

WEAPONIZING THE FINAL FRONTIER:  
THE UNITED STATES AND  
THE NEW SPACE RACE

A thesis presented to the Faculty of the U.S. Army  
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fulfillment of the requirements for the  
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MASTER OF MILITARY ART AND SCIENCE  
Military Space Applications

by

MAJOR JOSEPH SOLANO, US AIR FORCE  
M.S., Troy University, Troy, Alabama, 2009

Fort Leavenworth, Kansas  
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Name of Candidate: Major Joseph Solano

Thesis Title: Weaponizing the Final Frontier: The United States and the New Space Race

Approved by:

\_\_\_\_\_, Thesis Committee Chair  
Michael T. Chychota, M.S.

\_\_\_\_\_, Member  
Sean Kalic, PhD

\_\_\_\_\_, Member  
Thomas Gray, M.S.

Accepted this 9th day of June 2017 by:

\_\_\_\_\_, Director, Graduate Degree Programs  
Prisco R. Hernandez, Ph.D.

The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

## ABSTRACT

WEAPONIZING THE FINAL FRONTIER: THE UNITED STATES AND THE NEW SPACE RACE, by Major Joseph Solano, 97 pages.

Weaponizing space has been a major topic of debate in the United States for over sixty years. Recent steps by adversarial nations continue to increase tensions in the space domain. The central research question is, should the United States develop and deploy weapons in space? The ultimate decision is driven by the National Space Policy developed by the President of the United States. The two major courses of action are develop and deploy space based (offensive and defensive) or continue the path towards maintaining space as a peaceful sanctuary. Either decision will have numerous impacts on the national instruments of power and operational variables. The best course of action for the United States is to maintain the initiative by developing and deploying space based weapons in order to protect national security and freedom of access.

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## ACRONYMS

ASAT	Antisatellite
BMD	Ballistic Missile Defense
CD	Conference on Disarmament
DIME	Diplomatic, Informational, Military, and Economic
FAS	Feasible, Acceptable, Suitable
ISR	Intelligence, surveillance, and reconnaissance
Lt Col	Lieutenant Colonel
NASA	National Aeronautics and Space Administration
PAROS	Prevention of an Arms Race Outer Space treaty
PMESII-PT	Political, Military, Economic, Social, Informational, Infrastructure, Physical Environment, and Time
U.S.	United States
UN	United Nations
USG	United States Government



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## CHAPTER 1

### INTRODUCTION

Some people don't want to hear this, and it sure isn't in vogue . . . but—absolutely—we're going to fight in space. We're going to fight from space, and we're going to fight into space when [U.S. and allied assets on orbit] become so precious that it's in our national interest.<sup>1</sup>

—General Joseph Ashy, CINCSPACE, 1996

#### Background

The fourth-century Roman writer, Publius Flavius Vegetius Renatus, once said, “If you want peace, prepare for war.”<sup>2</sup> For the purpose of this study, space weaponization is defined as any non-nuclear space-based device that is designed and deployed to identify, characterize, track, destroy, damage, or degrade other devices in outer space in the air, on land, or on sea. The author developed this unique definition by combining multiple definitions previously published by space professionals. The weaponization of space represents a shift from current U.S. space policy of militarization. The definition of space militarization is the use of targeted satellite capabilities, such as intelligence, surveillance and reconnaissance, communications, and weather with non-aggressive

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<sup>1</sup> William B. Scott, “USSC Prepares for Future Combat Missions in Space,” *Aviation Week and Space Technology*, 5 August 1996, 51, accessed 15 October 2016, <http://aviationweek.com/awin/ussc-prepares-future-combat-missions-space>.

<sup>2</sup> Flavius Vegetius Renatus, *De Re Militari (Concerning Military Affairs): the Classic Treatise on Warfare at the Pinnacle of the Roman Empire's Power* (London: Leonaur, 2012), 2.

military purpose.<sup>3</sup> At infancy, early space documents revealed the Truman Administration's practice of militarization versus weaponization strategy deliberately intended to support peaceful space initiatives and prevent aggression within the domain. With increased hostilities from enemy threats, now is the time for change. Over the last seventy-one years, space has gradually escalated towards one path—weaponization. The evolution of weaponization has occurred in all other operational domains such as air, land, sea, and cyberspace. If the United States does not weaponize space, then the strategic advantage of protecting and defending national space assets will be lost. The dependence of space assets and technology has evolved into a strategic center of gravity that is prime for enemy attack and exploitation.

The United States military began investigating the potential application of satellites in 1945. Initial analysis from the RAND Corporation determined that satellites have the potential to be “one of the greatest technological tools of the twentieth-century and the use of such a device could produce repercussions in the world comparable to the atomic bomb.”<sup>4</sup> By the end of 1953, the Truman Administration made the strategic decision to prioritize funding of a strategic bombing force versus satellite development based on the current threat analysis and perceived utility of space. The initial research conducted by the RAND Corporation during the Truman administration set the foundation for space policy and system development that resonated into the twenty-first-

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<sup>3</sup> Sean N. Kalic, *US Presidents and the Militarization of Space, 1946-1967*, Centennial of Flight Series 19 (College Station, TX: Texas A&M University Press, 2012), 5.

<sup>4</sup> RAND Corporation, *Preliminary Design of an Experimental World-Circling Spaceship* (Santa Monica, CA: RAND, 1998), 1-2.

century. In contrast to President Truman, President Dwight D. Eisenhower actively pursued the development of space assets and policy for the military, specifically for peaceful purposes. Although Eisenhower opposed the premise of weaponizing space, he approved the initial development of antisatellite systems, ballistic missile defenses, and space-based reconnaissance satellites due to growing Soviet threats and aggression. The Soviet Union's successful launch of Sputnik in 1957 continued to shape the Eisenhower and Kennedy administrations towards further antisatellite system development, while maintaining the position that space should remain weapons-free. In addition, Kennedy argued that the U.S. military's use of space assets for reconnaissance and communication was within the bounds of maintaining space as a peaceful domain.<sup>5</sup> Beginning in 1961, Kennedy shifted from previous space policy and developed four main principles required to reshape the United States position. The principles Kennedy described for his space policy were "scientific, commercial/civilian, military, and national prestige."<sup>6</sup> Kennedy's intent was to ensure that space policy remained balanced within three separate functions, while projecting the United States' power across the globe. Lyndon B. Johnson continued his predecessor's policies of using space for specifically peaceful purposes. A major accomplishment of the Johnson administration was the signing of the 1967 Outer Space Treaty. This accomplishment was made possible by early groundwork laid by President Eisenhower and represented a key framework for international space law. President Johnson continued heavy investment in antisatellite (ASAT) and ballistic missile defense

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<sup>5</sup> Kalic, 61.

<sup>6</sup> Ibid., 76.

(BMD) technology due to these systems operating on the ground and not in outer space, which would violate the Outer Space Treaty of 1967. Near the end of his presidency, Johnson deliberately unified space into a single national policy that focused on both military and civilian initiatives. By the end of the Carter administration in 1981, a total of sixteen nations had active satellites in space. President Carter signed National Security Council Presidential Directive 37, National Space Policy, which continued a peaceful space agenda and listed requirements to secure the national space program.<sup>7</sup> Towards the end of the Cold War to the beginning of the twenty-first century, the Reagan, Bush, and Clinton administrations all recognized the value of the space domain with respect to national strategy. In 1982, President Reagan's language in the National Security Decision Directive 42 is the first step towards a new path in space policy. The National Security Decision Directive 42 stated that the United States will "pursue activities in space in support of [the nations] right of self-defense."<sup>8</sup> The directive also granted approval for an organic U.S. ASAT capability and the foundation for the Strategic Defense Initiative. During the President George H. W. Bush administration, space was first unveiled as a true force enabler. Operation Desert Shield and Desert Storm demonstrated the current capability and future potential of space across the strategic, operational, and tactical levels of war. Some of the most crucial systems included position, navigation, and

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<sup>7</sup> James E. Carter, "Presidential Directive/NSC-37: National Space Policy," Jimmy Carter Presidential Library and Museum, 11 May 1978, 2, accessed 15 October 2016, <https://www.jimmycarterlibrary.gov/documents/pddirectives/pd37.pdf>.

<sup>8</sup> Ronald Reagan, "National Security Decision Directive 42: National Space Policy," Federation of American Scientists, 4 July 1982, 2, accessed 15 October 2016, <https://fas.org/irp/offdocs/nsdd/nsdd-42.pdf>.

timing, missile defense, communication, imagery, signals intelligence, and weather data. During the Clinton administration, space funding decreased for National Aeronautics and Space Administration (NASA) and the Department of Defense budget. President Clinton continued Reagan's policies, which failed to posture the United States appropriately for the growing space threats and challenges of the twenty-first-century. The growth of space-faring nations quadrupled and the investment and development of antisatellite and counterspace systems rose.<sup>9</sup> In 2001, Secretary of Defense Donald Rumsfeld headed a space commission tasked with examining the future of United States space security, which ultimately released the *Report of the Commission to Assess United States National Security Space Management and Organization, Executive Summary*. The report concluded that to avoid a "Space Pearl Harbor," the "U.S. government should vigorously pursue the capabilities called for in the National Space Policy to ensure that the President will have the option to deploy weapons in space to deter threats and, if necessary, defend against attacks on U.S. interests."<sup>10</sup> The Rumsfeld commission stated that space warfare is a "virtual certainty," and the "U.S. must develop the means both to deter and to defend against hostile acts in and from space."<sup>11</sup> In addition, the commission also called for improvements in "defense in space" and "power projection in, from, and through

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<sup>9</sup> United States Joint Forces Command, *The Joint Operating Environment (JOE) 2010* (Suffolk, VA: USJFCOM, 18 February 2010), 36.

<sup>10</sup> Report of the Commission to Assess United States National Security Space Management and Organization pursuant to Public Law 106-65, the National Defense Authorization Act for Fiscal Year 2000, Section 1622, 11 January 2001, accessed 15 October 2016, <http://www.dod.gov/pubs/space20010111.html>.

<sup>11</sup> *Ibid.*, x.

space.”<sup>12</sup> This resulted in President George W. Bush’s updated National Space Policy intending to maintain freedom and flexibility within the space domain. Specifically, the policy states:

The United States will oppose the development of new legal regimes or other restrictions that seek to prohibit or limit U.S. access to or use of space. Proposed arms control agreements or restrictions must not impair the rights of the United States to conduct research, development, testing, and operations or other activities in space for U.S. national interests.<sup>13</sup>

Moreover, the United States withdrew from the 1972 Anti-Ballistic Missile Treaty in 2002, which loosened national restraints regarding continual development of missile defense systems in addition to Article V constraints on deploying “space based ABM systems.”<sup>14</sup> In 2007, China raised additional concerns of the space environment to include space debris with a successful test of a direct ascent ASAT weapon against a Fengyun 1C satellite, creating thousands of pieces of debris (see figure 1).<sup>15</sup> One year later, President George W. Bush approved Operation Burnt Frost, which ordered the USS Lake Erie, a Ticonderoga-class guided-missile cruiser, to launch a SM-3 missile to strike a failing satellite. Although both land based, the two ASAT events can be marked as the first steps towards a modern day space race. In addition, by 2011 foreign entities such as

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<sup>12</sup> Report of the Commission, 16.

<sup>13</sup> Federation of American Scientists, “United States National Space Policy,” 31 August 2006, 2, accessed 15 October 2016, <https://fas.org/irp/offdocs/nspd/space.pdf>.

<sup>14</sup> Treaty between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Anti-Ballistic Missile Systems, 26 May 1972, *UNTS* 994, no. 13446 (1972), accessed 1 September 2016. <http://www.state.gov/t/isn/5181.htm>.

<sup>15</sup> Lee Billings, “War in Space May Be Closer than Ever,” *Scientific American*, 10 August 2015, accessed 15 January 2016, <https://www.scientificamerican.com/article/war-in-space-may-be-closer-than-ever/>.



China and Russia began exploiting and aggressively developing techniques to interfere with satellite capabilities (i.e., jamming and lasing) in response to the United States advantage in space. With the context of an increasingly contested environment, Presidents Bush and Obama shifted from previous passive space policies and leveraged aggressive language towards protecting U.S. space interests. From Truman to Obama, the U.S. Presidents' space policies continue to expand in scope, and have adopted language that is more aggressive. U.S. space assets have nested themselves in the daily life of all Americans. As the leading space-faring nation, one of our greatest capabilities has become one of our biggest dependencies.

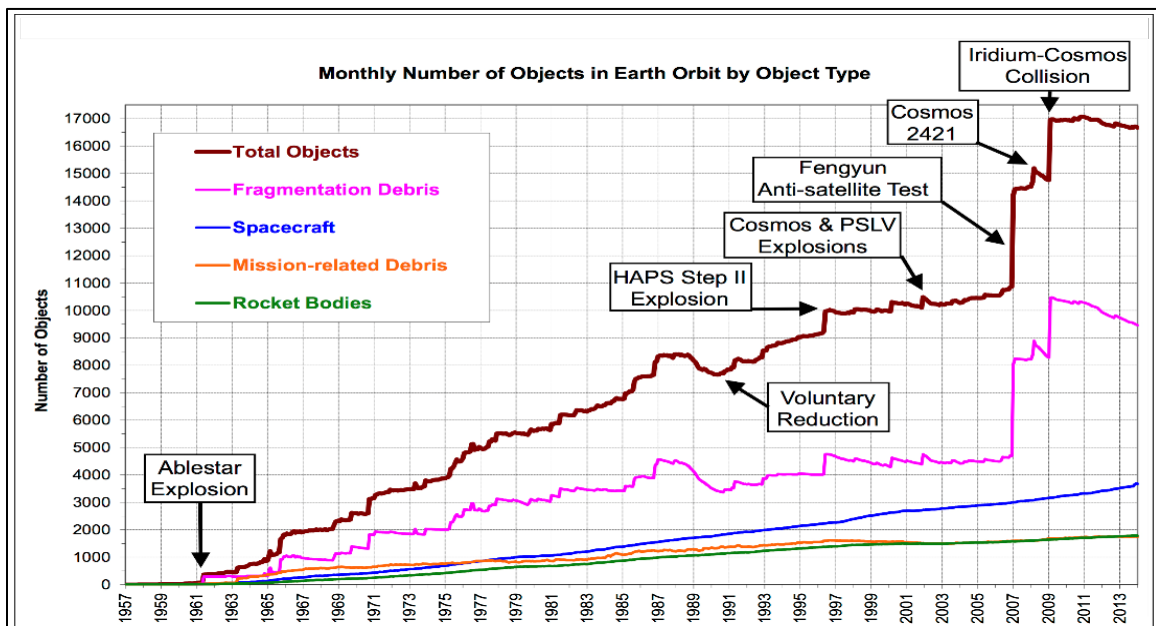


Figure 1. Monthly Number of Objects in Earth Orbit by Object Type

Source: Mika McKinnon, "A History of Garbage in Space," GIZMODO, May 2014, accessed 15 October 2016, <http://gizmodo.com/a-history-of-garbage-in-space-1572783046>.

