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## THE WEAPONIZATION OF SPACE: A CALL FOR COOPERATION

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**JCSP 45**

**Solo Flight**

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**THE WEAPONIZATION OF SPACE: A CALL FOR COOPERATION**

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## THE WEAPONIZATION OF SPACE: A CALL FOR COOPERATION

In January 2007, the Chinese government successfully destroyed an obsolete Chinese weather satellite that was on orbit at an altitude of 860 km.<sup>1</sup> The anti-satellite (ASAT) missile test was called provocative and irresponsible as China delayed informing other nations of their intentions<sup>2</sup>, and the test resulted in the production of a low earth orbit (LEO) debris field ranging in altitude from 200 to 4000 km; effectively posing a major threat to other nations' satellites orbiting within the entire LEO sphere.<sup>3</sup> The United States government submitted a formal complaint to the United Nations, but no action was taken<sup>4</sup>. The Chinese ASAT test sent a clear message to the world of their ability to destroy objects on orbit and solidified their place as another major player, and threat, in the space domain. Space is said to be "offense-dominant", in that it is easier to attack space systems than protect them.<sup>5</sup> As such, current international treaties and norms do not adequately address the continued weaponization of the space domain and the control of arms therein. If left as is, the continued action of nations attempting to secure their space assets and capabilities could lead to a space arms race which current policies are not set to enforce, nor police. International authorities must be identified and prepared to enforce worldwide space policies, laws, and norms in order to protect the space domain and preserve nations' access to it for future use and exploration. This essay will examine the current state of international treaties and norms regarding the weaponization and control of arms within the space domain. Threats to space systems will be discussed, as well as the actions space-faring nations are prepared to take in order to defend space assets or deter aggression in space. Based on the aforementioned threats and potential actions, the

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<sup>1</sup> Mark Gubrud. "Chinese and US Kinetic Energy Space Weapons and Arms Control." *Asian Perspective* 35 (2011). 617.

<sup>2</sup> The Guardian, "China confirms anti-satellite missile test", Last modified 23 January 2007. <https://www.theguardian.com/science/2007/jan/23/spaceexploration.china>

<sup>3</sup> Gubrud 617.

<sup>4</sup> Adam G. Quinn. "The New Age of Space Law: The Outer Space Treaty and the Weaponization of Space." *Minnesota Journal of International Law* 17, no.2 (Summer 2008). 476.

<sup>5</sup> Joan Johnson-Freese & David Burbach. "The Outer Space Treaty and the Weaponization of Space." *Bulletin of the Atomic Scientists* 75, no.4 (2019). 137.

effectiveness of current and proposed international space policies will be explored, as well as recommended courses of action nations could implement in order to minimize or avoid a space arms race.

The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (also known as the Outer Space Treaty (OST)) is the foundation of space law and entered into force in October 1967.<sup>6</sup> 105 nations are states/parties to the treaty, while another 26 have signed it but have not yet completed ratification.<sup>7</sup> Conceived during the Cold War it is apparent the OST was influenced by the US/USSR power struggle that was occurring at the time.<sup>8</sup> The OST stresses the maintenance of peace in outer space exploration as well as forbidding the placement of nuclear weapons or weapons of mass destruction (WMD) in Earth orbit or on orbit around other celestial bodies.<sup>9</sup> Article IV to the Treaty provides additional arms control provisions which forbids states/parties from installing WMDs on celestial bodies or stationing WMDs in outer space in any other form. The establishment of military bases, testing of any types of weapons, or conducting military exercises on the moon or other celestial bodies is also forbidden.<sup>10</sup> Based on these provisions, the acceptance and interpretation of the Treaty by nations has shaped their actions in outer space.<sup>11</sup> However, the treaty does not specifically restrict the use and/or placement of conventional weapons in outer space, therefore the actions of the Chinese in 2007 could be interpreted as being within the guidelines of the OST. Conversely, analysts have argued that the lack of definition within the Treaty regarding what a “weapon” actually is, and the Treaty’s repeated reference to using space for peaceful purposes, could broadly

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<sup>6</sup> United Nations Office for Outer Space Affairs. “Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies.” Last accessed 24 May 2020. <https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html>.

