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## THE SPACE DOMAIN : DETERRENCE AS USUAL?

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JCSP 45

*Exercice Solo Flight*

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**THE SPACE DOMAIN: DETERRENCE AS USUAL?**

By Major Phillip Desmarais

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## **THE SPACE DOMAIN: DETERRENCE AS USUAL?**

### **INTRODUCTION**

Imagine a day where you wake up out of habit but your alarm did not sound. You check the alarm you set on your smartphone and notice that you do not have a cellular signal. At least you have wireless internet to check the weather and the news but that is not working either. You try the television for the news updates and get an error screen when you turn it on. On the way in to work you stop to get gas but the card reader at the pump is out of order. No problem, you can just get cash from the ATM – but that is out too. As you get in to the city, the traffic lights are dark and traffic is getting heavier by the second. You turn on your vehicle's navigation system to find a faster way to the office but it will not acquire the signal. When you finally get to work, there is an air of great consternation amongst your coworkers. Stock markets have crashed and commercial air travel has halted. This is the moment when you start to realize how many aspects of 21st century existence are inextricably dependent on systems and capabilities that reside in the space domain. Why did this happen? Has there been an attack or just a system malfunction? It is hard to imagine someone attacking the systems that form the backbone of our daily life. Or is it?

This scenario only begins to scratch the surface of how an attack on space systems would completely cripple our modern way of life. Can we ensure that this never happens? Doing so may be more difficult than it seems. There are many state and non-state actors that have identified the military advantage gained by space systems and have also deduced that advantage as a critical vulnerability. Systems and capabilities are being developed by these

potential adversaries with the explicit purpose of holding allied space systems at risk.<sup>1</sup> The far-reaching effect of an attack on space systems is the impetus for engaging in the discussion and research surrounding deterrence and the space domain. The Cold War era led to extensive research and writing on deterrence theory and strategy, what was applicable then is not necessarily so in the space domain in today's Information Age.

The space domain has become increasingly contested, congested and competitive as the military and great powers no longer have exclusive access to the ultimate high ground.<sup>2</sup> It is unique in many ways from the other terrestrial domains and therefore needs special consideration, including how it is used and how it interacts with the other domains. This holds true for deterrence in the space domain as well. Accordingly, this paper will argue that deterrence in the space domain is too closely connected to broader deterrence to be considered as a separate discipline in a deterrence strategy.

To prove this argument, this paper will provide a critical review of the current discourse on the topic of space deterrence. It will first provide an overview of the space domain as it pertains to deterrence. Second, it will discuss deterrence theories and applicability to the space domain. The third section will evaluate how these theories combine to form a deterrence strategy by reviewing some of the current discussion on space domain deterrence. Lastly, this paper will provide recommendations on areas of further research and cursory thoughts on the validity of deterrence as applied to the space domain.

## **DISCUSSION**

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<sup>1</sup> Bryan Boyce. "Twenty-First Century Deterrence in the Space War-Fighting Domain Not Your Father's Century, Deterrence, or Domain." *Air and Space Power Journal* (Spring 2019): 34.

<sup>2</sup> Bryan Boyce. "Twenty-First Century Deterrence in the Space War-Fighting Domain Not Your Father's Century, Deterrence, or Domain." *Air and Space Power Journal* (Spring 2019): 35.

## The Space Domain and Deterrence

There are some initial aspects that differentiate this topic from its relatives. The space domain itself is unique in that it “is remote: [t]he distance and speed at which satellites operate makes them difficult to inspect, track, or assess damage from attacks. Conflict could be conducted remotely by both the attacker and defender with little to no direct risk of human casualties.”<sup>3</sup> This separates it from the terrestrial domains in that it is difficult to perceive the threat or imagine the consequences of an attack. This requires leaps in logic for the layperson to come to terms with why large sums of defence spending are put towards a nebulous threat. The term space deterrence itself can have different implications and leaves some room for interpretation. As Boyce has argued, “[S]pace deterrence presents a new challenge— that of defining what deterrence in the space domain looks like and how it might prevent conventional conflicts from starting in, or extending to, space.”<sup>4</sup> Is the goal to deter an attack that uses weapons systems from the space domain? Is it to deter an attack on space systems from within the space domain? Or is it to prevent terrestrial attack on space based systems? It stands to reason that depending on what type of space domain deterrence one is referring to; the chosen strategy needs to consider this nuance. Michael Krepon defined space deterrence as the “detering harmful actions by whatever means against national assets in space and assets that support space operations.”<sup>5</sup> It is therefore important to define the type of activity that needs to be deterred when discussing the space domain.