In addition to the historical growth of aggressiveness in space weaponization, the financial investment towards space is a critical factor. The United States spends over six times more than China regarding space budgeting (see figure 2). In actuality, the United States invests more in space than the rest of the space-faring nations combined.<sup>16</sup> The international community recognizes this investment and may view space as potential vulnerability for the United States. Foreign nations that do not have the capability to invest in space assets may focus their attention on developing cheaper technologies, such as jammers or ground based antisatellite weapons. In either case, the United States must ensure freedom of access to all national space-based capabilities. For instance, the United States Navy uses space based navigation for precision weapons targeting and travel. The Army utilizes space-based capabilities for communications, troop movement, supply deliveries, missile warning, weather, and Blue Force Tracking. The Air Force depends on space capabilities for targeting, weapon delivery, and intelligence, surveillance, and reconnaissance (ISR). The protection of these capabilities will be instrumental towards future U.S. space superiority.

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<sup>16</sup> Emma Luxton, “Organisation for Economic Co-operation and Development,” January 2016, accessed 15 October 2016, <https://www.weforum.org/agenda/2016/01/which-countries-spend-the-most-on-space-exploration/>.

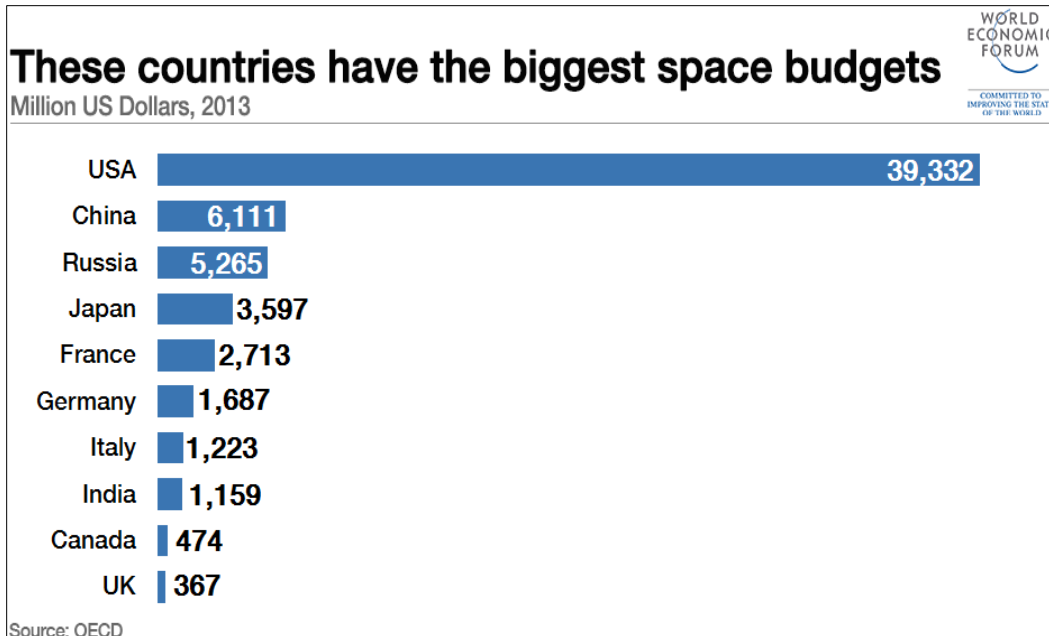


Figure 2. Countries with Biggest Space Budgets

Source: Emma Luxton, “Organisation for Economic Co-operation and Development,” January 2016, accessed 15 October 2016, <https://www.weforum.org/agenda/2016/01/which-countries-spend-the-most-on-space-exploration/>.

### The Research Question

Since the Truman administration, the question of weaponizing space continues to generate heated debate. Strong advocates on both ends of the spectrum have valid arguments, but ultimately the President of the United States is responsible for developing a national space policy directing a unified vision. The weaponization of space is a complex decision that impacts all four instruments of national power: Diplomatic, Informational, Military, and Economic (DIME). The use of DIME allows leaders to evaluate potential decisions based on multiple criteria in order to shape a policy that is balanced and in the best interests of the United States. Currently, the United States is the

largest consumer of space technology, in both the civilian and military sectors. According to Strategic Forecasting Incorporated, one of the world's leading geopolitical intelligence platforms, the United States has 549 active satellites orbiting the Earth. A far distant second is China with a total of 142 satellites (see figure 3).<sup>17</sup> Space is engrained into the cultural fabric of the United States with the launch of systems with position, navigation, and timing capability. Everyone with a cell phone is a user of space. The loss of space capabilities for even a single day could create a devastating impact on national policy, security, and economy.<sup>18</sup> This thesis intends to answer the primary question, should the United States develop and deploy weapons in space? Unfortunately, the answer to this question is not simple and first requires a detailed review of subordinate questions:

(1) How does weaponization of space impact the elements of diplomacy, Information, Military, and Economics (DIME)? (2) How does the military prepare the space cadre for the weaponization of space (force management and training)? The answers to each one of these questions will play a critical role in developing a final recommendation for senior command authorities to review and consider.

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<sup>17</sup> Stratfor, "The Real Danger from Space Weapons," 22 February 2016, accessed 12 September 2016, <https://www.stratfor.com/sample/analysis/real-danger-space-weapons>.

<sup>18</sup> Mike Gruss, "Air Force Solicits Info on Outsourcing WGS Operations," Space News, 23 September 2015, accessed 22 December 2016, <http://spacenews.com/air-force-solicits-info-on-outsourcing-wgs-operations/>.

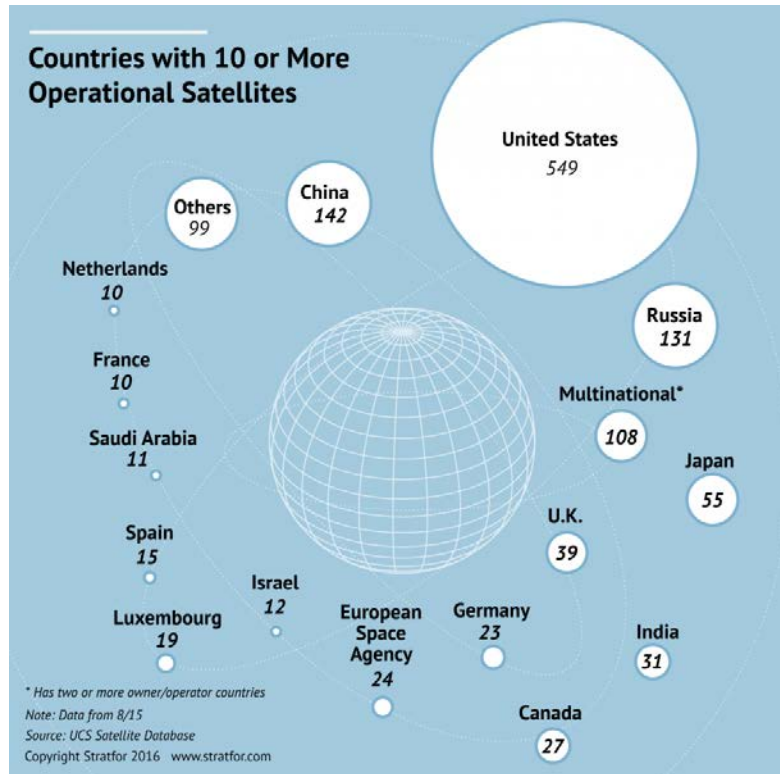


Figure 3. Countries with Ten or More Operational Satellites

Source: Strategic Forecasting Incorporated, “The Real Danger from Space Weapons,” February 2016, accessed 15 October 2016, <https://www.stratfor.com/analysis/real-danger-space-weapons>.

### Assumptions

1. The data of country’s space assets are accurate.
2. United States national space strategies remain unaltered throughout 17 June 2017.
3. Classification of material will not prevent accurate representation of data.
4. The reader has a foundational knowledge of space as a platform for national strategy.
5. Space is an equivalent domain comparable to land, sea, air, and cyber.

## Definitions

The below terms have a variety of definitions that must be taken into context. The key terms below entail the framework and categorization for informational consumption. The instruments of national power and the operational variables highlight major categories that are critical in shaping national policy. Each term constitutes a critical consideration for review. Senior leaders will contemplate the pros and cons in order to decide on a course of action that is the best interest of the United States. This thesis uses joint-approved doctrinal terms, when applicable:

Diplomatic (Instrument of Power): Diplomacy is the principle instrument for engaging with other states and foreign groups to advance United States values, interests, and objectives, and to solicit foreign support for United States military operations. Diplomacy is a principal means of organizing coalitions and alliances, which may include states and non-state entities, as partners, allies, surrogates, and proxies. The Department of State is the U.S. government (USG) lead agency for foreign affairs.<sup>19</sup>

Economic (Instrument of Power): A strong U.S. economy with the free access to global markets and resources is a fundamental engine of the general welfare, the enabler of a strong national defense. In the international arena, the Department of the Treasury works with USG agencies, the governments of other nations, and international financial institutions to encourage economic growth, raise standards of living, and predict and prevent, to the extent possible, economic and financial crisis.<sup>20</sup>

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<sup>19</sup> Department of Defense, Joint Publication (JP) 1, *Doctrine for the Armed Forces of the United States* (Washington, DC: Joint Chiefs of Staff, 2013).

<sup>20</sup> Ibid.

Informational Power (Instrument of Power): Information remains an important instrument of national power and a strategic resource critical to national security. The concept of information as an instrument of national power extends to non-state actors such as terrorist and transnational criminal groups that are using information to further their cause and undermine those of the USG and U.S. allies. Every Department of Defense action that is planned or executed, word that is written or spoken, and image that is displayed or relayed, communicates the intent of Department of Defense and by extension, the U.S. government.<sup>21</sup>

Military (Instrument of Power): The United States employs the military instrument of power at home and abroad in support of its national security goals. The ultimate purpose of the U.S. Armed Forces is to fight and win the nation's wars. Fundamentally, the military instrument is coercive in nature, to include the integral aspect of military capability that opposes external coercion. Coercion generates effects through the application of force (including threat of force) to compel an adversary or prevent our being compelled.<sup>22</sup>

Political Variable: The distribution of responsibility and power at all levels of governance—formally constituted authorities, as well as informal political powers. It

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<sup>21</sup> Department of Defense, JP 1, *Doctrine for the Armed Forces*, I-12.

<sup>22</sup> *Ibid.*, I-13.

includes influential political groups and the collective attitude of the population towards the United States.<sup>23</sup>

Military Variable: The military and/or paramilitary capabilities of all relevant actors in a given operating environment.<sup>24</sup>

Economic Variable: Encompasses individual and group behaviors related through resource production to consumption.<sup>25</sup>

Social Variable: Focuses on the ethnic composition of an operating environment, and also explores the customs and behaviors of the specified members.<sup>26</sup>

Information Variable: Involves military and civilian access and availability to information.<sup>27</sup>

Infrastructure Variable: Targets facilities and services required of a city or society.<sup>28</sup>

Physical Environment: Entails both geographical and man-made structures in addition to weather and climate in a specified operating environment.<sup>29</sup>

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<sup>23</sup> U.S. Army, Training Circular (TC) 7-101, *Exercise Design* (Washington, DC: Department of the Army, 26 November 2010), 3-2.

<sup>24</sup> *Ibid.*, 3-6.

<sup>25</sup> *Ibid.*, 3-12.

<sup>26</sup> *Ibid.*, 3-15.

<sup>27</sup> *Ibid.*, 3-20.

<sup>28</sup> *Ibid.*, 3-16.

<sup>29</sup> *Ibid.*, 3-31.



Time Variable: Focused on a specific time of an activity or event within an operating environment.<sup>30</sup>

Space: A joint definition for space does not exist. Doctrinally, space has the characteristics of not having geographic boundaries, follows the laws of orbital mechanics, is vulnerable to space environment considerations (including space weather and debris), and is dependent on the electromagnetic spectrum.<sup>31</sup>

Weaponization of Space: Any non-nuclear space-based device that has been specifically developed and deployed to identify, characterize, track, destroy, damage, or degrade other devices in outer space, air, land, or sea.

Militarization of Space: The use of targeted satellite capabilities such as intelligence, ISR, communications, and weather with non-aggressive military purpose.<sup>32</sup>

Space Debris: Orbiting particulates left behind during a satellite's lifetime, debris from satellite explosions or impacts, orbiting "trash," such as rocket bodies, or natural objects, such as meteoroids, can damage operational systems.<sup>33</sup>

### Limitations

The military discussion of space and U.S. capabilities can quickly escalate into discussion of classified information. This study will only discuss unclassified material. In

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<sup>30</sup> U.S. Army, TC 7-101, *Exercise Design*, 3-42.

<sup>31</sup> Department of Defense, Joint Publication (JP) 3-14, *Space Operations* (Washington, DC: Joint Chiefs of Staff, May 2013), x.

<sup>32</sup> Kalic, 5.

<sup>33</sup> Department of Defense, JP 3-14, *Space Operations*, I-19.

addition, the intent of this thesis is not to discuss specific space capabilities, but to recommend a shift in strategic policy.

### Scope and Delimitations

This study will concentrate on answering the question, should the United States develop and deploy weapons in space with respect to national instruments of power (DIME) and operational variables (PMESII-PT). This study does not address technological challenges with the weaponization of space, but the fundamental premise as a national strategy from 1945-2016. The scope of this study is to analyze the space policy of the United States and formulate a recommendation regarding the weaponization of space in order to meet the commanders' intent and completion timelines.

