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The Problems and Potential Solutions Related to the Emergence of Space Weapons in the 21st Century

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THE PROBLEMS AND POTENTIAL SOLUTIONS RELATED TO THE EMERGENCE OF SPACE WEAPONS IN THE 21ST CENTURY

ALEXANDER CHANOCK*

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I. INTRODUCTION

As space becomes more accessible to humans, the ability to control it becomes increasingly vital. Sending humans and objects into space is no longer as difficult or dangerous as it once was, which has resulted in humans using the capabilities of space in myriad ways that benefit our lives on Earth. The United States, in particular, has become dependent on space technology—much of its civil and military infrastructure is now based in

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space. However, due to the emergence of space weapons, this ever-increasing dependence on space has made the United States and many other countries more vulnerable. As such, the United States and the rest of the world now have to deal with complex issues related to space weapons so that their emergence does not destabilize the international system.

The United States already uses assets in space to assist with its military operations on Earth, but now the United States is also looking to weaponize space to protect those assets. Proponents of space weaponization see this development as a natural progression and imperative for the United States to maintain its military dominance. However, this decision comes with costs because it potentially creates instability in the international system. If the United States has a significant space weaponization program, then other countries, such as China and Russia, will likely follow suit because they will not want the United States to gain a significant military advantage. This will set off a space arms race similar to the nuclear arms race between the United States and the Soviet Union during the Cold War. However, if the United States fails to develop space weapons, it would likely be more vulnerable to attack and its military capabilities would be weakened. Therefore, it is vital that the United States and the rest of the world address the issue of space weapons in a responsible manner.

II. HISTORY OF THE U.S. MILITARY IN SPACE

The history of human activity in space began in 1957 when the Soviet Union successfully launched the satellite *Sputnik* into space. The United States feared that this launch would allow the Soviet Union to control space and use it against American citizens. This fear sparked a space race between the Soviet

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2 See id.

3 See id. at 169.


7 See id.
Union and United States, with each country trying to outdo the other. However, the space race between the two enemies was peaceful—neither country weaponized space. This peaceful beginning of space was also codified in several international treaties. The most significant of these agreements is the Outer Space Treaty (OST), signed in 1967 by the United States and 101 other nations. The OST sought to maintain space as a peaceful environment for all countries. However, it should be noted that the OST contains many ambiguous provisions, a fact that has recently led some to call its effectiveness into question. These deficiencies will be examined later in this article.

Despite the peaceful beginnings of space development, in recent years space has become increasingly more important for military affairs. Starting with the Persian Gulf War, the United States has used satellites as a means to conduct clandestine operations. Space technologies, such as global positioning systems (GPS), are now vital support mechanisms for the military. The United States, Russia, and China have also started to develop weapons that can be used in space. Today, the most prevalent weapon is the anti-satellite (ASAT) missile, which is designed to destroy satellites for strategic military purposes.

To date, several countries have successfully tested ASAT devices. In 2007, China shot one of its own satellites, and in 2008, the United States did the same. Another example of a space weapon is the X-37B military spaceship. This reusable and unmanned ship is based on Earth and carried into orbit by a
rocket.\textsuperscript{22} It then reenters the atmosphere and lands like an airplane.\textsuperscript{23} The United States is widely suspected of developing the X-37B and other space vehicles for use as "space bombers,"\textsuperscript{24} but this information has not been publicly confirmed.\textsuperscript{25}

III. SPACE POLICY CHANGES

Consistent with its development of weapons for space, the United States has taken a number of policy steps that illustrate it no longer views space as existing solely for peaceful means. This is exemplified by the United States withdrawal from the Anti-Ballistic Missile (ABM) Treaty in 2001.\textsuperscript{26} At that time, President Bush stated that the reason for the withdrawal was that the treaty was an outdated relic of the Cold War.\textsuperscript{27} However, there is reason to believe that the real reason for withdrawal was that the United States wanted to develop specific ABM space-based weapon systems, which were banned by the ABM Treaty.\textsuperscript{28}

