commercial space and how the DoD could leverage these capabilities to their advantage. The capabilities were determined to include infrastructure, innovation culture, and communications. *The delegates concluded that the appropriate use of these capabilities was not exclusive, and in the demands of a commercial space war, all the capabilities should be used.* Next, the roundtable discussed what restrictions, if any, the government should impose on commercial space industries. *The delegates concluded that the government should continue to follow regulatory frameworks and tailor regulations in response to particular innovations.* Lastly, the roundtable discussed how the government should support commercial space industries during time periods of war and peacetime. *The delegates concluded that the government should protect American commercial space industries, provide relief from liability, and information/intel.* Overall, the government must continue to bolster their own space capabilities by also focusing on the protection and interests of the commercial space allies while still remaining within a regulatory framework in order to continue the development and growth of both the government and commercial space.

Takeaways and Recommendations: Despite the growth of commercial space industries, the government must continue to use existing commercial space capabilities while simultaneously expanding investments on emerging/experimental capabilities. In order for the DoD to leverage these capabilities in the private sector, they need to draw upon models such as the CRAF and DAP. With the growth and expansion of new space technology, it is important for the private industries to also operate in good faith. Yet, if the government finds the commercial space companies are not operating in good faith nor within regulatory frameworks, there should be penalties such as revoking licenses. For continued support of commercial space industries, the government should continue funding, contracts, and public support to maintain relief from liability. Additionally, the government should also include Space Domain Awareness Data in their relationship with commercial space as a method of intelligence and information. Lastly,

the government should actively protect assets such as launch stations or ground relays of commercial space industries during times of war and peace.

Workshop III: International Space Traffic Coordination

Executive Summary: Over the past decade the cost of entering Low Earth Orbit (LEO) has dropped dramatically, leading to the rise of commercial satellite operators and increasing the number of spacefaring countries. However, International Space Traffic Coordination (STC) has not kept pace with LEO's exponentially growing population. Without an updated and better structured STC framework the international community risks an unsustainable buildup in LEO's population and inert space debris. Should an orbit's satellite population growth exceed its carrying capacity, then a collision between two objects could trigger a chain reaction, destroying all satellites in orbit and rendering space inoperable. This is called the Kessler Syndrome; this is what we seek to avoid.

This working group identified the lack of incentives among international adversaries to compromise on this core problem within the existing international order. Major actors (U.S., China, Russia) currently operate under the realist philosophy, seeking power and security and using bargaining and coercion to achieve desired outcomes (with respect to other major powers). Desiring a more stable and organized space environment over realist anarchy, we sought to shift the international order from one of realism to one of liberalism where no single actor holds outsized power. To achieve this, we need to dilute the power of major actors to the point where coalitions and cooperation become crucial to success. If major powers can gain more from cooperation than the current status quo allows, we believe there will be greater action towards developing international STC rules and norms.

Main Discussion Points: We've identified three potential solutions that could help encourage a shift towards liberalism: diluting the power of the Permanent Five (P5) members on the U.N. Security Council (UNSC), establishing a space economy modeled after the International Telecommunications Union (ITU), and expanding the EU's Space Surveillance and Tracking support framework (EUSST), internationally. Each seeks to change the international institutions which govern and control STC activities and norms of behavior.

The Permanent Five: Spacecraft live in a constant state of dual use: what is a communications satellite today can be a kinetic projectile tomorrow. Such security concerns all but ensure that an eventual disagreement will find its way to the UNSC. With their absolute veto power, there is little incentive among the P5 to cooperate. As the U.S. relies on space technology for civilian and military operations more than China and Russia, there is little incentive for these actors to compromise and change the status quo. Doing so could remove their ability to strike U.S. satellites, putting their military objectives in jeopardy. We need to change their calculus and dilute their power. This could be achieved through any of these three changes:

- Amending the consensus rule from unanimous to 4/5 approval [lowers the barrier for motions to succeed]
- Changing the Chairmanship to a council of 2-3 P5 members [increases the number of major powers in charge of the agenda]