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<sup>3</sup> Ali Jafir & John Stevenson. “Space Deterrence: The Vulnerability-Credibility Tradeoff in Space Domain Deterrence Stability.” *NSI Concept Paper* (April 2018). 9.

<sup>4</sup> Bryan Boyce. “Twenty-First Century Deterrence in the Space War-Fighting Domain Not Your Father’s Century, Deterrence, or Domain.” *Air and Space Power Journal* (Spring 2019): 38.

<sup>5</sup> Krepon, M. “Space and Nuclear Deterrence,” In *Anti-Satellite Weapons, Deterrence and Sino-American Space Relations*, Washington, D.C.: Stimson Center: 2013.

Yet another complicating factor when discussing deterrence in the space domain is that most often the capability the system provides as opposed to the space object itself is what must be defended through deterrence. Space systems often span multiple domains. They are comprised of much more than just the satellite. For example, space systems have terrestrial components that make up the overall architecture of the capability. While not a warfighting domain, the electromagnetic spectrum is essential to the functioning of space capabilities while at the same time it is a significant vulnerability. This means that an actor can attack a space system without actually being in the space domain and therefore complicates the development of strategies for the space domain. This is grounds to consider a multi domain approach to deterrence.

### **Deterrence Theories and the Space Domain**

Deterrence theory can be broken down into two approaches, two sets of circumstances and two timeframes. The two fundamental approaches to deterrence are by denial and by punishment: “Deterrence by denial involves discouraging the adversary from taking undesirable actions by convincing them that their goals are impossible to be achieved,” whereas, “Deterrence by punishment, is based on convincing the opponent of the inevitability of incurring unacceptable losses (hence the "punishment") if unwanted actions are taken.”<sup>6</sup> The two sets of circumstances are direct and extended deterrence: “Direct deterrence consists of efforts by a state to prevent attacks on its own territory . . . [e]xtended deterrence involves discouraging attacks on third parties, such as allies or partners.”<sup>7</sup> The direct circumstance is very relevant to the space domain as the number of space faring nations continually

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<sup>6</sup> Ali Jafir & John Stevenson. “Space Deterrence: The Vulnerability-Credibility Tradeoff in Space Domain Deterrence Stability.” *NSI Concept Paper* (April 2018). 4.

<sup>7</sup> Michael Mazarr. “Understanding Deterrence.” *Perspective* (2018). 3

increases. The extended circumstance is equally important as alliances continue to be a major part of contemporary strategies.<sup>8</sup> The two time frames of deterrence are general and immediate. “General deterrence is the ongoing, persistent effort to prevent unwanted actions over the long term and in non crisis situations. Immediate deterrence represents more short-term, urgent attempts to prevent a specific, imminent attack, most typically during a crisis.”<sup>9</sup> The scope of deterrence actions also play an important role in determining how to develop a strategy: “Narrow deterrence involves deterring a particular type of military operation within a war, whereas broad deterrence involves deterring all war.”<sup>10</sup> As it pertains to the space domain, it can be said that narrow and broad deterrence occurs simultaneously. An unrestricted war in the space domain is akin to the concept of mutually assured destruction taken from nuclear deterrence. The physical and scientific properties of the space domain are such that the damage caused by kinetic attacks in space will have cascading effects that could render entire orbits useless regardless of which side of the conflict one is on. The nations that possess the capabilities to launch an attack in space are also the same ones who depend on the domain for the capabilities it provides, albeit some more than others. The high cost of war, especially of one in the space domain, is a powerful deterrent regardless of having the capability to attack in the space domain.<sup>11</sup> There is a shared vested interest in preserving the utility and preventing the pain of conflict in the space domain.

In terms of narrow deterrence, space assets and capabilities support military operations daily. Although there are not any declared wars occurring, there are many conflict zones

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<sup>8</sup> United States. *DoD Strategy for Deterrence in Space*. Washington, D.C.: Department of Defense. 1.

<sup>9</sup> Michael Mazarr. “Understanding Deterrence.” *Perspective* (2018). 4

<sup>10</sup> Lawrence Freedman. “The Meaning of Deterrence” In *Deterrence*, 26-42. Cambridge: Polity Press, 2004. 32.

<sup>11</sup> Michael Mazarr. “Understanding Deterrence.” *Perspective* (2018). 6.

around the globe that are supported by military space capabilities. One such Canadian example is the space situational awareness mission supported by the Sapphire satellite system.<sup>12</sup> From position, navigation and timing to overhead persistent infrared sensors, narrow deterrence occurs in support of military operations below the threshold of war.