Recent reports from the Obama Administration provide additional evidence that the United States is shifting toward a more militarized space policy. In the 2012 Department of Defense Strategy Report, the Obama Administration stated that the United States needs to invest in space technology to help protect U.S. interests.\textsuperscript{29} Also, under the White House Space Policy, President Obama declared that "'peaceful purposes' allow[ ] for space to be used for national and homeland security activities."\textsuperscript{30} The President further elaborated that the United States "will employ a variety of measures to help assure the use of space for all responsible parties . . . [and] deter others from interference and attack . . . and, if deterrence fails, defeat efforts to attack them."\textsuperscript{31} At the end of the report, the President specified that

\begin{footnotesize}
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\item \textsuperscript{23} \textit{See id.}
\item \textsuperscript{25} \textit{See id.}
\item \textsuperscript{26} \textit{See Maogoto \\ & Freeland, supra note 1, at 166.}
\item \textsuperscript{27} \textit{See id.}
\item \textsuperscript{28} \textit{See id.}
\item \textsuperscript{29} U.S. \textit{Dep't of Def., Sustaining U.S. Global Leadership: Priorities for 21st Century Defense} 5 (2012).
\item \textsuperscript{30} \textit{White House, National Space Policy of the United States of America} 3 (2010).
\item \textsuperscript{31} \textit{Id.}
\end{itemize}
\end{footnotesize}
the Secretary of Defense must “develop capabilities, plans, and options” for space defense measures.\textsuperscript{32} Even though the President does not specify what types of space military activities should be developed, it is apparent from the report’s broad language that the President desires to have military capabilities in space (possibly including space weapons) to help defend American space interests.\textsuperscript{33}

IV. SPACE WEAPONS: DEFINITION AND USE TODAY

One major obstacle to sufficiently addressing the space weapon issue is that what constitutes a “space weapon” is not altogether clear. One reason for this is that there is no universally agreed-upon definition.\textsuperscript{34} This presents several problems in determining whether a space device is a space weapon or a tool used to assist the military, such as a GPS tracker. It is important to clearly distinguish space weapons from other space tools and devices if one wants to construct an effective legal regime for regulating the weaponization of space.

Although there is no official definition of “space weapon,” there are several proposed definitions that could clarify the matter. The United Nations (U.N.) Institute for Disarmament Research proposed that:

A space weapon is a device stationed in outer space . . . or in the Earth environment designed to destroy, damage or otherwise interfere with the normal functioning of an object or being in outer space, or a device stationed in outer space designed to destroy, damage or otherwise interfere with the normal functioning of an object or being in the Earth environment. Any other device with the inherent capability to be used as defined above will be considered as a space weapon.\textsuperscript{35}

Importantly, this proposed definition states that a space weapon can be stationed on Earth and have “dual-use” capabilities, as illustrated by the final sentence.\textsuperscript{36} However, this dual-use prohibition is likely why the proposed definition failed to garner approval from spacefaring nations.\textsuperscript{37}

\textsuperscript{32} Id. at 14.
\textsuperscript{33} See id.
\textsuperscript{34} See Park, \textit{supra} note 10, at 882.
\textsuperscript{35} \textsc{David Webb, Praxis Centre, On the Definition of a Space Weapon (When Is a Space Weapon Not a Space Weapon)} 10 (2005).
\textsuperscript{36} See id.
\textsuperscript{37} See id.
Some countries have also offered their own definitions, which could shed light on a potential definition. For example, Canada proposed that space should continue to be usable for surveillance and intelligence gathering, but that devices designed to inflict physical harm on any other object should be banned.38 These proposals show that although there is not a universal definition, there is a general consensus that a “space weapon” must have the capability to inflict damage on another space object. Nevertheless, what is unclear to the international community is whether a space weapon’s primary purpose is to inflict harm and whether it must be based in space.

These definitional problems are evident when one examines some of the prominent weapons used in space today. For example, ballistic missile technology has the potential to be used for ASAT weapons.39 As a result, it is unclear whether one can classify ASAT devices as space weapons because of the dual-use issue. Whether the X-37B is a space weapon is also uncertain because, although it is capable of inflicting damage on other space objects, the ship does not stay in space.40 As a result, the U.S. military maintains that it is not a space weapon.41 These examples illustrate that a clear and encompassing definition for space weapons is needed in order to effectively address the issue.