### Significance of This Study

The intent of this study is to present a fair and accurate view of the ongoing weaponization of space debate. This thesis will formulate an argument for the weaponization of space utilizing DIME as the framework. Key terms and definitions provide clarity and focus. The literary research and evaluation entails historical or theoretical frameworks that will shape the presentation of the research. Instruments of national power and operational variables provide a framework for the research methodology to demonstrate the validity of the argument by identifying key means and criteria. Analysis performed demonstrates the uniqueness of this thesis while providing a recommendation for action. This research will result in providing recommendations towards impacting national policy with the intent of securing freedom by weaponizing the space domain. In addition, the data collected will focus on developing a

comprehensive review of national space strategy in order to remove confusion and inconsistencies between policy and execution. The benefit of this study is to spark further discussion into the ongoing debate of weaponizing space. This decision will not be made overnight, but the question must be answered to protect national security against potential adversaries.

### Summary

The intent of this research is to recommend a shift in United States space policy towards weaponization of space from militarization in order to secure freedom of access and set the necessary foundation for unified action against threats to national security. Over the last seventy-one years, the national space policy has incrementally taken steps from a peaceful, centric strategy towards the very early stages of weaponization. This is evident with the aggressive language within President Obama's national space policy. History has shown us that it is human nature to escalate the nature of war within operating environments; is space not the same? The primary question answered within this thesis is should the United States develop and deploy weapons in space? The collected research presents an argument that now is the time for a national strategy advocating for space weaponization that intends to drive the development of technology and tactics, techniques, and procedures at the lower echelons of command.

## CHAPTER 2

### LITERATURE REVIEW

#### The Weaponization of Space

Chapter 1 of this study was a brief introduction, setting the stage of the thesis from the Truman Administration to present day. In order to understand the direction of space policy, one must understand the historical context. Chapter 1 briefly introduced policies, doctrine, and initiatives to provide the reader the overall significance of this topic.

Chapter 2 captures and introduces all relevant documents utilized in the research of the primary question, should the United States develop and deploy weapons in space? In order to formulate a proper thesis argument, prudent authors must immerse themselves within the topic to understand current threats, historical writings, and potential counter arguments. An additional intent of this study is to provide a recommendation intending to develop a clear space policy. Current space guidance regarding militarization and weaponization overlaps and contradicts one another, which leads to confusion when developing and executing directives.

#### Arguments for Space Weaponization

The transition into the twenty-first-century has brought about new space threats and challenges that the Truman era could not have predicted. The result of developing ASAT technology in the 1950s set in motion an ASAT war that escalated with the 2007 Chinese ASAT test. Following the ASAT test from China, Congressman Terry Everett (R, AL), the ranking Republican member of the Strategic Forces Subcommittee of the

House Armed Service Committee, referred to the test as a “clear wake up call for the Administration, Congress, and the American people,” and “apparently this single test is part of a broader effort to mature their direct-ascent ASAT capability and to develop a spectrum of counterspace capabilities.”<sup>34</sup> The question at this point is not whether space will be weaponized, but when. Congressman Everett’s testimony is a consistent representation of many influential civilian leaders that share similar opinions. The need for a clear, bold, and transparent space policy allowing for unified action is critical in posturing future space forces. This is the consistent gap identified from previous advocates for weaponization of space. While the first step is to identify a gap, the second and most critical portion is the implementation of a clear and coherent strategy.

According to JP 3-14, *Space Operations*, space capabilities, and associated policies have continued to evolve since the beginning of the Space Race starting in 1955. The continued use and expansion of space had led to a congested, contested, and competitive environment.<sup>35</sup> According to space doctrine, five major considerations exist when considering the use of space as an operational domain. The first consideration is vulnerability. The concept of vulnerability impacts all three main sectors of space: military, civil, and commercial. Joint doctrine recognizes the United States dependency on space assets and identifies the vulnerability associated with this reliance. Within the concept of vulnerability, joint doctrine also identifies the concept of purposeful

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<sup>34</sup> Terry Everett, “Arguing for a Comprehensive Space Protection Strategy,” *Strategic Studies Quarterly* (Fall 2007): 21-22.

<sup>35</sup> Department of Defense, JP 3-14, *Space Operations*, I-1.

interference, which is the “deliberate actions taken to deny or disrupt a space system, service, or capability.”<sup>36</sup> Purposeful interference is an important term to understand because it warns all enemies that an act on a space system is an act of war. It is critical that the commander’s understand the enemy’s capabilities in order to characterize, identify, and recognize interference. The second consideration is freedom of action.<sup>37</sup> The U.S. government believes that, as a world superpower, it has the ability to use space capabilities at any given time and place without interference by enemy forces. At the core of this consideration is developing the ability to protect critical space assets. The third consideration is protection.<sup>38</sup> This consideration intends to not only protect the space system, but also the supporting infrastructure to ensure capability is available when needed. Global reach and responsiveness is the fourth consideration and focuses on uniqueness of space and the limitations with respect to reconstitution of systems. The ability to replace satellite systems is not a rapid process and takes years. This limitation emphasizes the protection aspect of these national space capabilities. Last, space deterrence is the ability to utilize joint force operations to ensure protection against U.S. space capabilities.<sup>39</sup> All five of these considerations focus on the protection of maintaining U.S. space superiority and represent a small shift towards a space weaponization strategy. JP 3-14 is the single joint publication for space operations. While

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<sup>36</sup> Department of Defense, JP 3-14, *Space Operations*, I-2.

<sup>37</sup> *Ibid.*

<sup>38</sup> *Ibid.*

<sup>39</sup> *Ibid.*

the publication escalates the aggressive language and hints towards a weaponization mentality, the official guidance and direction to unify the space community is absent. The core of this document focuses on space as a force enabler, not as a weaponization capability equal to air, space, and cyber. There is a major gap in joint doctrine regarding the transition of space pacification and weaponization. Doctrine must reflect the current threat environment and lay the groundwork towards a strategy that will deliberately focus efforts towards a singular vision. Current doctrine fails to provide the necessary vision and guidance to combat future challenges or threats in the space domain.

Along with the shift in aggression in joint doctrine, President Obama's *National Space Policy of the United States of America* echoes a similar message as Joint Publication 3-14. The National Space Policy Principle states:

The United States will employ a variety of measures to help assure the use of space for all responsible parties, and, consistent with the inherent right of self-defense, deter others from interference and attack, defend our space systems and contribute to the defense of allied space systems, and, if deterrence fails, defeat efforts to attack them.<sup>40</sup>

This is the most aggressive space policy to date, and indicates a transition from militarization to the cusp of weaponization. Satellite systems are now equivalent to an airplane, ship, or tank, and the United States must prepare to defend these systems from attack.<sup>41</sup> The next logical step is the development and execution of this philosophy to secure national interests. Just as with any mission set, guidance must be clear to enable

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<sup>40</sup> Barak Obama, *National Space Policy of the United States of America* (Washington, DC: White House, 2010), accessed 15 October 2016, 3, [https://www.whitehouse.gov/sites/default/files/national\\_space\\_policy\\_6-28-10.pdf](https://www.whitehouse.gov/sites/default/files/national_space_policy_6-28-10.pdf).

<sup>41</sup> George W. Bush, *U.S. National Space Policy* (Washington, DC: White House, August 2006), accessed 20 October 2016, <https://fas.org/irp/offdocs/nspd/space.pdf>.

unified action. The inconsistency and disconnect with current policy and the threat environment only causes delays in designing, creating, and launching weaponization capabilities from space. The United States will not always have the luxury of neutrality regarding the topic of space weaponization. Former President Obama and President Trump are at a critical juncture requiring key decisions on the future of national space capabilities. Currently, the inconsistent messaging negatively impacts strategy by limiting national capability while allowing foreign nations to rapidly expand their space portfolio. The United States has the opportunity to take advantage and leverage its superiority in space as a critical capability.

While doctrine and policy are critical indications towards a policy of weaponization, inevitability is a mental construct and methodology that deserves consideration. Lieutenant Colonel (Lt Col) Thomas Bell describes the inevitability of space weaponization by stating “just as the role of US military operations in space has gradually shifted from scientific interest, through intelligence collection, to robust combat support, so it will continue to shift inevitably towards the weaponization of space.”<sup>42</sup> Logically, this determination is a reasonable conclusion. Why would space be any different from all four other military domains? Lt Col Bell argues that “it is inevitable that mankind will weaponize space, and equally likely that this weaponization will occur with maturing of specific technologies over the next thirty years.”<sup>43</sup> The ability for the

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<sup>42</sup> Thomas Bell, *Weaponization of Space: Understanding Strategic and Technological Inevitabilities* (Maxwell Air Force Base, AL: Air War College, 1999), 3.

<sup>43</sup> *Ibid.*, 2.



United States to develop and integrate space into the military construct will provide the asymmetry required of future conflicts. Lt Col Bell believes that space weapons, which include the ability to conduct warfare in, from, or through space, will be required in the next major conflict of the United States due to the mandate to ensure freedom of access.<sup>44</sup> Future adversaries intend to create an asymmetrical advantage against the United State and the elimination of space superiority will create the desired effect. The three major requirements for space identified by Lt Col Bell are enhanced space surveillance; develop the capability to deny a potential enemy the use of space; and develop capability to protect United States space assets from the enemy.<sup>45</sup> Bell's analysis presents similar doctrinal gaps that exists in joint doctrine and national space policy, but adds a unique perspective that technology itself could be a major driver in the weaponization of space, not necessarily people. While Lt Col Bell illustrates the criticality of space operations to warfighting, his focus lacks the robustness on the methods to develop and shape a new space policy emphasizing weaponization and the impacts on the national instruments of power.

In Benjamin Lambeth's book, *Mastering the Ultimate High Ground*, he presents an argument that the development of space weapons will complete and legitimize space as a true military power equal to land, air, sea, and cyber.<sup>46</sup> Senior civilian leaders must recognize the importance of their military space subject matter experts in order to

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<sup>44</sup> Bell, 3.

<sup>45</sup> *Ibid.*, 11.

<sup>46</sup> Benjamin S. Lambeth, *Mastering the Ultimate High Ground: Next Steps in the Military Uses of Space* (Santa Monica, CA: RAND, Project Air Force, 2003), 113.

develop a comprehensive strategy to protect the United States against all threats.

Lambeth references Retired General Howell Estes, former United States Space Command Commander, to support one of his main points:

If we examine the evolutionary development of the aircraft, we see uncanny parallels to the current evolution of spacecraft. . . . The potential of aircraft was not recognized immediately. Their initial use was confined to observation . . . until one day the full advantage of applying force from the air was realized and the rest is history. So too with the business of space . . . [military] space operations, like the land, sea and air operations that evolved before them will expand [into] the budding new mission already included into the charter of US Space Command . . . as they become more and more critical to our national security.<sup>47</sup>

While Lambeth intends to spark discussion and present information arguing both for and against supporting weapons in space, his research lacks the recommendations and framework to shape a new space policy. Lambeth states that the “United States possesses the essential wherewithal in principle to begin weaponizing space today. Reduced to basics, it is only a question of leadership choice, societal acceptance, and which particular force-employment alternatives to pursue first.”<sup>48</sup> This statement targets the diplomatic instrument of power. This study will expand Lambeth’s focus towards reviewing all four instruments of power and operational variables to collect data and formulate a strategy intending to provide clarity and unity of effort towards space operations.

The Rumsfeld Commission is the core document of the twenty-first-century that highlighted the need for the United States to readdress their posturing for space. The

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<sup>47</sup> Howell M. Estes, III, “Doctrinal Lineage of Space” (lecture, AFA National Symposia, Los Angeles, CA, 18 October 1996), accessed 27 October 2016, <http://secure.afa.org/AEF/pub/la6.asp>.

<sup>48</sup> Lambeth, 118.

Commission's intent was to assess the current and future state of the national space capabilities while analyzing vulnerabilities associated to the threat environment. The major conclusion from the assessment was that the "U.S. is more dependent on space than any other nation" and cautions that adversarial nations will view that as a vulnerability.<sup>49</sup> Tactics and techniques identified by the Rumsfeld Commission include denial and deception, jamming, microsatellite, and nuclear detonation.<sup>50</sup> While the commission identified high-level strategies to reduce vulnerabilities, and called for the President of the United States to have the option to deploy weapons in space, official policy has yet to transition. The commission stated, "The United States must develop, deploy, and maintain the means to deter attack on and to defend vulnerable space capabilities," but is missing the recommended doctrine and policy updates to incorporate into the national space strategy.<sup>51</sup> The commission illustrates the need for "explicit national security guidance and defense policy to direct development of doctrine, concepts of operations, and capabilities for space, including weapons systems that operate in space and that can defend assets in orbit and augment air, land, and sea forces."<sup>52</sup> In addition to space policy, leadership must recognize that that robust training will be required to

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<sup>49</sup> Report of the Commission to Assess United States National Security Space Management and Organization pursuant to Public Law 106-65, the National Defense Authorization Act for Fiscal Year 2000, Section 1622, 11 January 2001, 18, accessed 16 September 2016, <http://www.dod.gov/pubs/space20010111.html>.

<sup>50</sup> Ibid., 19-21.

<sup>51</sup> Ibid., vi.

<sup>52</sup> Ibid.

bolster any capability developments. Space professionals will require training on space systems to develop tactics, techniques, and procedures allowing for space superiority. In addition, the Rumsfeld Commission noted that in July 2000, “The Xinhua news agency reported that China’s military is developing methods and strategies for defeating the United States military in a high tech and space-based future war.”<sup>53</sup> The Rumsfeld Commission used historical analysis to review warning signs of previous identified space scenarios that exposed vulnerabilities that could have resulted in catastrophe. The commission emphasized that the United States is ignoring warning signs of Chinese space aggression, allowing for unacceptable risk assumption. The commission report states, “Surprise is most often not a lack of warning, but the result of a tendency to dismiss as what we consider improbable.”<sup>54</sup> If the Chinese weaponize space first, the United States would lose its space superiority along with a general decline in overall military capability. The results would be disastrous. Although the development of space weapons is not a simple task due to technology development and extreme cost, the commission recommends starting now. The value of the Rumsfeld Commission to this study is the identification of a growing threat against the space domain and a recommendation for a space strategy transition from militarization towards weaponization. This study intends to take the recommendations to the next level by actually developing strategy recommendations regarding developing space professionals and space policy, but falls short of implementable recommendations. Without formal

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<sup>53</sup> Report of the Commission, 14.