- Shifting to a coalition-based membership (i.e., EU instead of France) [requires coalition agreement or majority will to exert veto power]

In each scenario the major powers would be more inclined to compromise, as their individual power has decreased. Alternatively, if STC issues could avoid the UNSC, either through another adjudication process or a new institution dedicated to STC, then the absolute veto power of the UNSC would become irrelevant. While an unlawful destruction of a satellite would still trigger action at the USNC, a better institution could facilitate a space environment where satellite attacks become a less attractive military option.
The Space Economy: **L**iberalism centers around the common pursuit of wealth by all nations. This requires a more developed, secure, and reliable space economy than exists today. Establishing a space economy modeled after the ITU would create the necessary conditions for liberalism to succeed. This would begin with the formation of an International Space Management Organization (ISMO) as a central authority. The ISMO would allocate orbits much like how the ITU allocates frequencies. Guided by a Board of Governors comprised of state shareholders, the ISMO would lease or sell shares of orbitals to states and corporations. In receiving this allocation, operators would gain property rights over their orbital with the agreement that they will abide by certain standards and practices regarding STC. Furthermore, the ISMO would reserve or subsidize orbitals for developing actors, fulfilling the requirements of Article I of the Outer Space Treaty. Since they are the entity allocating orbital property rights, the ISMO would have grounds to adjudicate disputes and claims between shareholders. This is perhaps the most important aspect of the ISMO: creating a multi-stakeholder adjudication process. This could be modeled after the International Court of Arbitration, the International Civil Aviation Organization, or a new structure best pertaining to the nature of STC.

Expanding the EUSST: The ISMO plays into our final proposal, expanding the EUSST internationally. This organization would track satellites from all actors, providing a standard data set for the ISMO and other actors to use when navigating LEO. Within this organization there would be two assemblies, one focused on norm and policy creation and another on advising government enforcement. This organization's strength would come from its collection of valuable orbital data and standardization of operating norms. A country would only get access to this data if they contributed their own satellite data and abided by the organization's operational norms.

This organization could potentially be a part of the ISMO or an independent but cooperating agency. Their data collection and categorization combined with standard operating practices could allow greater distinction between military and civilian space activities. Standardized and trusted data may provide clearer declaration of intent between adversarial nations. It is understood that the sharing of tracking data could appear detrimental to military missions. However, as the large community of amateur satellite trackers could tell you, there is no hiding the trajectory of one's orbit if an adversary seeks to find you. Having trusted, filtered, and regulated data would allow countries to avoid other satellites while securing the privacy of their operations enough to act with discretion.

Key Takeaways and Recommendations: Considering these solutions points to a clear issue: the major powers need a reason to change the status quo. What countries lack must be used to

bring them to the negotiating table, and we concluded that a more secure and standardized space economy and international orbital data are the best carrots available. When combined, the ISMO and EUSST-equivalent leverage crucial data and information to implement economic organization, creating a more stable international structure to draft, standardize, and enforce STC. If this can be done, we may be able to avoid amending the P5. Changing the structure of the UNSC is the most difficult proposal to accomplish, as its existing structure favors the incumbent major powers. If the international community adopts the ISMO and EUSST-equivalent, then better coordination of movements and dissemination of space traffic data may prevent an issue arising that would require the attention of the UNSC, avoiding the issue altogether.

Workshop IV: Space Warfighting

Executive Summary: In this workshop, we dissected the main issues that are currently prevalent in space as a warfighting domain: those being the defense of our interests, what weapons and capabilities we must provide, and the rules of engagement between our country, other countries, and private entities. The overarching concept that drove this discussion was that, in order to maintain peace in this domain, we must prepare with a warfighting mentality that will enable our country and allies to combat the conflict when it presents itself.