The theoretical staples that underpin the aforementioned concepts are that of capability, credibility and communication. The ingredients of an effective deterrence strategy must incorporate these three fundamental concepts. In basic terms, once it has been determined what the adversary holds of value, the deterring actor must have the capability to affect it, the means by which to take action, a legitimate framework within which to operate and must communicate to the adversary what will happen.<sup>13</sup> If any one aspect of this triad is weaker than the other, the deterrence posture as a whole is compromised. While it can be shown that space capabilities are linked to certain aspects of deterrence theories, it is not until these theories are combined that they form a deterrence strategy. Which principles are best suited for application in a deterrence strategy for the space domain is what will now be explored.

### **Deterrence Strategies and the Space Domain**

In reviewing some of the contemporary literature on space deterrence, there is a common characteristic of space systems that persists throughout. The vulnerability of space systems is widely agreed upon as an unavoidable aspect of the domain, but depending on how it is perceived it can be either support or dilute deterrence. In his paper on space deterrence, Kopec submits that there is a gap between credibility and vulnerability that is created due an asymmetric dependence on space systems. If an attack were to take place that damaged a

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<sup>12</sup> Canada. "Sapphire Satellite in Space." Last accessed 6 April 2019.

<sup>13</sup> Robert Haffa. "The Future of Conventional Deterrence: Strategies for Great Power Competition." *Strategic Studies Quarterly* (Winter 2018): 96.

space system that country X was highly dependent on, the retaliatory attack on an equivalent space system belonging to country Y would not have the same impact due to their lesser dependency on that space system.<sup>14</sup> This scenario plays on the fact that deterrence is best suited for situations where either side has a relatively equal amount to lose. It speaks to the credibility of retaliatory actions. If country X has more to lose than country Y, there is a favourable offensive advantage to country Y, the less dependent country. Country Y is therefore more difficult to deter by punishment also contributing to a reduction in credibility have an overall negative impact to the deterrence posture of country X.

This situation of asymmetric dependency is prevalent today in particular with threat actors such as Iran. The Western alliance nations possess the technological advantage over rogue states like Iran and with that also have a great dependency on the space based effects that enable their advantage.<sup>15</sup> From satellite communications, position navigation and timing to reconnaissance, the alliances of today rely heavily on space based technology leading to said potential vulnerability. This decreases the deterrence effect because of how the adversary perceives the advantage as a vulnerability. According to Kopec's logic, when the adversary has a lower dependency and possess the capabilities to disrupt or destroy space systems, they are less likely to be deterred due to the capability vulnerability gap.<sup>16</sup>

Kopec also submits that a more stable deterrence dynamic would exist, similar to the bipolar stability of Cold War nuclear deterrence, if more countries are equally dependent on space systems.<sup>17</sup> In this case the costs are more equally shared among actors involved; therefore,

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<sup>14</sup> Rafal Kopec. "Space Deterrence: In Search of a "Magical Formula"." *Space Policy* (2018). 4.

<sup>15</sup> Bryan Boyce. "Twenty-First Century Deterrence in the Space War-Fighting Domain Not Your Father's Century, Deterrence, or Domain." *Air and Space Power Journal* (Spring 2019): 34.

<sup>16</sup> Rafal Kopec. "Space Deterrence: In Search of a "Magical Formula"." *Space Policy* (2018). 4.

<sup>17</sup> *Ibid.*

the deterrence principles are more easy to apply. One such effort that would spread the dependency of nations and militaries is the cooperative payloads or dual use systems. Cooperation between military, civilian and even international entities is common practice to help mitigate the high cost of space launch. France, China and Japan have deliberately developed technology for dual use purposes.<sup>18</sup> While this type of collaborative arrangement was established with resource maximization in mind, there is a deterrence effect in having bilateral or military-civil shared payloads. This increases more nations' dependency on space based capabilities but also complicates the deterrence equation for the space domain by introducing another actor that may not be otherwise implicated in the deterrence relationship.