<sup>54</sup> *Ibid.*, xv.

guidance on the weaponization of space, the establishment of unified actions is unachievable. The United States cannot afford to continue the policy of wait and see.

Retired General John Loh, former United States Air Combat Command commander, in a Center for Strategic Policy roundtable summary in 1998 titled, “The Need for American Space Dominance,” describes his frustration with the lack of protection towards space assets. Loh states, “When you read the Air Force’s long-range plan, there are a lot of good words about how it is going to maintain superiority . . . but when it comes to the focus on how you are going to achieve and maintain space superiority and core competency, it falls short because of the policy issues.”<sup>55</sup> General Loh continues to describe current space policy as “having our head in the sand,” assuming that when we need our space capabilities most, they will be available. This roundtable exemplifies the core of this study by identifying the need for a comprehensive review of literature in order to create a policy focused on protecting space investments and capabilities that are critical to the battlespace. The gap in this roundtable summary is the lack of recommendations to correct the identified shortcomings. The lack of solutions lessens the credibility of the article. The United States ought to take the necessary means to ensure the availability and usability of space assets against a threatening environment. The lack of an official space policy towards weaponization creates confusion and prevents the space cadre’s ability to protect and defend national capabilities.

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<sup>55</sup> Center for Security Policy, “Summary of ‘The Need for American Space Dominance’,” 23 January 1998, accessed 15 October 2016, <http://www.centerforsecuritypolicy.org/1998/01/23/summary-of-the-need-for-american-space-dominance-2/>.

## United States Treaties and Policies

The Outer Space Treaty of 1967 is the central treaty governing international space policy under the United Nations Office for Outer Space Affairs. The treaty modeled the Antarctic Treaty, intending to prevent a new form of colonial competition and potential conflicts due to exploration.<sup>56</sup> Article I states that the exploration and use of space should be carried out for the benefit of all mankind. Article II dictates that no nation can claim the moon and other celestial bodies. Article III states that parties to the treaty shall carry on with space exploration in accordance to international law. The fourth article states, “parties to the Treaty undertake not to place in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space.”<sup>57</sup> At the time of composition, nuclear weapons were the centerpieces of Cold War disputes. The language used by the creators of the Outer Space Treaty of 1967 were either specifically attempting to solve a short-term concern or a strategically desired, narrow focus. In either case, the major criticism of this treaty is the overall failure to prevent the use of conventional weapons from space. The decision to not include conventional weapons in the treaty has led to the forty-nine year debate on space weaponization. Many space advocates believe that the Outer Space Treaty requires modifications to represent technological advancements. Global support for a new treaty varies based on individual nation

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<sup>56</sup> Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, 19 December 1966, *UNTS* 610, no. 8843 (1967), accessed 1 September 2016, <http://www.state.gov/t/isn/5181.htm>.

<sup>57</sup> *Ibid.*

capability and the United States has recently rejected any notion of a new agreement (i.e., PAROS—Prevention of an Arms Race Outer Space Treaty). This study will perform a full review of available unclassified literature in order to develop and recommend a policy towards weaponizing space.

In addition to the Outer Space Treaty of 1967, the United States participates in the United Nations Register of Objects Launched into Outer Space. The registration requires participants to establish their own registries, and collaborate with the Secretary-General for compilation into the United Nations Register. The United Nations Office for Outer Space Affairs is currently the specific office responsible for outer space. As of 2016, approximately 92 percent of all satellite, probes, landers, manned spacecraft, and space station flight elements launched into Earth's orbit or beyond have been registered with the Secretary-General.<sup>58</sup> Ethical concerns call into question the accuracy of the information provided from individual nations. The ability to confirm the provided system data is nearly impossible and results in little comfort towards preventing the deployment of weaponized space systems. All treaty participants, including the United States, utilize this policy loophole. This policy highlights the distrust between opposing nations in determining strategy and positioning regarding weaponizing space. While the United Nations Register of Objects Launched into Outer Space Treaty intends to maintain space as a peaceful domain, more rigor and verification methods are required to meet the intent of the agreement.

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<sup>58</sup> United Nations, Office for Outer Space Affairs, "United Nations Register of Objects Launched into Outer Space," accessed 15 October 2016, <http://www.unoosa.org/oosa/en/spaceobjectregister/index.html>.

Additionally, the historical signing of the Antiballistic Missile Treaty of 1972 by U.S. President Richard Nixon further sparked discussion on space weaponization with the restrictions placed on participating nations. In June of 2002, President George W. Bush made the unilateral decision to withdraw from the Antiballistic Missile Treaty of 1972. This was a recommendation of the Rumsfeld Commission, and it removed restrictions on the placement of missile defense components and weapons in space.<sup>59</sup> The announcement sent a message to the world that the United States was prepared to rid itself of regulations that may potentially hamper the freedom to weaponize space. The Bush administration immediately rejected the premise that withdrawing from the Antiballistic Missile Treaty supported a policy of weaponizing space.<sup>60</sup> To this day, the United States has yet to acknowledge an official policy towards weaponizing space. The gap in this document references the impact that occurred because of the treaty withdrawal. Strategic decisions play a vital role in understanding that for every action there is a counter-action performed by adversarial forces. The United States has the responsibility to understand how its leading role in space drives other nations forward.

The United States policy on space weaponization is non-existent, leading to confusion. While the United States denies any intent to weaponize space, recent aggressive language within national space policy creates confusion. Many nations, such

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<sup>59</sup> Kenneth S. Blazejewski, "Space Weaponization and US-China Relations," *Strategic Studies Quarterly* (Spring 2008): 36.

<sup>60</sup> Arms Control Association, "The Anti-Ballistic Missile (ABM) Treaty at a Glance: Fact Sheets and Briefs," August 2012, accessed 15 October 2016, <https://www.armscontrol.org/factsheetsabmtreaty>.



as China and Russia, are attempting to force the United States to sign a space treaty preventing the use of conventional weapons in space.<sup>61</sup> The United Nations (UN) Conference on Disarmament (CD) is the official international body for the negotiation of disarmament agreements. The most recent attempt is the prevention of an arms race in outer space treaty. The United States consistently opposes this treaty due to weapons definitions and language, but continues to assert space usage as strictly peaceful.<sup>62</sup> The unwillingness of the United States to sign the prevention of an arms race in outer space treaty announces to the international community that all options are on the table.

#### Foreign Perspective on United States Policy and Doctrine

China is watching the United States very closely regarding national space policy.<sup>63</sup> China is another nation that has mastered the art of not producing a clear and consistent message regarding national space intentions. Publicly, China opposes the weaponization of space and, along with Russia, is advocating for the signing of the prevention of an arms race outer space treaty (PAROS).<sup>64</sup> Kenneth Blazejewski's article, *Space Weaponization and US-China Relations*, describes the current confusion regarding United States policy and doctrine, and how the lack of messaging is shaping China's strategy. Blazejewski describes four interpretations of China concerns regarding United

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<sup>61</sup> Arms Control Association.

<sup>62</sup> Blazejewski, 35.

<sup>63</sup> *Ibid.*, 37.

<sup>64</sup> *Ibid.*

States space efforts: China seeks only to maintain its defensive military position; China is concerned that the United States seeks to deny Chinese use of outer space; China's statements at the CD are nothing more than empty rhetoric, and their real intentions are to launch space weapons; and China's actions are the product of "stove piped bureaucracies" that are the result of poorly coordinated policies.<sup>65</sup> This article separates itself from others in the literary review by offering limited policy adjustments based on strategic communication and passive weapon strategies. The identified gap applies to the conclusion that the cost of weaponization outweighs the benefit. This strategy is dangerous, and could result in the loss of space superiority for the United States. The article stops short of presenting a costly and global impact comparison, further refining the potential impacts of a weaponization strategy.

Similar to China, the Russians produced the 2010 Military Doctrine of the Russian Federation to describe military threats to their sovereignty.<sup>66</sup> The threats include state and military command and control, disruption of strategic nuclear forces, missile warning systems, and monitoring of space. Space weaponization and strategic precision weapons are characterized as Russia's top national threats.<sup>67</sup> In Jana Honkova's article, "The Russian Federation's Approach to Military Space and Its Military Space

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<sup>65</sup> Blazejewski, 39-40.

<sup>66</sup> School of Russian and Asian Studies, "The Military Doctrine of the Russian Federation Approved by Russian Federation Presidential Edict on 5 February 2010," 20 February 2010, accessed 22 October 2016, [http://www.sras.org/military\\_doctrine\\_russian\\_federation\\_2010](http://www.sras.org/military_doctrine_russian_federation_2010).

<sup>67</sup> Ibid.

Capabilities,” she states that Russia is heavily investing in space in order to close the gap and surpass the world’s sole superpower in space.<sup>68</sup> In addition, Honkova describes how Russia believes that space will eventually be a military battleground.<sup>69</sup> This article provides a similar tone as Blazejewski, but stops short of providing recommendations for de-escalation. Honkova’s methodology intends to provide information of Russian state of mind and capabilities. In addition to Honkova’s article, editor Lee Billings concludes that recent United States space policy shifts (i.e., monetary investment and withdrawal from anti-ballistic missile treaty) concern Russia and China. These concerns have resulted in the development and testing of controversial space capabilities in order to protect themselves from potential threats from the United States.<sup>70</sup> Mr. Billings believes that China and Russia are developing space weapons based on the perceived threat of the United States. Although, the Billings article highlights the threats (i.e., ASATs and debris) and impacts to United States space capabilities with a growing adversarial threat, the article fails to provide strategic policy recommendations to ensure access to space. The void in policy recommendations is the key to this thesis. On the surface, China and Russian intentions appear genuine towards preserving the sanctity of the space domain for peaceful purposes. On the other hand, due to the current investment and technological advantage, China and Russia could be attempting to delay the United States until

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<sup>68</sup> Jana Honkova, *The Russian Federation’s Approach to Military Space and Its Military Space Capabilities* (Arlington, VA: Marshall Institute, November 2013), 1.

<sup>69</sup> *Ibid.*, 8.

<sup>70</sup> Billings.

prepared to weaponize space. In order to prevent vulnerabilities, the United States Government must focus energy on a consistent policy that generates unified action.

Development of near peer space capabilities by foreign nations is another factor that impacts the United States policy towards space weaponization. The Global Positioning Satellites are the world leading system for positioning, navigation, and timing. This system is a staple for navigation, bank transactions, weapons targeting, and geolocation. Competing space nations such as China and Russia are concerned with their national dependence on a foreign space system. In response, China and Russia have developed and recently launched Beidou and Global Navigation Satellite System respectively in order to protect their national interests. Chinese scholar Eric Hagt, in his testimony to the United States-China Economic and Security Review Commission, testified, “China has come to see the current strategic balance in space as intolerable and intolerable to its core national security interests and its sovereign rights to access space.”<sup>71</sup> One illustrative example is China’s strategy to launch up to one hundred satellites to grow and develop an organic navigation capability.<sup>72</sup> The strategic implication of this decision is grand. China and Russia from a national perspective are concerned with their reliance on a foreign system for precise navigation and timing. Militarily, a prudent observer must take pause with this decision looking to understand the messaging. China and Russia desire an organic navigation and timing capability for

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<sup>71</sup> Hearing before the United States-China Economic and Security Review Commission, *China’s Military Modernization and Its Impact on the United States and the Asia-Pacific: Hearing*, 110th Cong. 1st sess. 29-30 March 2007, 174.

<sup>72</sup> United States-China Economic and Security Review Commission, *China’s Military Modernization*, 180.

the purpose of protecting themselves during a wartime environment where tactics, techniques, and procedures may be implemented to degrade enemy space capability in the region. According to the commission report, the United States' unclear and inconsistent strategy is forcing China to explore space weaponization options as a sense of national security.<sup>73</sup> This article is comprehensive and explores the entire military relationship between China and the United States. The space portion of this report provides insight on space weaponization from the perspective of China. The report states, "China did not challenge United States power in space, it was challenging the United States self-described right to dominate it."<sup>74</sup> This unique perspective provides expert analysis that should shape United States policy towards the weaponization of space while incorporating China's perspective on the perceived aggression of the United States. The analysis focuses on the single diplomatic portion of the instruments of national power when a comprehensive approach provides further fidelity. This study will expand the analysis and build towards a recommended strategy.

Preparing for conflict entails developing an asymmetrical advantage over the intended enemy. In the article, *Action/Reaction: U.S. Space Weaponization and China*, Hui Zhang references the Pentagon's Chinese military power report claiming China is developing space weapons and "intends to deploy such weapons, including a direct ascent system, ground-based laser anti-satellite weapons, and microsattelites for weapons

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<sup>73</sup> Ibid., 174.

<sup>74</sup> Ibid., 183.

purposes.”<sup>75</sup> Technological challenges aside, two avenues of approach derive from this information. Either the intelligence is lacking and the information is unfounded or the intelligence is true. Senior leadership must trust the intelligence gathered in order to posture themselves appropriately for potential adversaries and threats. The action can take form in any element of DIME, depending the expected result, resources available, and the desired end state. In addition, Zhang provides valuable insight from the Chinese perspective on United States policies in space. The gaps identified in this article highlight the lack of policy recommendations of either de-escalation or weaponization. Zhang’s article is similar in theme regarding other foreign perspectives on United States space capability. The current space strategy of militarization and the inconsistencies of a weaponization strategy automatically provoke foreign space-faring nations to prepare for a weaponized space environment. The withdrawal of the ABM treaty and the refusal to sign any treaty that limits national space objectives sends a powerful message to the international community. Actions speak louder than words. The senior leadership of the United States more than ever needs to accurately assess all current and future space threats and develop a comprehensive strategy to protect these systems in time of peace and war.

The Chinese are not the only nation developing antisatellite technology. The Global Security article, *ASAT Anti-Satellite Capabilities*, describes Russia’s recently successful test of their new antisatellite missile known as the Nudol. In response to this test, then Representative Mike Pompeo (R, Kansas) of the House Committee on

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<sup>75</sup> Hui Zhang, “Action/reaction: United States Space Weaponization and China,” *Arms Control Today* 35, no. 10 (December 2005): 10.