<sup>7</sup> Ibid.

<sup>8</sup> Quinn 477.

<sup>9</sup> David C. DeFrieze. “Defining and Regulating the Weaponization of Space.” *Joint Force Quarterly* 74, 3<sup>rd</sup> Quarter (2014). 111.

<sup>10</sup> Ibid.

<sup>11</sup> Quinn 480.

be interpreted as forbidding the use of any weapon systems in space, not just WMDs.<sup>12</sup> This ambiguity has sparked a debate and a requirement for clarity regarding weapons in space, arms control, and the extent to which nations may act in a deterrence or defence capacity.

The actions of the Chinese in 2007 is not something new. Space-faring nations such as the US and Russia, have already tested ASAT systems (albeit much earlier than the Chinese) indicating a progression from the militarization of space to its inevitable weaponization.<sup>13</sup> Also, as recently as February 2020, it was reported by the US that a pair of Russian spacecraft had been maneuvering and trailing a US spy satellite, at times coming within 100 miles of it.<sup>14</sup> A clear indication that there exists a capacity for space-faring nations to function operationally in the space domain and with that threaten the operational capabilities of other nations' strategic space assets should conflict arise terrestrially, or in peace-time to negatively impact diplomatic and political relations.

Not long after the end of the Cold War, the US attained space hegemony as Russia, despite its historical accomplishments in space, was no longer in a financial position to keep up with the US. However US space hegemony was short-lived with Russia's and China's continued development of capabilities to disable US satellites, thereby placing the US and its allies in a more competitive and dangerous international security environment.<sup>15</sup> The fragile nature of satellites make them vulnerable and susceptible to damage if hit with even a small object.<sup>16</sup> This weakness may be exploited through the use of offensive systems (both earth and space-based) rendering extremely expensive space assets useless. Kinetic energy, directed energy, and nuclear explosions all present a threat to currently deployed space systems.

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<sup>12</sup> Arms Control Association. "The Outer Space Treaty at a Glance." Last modified August 2017. <https://www.armscontrol.org/factsheets/outerspace>.

<sup>13</sup> Alexey Arbatov. "Arms Control in Outer Space: The Russian Angle and a Possible Way Forward." *Bulletin of the Atomic Scientists* 75, no.4 (2019). 152.

<sup>14</sup> W.J. Hennigan. "Strange Russian Spacecraft Shadowing US Spy Satellite, General Says." Time Magazine Online. Last modified 10 February 2020. <https://time.com/5779315/russian-spacecraft-spy-satellite-space-force/>.

<sup>15</sup> Steve Hirsch. "There is no "War in Space." Air Force Magazine Online. Last modified 29 May 2018. <https://www.airforcemag.com/article/there-is-no-war-in-space/>. 36.

<sup>16</sup> Max Mutschler. *Arms Control in Space: Exploring Conditions for Preventative Arms Control*. Palgrave Macmillan, 2013. 109.

The Chinese ASAT test of 2007 was a kinetic energy attack where the brute force of a ballistic missile had been used to destroy the satellite. Kinetic energy weapons are the easiest space weapons to develop for space-faring nations and can be deployed for earth-to-space, or space-to-space engagements.<sup>17</sup> Another type of kinetic energy attack includes the use of micro-satellites that would normally be used for tasks such as active debris removal (ADR) or on-orbit servicing (OOS). ADR and OOS satellites can also be dual-purposed to destroy enemy satellites<sup>18</sup>, and are considered relatively inexpensive to make but pose a significant asymmetric threat to space assets due to their deceptive nature.<sup>19</sup>

Directed energy weapons use the energy of lasers or microwaves to disorient, blind or destroy the functionality of satellites by interfering with satellites' optical sensors or by exposing the satellite to high amounts of laser light causing a disruption in the spacecraft's thermal balance and ultimately damaging sensitive internal components.<sup>20</sup> As with kinetic energy ASAT weapons, directed energy counter-space efforts could be either earth or space-based. At present China is in possession of these types of weapons thereby diversifying the means by which they can attack adversarial space systems.<sup>21</sup> Another directed energy space weapon is one that would use microwaves to disrupt satellite systems. This technology is still in development, and due to the filtering effects of the earth's atmosphere, use of microwave directed energy weapons would be restricted to space-to-space engagements.<sup>22</sup>

Nuclear explosions in the vicinity of satellites contribute towards a three-pronged effect depending on how close the blast is to the space asset. If the explosion is close enough to the satellite, the spacecraft will be destroyed; if the blast is not close enough to cause physical damage

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<sup>17</sup> Ibid 111.