Main Discussion Points: Civilian cyber capabilities are the backbone to defending U.S satellites and interests in space. In defending against Russian attacks, Starlink especially has presented itself as a viable and reliable ally while contributing to the growth of civilian interest in space. The U.S also condones civilian ventures and exploration of space, which can only strengthen and expand this investment and partnership. With cyber, though, there exist certain limitations that interfere with these capabilities, namely the high accessibility to interference and the need for reliable spectrum to communicate with satellites.

Satellites on station have also been bypassed by the recent and continually progressing cyber defense technology. Another issue discussed was the use and distribution of weapons in space. Our current strength lies in our ground-to-ground capabilities. With missiles, lasers, and jamming, we are able to present highly active and capable weapons to deter our adversaries, but if we have possession of this technology, then so do our enemies. To combat our adversaries' advancing capabilities, we must improve our maneuverability and detectability assets, management of distance between us and other objects in space, and the lack of visibility we are able to obtain for our own weapons relative to the weapons of our adversaries.

Finally, we discussed certain rules of engagement that must exist in order for space to continue as a peaceful domain. Fortunately, we are able to draw from other domains to model and construct our laws and policies. The Freedom of Navigation Exercise was used as an example of how we can assign certain orbits or areas of space for countries and entities while designating other areas as international "territory". Because this is a new and growing domain, it is malleable to the point where we can instill these rules before decisive conflict begins. Although this is an advantage, the lack of set territory naturally alludes to the question of who has the authority to assign rules. Currently, we foresee China as our biggest adversary and defiant to any rules we may put in place, and our lack of communication with

their government and military only stresses this relationship further.

Key Takeaways and Recommendations: Considering both the strengths and weaknesses discussed, we then formulated solutions to these issues before they escalate and evolve into bigger complications. For defense, we must improve our satellite technology to ensure that it is able to compete with the ever-changing abilities of the cyber domain. Physically, these satellites can be armed with their own lasers and sensor shields in order to deter and evade while improving thruster speed in order to escape the advancements of enemy spacecraft. Identified as the biggest strength in defense, we also need to continue to outsource to the civilian side of the issue in order to reinforce the alliance and partnership it provides. For the shortcomings we face with weapons, innovation and expansion is key. Plasma plumes, decoys, and coloring can all be used in order to deceive and allude the detection of the enemy. Entering into exotic orbits can also foil targeting in ways similar to unpredictable maneuver in the air domain.

Light and e-optical technology, as well as infrared and synthetic aperture radar can either work toward or against our weapon advantage, depending on how we choose to expand and innovate. With rules of engagement, collaboration is the only feasible option we see as providing solutions. The involvement of other countries and entities will ensure cooperation and adherence to policies emplaced while providing a solid face of retaliation for any actors that choose to defy them in space. As far as collaboration with China, incentives can be used in order to open up communication and guarantee their compliance. Ultimately, in order to actively combat and resolve the issues we identified in the warfighting of space, we must continually improve and progress alongside our allies and enemies, especially in establishing rules of engagement, weapons, and defense, ensuring our position in this new and expanding domain.

Workshop V: Strategic Foresight for the Space Enterprise

Executive Summary: The only certainty we have for the future is that it will be different from today. In order to limit the impact and shock of this uncertainty, leaders must engage in strategic foresight practices. Foresight involves scanning the horizon, casting a wide net, and looking for potential connections across disparate and related fields to uncover the realm of the possible. Foresight differs from forecasting in that forecasting seeks to *predict* a future or *define* probable events. Foresight on the other hand does not yield predictions, rather it is an exercise in conceptual analysis that can assist leaders in exposing emerging trends and areas of concern. Armed with this information, decision makers can allocate resources or attention and avoid or mitigate the pitfalls of surprise. This workshop paired cadets and traditional students with thought leaders from industry and academia to engage in strategic foresight for the space domain.