Intelligence stated, “The Russians continue to develop their technological abilities to weaponize space and to take out our [U.S.] national technical means—kinetically and through cyber.” Pompeo also stated, “We [the U.S.] can foolishly turn a blind eye to these developments, or acknowledge this threat and develop our own capabilities to ensure that our satellites—military and commercial—are not susceptible to attack or blackmail.”<sup>76</sup> The language of Representative Pompeo is important towards understanding the perspective of this nation’s civilian leadership. Mark Schneider, a former Pentagon official now with the National Institute for Public Policy, stated that the “Russian test highlights the failure of the United States to prepare for space warfare. There is an enormous asymmetry in play regarding space weapons.”<sup>77</sup> Schneider continues to state, “For decades the Congress has prevented the US from putting weapons in space.”<sup>78</sup> Adversaries of this nation play by a different set of rules and policies. This article provides valuable perspective on foreign space threats that are consistent with many senior policy makers and advisors. The gap identified in this article is any substantive policy recommendations to secure United States space systems. The identified gap is consistent with previous articles referencing the topic of weaponizing space. The United States should not allow for a lack of strategy and foresight to create an environment by which our space systems remain vulnerable and prime for targeting.

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<sup>76</sup> Global Security, “System A-235 / RTC-181M complex 14TS033 / ROC ‘Nudol’: ASAT Anti-Satellite Capabilities,” accessed 2 September 2016, <http://www.globalsecurity.org/wmd/world/russia/a-235-asat.htm>.

<sup>77</sup> Ibid.

<sup>78</sup> Ibid.

### Arguments against Space Weaponization

While there are many proponents of weaponizing space, thorough research and diligence requires the analysis of counterarguments. Opponents of weaponizing space believe that weaponization is preventable. Advocates believe space weapons will increase hostility and result in a greater loss of military and commercial space capabilities. Focus should instead target diplomacy, not weaponization. Lt Col Donald Christy argues in his paper, *United States Policy on Weapons in Space*, that the “weaponization of space is not inevitable. The decision to place weapons in space is a choice.”<sup>79</sup> Christy argues that the global hesitation to weaponize space indicates that weaponization is preventable. The premise of this statement is to explore the psyche of humans, and not assume that humans cannot control their behavior and reasonably avoid weaponizing the space domain. Last, Christy presents an argument towards the cost benefit analysis of protecting space assets. Space assets are very expensive, and developing billion-dollar systems to protect and defend billion-dollar systems is preventable and cost effective, especially in the current fiscally constraint environment.<sup>80</sup> Lt Col Christy identifies major arguments of proponents of weaponizing space, and provides counterarguments focused on diplomacy, while making the case for more capability diversity within space to limit vulnerabilities. The first gap identified is in reference to the assumption that since space has been weapons-free for forty-five years, the domain has the ability to remain weapons-free. The second gap is the understatement of the importance that space plays in national strategy

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<sup>79</sup> Donald Christy, “United States Policy on Weapons in Space” (master’s thesis, U.S. Army War College, 2006), 5.

<sup>80</sup> *Ibid.*, 7.



with respect to the effect of “wait and see” mentality. Third, Lt Col Christy’s paper, published prior to China’s 2007 ASAT test, requires a new assessment of national policy with respect to global threats and challenges in space.

The second main argument opposing the weaponization of space relates to the increased probability that other nations will counter such an effort with space weapons of their own. In addition, the escalation of weaponization in space will cripple the most-utilized space system that falls within space force enhancement. The capabilities under this umbrella are position, navigation, and timing, communications, intelligence, surveillance, and reconnaissance.<sup>81</sup> John Klein, the author of *Space Warfare: Strategy, Principles, and Policy*, recommends the creation of an international UN arms control agreements to reduce the likelihood of space weapons deploying in order to prevent an arms race.<sup>82</sup> In addition, Klein argues that the ultimate use of space weapons (i.e., command of space) does not translate into space superiority, but instead create an environment with increasing hostility in the domain. Klein’s perspective is very similar to Lt Col Christy, but adds the element of establishing and implementation of international business rules on the use of space. The methodology, used by Klein, leverages case studies from the air and naval (including maritime) models to perform a comparative analysis of the path to space weaponization. Ultimately, Klein presents cases for both sides of the argument while presenting policy and organizational recommendations. This

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<sup>81</sup> Department of Defense, JP 3-14, *Space Operations*, II-4.

<sup>82</sup> John J. Klein, *Space Warfare: Strategy, Principles and Policy (Space Power and Politics)* (Stanford, CA: Routledge, 2006), 145.

thesis agrees with specific portions of Klein’s proposals, but differs in the required end state to protect national assets.

The third argument against weaponizing space is the diplomatic position of “proactive prevention.”<sup>83</sup> The focus of this argument is to generate discussion on goal achievement and viability. Hitchens and Johnson-Freese explore six strategic advantages with this strategy. First, proactive prevention prevents actions to degrade the space environment for all by creating a universal set of rules. Second, this strategy allows for open discussion with Russia and China. Third, it prevents costs associated with weaponizing space. Fourth, provides the private sector more time to increase space resiliency. Fifth, it allows the Air Force and intelligence community to develop protection strategies and technologies for unique capabilities. Sixth, the United States government and the private sector receive a larger window to develop future space capabilities. These six principles intend to prevent a space war by establishing “strategic restraint,” and strive for a full understanding of the adversaries’ intent and capabilities in space.<sup>84</sup> The authors present the argument that space differs from other military domains, and should transition into an international partnership. This requires an increase in diplomacy and the addition of rules and norms similar to Klein’s arguments. The strategic paper entails a fundamental flaw assuming that the United States does not face an imminent threat in space, and views public aggressive actions as simply demonstrations. This assumption

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<sup>83</sup> Theresa Hitchens and Joan Johnson-Freese, *Toward a New National Security Space Strategy: Time for a Strategic Rebalancing* (Washington, DC: Atlantic Council, June 2016), 3.

<sup>84</sup> *Ibid.*

results in a comfort factor that translates into complacency and further national susceptibility. Recent Chinese ASAT testing in addition to increased Russian space investment paint a different picture that will need to play in the ultimate calculus.

The fourth argument impacting the weaponization of space references is the question of morality. In the article, *Moral and Ethical Decisions Regarding Space Warfare*, Col (now General) John Hyten and Dr. Robert Uy describe the moral and ethical considerations to evaluate as the United States shapes national space policy. The article highlights a quote from Bill Graham, who served as the Canadian foreign affairs minister in 2001, stating, “The big, red line we all have is the weaponization of outer space, which would be immoral, illegal, and a bad mistake.”<sup>85</sup> Although the article appeals to proponents on both sides of the argument, a case study methodology educates the readers of the logic and conflicting opinions ongoing in this debate. The gap in the research is that it fails to recommend a confirmation or shift in national space policy. In addition, the journal published prior to the ASAT show of force efforts by China and the United States. The morality perspective is critical in the analysis of the weaponizing space discussion. Just because a nation has the ability to exploit a capability in a warfighting domain—should they?

There is little argument that the United States is nationally dependent on the space domain. Space provides opportunities for the United States to further develop additional capabilities. Opponents of space weaponization argue that the United States is the most

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<sup>85</sup> John W. Hyten and Robert Uy, “Moral and Ethical Decisions Regarding Space Warfare,” *Air and Space Power Journal* 18, no. 2 (Summer 2004): 51.

dependent country on space for both the military and civilian sectors. As a result, the United States has the most to lose in instigating an arms race by weaponizing space.

### Summary

This chapter provided a review of literature regarding the research topic of the weaponization of space. The comprehensive and thorough literature review allows the readers to develop their own conclusion. Historical and theoretical context provides a robust perspective on the research question and the approach to research. The domestic and foreign resources shape the framework of this thesis and provide a rigorous baseline for future analysis. In addition, a review of international agreements and treaties outline the current stance of U.S. space policy and obligations. While varying opinions exist towards the weaponization of space, U.S. policy makers maintain the responsibility to weigh all factors in order to design a strategy that ensures freedom of access to space.

## CHAPTER 3

### RESEARCH METHODOLOGY

Throughout the literature review period of this study, several inconsistencies arose between the recent aggressive language in space doctrine and actual policy. Using qualitative methodology by way of documentary analysis has allowed for the comprehensive review of space literature to analyze the impact of weaponizing space and the national confusion in space policy. Although the weaponization seems inherently military, the three other instruments of national power are equally important. The DIME construct is used as the framework to illustrate the wide-ranging impacts and considerations of this study. When the United States prepares for conflict, the objectives are achieved by utilizing all national instruments of power. In addition to DIME, the operational variables including Political, Military, Economic, Social, Informational, Infrastructure, Physical Environment, and Time (PMESII-PT) provide further refinement to the analysis.

Previous chapters identified an introduction and literature review of space history and development since the end of 1945. The stage is set for the ongoing debate of the weaponization of space, and allows gathering of all relevant information to allow senior leaders to make an informed decision. The strategic impact of this decision will set the stage for the next phase of military warfare. This study will utilize DIME and PMESII-PT to shape the documentary analysis methodology.

An organization, now known as Research and Development or RAND, researched the use of military space dating back to the Truman Administration. This organization began the initial analysis on the benefits of the space and how the domain towards

meeting national objectives. In 1982, the USAF space professional community consolidated into a major command, currently known as Air Force Space Command. This command is responsible for enabling military operations worldwide using space and cyber operations. Organizationally, Air Force Space Command falls subordinate to United States Strategic Command, a unified combatant command.

The first step in formally researching space weaponization is to determine how space evolved by performing a comprehensive review of historical doctrine and organizational structure. This involved a review of space history and leadership decisions that shaped the use and development of this capability. In addition to understanding doctrine and structure, defining key terms was critical to shape the discussion. Soon after initial space system analysis occurred, senior civilian and military leadership saw the potential for space as a new operational domain to extend global reach while providing key capabilities.

The next phase was to perform a comprehensive review of current space doctrine and policy impacting space and the weaponization of the domain. A plethora of data exists on the space domain, but a shortfall exists on the United States position of weaponizing space. Along with understanding current doctrine and policy, a researcher must strive to understand the mindset of the decision makers of the specific era. This will assist in formulating a full understanding of the topic in order to provide a comprehensive analysis.

With a firm understanding of space doctrine, structure, and policy, a literary review completes the perspective on the topic. In this research, all arguments intend to educate the reader prior to formulating any conclusions and recommendations.

Last, the review analyzed foreign threats that could influence or harm United States space capabilities. During threat analysis, foreign nation policies and doctrine provide great fidelity towards further understanding the primary and secondary research questions. Although, sufficient data exists to compile this thesis, the overall study will be deliberately scoped due to the classification limitation previously mentioned.

### Documentary Analysis

Documentary analysis is a research methodology intended to study and interpret information through a comprehensive review of data that is germane to the study. During the research phase, conflicting data exists regarding the U.S. policy on weaponizing space. This confusion has led to inconsistent policies and direction preventing unity of effort. Within the documentary analysis methodology, DIME and PMESII-PT allows the ability to shape the research into major functional categories. This study will result in a recommendation and conclusion for senior leader action.

### DIME

#### Diplomatic

Diplomacy is the primary instrument of power that communicates with other nation states and foreign entities in order to achieve United States objectives. The lead agency for this instrument is the Department of State. It is important that military members across all ranks understand the role of diplomacy, and how this instrument can impact military options. The diplomacy instrument of power consists of embassies,

ambassadors, negotiations, treaties, policies, and international forums.<sup>86</sup> This study will focus on the role of space treaties and policies in place that influence the decision of weaponizing space. The lack of specificity in national policy and direction has led to confusion and inconsistencies in U.S. themes and messages.

### Information

The United States uses information to provide guidance directing the use of information as an instrument of national power. Information is key in articulating specific messages and themes for strategy development. This instrument provides the critical capacity for organizations to achieve unified action. Information affects all instruments of power and has the ability to create asymmetric advantages of the enemy, if used appropriately. Information consists of military information (i.e., military information support operations), public affairs, communication resources, and media spokespersons.<sup>87</sup> Information is key in the review of space history and the data collection of weaponization. The information collected through various types of sources impacts the reader's ability to analyze the data in order to formulate an opinion. Additionally, reflecting on the use of information as an instrument of power sets the tone of national policy to the international community. This instrument should also reflect the messaging for both domestic and international objectives. Domestically, information can drive unity of effort and action. Internationally, information is a major player in driving agendas towards meeting the commander's objectives. This thesis intends to review all applicable

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<sup>86</sup> Department of Defense, JP 1, *Doctrine for the Armed Forces*, I-12.

<sup>87</sup> *Ibid.*



space documents regarding weaponization in order to use information to shape a new domestic space policy.

### Military

The military has the responsibility of protecting this nation for domestic and foreign threats. The Armed Forces as an instrument of power must ensure that it follows U.S. policies, treaties, and professional standards. This instrument projects military power to ensure protection of national interests. A few categories of the military instrument of power are the range of military operations, technology, size, and force composition.<sup>88</sup> The U.S. military has become dependent on space as a force enabler supporting combat operations. Capabilities such as satellite communication, intelligence, surveillance and reconnaissance, and navigation have revolutionized the battlespace, and have provided an asymmetrical advantage over enemy forces. This advantage is critical in today's operational environment.

### Economics

The United States operates under a free market with very little governmental influence. Economics can be utilized as a source of power that can impact all instruments and their outputs. The Department of the Treasury is the lead agency for the United States economy and a key participant in international economics. A few types of economic power are trade policies, assets seizure and release, trade embargoes, financial aid, and

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<sup>88</sup> Department of Defense, JP 1, *Doctrine for the Armed Forces*, I-13.

tariffs.<sup>89</sup> Economic impacts are an important variable to evaluate in this thesis because it objectively evaluates the financial factors that are linked to the space domain. Any sound policy will consider the economic considerations prior to approval of a new domestic agenda. The economic factors reviewed in this thesis evaluate both domestic and international variables.

While the use of DIME is critical in this study, the additional utilization of operational variables will provide for a deeper understanding and shaping towards planning operations. The variables provide full spectrum situational awareness on any condition that could impact the environment. The operational variables include Political, Military, Economic, Social, Informational, Infrastructure, Physical Environment, and Time. These variables have the ability to describe not only situations, but also the capabilities of enemy forces across all levels of command.