V. PROBLEMS WITH WEAPONIZING SPACE

As evidenced by the development of the aforementioned space weapons, there is a strong likelihood that space will be weaponized in the near future. This raises numerous concerns for countries and people on Earth. There are many critics who believe that space needs to remain peaceful and free of weapons because conflicts in space could easily affect the entire world.42

The main problem associated with weaponizing space is that an arms race would likely occur, which could destabilize the international system and make the world more vulnerable to war.

38 See id.
40 See X-37B Orbital Test Vehicle, supra note 22.
Accordingly, if the United States develops space weapons, other countries such as China and Russia will inevitably start to develop their own weapons to counteract the United States' advantage in space.43 Since space is the ultimate high ground, other countries will be forced to counteract the United States' advantage in space or else face the consequences of a superpower with a strategic advantage. This potential arms race will also cost countries vast amounts of money and will put many weapons in space, which increases the likelihood that they will be used. Such an arms race would be expensive because launching weapons into space is incredibly costly. As a cost reference point, sending the X-37B on one mission costs roughly $100 million.44

Another major concern is the amount of space debris that space weapons would produce. This problem is complex and requires a separate lengthy analysis to detail all the potential problems. However, it is vital for a discussion of space weapons to briefly survey this topic because the production of space debris is a natural concern that arises when a country considers utilizing space weapons. The fear is that destroying objects in space could generate extremely dangerous debris with a long orbital life.45 This will in effect create "perpetual shrapnel that poses a grave threat to all other satellites in orbit."46 As noted by Joel Primack, one of the premier experts on space debris, "the weaponization of space would make the debris problem much worse, and even one war in space could encase the entire planet in a shell of whizzing debris that would thereafter make space near the Earth highly hazardous for peaceful as well as military purposes."47 An example of the disastrous effects of space debris was seen when the Chinese ASAT test in 2007 produced "2,087 pieces of debris large enough to be routinely tracked" and "generated over 35,000 pieces of debris down to 1 centimeter in size."48 In January 2013, one of these pieces severely damaged a

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43 See Walsh, supra note 5, at 778–79.
45 Johnson, supra note 42.
47 See Johnson, supra note 42, at 56 (internal quotation marks omitted).
Russian spacecraft. As this collision illustrates, if one controlled military test can cause harmful debris six years later, a space war could have disastrous consequences for space assets that could continue for years after the conflict has ended. This is especially dangerous for the United States because its civilian and military infrastructures rely heavily on space commons. The United States owns 95% of the military satellites and pays two-thirds of the expenditures for commercial space uses. Thus, space debris could collide into many valuable U.S. assets.

VI. WHY THE UNITED STATES IS MOVING TOWARD WEAPONIZING SPACE

As illustrated by President Obama’s policy and the development of space weapons, it is evident that the United States wants to develop space weapons even though there are many potential dangers. Although this development might destabilize the international system and start an arms race, as discussed above, the United States has some valid reasons for taking these risks. These reasons include the inevitability of the weaponization of space and the vulnerability of U.S. space assets. The inevitability theory of space weaponization stems from the notion that the international community will develop weapons for space just as it has for every other frontier. For example, at first airplanes were not used as weapons, but as technology progressed and the need for planes increased, airspace became weaponized. Logically, it follows that space is no different than airspace and thus will eventually become weaponized. This is because one of the potential benefits of weaponizing space is too great to ignore—it would provide the weaponizing country with a substantial tactical advantage.

The United States is also in a unique situation because it has the ability to almost unilaterally decide whether space will be weaponized. However, this advantage will not last forever, and proponents of weaponization argue that the United States must seize this advantage before it is too late and other countries,

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50 Johnson, supra note 42, at 53.
51 See White House, supra note 30, at 4.
52 See Maogoto & Freeland, supra note 1, at 383–84.
53 See Walsh, supra note 5, at 783–84.
54 See id. at 781; see also Park, supra note 10, at 888–89.
such as China, can dictate how space will be used. As such, proponents of weaponizing space believe that the United States needs to be at the forefront of space weaponization and cannot afford to let its military power slip away by not being prepared for the future of warfare.