Main Discussion Points: To begin the workshop, participants discussed the nature of the evolving global and space environment, namely that it is volatile, uncertain, complex, and ambiguous (VUCA). With this foundation in mind, participants performed fringe signal scanning to uncover emerging trends, that when combined, could become significant drivers of change both in space and terrestrially. In order to provide a more comprehensive picture of emerging global signals, participants were unconstrained by space topics and were asked not

to seek out trends they believed might be important, but rather scan the horizon broadly, free from confirmation bias. The result of this work was a wide variety of signals, ranging from genetic modification to AI algorithms receiving patents, to workforce burnout, weather control, nuclear fusion, and a variety of topics in between. With these signals, participants then began drawing connections and creating futures webs with second and third-order effects mapped out, and possible time horizons identified. Following this work, key topics were identified and mapped on a cross-impact matrix to determine stakeholders and relevant parties. Finally, participants identified critical uncertainties and possible "black swans" related to these issues in order to inform decision makers on possible actions to be taken.

Key Takeaways and Recommendations: Workshop participants identified four possible catalysts for future change, two from the space domain and two others. The primary area of focus was a potential boom in the U.S. space industrial base, which included emerging growth areas like space mining, off-world habitation, space-based solar power, and broader access to space capabilities globally. Along these lines, another key topic was an advancement in space policy and awareness, with the implication that future space policy will ultimately shape not just actions taken in space but could affect the sustainability and survivability of life on Earth. Will precious space resources be open for harvesting? Will states be able to claim territory on celestial bodies? Can policies that promote restraint and deterrence be enacted or is conflict inevitable? These are some of the primary questions considered with space policy foresight. Other areas of focus included a push toward green/renewable energy and the emerging use of weather control, both for peaceful and nefarious purposes.

While all of these areas could have a significant positive impact on humanity and the global economy, there are a number of other challenges that must also be considered. These challenges were identified as critical uncertainties and could have a fundamental impact on how the trends identified play out in the future. The critical uncertainties identified by participants were: space governance (autocratic vs. democratic values in space); viability of the space domain (Will Kessler syndrome reduce/negate utility?); technological advancements (nuclear fusion, space-based solar power, weather control, maturity timelines and unintended consequences); a changing international order (bipolarity, multipolarity, other); distribution of technology globally (Who will have access, and when); and finally, how the public and governments will react to all of these trends. It is these critical uncertainties that participants advocate for continued research and investigation. Strategic foresight can identify these gaps in understanding, but proactive effort is also necessary to address these uncertainties to enable leaders to favorably shape the future environment and minimize the possible negative impacts of strategic surprise.

Workshop VI: Future of Conflict via Science Fiction

Executive Summary:

Session 1: Within Workshop 1, there was a great emphasis on character and setting development, and how a story can start with either a main character that you build around, or it can begin with a setting that you develop and then place a character into. Having a structural approach to writing and planning your story is extremely important, and it helps to know the end of the story before you begin writing it. Assembly delegates began with the story 'seeds'

that they developed prior to the workshop, and then set out to ask 'Who?' 'Where?' and 'Why?'. This is known as the 'origins game', for the understanding of which we listened to a brief podcast. At the end of the first workshop, we created a sentence to describe the loose plot of our story, outlining the struggle of the main character and why it should matter to the reader.

Session 2: During the second workshop, there was an initial jump back into the original workshop format, where we were discussing how to create both an internal and external struggle for a character to make the audience care about their journey, and we discussed the reasons why that should matter. After this, we had a 20-minute window of time where we brainstormed and worked on our individual products. After our work time, we came together to share ideas, discuss the impact that internal and external struggles had on our work, and exchange feedback to foster creative thinking. Next, we shifted gears to draw attention to why science fiction matters in the realm of space and warfighting.

Session 3: We discussed how science fiction is a great way to illustrate concepts that can be difficult to describe, using imagery to make things such as AI seem more feasible. Science fiction, we discussed, is what we ultimately reach for and has been a way for us to see the future of technology. Examples of this can be seen with video calling, which was once seen only in science fiction until it was made possible, and with AI decision aids. Science fiction also acts as a way to reach a broader audience and influence the public, which can be both helpful and harmful. The 'Top Gun' effect of boosting positive views can be counteracted by satirical science fiction titles, similar to the 'Space Force' show. Different perspectives from the media can control public perception and willingness to support. Making space more digestible is an issue that can be aided by the military, potentially to set more realistic expectations.