<sup>18</sup> Brian Chow. "Space Arms Control: A Hybrid Approach." *Strategic Studies Quarterly* (Summer 2018). 108.

<sup>19</sup> Mutschler 111.

<sup>20</sup> Johnson-Freese & Burbach 138.

<sup>21</sup> Vishnu Anantamula. "US Initiative to Place Weapons in Space: The Catalyst for a Space-Based Arms Race with China and Russia." *Astropolitics 11* (2013). 143.

<sup>22</sup> Mutschler 110.

the electromagnetic pulse produced from the detonation will paralyze unshielded satellites' electronic components, rendering them useless; furthermore the resultant radiation from the blast could persist for years and contaminate the area making that region of space unusable for future space systems.<sup>23</sup> As the US, China and Russia are all nuclear powers and have demonstrated ASAT capabilities, the nuclear threat to these countries' space systems is very real and warrants consideration on how to control space arms and the potential for nuclear weapons proliferation into the space domain.

Space-faring nations all have their reasons for the militarization, and ultimately weaponization, of space. The US is the undisputed leader in space technology which has translated into its goal of maintaining space superiority. In June 2018, when President Donald Trump directed the Chairman of the Joint Chiefs of Staff to create a space force as a sixth branch of the military, he stated that, "we must have American dominance in space".<sup>24</sup> The reason being is that the US has an over-reliance on space systems for C4ISR which translates into it being heavily dependent on outer space technology to promote national security.<sup>25</sup> Chinese strategists are aware of this weakness and plan to exploit the US's vulnerable space infrastructure in case of war by conducting asymmetric warfare against the US; hence the need for the ASAT test conducted in 2007.<sup>26</sup> The US has the most invested in the space game, which makes them extremely vulnerable to these offensive counter-space attacks unless they take the initiative. General John Hyten, currently the 11<sup>th</sup> Vice Chairman of the Joint Chiefs of Staff stated in 2018 that there is, "no doubt in my mind we're going to have to deploy defensive counter-space systems because our adversaries are building offensive counter-space systems".<sup>27</sup> Statements such as this indicate that a space arms race, and the potential for the

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<sup>23</sup> Ibid 109.

<sup>24</sup> Johnson-Freese & Burbach 138.

<sup>25</sup> Blair Stephenson Kuplic. "The Weaponization of Outer Space: Preventing an Extraterrestrial Arms Race." *North Carolina Journal of International Law and Commercial Regulation* 39, no.4 (Summer 2014). 1142.

<sup>26</sup> Harsh Vasani. "How China Is Weaponizing Outer Space." *The Diplomat Online*. Last modified 19 January 2017. <https://thediplomat.com/2017/01/how-china-is-weaponizing-outer-space/>.

<sup>27</sup> Hirsch 35.

weaponization of space, is imminent if not already underway. Without international intervention and the cooperation of space-faring nations to control space arms proliferation, there exists a risk of losing access to the space domain should there ever be a conflict in space.

The fragility of space as an environment cannot be understated as it has the least ability to repair itself.<sup>28</sup> This environment is key to the continued operation of commercial satellite services such as telecommunications, earth observation, and positioning services, all of which contribute to the global space industry.<sup>29</sup> It is estimated that the global space industry could generate revenue of more than \$1 trillion by 2040, up from the \$350 billion that was reported in 2019.<sup>30</sup> These services, and the revenue they generate, are increasingly important factors for the modern economies of the twenty-first century. Nations whose economies rely on the global space industry would be devastated should there ever be a conflict in outer space due to the substantial addition of space debris which would lead to either degraded commercial satellite operations, or even worse, full operational closure.<sup>31</sup> It is this risk of full operational closure and the loss of a sustainable space domain which should inspire cooperation among space-faring nations to seriously consider and implement policies which would protect space and ensure it remains accessible for continued economic growth and exploration.