The vulnerability argument focuses on the vast amount of both civilian and military interests at stake in space. The U.S. military relies heavily on its space capabilities to conduct war on Earth. For example, reports indicate that the United States uses “satellites for [95%] of reconnaissance and surveillance information, [90%] of military communications, [and 100%] of navigation and positioning.” Because of this heavy reliance, if military satellites are not properly protected, the United States’ ability to engage in war will be severely diminished. Furthermore, the civilian infrastructure of the United States is largely based in space. Satellites are now frequently used to support “telecommunications, banking and finance, energy, [transportation], and essential government services,” which makes these industries increasingly vulnerable to a devastating attack. These concerns are exemplified by the 2001 Rumsfeld Commission, which stated that the United States was vulnerable to a “Space Pearl Harbor.” The report makes clear that a Space Pearl Harbor would have devastating consequences for the United States. It is important to note that then-U.S. Secretary of Defense Donald Rumsfeld commissioned this report in 2001, and in the last twelve years, the United States has substantially increased its reliance on space, exacerbating the report’s concerns. Consequently, proponents of weaponization argue that it is vital for the United States to protect these space interests before it is too late.

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55 Park, supra note 10, at 888–89.
56 See id.
57 Dean Cheng, Chuck Hagel Must Answer Chinese Challenge to U.S. Space Domi-
58 See Park, supra note 10, at 895.
60 See id. at xiii.
61 See id.
62 See id. at xv.
VII. LEGAL FRAMEWORK FOR THE WEAPONIZATION OF SPACE

One major issue associated with the emergence of space weapons is that the international system has not set up an adequate legal regime to address the problem. The U.N. has tried to construct such a legal regime (consider the U.N. General Assembly’s Prevention of an Arms Race in Outer Space); however, the United States has not signed any such agreement, making the proposed measures ineffective. As a result, the only international legal framework that specifically addresses the problem of space weaponization is the OST. However, this treaty was signed in 1967 and contains many ambiguous provisions that prevent it from effectively dealing with the proliferation of space weapons in the 21st century.

The OST forms the basis of space law because it deals with many space-related international issues, including the militarization and weaponization of space. In the preamble, the OST states that the treaty is designed to ensure that space is used for peaceful purposes. However, the treaty does not define the term “peaceful purposes.” Article IV of the OST also deals with space weapons by banning the placement of nuclear missiles or “any other kinds of weapons of mass destruction” in space or on any celestial bodies. Also, Article VII in essence restricts a state from shooting down a satellite with a ground-based attack.

However, the OST does not specifically address all the potential uses of space weapons, which makes several key areas of the space weaponization debate ambiguous. One major example is how the OST remains “silent about satellites attacking ground-based targets.” This silence is important because there is a “fundamental truth [in] international law . . . that if an act is not
specifically prohibited, then that act is permitted.”  This creates the troubling possibility that a country cannot shoot down a satellite from the ground but is permitted to use space weapons to attack ground-based targets. The OST also mentions nothing about dual-use space weapons. Just like satellites attacking ground-based targets, this silence in effect permits space actors to implement dual-use space weapons. Consequently, dual-use weapons capabilities, such as ASAT missiles, can be used as a way to avoid international legal constraints under the OST.

The OST also does not specifically define several key terms. The main example is that the OST does not define “any other kinds of weapons of mass destruction” in space. This leads to the question of whether this term applies “to weapons with destructive capability comparable to nuclear weapons” or to space weapons in general. Also, the ban on nuclear weapons is ambiguous because the OST does not explicitly define “nuclear weapon.” It is unclear whether the nuclear ban applies to some specific types of space weapons, such as lasers that are triggered by a nuclear reaction, or hypervelocity rod bundles, which may be used as ASAT weapons but emit low levels of radiation due to being made of depleted uranium. Although these few ambiguities are narrow, they exemplify the deficiencies of a treaty signed in 1967 to deal with the military realities of 2013.

The OST also does not define where space begins, which leads to questions of whether some low-orbit or high-atmosphere weapons can be governed by the OST. This is problematic because weapons are categorized according to deployment mode. Thus, it is essential to delineate airspace from outer space; otherwise, countries could put weapons in low orbit and claim that the OST does not apply because they are not in space.

All of these problems associated with the OST show that it is inadequate to properly deal with the proliferation of space weapons.

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72 See Quinn, supra note 63, at 494.