Main Discussion Points:

- Is there a system for building great science fiction?
- What makes a character worth caring about?
- Internal and external struggles, what is the relation between morality and warfighting?
- Why is science fiction relevant to the future fight?
- Why is science fiction relevant to the way technology develops?
- How does the perception of space change in relation to science fiction?
- How can we make space more digestible?
- Perception of Space Force and their capabilities and responsibilities in the general public can be formed by science fiction that is easily consumable.
- Unrealistic public expectations also need management.
- Wargaming: Practice mission planning can be done via science fiction writing, and can act as a platform to problem solve, safely discover, and assess potential consequences of military strategy and future technology.

- Technology: Science fiction often inspires new technology and gives direction to those who develop new technologies and their capabilities.
- Great science fiction fosters creative, critical, and analytical thinking.
- Science fiction allows cadets to problem solve and incorporate the aspect of morality to war and space concepts.
- Discussion and good communication skills lead into persuasive writing and higher order execution of strategic concepts.

Key Takeaways and Recommendations:

- Great discussion promoted a healthy environment for sharing ideas and growing individually with the help of others around us.
- Teamwork was there, but maybe one-on-one exercises could be beneficial as well.
- This workshop should be expanded in future years to come, maybe with more participants from other schools.

Workshop VII: Allied Space Deterrence: Waging Peace in Space

Executive Summary: The Ukraine Crisis has demonstrated two important themes of the current international stage: the lacking power of NATO and the increasing reliance on space to wage war. In addition to the Ukraine Crisis, anti-satellite (ASAT) testing by Russia and China has sparked discussion over NATO's response, should escalation occur. NATO must create a new space strategy with updated deterrence strategy in hard and soft law. When developing deterrence strategies, there are key assumptions and considerations to factor into the framework: for example, Thucydides' trinity of fear, honor, and interest; causes of conflict and escalation; and the impacts of miscommunication and misinterpretation. One must also consider each state's actions and reactions, especially main actors in space such as NATO, China, and Russia. Strategies already employed include economic sanctions, a form of deterrence by punishment; redundancy in capabilities like GPS, a form of deterrence by denial; and the current norms of space behavior. Nevertheless, NATO should evaluate different deterrence strategies as new threats emerge, including irreversible effects (i.e., Kessler Syndrome), loss of human life, first strike, and breakdown of communication. This paper proposes to diversify NATO's deterrence framework through reduction of NATO's space reliance, a deterrence by interdependence strategy, and prioritization of a diverse and resilient constellation system. Finally, NATO must ensure cooperation and mutual understanding in space behavior, establishing clear norms and thresholds for all actors.

Main Discussion Points:

Framing Questions

- What are the top priority threats that NATO is currently trying to deter or respond to?
- What would a space attack look like in relation to these threats?
- What are some of NATO's possible policy options to deter these scenarios?

Understanding the current deterrence framework allows leaders to refine actions and define norms through means tailored to certain threats. Currently, the space domain supports other domains and respective missions. There remains ambiguity in the current space deterrence model in part because of reliance on cross-domain response and retaliation.

Identified Threats to Space Deterrence

Irreversible Effects**:** ASAT operations are instruments that render a satellite permanently disabled, leading to the satellite becoming uncontrollable debris and contributing to a Kessler Syndrome scenario. The Kessler Syndrome is an exponential increase in density of space debris in Lower Earth Orbit (LEO), making collisions unavoidable and making space inaccessible and resources unusable.

Loss of Human Life**:** Most countries consider any action that threatens human lives to any degree as an attack, which is likely to lead to escalation. In space, this can manifest in hazardous debris which may, even unintentionally, harm humans on space stations (e.g. the International Space Station).

First Strike**:** If an actor is the first to develop certain technology, it is inherently incentivized to employ such technology before other actors acquire it. Because NATO members are increasingly dependent on space, China and Russia may be incentivised to enact preemptive strikes in space, crippling the most reliant actors.