### PMESII-PT

#### Political

The political variable encompasses both the responsibility and power across all levels of governance, including both recognized and transitional political powers. This variable also entails key political groups and public opinion towards the United States. The sub-variables of the political variable include attitude towards the United States, core of political power, government type, effectiveness and legitimacy, and political groups. Within each sub variable are further sub variable settings that evaluate the threats and

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<sup>89</sup> Department of Defense, JP 1, *Doctrine for the Armed Forces*, I-13.

impact of weaponizing space.<sup>90</sup> These variables align with the diplomatic instrument of power and share similar analysis. The distinguisher between the two variables focuses on opposing viewpoints of the United States, and how doctrine should shape national policy.

### Military

The military as an operational variable describes enemy, friendly, and neutral capabilities within a given operational environment. Within this concept is the inclusion of both armed nonmilitary and unarmed combatants. The key intent is to allow decision makers the ability to accurately account and plan for opposing forces. The sub-variables for the military operational variable are military force composition, military force type, non-state forces, unarmed combatants, nonmilitary, armed combatants, and function. Sub- variable settings will be the major template utilized to account for enemy military forces.<sup>91</sup> This variable will be key in setting the stage for understanding the opposition's position on weaponizing space and the impact to the global community. This variable will provide additional fidelity by including consideration of hostile forces into the analysis of space capabilities and intent.

### Economic

Similar to the economic instrument of power, the economic operational variable includes the economic evaluation of a specific environment. The variable although is intended to drill further and consider other considerations such as black market and

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<sup>90</sup> U.S. Army, TC 7-101, *Exercise Design*, 3-2.

<sup>91</sup> *Ibid.*, 3-6.

underground activities that may impact the primary economy. The sub-variables included within this operational variable are economic diversity, employment status, economic activity, illegal economic activity, and banking and finance.<sup>92</sup> The economic variable will be critical in identifying state or non-states actors that have the financial capability or incentive to threaten the United States in the space domain. In addition, a review of the United States space spending provides data on the national investment and commitment towards these capabilities.

### Social

The social variable intends to provide fidelity, cultural, religious, and ethnic composition of an environment. Also included are the associated beliefs and values of those members in society. This variable does not act alone, and will be valuable within the military variable to shape strategies affecting military operations. The sub-variables of this variable are the demographic mix, social volatility, education level, ethnic diversity, religious diversity, population movement, languages, criminal activity, and human rights.<sup>93</sup> This variable will provide insight into possible organic capability or social volatility that could be a factor in shaping a policy that could impact U.S. interest in space.

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<sup>92</sup> U.S. Army, TC 7-101, *Exercise Design*, 3-12.

<sup>93</sup> *Ibid.*, 3-15.

## Informational

The information operational variable will provide additional fidelity to the information instrument of national power. Information in this category will focus on the scope, characteristics, and impacts of individuals, organizations, and systems that can affect the operational environment. The advantage of controlling the flow of information to military and the general population is powerful tool regardless of the operation. The sub- variables of information are public communications media, information warfare, intelligence, and information management.<sup>94</sup> The information evaluated will be for both friendly and enemy and it provides prospective on intent and posturing that will be critical in the decision making process. Examples of utilizing information are the national and military space strategies that convey the American message on the use of space and impacts if disturbed.

## Infrastructure

The infrastructure focuses on structural facilities and installations necessary for the overall function of a given area of concern. Infrastructure is a central variable because of the influence towards other operational variables. The ground infrastructure for satellite command and control traditionally requires large power, heating, and cooling requirements that limit mobility and generates fixed targets or points of failure. The sub-variables for infrastructure are construction patterns, urban zones, building density, utilities present and level, and architecture. This variable is valuable based on

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<sup>94</sup> U.S. Army, TC 7-101, *Exercise Design*, 3-20.

understanding space threats along with infrastructure required for potential command and control networks and development facilities.<sup>95</sup>

### Physical Environment

The physical environment includes manmade and natural geographic structures to include weather and climate in the operational environment. The sub-variables for physical environment include terrain, natural hazards, climate, and weather.<sup>96</sup> For the purpose of this study, this variable will have little influence on the space domain.

### Time

The time variable intends to evaluate the timing, conditions, and duration of activities within a specified operating environment. The sub-variables are knowledge of the area, cultural perception of time, key-event, information offset, exploitation, key date, time, or events.<sup>97</sup> Time will play a role in this study due to potential urgency in the decision process regarding the weaponization of space and the development of capabilities.

### Summary

Chapter 3 identifies the methodology for this study. Documentary analysis provides the process to gather the required information (friendly and enemy) for development of a comprehensive recommendation that answers the research questions.

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<sup>95</sup> U.S. Army, TC 7-101, *Exercise Design*, 3-26.

<sup>96</sup> *Ibid.*, 3-31.

<sup>97</sup> *Ibid.*, 3-42.

Within documentary analysis, DIME and PMESII-PT categorize the collected analysis into a digestible format for the reader.

## CHAPTER 4

### ANALYSIS

#### Introduction

The topic of space weaponization continues to generate the writing of hundreds of novels, movies, and generates spirited discussion. Numerous opinions and recommended courses of action exist on the topic. The purpose of this research was to analyze the collective body of work including books, documents, policy, and doctrine in order to shape a strategy intended to secure freedom of access in space and the protection of assets now and in the future. The purpose of chapter 4 is to analyze the body of work reviewed within the comprehensive literature review. In addition to the literature review analysis, the results of the findings will answer the primary and secondary questions of this thesis. The problem statement of this thesis focuses on the U.S. dependency on space capabilities and consideration of weaponization of space as an avenue to defend and protect national assets. The primary question is should the United States develop and deploy weapons in space? Subsidiary questions include: How does weaponization of space impact the elements DIME and PMESII-PT? How does the military prepare the space cadre for the weaponization of space? These questions are fundamental for the recommended policy changes. The results from Chapter 3 answer two different concerns. The first addresses the strategic policy and doctrinal aspect, while the second focuses on the organization, training, and equipping. Lastly, the analysis evaluated the data by utilizing the Feasible, Acceptable, and Suitable Test (FAS). The FAS test evaluates a course of actions validity. Per U.S. Army Field Manual 5-0, “feasibility” is being able to accomplish the mission within the established time, space, resources, and limitations.



“Acceptable” is the COA that must balance cost and risk with the advantage gained. “Suitable” acts as the COA that can accomplish the mission within the commander’s intent and planning guidance.<sup>98</sup> The use of DIME and PMESII-PT will provide the reader a structured framework focused on the analysis of all major sections of national strategy. While these structures are similar in context, this paper focused on elements of DIME and used PMESII-PT to identify any additional gaps.

The first element of DIME is diplomacy (political and social in PMESII-PT). Diplomacy is the primary instrument of power that communicates with other nation states and foreign entities in order to achieve U.S. objectives. The lead agency for this instrument is the Department of State. It is important that military members across all ranks understand the role of diplomacy and how this instrument can impact military options. The diplomacy instrument of power consists of embassies, ambassadors, negotiations, treaties, policies, and international forums.<sup>99</sup> This study has discovered that the element of diplomacy has many factors to consider including preexisting treaties, escalatory responses, global leverage, and national security concerns. The research conducted revealed indecisiveness between weaponizing space and utilizing diplomacy as an alternative strategy. Proponents of weaponization argue that the weaponization of space is inevitable, and in order to maintain space superiority, now and in the future, space weapons are a must. The opposition argues that the weaponization of space will escalate conflicts and violate the notion of space being strictly for peaceful purposes.

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<sup>98</sup> U.S. Army, Army Doctrine Publication (ADP) 5-0 (FM 5-0), *The Operations Process* (Washington, DC: Department of the Army, March 2010) B-14.

<sup>99</sup> Department of Defense, JP 1, *Doctrine for the Armed Forces*, I-12.

Regarding the primary research question, the only consensus is the lack of one. The findings concluded that civilian leadership and diplomatic agendas per their national policy decisively shape the diplomatic element of DIME. Ultimately, the President of the United States is the final decision authority on space policy and is responsible for setting the strategic agenda. Starting in 2001, the National Defense Strategy shifted from a primarily militarization focus towards the infancy stages of weaponization. Language within national space policy and the withdrawal from the Anti-Ballistic Missile Treaty began laying the foundation and removed restrictions for the possibility of space weaponization. Additionally, while still participants of the Outer Space Treaty of 1967, the United States retains the flexibility to take action that will protect and defend critical national assets. Domestically, research indicated that the weaponization of space could have both positive and negative impacts to national policy. Recent technological advancements continue to drive concerns for Russia and China regarding space advancement and the potential for space weaponization. China and Russia have both supported signing treaties to prevent the weaponization of space, but the United States has refused to acknowledge the concern.<sup>100</sup> Foreign nations understand that the first nation to weaponize space will have a strategic advantage across all elements of DIME and preventing/delaying the United States from developing and deploying weapons in space would be a strategic victory. The true intentions of foreign nations must calculate into the diplomatic decision of weaponizing space.

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<sup>100</sup> Blazejewski, 35.

Table 1. Diplomacy FAS Test			
Diplomacy	Feasible	Acceptable	Suitable
Weaponization	X	X	X
No Weaponization	X	X	X

Source: Created by author.

Information is the second element of DIME (Informational in PMESII-PT). Information remains an important instrument of national power and a strategic resource critical to national security. The concept of information as an instrument of national power extends to non-state actors such as terrorist and transnational criminal groups that use information to further their cause and undermine those of the United States Government and our allies. Every coordinated Department of Defense action, word that is written or spoken, and image that is displayed or relayed, communicates the intent of Department of Defense, and by extension the U.S. government.<sup>101</sup> The technological domain within the instrument of power includes traditional communication models such as the sender, receiver, transmission medium, and the message. With the technological innovations over the last twenty years, additional elements have been included that introduce challenges to the information instrument of power. These additions include the internet, radio waves, satellite communications, and wireless networks. The United States has struggles in the use of information as a soft power strategy in the full range of military operations. The ease and accessibility of information tools has created challenges in addition to potential opportunities. As a nation, the United States has primarily focused

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<sup>101</sup> Department of Defense, JP 1, *Doctrine for the Armed Forces*, I-12.

on diplomacy, military, and economic portions of DIME, while neglecting the powerful instrument of information until the Rumsfeld Commission and the aggressive language in the National Space Policy of 2006. The policy listed three principles that are critical to evaluate regarding the idea of weaponizing space:

1. The United States commits to the exploration and use of outer space by all nations for peaceful purposes, and for the benefit of all humanity.<sup>102</sup>
2. The United States considers space capabilities—including the ground and space segments and supporting links—vital to its national interest. The United States will preserve its rights, capabilities, and freedom of action in space; dissuade or deter others from either impeding those rights or developing capabilities intended to do so; take those actions necessary to protect its space capabilities; respond to interference; and deny, if necessary, adversaries the use of space capabilities hostile to United States national interests.<sup>103</sup>
3. The United States will oppose the development of new legal regimes or other restrictions that seek to prohibit or limit access to or use of space. Proposed arms control agreements or restrictions must not impair the rights of the United States to conduct research, development, testing, and operations or other activities in space for U.S. national interests.<sup>104</sup>

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<sup>102</sup> Bush, 1.

<sup>103</sup> Ibid., 1-2.

<sup>104</sup> Ibid., 2.

The three listed principles describe national space policy for the United States. The first principle describes the United States commitment towards the utilization of space for peaceful purposes, but do U.S. adversaries have the same intent? As the world leader in space development and usage, the United States maintains an asymmetrical advantage over adversaries that potentially threatens their foreign environment. This advantage has the potential to drive adversaries to respond by creating similar capability, or alternative means, to negate the capability. The Outer Space Treaty of 1967 is the sole space treaty that creates the coalition preserving space as a peaceful environment. The second principle tends to conflict with the first principle, but in reality intends to provide more fidelity. Although the literature review uncovered many differing perspectives, the one fact is, in 2016, weaponization has occurred in four out of five warfighting domains. The land, sea, air, and cyber have all fully transitioned from a peaceful to a warfighting environment. A fair assumption to make is that the space domain will follow at some point.

The National Space Policy of 2006 is the first to use aggressive language focusing on the rights of nations' use of space and the repercussions of impacting freedom of access. The key phrase is that the United States will take necessary actions to protect its space capabilities. This is a strong informational statement to make, indicating the possibility that space is transitioning from militarization to weaponization. The third principle targets the freedom to conduct research or develop capabilities that would restrict the United States from meeting national objectives. This is relevant with the United States' refusal to sign the prevention of an arms race in outer space treaty developed by both China and Russia.

The opposition is justified by two main arguments. First, the United States believes the prevention agreement is unnecessary since the problem currently does not exist. Secondly, the United States has yet to agree with foreign nations on the definition of a space weapon.<sup>105</sup> While these two definitions are correct, they just explain a portion of the story. The United States has a long history of honoring treaties signed on behalf of the nation. To sign a treaty such as the prevention of an arms race in outer space treaty limits strategic and operational flexibility in the space domain. In a perfect world, a treaty would prevent a new space race, but in reality, the enemy has a say, which adds a layer of complexity. China and Russia’s attempt for a peace treaty in space is a tactic intended to slow down American efforts in order to gain equal, if not superior technology.<sup>106</sup> The first nation to weaponize space would send a ripple through the world of space superiority. Near-peer nations want this title for themselves. The United States cannot afford to slow down its innovation in order to develop, create, and deploy the technology to secure the desired freedom of access to space. This technology will take many years to develop, and the clock is ticking.

Table 2. Information FAS Test			
Information	Feasible	Acceptable	Suitable
Weaponization	X	X	X
No Weaponization	X	X	X

*Source:* Created by author.

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<sup>105</sup> Blazejewski, 35.

<sup>106</sup> *Ibid.*, 39.

The military is the third element within the instrument of national power constructs (Military, Physical Environment, and Time in PMESII-PT). Over the last twenty years, the military has integrated space capabilities into every segment of operations. United States military space assets are force enablers that provide satellite communication, missile warning, launch, space control, positioning, navigation, and timing in order to achieve a desired objective or end state. Although an operational domain for fifty years, space is considered one of the youngest warfighting domains and the military rules of engagement are still in their infancy. The analysis of the literature reviews unveiled three main findings. First, space remains weapons free.<sup>107</sup> Multiple authors argue that humans have the capability to prevent further aggression in space and that the space is fundamentally different from the other warfighting domains. The second argument recommends space weaponization (offensive minded). Due to national dependency and integration of space assets, the critical capabilities require protection. Adversaries view space as a vulnerability of the United States, and will leverage this as a potential vulnerability in future conflicts. The United States cannot afford to lose freedom of access in space. In this mindset, the United States will proactively weaponize space in order to maintain initiative and protect national security.<sup>108</sup> The third finding recommends that the United States weaponize space due to adversarial threats (defensive minded). Adversaries will develop space-based weapons because they believe the United

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<sup>107</sup> Christy, 13.