Conversely, the vulnerability of space systems and the asymmetric dependence on them could also contribute to the deterrence equation by increasing credibility. In a study done by the National Security Institute, Jafri and Stevenson submit that “we argue that unmitigated risks of dependence on the space domain enhances the credibility of the most space-dependent nations; the reliance on the domain creates a credible threat that a state whose space assets are intentionally degraded or destroy will commit to a firm, not necessarily proportional response.”<sup>19</sup> In this instance, the authors highlight a proportional relationship between vulnerability, dependence and credibility. In essence, the more vulnerable and dependent one is on a space system, the more likely one is either defend or retaliate should it be attacked. This scenario applies aspects of deterrence by denial, punishment supported by increase credibility. If country Y acknowledges that country X has a great deal to lose if its space systems are compromised, it may be deterred from attacking in the first place, therefore

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<sup>18</sup> United States. *CRS Review for Congress, China's Anti-Satellite Weapon Test*. Washington, D.C.: Chief of Review Services, 2007. p 28.

<sup>19</sup> Ali Jafir & John Stevenson. “Space Deterrence: The Vulnerability-Credibility Tradeoff in Space Domain Deterrence Stability.” *NSI Concept Paper* (April 2018), 2.

deterrence by denial. Should country Y still proceed with an attack, the high dependence of country X all but guarantees a retaliatory attack, therefore deterrence by punishment. If a nation is considers itself dependent on space capabilities, it must communicate what response will occur after an attributable space attack. Now supported by communication, the combination of deterrence theory principles has formed a possible strategy.

Space is the domain that links all other domains together. It has a long history of military applications, its impact on the global economy is massive, it is a key enabler of the information age and is used in global diplomacy. “Effective twenty-first century deterrence needs to be national and multinational, multidiscipline, and multidomain, combining diplomatic, informational, military, and economic (DIME) means to prevent terrestrial conflicts from extending to space.”<sup>20</sup> It is through this lens of multiple “multis” that Boyce builds his argument on how deterrence in the space domain ought to be addressed. This approach takes advantage of the very active discussion surrounding the evolution of warfare to include operations that deliberately use multiple domains. It also touches on the fact that space systems may serve tactical objectives but they can very quickly become implicated at the political level. By introducing DIME in to the deterrence strategy discussion it brings emphasis to the point that deterrence is not just a military problem set. While combining DIME, multi domain and deterrence theories to develop strategies provides diverse and flexible options, it may be too burdensome to solve a complex problem with an overly complex solution set.

## **CONCLUSION**

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<sup>20</sup> Bryan Boyce. “Twenty-First Century Deterrence in the Space War-Fighting Domain Not Your Father’s Century, Deterrence, or Domain.” *Air and Space Power Journal* (Spring 2019): 34.

This paper has explored the fundamental concepts of deterrence and their combination into strategies as they may be applied to the space domain. Deterrence theory has to be applied in slightly nuanced ways to the space domain and this then must be extrapolated into an equally nuanced broader deterrence strategy. The Canadian Armed Forces' coalition and alliance based approach to operations is clearly represented in the space domain. Canada provides niche capabilities that are heavily relied upon by our allies. It is therefore appropriate for an alliance to develop a strategy based on extended deterrence principles. The world has already witnessed possible failures of deterrence in the space domain with the U.S., and China both demonstrating the capability despite the long lasting damage caused by the 2007 Chinese event.<sup>21</sup> Despite the negative response from the international community following the Chinese test, most recently India conducted a similar test demonstrating the capability to destroy satellites by using a direct ascent anti-satellite weapon.<sup>22</sup>

It is difficult to determine if it was a lack of deterrence that contributed to any of these weapons tests. The level of integration that space systems have within today's military and society make of special interest to protect. The research in this regard is nascent and there are studies that are both for and against the development of space deterrence as a strategy. This field of research should be continued by analyzing the fundamental deterrence concepts of credibility, capability and communication vis-à-vis the congested, contested and competitive characteristics of the space domain. The additional complicating factor in this discussion is the legal framework that allows actions to take place at all. This is an emerging field of study

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<sup>21</sup> United States. CRS Review for Congress, China's Anti-Satellite Weapon Test. Washington, D.C.: Chief of Review Services, 2007.

<sup>22</sup> Space News, India Tests Anti-Satellite Weapon. <https://spacenews.com/india-tests-anti-satellite-weapon/>. Last Accessed 6 May 2019.

and is critically linked to the credibility of a nation's capabilities. Any further research must take into consideration the current legal discussion surrounding space and deterrence.

Deterrence has become an increasingly complex strategy to apply in today's multipolar global security environment. Policy makers have many ways to conceive a deterrence strategy in light of the extensive set of tools available to them. Today's environment is so drastically different, and ever-changing that it may be more beneficial to return to first principles prior to getting the cart too far in front of the horse.

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