Breakdown of Communication**:** This can be defined as a misunderstanding between actors, leading to asymmetric responses that contradict the respondent's norms or values given the reality of the situation. Asymmetric responses can provoke escalation, exacerbated when one or both countries have not thoroughly identified norms and 'redlines' of behavior. To understand space deterrence, the following case studies serve as models: the Vietnam War, the Cuban Missile Crisis, and the 2017-2018 U.S.-North Korea Crisis.

Key Takeaways and Recommendations: Conventional actions against NATO in space and subsequent responses are not entirely symmetrical. Actions done for prevention or retaliation in space have to be nation-oriented such that the effect is focused on a threatening punishment or denial toward aggression. For example, China and Russia rely less on space systems than the U.S., so destroying China or Russia's satellites could render a different response compared to the destruction of an American satellite. Similarly, because North Korea limits its internet capability by blocking global networks, limiting GPS access would have different implications than GPS outages among NATO members.

Deterrence Policy Suggestions

Diversify NATO Dependency in Space**:** The United States, and by proxy NATO, is currently more dependent on space than other adversaries. If the current fleet of U.S. space assets are compromised, it would immediately weaken its military posture. Through diversification of capabilities across domains and redundancy of NATO space assets, the alliance can deter space aggression through denial of benefit.

Deterrence by Interdependence**:** By increasing interdependence on space, NATO can promote responsible space behavior. As nations around the world become space-dependent, they will become more invested in responsible space behavior. Building up national space-reliant infrastructures, including space-based communication systems, global positioning satellites,

and earth imaging technology, will ensure a stronger incentive to protect space. NATO can encourage this through collaboration and supporting the global commercial space industry. By helping other countries utilize space technology, NATO will secure broader motivation for a sustainable space environment. Actions that were once appealing to less space-dependent nations (e.g., kinetic ASAT attacks) will be de-incentivized.

Diverse / Resilient / Redundant Constellations**:** Weaponizing space has the potential to escalate terrestrial tensions and should be avoided. As space technology develops, weapons should not be at the forefront of a space race. Globally, NATO could enter a security dilemma where actors aim to increase security through weapons, furthering danger worldwide. To safeguard our largely vulnerable dual-use space capabilities, such as imagery satellites providing intelligence, surveillance and reconnaissance (ISR), we need to procure constellations that are resilient to aggression through redundancy and diversity

Foster Cooperation and Mutual Understanding**:** Communication at the state level, especially when actors have different native languages, will always have its challenges. In his analysis of international law during the Gulf War Crisis, Dr. Christopher Kuner identifies the "rule of linguistic equality"[1] as a critical norm in diplomatic communication. In short, state actors and diplomats are entitled to communicate in their native language. The implications thereof suggest that NATO maintains a cohort of the most astute translators such that social nuance and speech connotations are preserved.

Establish Clear Norms and Thresholds**:** Clearly defined norms of behavior are essential for stability within any domain. However, space faces a unique challenge due to its underdeveloped understanding of acceptable behaviors. Underdeveloped norms can lead to misunderstandings between two non-aggressive states. It also complicates deterrence by challenging the idea of responsible imposal of cost. Little precedent exists of what non-escelatory proportional punishment looks like. This makes response to aggressive action in the space domain risky. Lastly, NATO must make its redlines explicitly known with clear examples, so that adversaries have a clear understanding of NATO's expectations for behavior, preventing unintentional conflict.

Future Implications

Space is not a new domain, but one that has become renovated and refined for decades by warfighters and policymakers alike. The means of protecting space assets, deterring hostile action, and ensuring the success of international operations have evolved as new threats arise. The ambiguity of space deterrence, and subsequent responses, is a challenge that requires us to predict the unknown. Space is shaped by daily actions that reinforce thresholds and norms for expansion into the final frontier. *S&D*

[1] Kuner, "Linguistic Equality in International Law: Miscommunication in the Gulf Crisis."