73 See Outer Space Treaty, supra note 11, art. IV.

74 See Crockett, supra note 70, at 685.

75 See Outer Space Treaty, supra note 11, art. IV.

76 See Crockett, supra note 70, at 687.

77 See Wolff, supra note 39, at 9.

78 See id.

79 See id.
The treaty has too many holes and not enough teeth to police a space arms race among the world superpowers. As a result, it is vital that the international community amend the treaty or create an entirely new one that is properly constructed to handle the emergence of space weapons in a realistic and efficient manner.

**VIII. POTENTIAL SOLUTIONS**

There are a number of different views on how the United States should address the issue of space weapons. On one end of the spectrum is the view that the United States should abstain entirely from developing space weapons and help construct an international legal regime to restrict them. On the other end is the notion that an international legal regime would prove futile and the United States should continue developing space weapons in order to dominate the new frontier. There are also proposals that fit between the two extremes, such as developing space weapons to act as a deterrent or constructing an international legal system that allows weaponization but limits it in ways that would avoid an all-out arms race. Each idea set forth has both merits and problems, which will be examined below.

**A. SPACE DOMINANCE**

There is a view among many U.S. officials and politicians that instead of adhering to a restrictive international legal regime that would prevent the United States from ascertaining a substantial military advantage in space, the United States should proceed with developing space weapons and dominate the upcoming space race without international oversight. If the United States is able to dominate the space weaponization race, it will only further cement its military superiority over the rest of the world. The thinking follows that if the United States is a dominant player in the space race, then it could potentially solve the inevitability and vulnerability problems associated with space weaponization. By controlling space, the United States would remain at the forefront of the inevitable weaponization of

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80 See Johnson, supra note 42, at 55.
81 See id.
83 See Johnson, supra note 42, at 54.
84 See id. at 54–55.
85 See id.
space. As for the vulnerability problem, no country will attempt a "Pearl Harbor"-type attack on U.S. interests in space because the United States would have obtained an unassailable military and commercial dominance.\(^86\)

Although dominating space might seem like an advantageous idea for the United States, there are many problems with this thinking. First, it is highly unlikely that the United States will be able to dominate space.\(^87\) Considering the economic rise of China and its aspirations for a stronger military, it is highly doubtful that the Chinese would allow the United States to control space.\(^88\) China would likely see such a policy as highly provocative and would use its vast resources to compete with the United States in a space arms race.\(^89\) This would only realize the fears of a space arms race and would likely force the United States to allocate much more money to the development of space weapons.\(^90\) This would, in turn, compromise the United States' ability to pursue other military and nonmilitary priorities, especially considering that the United States is trying to reduce its deficit and budget in the wake of the Great Recession.\(^91\) Therefore, the benefits of having a dominant space weapons program will probably not outweigh the economic costs.

China and Russia also cannot afford to allow the United States to dominate space because the United States could presumably take out their nuclear capabilities via space weapons, consequently eradicating the deterrent effects of China and Russia's nuclear programs.\(^92\) This would allow the United States to intervene in China and Russia's regional affairs more easily, without fearing the threat of nuclear weapons.\(^93\) Therefore, an American monopoly on space weapons could lead these two countries to counteract in other more dangerous ways. Russia could potentially refuse to limit its nuclear deterrence, while China could

\(^86\) See id.

\(^87\) See MacDonald, supra note 82, at 1, 23.

\(^88\) See id.


\(^90\) See MacDonald, supra note 82.

\(^91\) See id.


\(^93\) See id.
build more nuclear weapons, thus impeding the efforts to reduce the number of nuclear weapons in the world.\textsuperscript{94} Another significant problem is that even if the United States could dominate space, this dominance would create new threats. According to Rebecca Johnson, in space, "the United States needs to be more aware that its actions could be self-fulfilling, and may well provoke asymmetric security responses in others that create greater international threats and vulnerabilities."\textsuperscript{95} U.S. space dominance would cause countries that normally have "no political desire or intention to threaten the United States" to develop their own countermeasures because of the imbalance that space dominance would bring.\textsuperscript{96} Therefore, because of the high likelihood of an accelerated space race and the rise of new asymmetric threats, it is clear that attempting to dominate space will likely cause more problems than it solves.