<sup>108</sup> Blazejewski, 39.

State has or will have the capability, or to simply challenge the Americans.<sup>109</sup> This option forces the United States to develop space-based weapons founded on foreign threat assessments and the potential for the loss of space supremacy. Two of the three derived opinions drive the United States towards a potential policy shift. While many differing opinion and recommendations exist, the only three discussed are the major three opinions captured during the literature review.

In order to demonstrate the importance of space in U.S. warfighting capabilities, an adversarial strategic center of gravity analysis reveals space critical capabilities, critical requirements, and critical vulnerabilities. A center of gravity analysis identifies both friendly and enemy strengths and weaknesses that can be diminished or exploited by potential adversaries. Critical capabilities act as crucial enablers that are essential to the accomplishment of objective(s). Critical requirements are the “conditions, resources, and means” that allow critical capabilities to function.<sup>110</sup> Critical vulnerabilities are those requirements that are susceptible to enemy attack. All three characteristics are critical in identifying and understanding the factors that shape a national strategy. While not all-inclusive for classification purposes, the intent of this analysis is to demonstrate the importance of space capabilities within the U.S. military architecture, and highlight the importance of their protection. For the purpose of this paper, the only center of gravity analyzed is the space domain.

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<sup>109</sup> Billings.

<sup>110</sup> Department of Defense, JP 5-0, *The Operations Process*, III-24.



Table 3. Center of Gravity Analysis	
United States COG Analysis (Space Centric)	
Center of Gravity (COG)	United States Military (Space Focus)
Critical Capability (Space Centric)	<ul style="list-style-type: none"> <li>-Enable positioning, navigation, and timing for operations (munitions, troop movement, tracking etc.)</li> <li>-Disrupt/Prevent adversary use of space capabilities</li> <li>-Provide early warning notification</li> <li>-Provide intelligence, surveillance, and reconnaissance</li> <li>-Enables Space Situational Awareness</li> <li>-Provide secure communication links (protected, remotely piloted aircraft etc.)</li> <li>-Provide Offensive/Defensive capability</li> </ul>
Critical Requirement	<ul style="list-style-type: none"> <li>-Command and control links</li> <li>-Trained operators</li> <li>-Space segment</li> <li>-Ground segment</li> <li>-Debris free environment</li> <li>-Analysts</li> <li>-Launch capability</li> <li>-Rules of Engagement</li> </ul>
Critical Vulnerabilities	<ul style="list-style-type: none"> <li>-Command and control links</li> <li>-Space &amp; Ground segments</li> <li>-Debris</li> <li>-Rules of Engagement</li> </ul>

*Source:* Created by author.

The center of gravity analysis (table 3) lists major space capabilities, requirements, and vulnerabilities using a military lens. The space capabilities provided are critical through all phases of a military operation. As a force enabler, space capabilities provide warfighters across all services with better situational awareness to minimize loss on the battlefield, and ensure forces properly prepare for the anticipated enemy. While the majority of responsibilities fall to the U.S. Air Force, all services contribute in providing effects from space. The ability to fly aircraft remotely from

halfway across the globe and precision-guided weapons has been the corner stones of innovation within the military. Space has eight critical requirements in order to provide the desired effects. These requirements impact many nations, and are important to identify in order to dedicate limited resources (monetary, people, etc.) appropriately. While the capabilities and requirements are important, understanding vulnerabilities provide the most awareness. The most important part of understanding a domain's vulnerabilities is the ability to provide an honest assessment on system limitations and capability gaps. The four vulnerabilities listed are essential for planning purposes. As potential single points of failure, they require additional consideration in order to achieve any form of operational resiliency. Each of the vulnerabilities has the ability to negatively impact the entire architecture and the ability to project power. These vulnerabilities require protection to ensure the capability exists when needed most.

Table 4. Military FAS Test			
Military	Feasible	Acceptable	Suitable
Weaponization	X	X	X
No Weaponization	X		

*Source:* Created by author.

Economics is the final instrument of national power (Economic and Infrastructure in PMESII-PT). The United States has the largest economy in the world. The national gross domestic product of the United States is \$17.4 trillion with China closely following at \$10.4 trillion (figure 4).

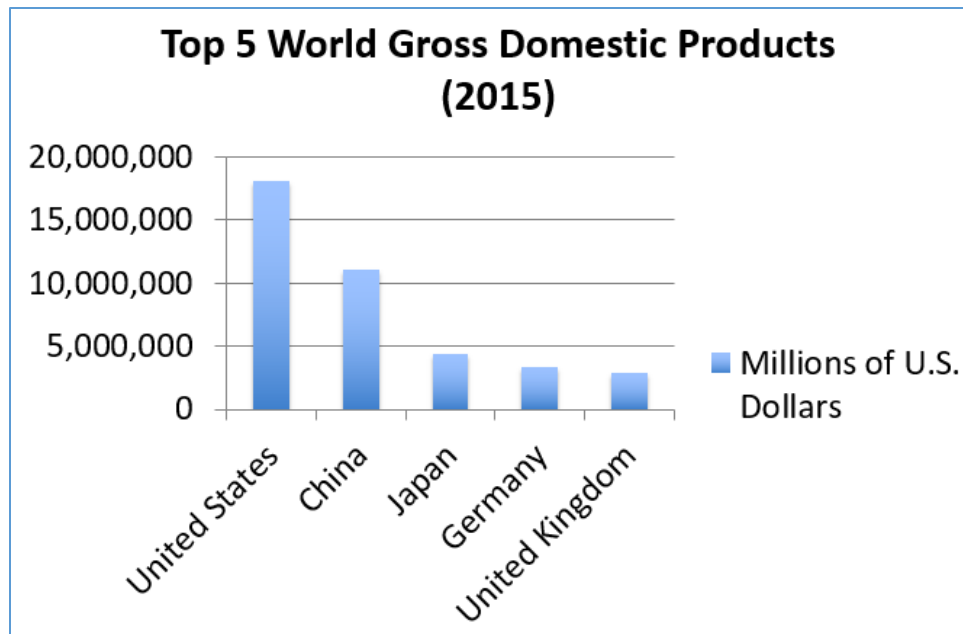


Figure 4. Top Five World Gross Domestic Products

Source: Created by Author

The Russian economy is listed tenth worldwide with a total gross domestic product of nearly \$2 trillion.<sup>111</sup> Understanding of the economic situation of the largest three space-faring nations is critical in gaining perspective on space strategy. Nations view monetary investment as an indicator towards national strategy and capability development. The United States, as the largest economy in the world, also has a strong economic base for the supply and development of space capabilities. With the United States applying considerable funding towards the space domain, the foreign community

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<sup>111</sup> Myles Udland, “Here’s a Friendly Reminder That the US is the Biggest Economy in the World,” Business Insider, 15 February 2016, accessed 15 October 2016, <http://www.businessinsider.com/united-states-worlds-biggest-economy-2016-2>.

can perceive this investment as a risk to their national security.<sup>112</sup> Investment translates into technological advances that create a larger capability gap with foreign nations. This is a concern for adversaries of the United States. In 2015, the United States Comptroller accounted for the spending of \$6.2 billion towards space systems (table 5). Although other sources of funding may also contribute to space system development, this thesis will only focus on published and unclassified projections.

Table 5. 2014/2015 US Investment in Military Capabilities (\$ in billions)		
	2014 Enacted	2015 Requested
Aircraft/Related Systems	42.4	40.0
Shipbuilding/Maritime Systems	23.0	22.0
Missiles & Munitions	9.5	9.0
C4I Systems	6.2	6.6
Space Systems	6.2	6.2

*Source:* Created by Author

In this definition, the space system includes all three segments: space, ground, and launch. In 2016, the Presidential Budget included a \$7.1 billion budget for space.<sup>113</sup> The major programs listed for space procurement are satellite communications, Overhead Persistent Infrared, and Global Positioning System III.<sup>114</sup> The funding of these space

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<sup>112</sup> Zhang, 6-7.

<sup>113</sup> Department of Defense, *United States Department of Defense Fiscal Year 2016 Budget Request* (Washington, DC: Office of the Secretary of Defense, February 2015), 51, accessed 20 October 2016, [http://dcmo.defense.gov/Portals/47/Documents/Publications/Annual%20Performance%20Plan/FY2016\\_Performance\\_Budget.pdf](http://dcmo.defense.gov/Portals/47/Documents/Publications/Annual%20Performance%20Plan/FY2016_Performance_Budget.pdf).

<sup>114</sup> *Ibid.*

programs is critical in maintaining current space superiority while maintaining readiness for future operations. Each one of these programs plays a vital role in allowing the warfighter to project power across the globe and ensure that U.S. space capabilities are second to none. The listed programs are not all-inclusive, but are a snapshot to represent funding allocation. The weaponization of space is an important factor to consider due to the strategic implications towards the national economy. Weaponizing space has the potential to constrain financial opportunities in the space domain by limiting investments relationships (domestic or international), reducing revenue streams, and increasing international tension. Deliberately choosing not to weaponize space could cause consequences to freedom of access, national security concerns, and space supremacy.<sup>115</sup> All these factors play a role in developing a national strategy for space. Either decision will impact both civilian and military economic initiatives within the United States in addition to impacts amongst the international financial sectors. According to the Space Report 2016, the entire global space industry is valued at \$329 billion with the largest income from telecommunications, broadcasting, and earth observation generating \$126 billion (figure 6). Commercial infrastructure and support functions to include manufacturing all segments of space systems to include launch capability totaled \$120 billion. The USG spent \$44.57 billion on space technology in 2015. In addition to government space spending, non- USG invested \$31.95 billion in space.<sup>116</sup> In order to

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<sup>115</sup> Blazejewski, 36.

<sup>116</sup> Space Foundation, *The Space Report 2016: The Authoritative Guide to Global Space Activity* (Colorado Springs, CO: Space Foundation, 2016), 1-2.

operate the space systems developed, a dedicated space industry is required in order to create, launch, and operate space assets. In 2014, the U.S. civilian sector employed 221,585 workers as space cadre.<sup>117</sup> The importance of the civilian backbone in the U.S. economy cannot be understated. Any shift in national space policy would be ill advised to not consider the impacts of space weaponization on the civilian sector. The U.S. civil and military space industries have historically leveraged a symbiotic relationship that warrants consideration of economic risk.

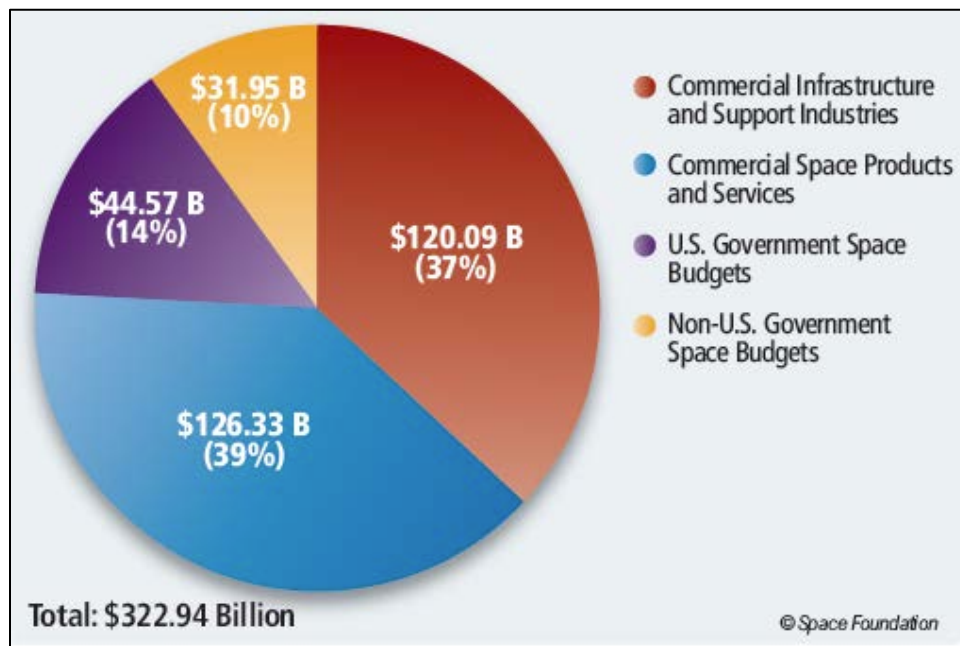


Figure 5. Space Budget

Source: Space Foundation, “The Space Report 2016,” accessed 12 November 2016, [https://www.spacefoundation.org/sites/default/files/downloads/The\\_Space\\_Report\\_2016\\_OVERVIEW.pdf](https://www.spacefoundation.org/sites/default/files/downloads/The_Space_Report_2016_OVERVIEW.pdf), 1.

<sup>117</sup> Space Foundation, 2.

The analysis is clear; both the U.S. military and civilian sectors maintain significant investment within the space industry. Development of a new national space strategy will require the inclusion of all elements of DIME in order to shape a strategy that meets the intent of the President of the United States.

Table 6. Economic FAS Test			
Economic	Feasible	Acceptable	Suitable
Weaponization	X	X	X
No Weaponization	X	X	X

*Source:* Created by author.