As previously discussed, there exists no worldwide space policy that contends with the weaponization of space. The OST addresses arms control in that it prohibits placement of nuclear weapons on orbit of the earth or other celestial bodies, but does not prohibit against the use or deployment of conventional weapons in space. Over the last 50 years nations have attempted (and failed) to control space weapons and the possibility of a space arms race through draft treaties.<sup>32</sup>

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<sup>28</sup> Mutschler 153.

<sup>29</sup> Ibid.

<sup>30</sup> Morgan Stanley. "Space: Investing in the Final Frontier." Last modified 02 July 2019. <https://www.morganstanley.com/ideas/investing-in-space>.

<sup>31</sup> Paul B. Larsen. "Outer Space Arms Control: Can the USA, Russia and China Make This Happen." *Journal of Conflict & Security Law* 28 no.1 (2018). 157.

<sup>32</sup> Chow 128.



This is not through a lack of want or denying that irrevocable harm could come to both the space domain and humankind if left unaddressed, but rather due to national self-interests.<sup>33</sup> In 2008, the Russian Federation and Republic of China presented to the Geneva Conference on Disarmament (CD) a draft Treaty on the Prevention of the Placement of Weapons in Outer Space and of the Threat or Use of Force Against Outer Space Objects (PPWT). Although not supported by the US, the joint effort by Russia and China indicated they are key proponents of a legally binding treaty banning the deployment of weapons in space<sup>34</sup>. The US, which currently holds a massive military space superiority over other nations is understandably reticent about accepting any agreement which would afford the US a loss of that military advantage and effectively level the playing field with its key adversaries.<sup>35</sup> However, the US Space Policy released in 2010 under the Obama administration indicated that the US would consider proposals and concepts for arms control measures if they were equitable, verifiable, and enhanced the national security of the US and its allies.<sup>36</sup> The question now being, how can the three superpowers come to an agreement? All three nations clearly wish to control arms in space however the means to the end seems to be elusive. Although the PPWT was not supported by the US, an analysis of the points that were unacceptable could provide some insight into how future negotiations could progress where space-faring nations could move ahead in negotiations and ultimately come to a mutual agreement in policy.

The US opposed the PPWT for three main reasons. The first being that the draft treaty did not address, nor restrict, the use of earth-based ASAT systems<sup>37</sup>. For the US, the threat of a kinetic energy attack against its extensive space infrastructure is a major concern and understandably a “line in the sand” with regards to treaty negotiations of this kind. Kinetic energy weapons are accessible to nations, and given the relatively simple nature of the technology, limited

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33 Ibid 111.

34 Mutschler 136.

35 Ibid 164.

36 Ibid 175.

37 Chow 111.

predominantly by the ability of a nation to actually launch the weapon into space. In May 2014, General William Shelton, then Commander of US Space Command, indicated that 11 nations had their own launch capabilities,<sup>38</sup> some of which may have aggressive agendas which could threaten US space systems therefore addressing ASAT systems in a treaty of this kind is prudent. For Russia and China, ASAT systems provide the leverage they require in order to keep the US in check by denying the US the establishment of space control<sup>39</sup>. Therefore consideration should be made in follow-on treaty negotiations that space will not be controlled by one nation, but understandably limited in order to protect nations' space assets.

As a compromise to this point of contention, future treaties should consider banning the disruption, damage, and destruction of another nation's satellites. A provision such as this should also incorporate a ban or limit on ASAT weapon testing in order to ensure other nations' satellites are not affected, or accidentally damaged or destroyed, by ASAT weapons tests.

The second US opposition to the PPWT was its lack of an integral verification regime<sup>40</sup>. Although expansive, space is a very transparent medium. This transparency allows for remote tracking, surveillance, and observation via optical, infrared, radar, and electromagnetic technology.<sup>41</sup> Furthermore, other nations or third parties would be capable of monitoring and tracking launches, and through remote sensing, detect the build-up of military assets either terrestrially or in space.<sup>42</sup> Under these supervisory efforts nations subject to the provisions of a space arms control / non-weaponization of space treaty can be monitored either through national technical means or by a third party, however enforcement of the treaty, and subsequent punishment should nations be in contravention, would also need to be comprehensively outlined.