**B. SPACE DOVES**

On the other end of the spectrum is the idea that the United States should not develop space weapons but should instead find ways to restrict all space weapons.\textsuperscript{97} Proponents of this course of action, often called "space doves," argue that the perceived threats relating to space weaponization are overblown and that there are other more practical and peaceful ways to protect the U.S. interests in space and simultaneously protect space commons from the dangers of space warfare.\textsuperscript{98}

One major argument that space doves make is that space warfare is impractical and there are other more efficient means of addressing the vulnerability issue.\textsuperscript{99} Instead of trying to use the military to protect satellites, the United States should find ways to make satellites less susceptible to attack.\textsuperscript{100} One way of achieving this goal is to develop defensive mechanisms for satellites.\textsuperscript{101} For example, the United States could develop maneuvering capabilities for satellites so that they could potentially dodge in-

\begin{itemize}
  \item \textsuperscript{94} See id.
  \item \textsuperscript{95} See Johnson, supra note 42, at 55.
  \item \textsuperscript{96} See id.
  \item \textsuperscript{97} U.N. INST. FOR DISARMAMENT RESEARCH, OUTER SPACE AND GLOBAL SECURITY 36 (2003).
  \item \textsuperscript{98} See Park, supra note 10, at 896–97.
  \item \textsuperscript{100} See id.
  \item \textsuperscript{101} See id.
\end{itemize}
coming missiles.\textsuperscript{102} They could also harden satellites, which would entail adding an armor-like layer to satellites to protect them from nuclear radiation, which normally renders satellites ineffective.\textsuperscript{103} The cost of this latter improvement is not great; it is estimated that it would only cost 2\% to 3\% more than the original price for low-orbit satellites.\textsuperscript{104}

Another way for the United States to protect space assets without the use of space weapons is to develop a backup plan in case satellites are attacked.\textsuperscript{105} This would allow the United States to retain its military and civil capabilities that rely on space technology. One means of achieving this is to develop the ability to rapidly replace or bypass damaged satellites.\textsuperscript{106} The United States could also compensate for lost satellite functions by using regional backup systems that are not based in space.\textsuperscript{107} This would make it more difficult for an enemy to mount an effective ASAT attack because achieving the desired objective of disrupting the U.S. space infrastructure would require the enemy to hit multiple satellites simultaneously.\textsuperscript{108}

Space doves also advocate that the United States could use its international influence to create a legal regime to effectively stop the production of space weapons. Space dove Nina Tannenwald argues that the United States should use its power and position to create an “operational regime for space based on the rule of law.”\textsuperscript{109} She adds that the rest of the world is not rushing to weaponize space and instead is ready to follow the United States’ “lead in devising new rules for its effective management.”\textsuperscript{110} Tannenwald argues that the United States occupies a unique position—it can and should use its hegemonic status to influence the rest of the world to come to an agreement on the prohibition of space weapons.\textsuperscript{111} Another space dove, Major John Bellflower, furthers this argument by contending that the United States should adopt the concept of “lawfare,” whereby

\textsuperscript{102} See id.
\textsuperscript{103} See id.
\textsuperscript{104} See id.
\textsuperscript{105} See id. at 28.
\textsuperscript{106} See id.
\textsuperscript{107} See id.
\textsuperscript{108} See id.
\textsuperscript{110} See id.
\textsuperscript{111} See id.
law is used "as a substitute for traditional military means to achieve military objectives." One specific example of lawfare is to constrain an adversary’s military options by binding them to a rule of law. Bellflower argues that this tactic of lawfare can prevent the proliferation of space weapons if the United States spearheads the effort. Binding countries such as China and Russia to an all-encompassing prohibition against space weapons will effectively address international concerns and simultaneously mitigate the danger to U.S. space assets.