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<sup>38</sup> Subrata Ghoshroy. "The X-37B: Backdoor Weaponization of Space?" *Bulletin of the Atomic Scientists* 73 no.3 (2015). 25.

<sup>39</sup> Mutschler 134.

<sup>40</sup> Chow 111.

<sup>41</sup> Mutschler 156.

<sup>42</sup> Roger Handberg. "Is Space War Imminent? Exploring the Possibility." *Comparative Strategy* 36, no.5 (2017) 419.

Regarding enforcement, a neutral international organization similar to the International Atomic Energy Agency (IAEA) could be tasked with the monitoring of nations to ensure compliance, while an international tribunal could be assigned as an arbitrator.<sup>43</sup> The UN, with a standing committee under the convention of disarmament, could perform that role thereby ensuring transparency and preventing any notion of favoritism.<sup>44</sup>

As for punishment to nations who are in contravention of such a treaty, using the economic deterrence and enforcement capabilities of the World Trade Organization (WTO) could be an option.<sup>45</sup> A WTO-type system would provide measurable trade sanctions to punish the liable state and could also compensate the nation whose space assets were affected by the other nation's irresponsible or negligent activity.<sup>46</sup> If nations had thoughts of intentionally breaking the treaty, such actions would require serious consideration and risk assessment given the economic impact on the offending state. Hopefully this would be enough of a deterrent and ultimately uphold the spirit of the agreement.

The third US opposition to the PPWT was that there was no provision banning the possession, testing, production and stockpiling of banned weapons.<sup>47</sup> The concern here was that although nations would not be able to deploy the banned weapons, they could still possess them thereby creating a break-out scenario. In the opinion of the US, this did not solve the problem the draft treaty aimed to address. One option to deal with the continued possession, production and testing of banned weapons would be to create a robust inspection and verification programme where, as previously recommended, a neutral international organization would be responsible to ensure treaty compliance. A break-out scenario could only materialize if nations were able to actually place the weapons in space, which would require them being launched. Pre-launch inspections of registered

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<sup>43</sup> Mutschler 159.

<sup>44</sup> DeFrieze 112.

<sup>45</sup> Ibid 114.

<sup>46</sup> Ibid 113.

<sup>47</sup> Chow 111.

spacecraft would assure treaty members that their satellites would not be attacked by weapons systems that could lie dormant in space until such time as they are needed. However, nations may object to pre-launch inspections as they could be regarded as overly-intrusive, costly, and reveal trade secrets and military capabilities.<sup>48</sup> Nevertheless, there needs to be a trade-off if space-faring nations wish to preserve freedom of movement and operation in the space domain, and also guarantee that their costly space assets will not be compromised. A call for cooperation, compliance, and understanding is required by all nations if treaty negotiations are to have any hope of success to ensure space arms control and limit the weaponization of space.

Space has been used for military purposes for seven decades. With this militarization, the weaponization of space was inevitable given that as weapon technology emerged, it was just a matter of time before weapons would be placed in space thereby threatening costly space assets. Current worldwide space policies do not effectively control the weaponization of space, nor do they aim to limit earth or space-based weapons. Due to the fragility of nations' space assets they are subject to a growing number of threats which aim to destroy, damage, or impair their functionality, thereby denying nations' critical command and control, communication, and sensory capabilities. If left unchecked the weaponization of space will lead to an arms race which could result in a space conflict that would cause irreparable damage to the space environment, and limit, or even close, the space domain to future uses. The risks of this occurring are too high, and it is imperative that nations agree upon a space policy which addresses the weaponization of space and aims to control the proliferation of space arms. These international policies and norms will need to be monitored and enforced in order to ensure compliance, with violators being subject to punitive damages. Aggressive behaviour by nations in space is not something that may occur, it is occurring. It is for this reason that cooperative action must be taken now in order to address the lack of international

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<sup>48</sup> Ibid 123.

policies regarding weapons in space, as continued disregard will only lead to consequences which will affect all of humankind.

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