Although space doves have many valid arguments for reducing the danger of space weaponization, in reality, it is unlikely that their ideas will prevail. One problem with a complete ban on space weaponization is that it invokes the problems of the prisoners’ dilemma. If the United States decides to stop production of space weapons and the other superpowers, such as China and Russia, do the same, then all of the parties win. However, if a country like China or Russia decides to violate a prohibition agreement by developing weapons, it could potentially have a significant head start in the space weapons race, which would weaken the United States’ military ability. Whether such a scenario will occur is difficult to predict, but the principles of the prisoners’ dilemma indicate that there remains a strong possibility that the parties will secretly develop the weapons to gain an advantage. The incentive to “defect” will always remain, which makes a long-term solution addressing space weaponization almost impossible to achieve, even if the United States spearheads the effort. Thus, there is a strong argument against space doves that the most rational choice is to develop space weapons to ensure that the United States gets placed in an advantageous position in the prisoners’ dilemma.

Moreover, improving defensive capabilities for satellites is not a sufficient long-term solution for solving the vulnerability problem. Inevitably, as technology advances, enemies will figure out means to bypass the new defensive measures. It is also costly and difficult to continually add new defensive measures to satellites in order to keep them current with technological advances.

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112 See Bellflower, supra note 46, at 112 (internal quotation marks omitted).
113 See id. at 114.
114 See id. at 150.
115 See id. at 144.
116 See Quinn, supra note 63, at 494; see also Walsh, supra note 5, at 783–85.
117 See Quinn, supra note 63, at 494.
118 See Walsh, supra note 5, at 762–63.
Thus, the vulnerability problem is not sufficiently addressed by space doves’ proposal to improve satellite defenses as an alternative to the development of space weapons.

From a practical standpoint, it is highly unlikely that a legal regime that bans space weaponization will come into effect; as a result, a successful solution will need to recognize this reality. The U.S. Congress has consistently rejected any bill that tries to ban the use of space weapons. For example, both H.R. 2977 and H.R. 2420 sought to ban space weapons but failed.119 When H.R. 2977 was introduced in 2001 by Representative Kucinich, it did not garner a single co-sponsor.120 H.R. 2420, which was introduced in 2005, garnered only slightly more support in Congress but still failed to reach the floor, gaining only thirty-five co-sponsors.121 Although there are likely other political reasons why these bills failed, these two examples illustrate the lack of attention that U.S. politicians have given to banning space weapons.

On the international level, there has also been little political support from the United States for a prohibition.122 The U.S. policy for the past twenty years has been to resist all U.N. attempts to prohibit space weapons.123 According to Wortzel, the chairman of the United States–China Economic Security Review Commission, an internationally negotiated prohibition of space weapons is also unlikely to succeed because verifying compliance is very difficult to achieve.124 As such, it is important that arguments addressing the issue of space weaponization are grounded in the political realities of the domestic and international system.

C. A MIDDLE GROUND BETWEEN WEAPONIZATION AND SPACE DOVES

In the middle of the spectrum is the idea that the United States should develop space weapons but use them as means of deterrence or develop a legal regime to limit their use, or both. This approach seeks to take many of the ideas put forward by space doves but ground them in the political and military realities of the international system.

120 See H.R. 2977.
121 See H.R. 2420.
122 See Quinn, supra note 63, at 475–76.
123 See id.
124 See Goldfarb, supra note 4.
A deterrence strategy is one way the United States can try to limit the use of space weapons but still acknowledge that they exist. This idea is illustrated by Bruce MacDonald, who states that the United States should consent to space weaponization by other countries but develop a strong space military program that can attack enemy satellites quickly.\textsuperscript{125} However, MacDonald argues that the United States should only use these weapons as a last resort.\textsuperscript{126} This deterrence strategy will become even more effective as other superpowers start increasing their dependence on space infrastructure because the risk of an escalation in space will have increasingly devastating effects for all countries involved.\textsuperscript{127} Furthermore, to establish an adequate deterrence strategy, the United States should try to use space weapons that have reversible effects. For example, the United States could use a jammer that disrupts a satellite-to-ground station link but does not damage the satellite.\textsuperscript{128} This type of weapon would allow the United States to respond sufficiently to an attack but in a less dangerous way, thereby reducing the likelihood of destabilizing the international system.\textsuperscript{129} Additionally, this type of weapon would reduce the debris problem associated with space weaponization.\textsuperscript{130}

In addition to establishing a deterrence strategy, the United States can try to limit space weapon use through a legal regime.\textsuperscript{131} James Moltz, a professor at the Naval Postgraduate School, argues that such a legal regime should include a ban on:

- the use, testing, or deployment of weapons or interceptors, of any sort, above five hundred miles; a ban on stationing weapons, of any sort, in low-Earth orbit; a ban on the testing or use of lasers from ground, sea, or air-based orbital objects; and a ban on testing or use of other ground, sea, or air-based weapons against satellites or space-based objects.\textsuperscript{132}

Like Nina Tannenwald's proposal, to achieve Moltz's goal, the United States would use its hegemonic status to spearhead an international effort to either amend the OST or construct an entirely new international treaty that is more adept at address-

\textsuperscript{125} See MacDonald, supra note 82, at 19.
\textsuperscript{126} See id.
\textsuperscript{127} See id. at 22.
\textsuperscript{128} See id. at 16.
\textsuperscript{129} See id.
\textsuperscript{130} See id. at 21.
\textsuperscript{131} See Park, supra note 10, at 874–75.
\textsuperscript{132} Id. at 903.
ing the issues of space weapons in the 21st century. Along with Moltz’s proposals, this new or amended treaty should also unambiguously define what constitutes a space weapon and explicitly set out the difference between space and airspace. A new definition for space weapons similar to that proposed by the U.N. Institute for Disarmament Research would encompass dual-use technologies and any weapons that can cause damage to space assets. Such a definition would prevent countries from finding loopholes in a vague standard. Making the legal framework clear would help ensure that the limitations on space weapons are effective. This strategy is also politically practical because it could garner support from moderates in the Pentagon who disagree with the proponents of space domination, and it has great potential to receive bipartisan consensus in Congress. At the international level, it offers Russia and China a means to limit their use of space weapons as well.\textsuperscript{133} Since the weaponization of space seems almost inevitable at this point, this proposal is a smart solution because it limits space weapon growth in a way that is grounded in the reality of domestic and international politics.

This middle ground solution of deterrence and the establishment of a new legal framework that limits the use of space weapons is not without its problems. The same problems associated with verifying compliance that Wortzel discussed are still present.\textsuperscript{134} Just like many other issues in international law, it is not always easy to enforce new restrictions, and this becomes especially true when one recognizes the substantial advantages of developing a superior space weapons program. Also, a deterrence strategy contains many risks. One potential problem is that unlike deterrence in the nuclear weapons context, a deterrence strategy for space weapons might not adequately prevent attacks.\textsuperscript{135} For nuclear weapons, the threshold between tactical and strategic uses has diminished because using nuclear weapons has such drastic consequences.\textsuperscript{136} However, “[w]ith space weapons, their limited use in purely tactical situations . . . would be less likely to lead to escalation than tactical nuclear use.”\textsuperscript{137}

As such, it is much more likely that a country will use a space weapon than a nuclear weapon, even with knowledge that its

\begin{footnotes}
\footnote{133}{See id.}
\footnote{134}{See Goldfarb, \textit{supra} note 4.}
\footnote{135}{See MacDonald, \textit{supra} note 82, at 33.}
\footnote{136}{See id. at 19.}
\footnote{137}{See id.}
\end{footnotes}
enemy can retaliate. In addition to this concern, a deterrence strategy still has substantial risks because it is not altogether certain that such a policy will effectively halt escalation. In military conflicts, events rarely proceed as planned; consequently, there is always the possibility that retaliation will result in a larger escalation that jeopardizes the space commons and Earth. However, despite these issues, the problems of a middle ground solution are still less dangerous and destabilizing than the alternatives because they are grounded in the realities of the international system.

IX. CONCLUSION

The potential proliferation of space weapons is a key issue that the United States must grapple with in the 21st century. Since it is almost inevitable that countries will begin to develop space weapons, the international system needs to find a way to ensure that the proliferation of these new weapons does not destabilize the system. Right now, the United States is in the unique position where it can significantly influence how the international system will respond to the rise of space weapons. As a result, it is vital that the United States help construct a new legal regime and develop an effective deterrence strategy. This new legal regime must both modernize and clarify the ambiguities that plague the OST to ensure that the new legal system is effective at limiting the use of space weapons. Although the future of space weapons is uncertain, if the United States acts responsibly in its effort to limit the inevitable rise of space weapons, the world will become much safer.

138 See id. at 20.