The use of DIME and PMESII-PT provide a methodology in order to frame the analysis of literature on the weaponization of space. Whether or not space is weaponized, the only agreed upon information from the literature review is that the space domain has becoming increasingly more aggressive, driving the requirement for advance training. General John Hyten, the former Air Force Space Command commander, stated in his Space Mission Force White Paper, “The training and skills that sustained our space operations for the last several decades are not the same skills we need to fight through threats and win in today’s contested, degraded, and operationally-limited environment.”<sup>118</sup> This new training concept is called, “Space Mission Force,” and comprises “all units and personnel who constitute the operation of Air Force space

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<sup>118</sup> John Hyten, *White Paper: Space Mission Force* (Peterson Air Force Base, CO: Air Force Space Command, 29 June 2016), 2.

systems, primarily operating from garrison, as a ready force able to operate weapons systems and execute missions in a contested, degraded, and operationally limited environment.”<sup>119</sup> The Air Force has determined that a cultural shift is required in order to develop and grow a new set of skilled operators in order to protect freedom of access to space while preparing to defend systems, if required. The commander’s intent is to:

Implement Space Mission Force a new advanced training and force presentation model that prepares our space force to meet the challenges of today’s space domain, while ensuring we continue to provide vital space capabilities for the Joint Force now and in the future.<sup>120</sup>

The concept of Space Mission Force is to impact all space professionals to include operators, mission support, intelligence, and staff positions (Active and Reserve). The goal of Space Mission Force is to instill focus and discipline to generate a force capable of achieving space superiority by leveraging two main lines of effort: training and force presentation.<sup>121</sup> Training intends to increase the skill and proficiency of space forces by leveraging advance and realistic training. Traditional force presentation is utilized to align with Air Force combat by using traditional command and control structures. Space Mission Forces will generate Unit Type Codes in order to assemble forces and present them to combatant commanders to mirror institutionalized models by the Combat Air Force and Mobility Air Force.<sup>122</sup> Additionally, Air Force Space Command desires a space military force that no longer focuses on repetitive satellite

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<sup>119</sup> Hyten, 3-4.

<sup>120</sup> Ibid., 2.

<sup>121</sup> Ibid., 4.

<sup>122</sup> Ibid., 8.



tasks, such as states of health, timing updates, or station tracking. Instead, military members can focus on specialized tasks and threat assessments, which translate into new tactics, techniques, and procedures. The Space News article, “Air Force Solicits Info on Outsourcing WGS Operations,” states that the service wants to use uniformed space personnel more for battle management tasks, as opposed to routine satellite maintenance operations.”<sup>123</sup> The training transition exemplifies the shift from a passive reactive approach to a proactive philosophy. The military is training and preparing the space force for emerging threats reflecting a contested, degraded, and operationally-limited environment.<sup>124</sup> This new training includes advance techniques designed to identify, defend, and protect national space assets while maintain the capability to deny the enemy access to their space assets. The next logical step after training is implementation of the capability.

The analysis of weaponizing space presents data to support both sides of the argument. Utilizing DIME with PMESII-PT imbedded, allows for a framework within the documentary analysis methodology to present data in a digestible format. The weaponization of space requires strategic decisions composed of many variables. Just because something is possible does not mean that the plan is the correct course of action. Civilian and military leadership must consider all the ramifications to include any secondary and tertiary effects in order to make the best decision for the security of the United States.

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<sup>123</sup> Gruss.

<sup>124</sup> Hyten, 2.

## CHAPTER 5

### CONCLUSIONS AND RECOMMENDATIONS

#### Introduction

In the space arena, the early bird gets the worm. The United States currently maintains the asymmetrical advantage of space development and technological capability that can influence the next generation of warfare. This thesis intends to answer the primary question, should the United States develop and deploy weapons in space? In order to understand the primary question, two subsidiary questions arose: how does weaponization of space impact the elements of diplomacy, Information, Military, and Economics (DIME) and the operational variables Political, Military, Economic, Social, Information, Infrastructure-Physical Environment, and Time (PMESII-PT)? How does the military prepare the space cadre for the weaponization of space (force management and training)? Additional information and questions that arose required documentation to support future analysis. Subsequent research is needed to be achieved in order to fully capture and analyze this data. This chapter will analyze the results and implications collected in chapter 4 of this thesis; then will provide recommendations for further study and action. The analysis chapter of this paper uncovered multiple opinions regarding the strategic policy of space weaponization. The findings supported three potential courses of action: first, space remains weapons-free; second argument recommends space weaponization (offensive minded); third finding recommends that the United States weaponize space due to adversarial threats (defensive minded). In the case of most major national decisions, one unified idea failed to rise as the final solution in the analysis phases. Instead, courses of action packaged with a risk assessment present the

recommended options to achieve the desired end state. In this case, the desired end state is a space environment that allows the United States the freedom of access in a contested atmosphere with adversaries that intend to diminish that capability to their advantage. Details collected throughout this thesis provide refinement introduced later in this chapter. The conclusion is that a robust space policy emphasizing weaponization is, unfortunately, a necessary evil in order to maintain space supremacy and secure freedom of access.

### Interpretation

The analysis chapter of this thesis presented all the research uncovered during the literature review through the optic of DIME (and PMESII-PT). The Feasible, Acceptable, and Suitable analysis displayed at the end of each variable determines the viability of weaponizing space. The research did not discover the “silver bullet” solution. Each course of action presents unique risk along with secondary/tertiary impacts that informs senior leadership across all levels of command. The first variable analyzed by FAS was diplomacy (political and social in PMESII-PT) (see table 7).

Table 7. Diplomacy FAS Test			
Diplomacy	Feasible	Acceptable	Suitable
Weaponization	X	X	X
No Weaponization	X	X	X

*Source:* Created by author.

The weaponization option passed all three segments of the FAS test. Weaponization is feasible because the United States is the most capable nation regarding

space capabilities and is likely in the position of power to shape diplomatic efforts in the desired timeframe and domain with appropriate resources and constraints. The first step is to leverage the diplomacy element by solidifying national space policy with a clear mandate towards weaponization. Clear direction provides unity of effort and singularity towards achieving a desired end state. Additionally, the United States possesses significant influence within the United Nations to prevent the United Nations Office for Outer Space Affairs from imposing undesired restrictions on U.S. space efforts. As such, the United States continues to disapprove the prevention of an arms race in outer space treaty proposed by China and Russia by aiming to prevent space weaponization. Diplomatically, weaponization is acceptable based on the inherent ability to establish clear intentions to the international community by eliminating any ambiguity. Weaponizing space is the ultimate elephant in the room. The end state for space is weaponization and being the first nation to accomplish this feat will provide a great strategic advantage. While traditionally opposed to announcing national critical capabilities, adversaries currently perceive the United States space policy and initiatives aimed towards the ability to weaponize space. If handled appropriately, the United States can lead a major role in developing international space policy that is in line with national interests. This will come with a cost. Adversary nations may attempt to protest the complete policy shift or increase similar efforts, but current restrictions do not prevent the use of conventional (non-nuclear) weapons nor does the United States shy away from developing capabilities in other warfighting domains. The suitability of developing space diplomacy is another critical factor to consider. The weaponization option passed the FAS test based on current space policy requiring the ability to protect national assets in

order to ensure freedom of access. While national space policy does not list specifics, the requirement to protect space assets exists and capabilities are required to create the desired effect. Weaponization is one option to meeting the commander’s intent. On the other hand, the FAS analysis to not weaponize space concurrently provided important understanding towards the cost benefit analysis. Commanders require key information to make the best decision possible. The diplomacy instrument of power passes the feasibility test, but requires additional complications of preventing other nations from developing the capability. Space is a major enabler for the United States in all facets of DIME. Prevention and instituting verification methods can be complicated with current space rules of engagement and may leave the United States susceptible, if diplomacy fails. Not weaponizing space also passes the acceptability test. Arguments exist to maintain space as a peaceful environment intended for all mankind, and this option would maximize the cost benefit over weaponization. Lastly, diplomacy passes the suitability test, but incurs similar risk associated with the feasibility segment. Ultimately, diplomacy presents challenges and requires a mutual trust with foreign nations for compliance. Choosing not to weaponize space can meet the commander’s intent, but will require multiple layers of protection and validation in order to be effective. The diplomatic option to prevent the weaponization of space is not recommended.

Table 8. Information FAS Test			
Information	Feasible	Acceptable	Suitable
Weaponization	X	X	X
No Weaponization	X	X	X

*Source:* Created by author.

Information is the second element of DIME (informational in PMESII-PT). The weaponization of space within the information instrument of power passed all three segments of the FAS test. The feasibility test will pass due to the impacts both domestically and internationally. Weaponization assists the information instrument of power by providing clarity and vision. The goal of ultimately protecting assets and ensuring freedom of access to the space domain starts with understanding the end state and providing the commanders intent. Receiving a commander's intent is part of the Army's mission command philosophy designed to empower leaders to conduct operations. The six principles of the mission command philosophy are: Build a cohesive team through mutual trust; create a shared understanding; provide clear commander's intent; exercise disciplined initiative; use mission orders; and accept prudent risk.<sup>125</sup> These six principles directly correlate to the need of a clear weaponization information campaign in order to accomplish the mission. With a proper information strategy, a clear mission statement will reduce risk in one aspect by unifying effort to achieve a common goal. There is the potential for increased risk with international partners by publicly advertising, such a bold space weaponization policy. The major reason for the pass of this test is the advantage gain by taking the initiative to be the first nation to secure and protect the space domain with weaponization. The suitability test passed because an information concept of space weaponization is in line with the extrapolated trajectory since the 2006 National Space Strategy. If the senior level of command decides not to weaponize space, then information will play a major component in conjunction with the

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<sup>125</sup> U.S. Army, Army Doctrine Reference Publication (ADRP) 6-0, *Mission Command* (Washington, DC: Department of the Army, May 2012), 1-3.

diplomatic instrument of national power. This option also passes the FAS test, but introduces multiple levels of risk that fail to outweigh the gained advantage. The feasibility test passes because there are many proponents who wish to maintain space as a weapons free zone. This includes both United States and international partners. The issue is the reasoning behind the desires. Words have meaning. The adoption of this effort would require a reduction in tone of all national and military space policies reserving the right to take all actions necessary to protect space assets. In addition, this decision would drive an international agreement defining the terms of space weapons and any rules and regulations to enforce the policy. This information option will be a lengthy process requiring the trust of a “neutral” organization that has had questionable effectiveness in enforcing previous international agreements. This option regresses standing United States policy. If the United States deems this information change unacceptable, then the information instrument of power fails the feasibility test. The acceptability test also passes the FAS test, but contains major levels of risk. The major risk associated with this policy corresponds to the concern from outside regulation. Any agreement will force the United States to halt any (if any) efforts to weaponize space, creating an opportunity for an adversarial nation to surpass the United States as the space super power. This will drive catastrophic impacts across all elements of DIME. Never has the United States placed the fate of a critical warfighting domain in the hands of outside international organization that is not focusing primarily on United States interests. The suitability of this test passes only with the overarching assumption that the United States is willing to create a treaty or policy withdrawing any efforts to weaponize the space domain. If implemented, an international treaty could stabilize the space arena and ensure freedom

of action. Ultimately, information fails to meet recommendation criteria for the prevention of space weaponization.

Table 9. Military FAS Test			
Military	Feasible	Acceptable	Suitable
Weaponization	X	X	X
No Weaponization	X		

*Source:* Created by author.

The military is the third element within the instrument of national power construct (military, physical environment and time in PMESII-PT). The term military in this context includes all non-civilian systems (i.e., intelligence community, Department of Defense, etc.). The weaponization option within the military instrument of power passed all three segments of the Feasible-Acceptable-Suitable (FAS) test. The military lens is feasible because adequate resources and technological advantage to be the first to tame this domain. Financial resources are available for investment into weaponization technology. Limitations derive from technological development and acquisition of weapon systems within the appropriate timeline. The weaponization passed the acceptability test. The potential gain of space superiority and protection of national space systems is greater than any associated risk. The risk associated to this option is the international escalation that could lead to greater danger in the domain. With the continual escalation in all other domains, a reasonable military perspective assumes space will meet that eventuality. Executing a transparent and bold strategy of weaponization of space may drive an accelerated timeline. Suitability also passed the test based on the



military instrument meeting the intent of current national space strategy. Choosing not to weaponize space in the military instrument of power only passed the feasibility test. From a military perspective, the feasibility for the military to deliberately decide not to weaponize space would fall in line with current militarization doctrine directed by civilian leadership. Maintaining the status quo is feasible, but ultimately not recommended. The acceptability and suitability test of not weaponizing space did not pass the FAS test based on the accepted risk and the inability to accomplish key objectives from the national space policy requiring the ability to defend and protect space assets/capabilities. The goal of the military is to protect the U.S. interests both domestically and foreign. With that optic in mind, any hesitation to transition from militarization to weaponization is unacceptable. Failure to weaponize space leaves military systems that enable both domestic and international operations susceptible to attack and degradation of capability. The center of gravity analysis also demonstrates that space provides critical capabilities to the U.S. military and adversaries will continue to strive for a similar asymmetrical advantage.

Table 10. Economic FAS Test			
Economic	Feasible	Acceptable	Suitable
Weaponization	X	X	X
No Weaponization	X	X	X

*Source:* Created by author.

Economics is the final instrument of national power (economic and infrastructure in PMESII-PT). Billions of dollars every year funnel through contractor organizations to

develop, procure, operate, and maintain space systems. Weaponizing space through the economic lens passes all segments of the FAS test, but not without risk. The feasibility test passes because the space industry is well funded with budgets continuing to increase as adversaries continue to contest the domain. The 2016 appointment of General John Hyten, to the position as United States Strategic Command commander sends a key message that space and cyberspace are major factors in future conflicts. General Hyten, as former Air Force Space Command commander, is responsible for both 14th (space) and 24th (cyber) Numbered Air Forces, and his key knowledge and testimony will play a critical role in recommending future space policy and requesting additional funding. Weaponization passes the acceptability test with risk. An aggressive space policy from the United States will focus on potential trade relations in addition to increased hostilities from near peer adversaries through proxies like North Korea. The risk will require careful balancing, but the U.S. policy on space cannot afford to fall victim to external threats. The advantage gained is worth the associated risk. The suitability test passes for similar reason with the other instruments of power. Current national space policy demands focus on developing capabilities to defend and protect friendly space systems from any aggression. This demands significant research and testing to harness and employ. The lead-time for development is substantial and the space industry currently cannot support the concept of replenishment. Current timelines to replace a space asset could be twelve to twenty-four months depending on the program of records. The deliberate decision to not weaponize space through the economic lens also passed the FAS test. The feasibility segment passed based on the national strategy staying in an “as is” status. While feasible in conjunction with other instruments of power, the mission accomplishment is in

jeopardy with billion dollar assets developed with limited protection. Deciding not to weaponize space also passes the acceptability and suitability test. Leveraging other elements of DIME will take a lead in developing agreements to would prevent escalation in space and cost savings associated with protection. The agreements would also need to be acceptable to the President of the United States and incorporated into national space policy to shape financial investment into capabilities.

### Recommendations

The debate to weaponize space is a major discussion point in the twenty-first century. The recommendation of this thesis is that the United States should completely transition national space policy towards weaponizing the last warfighting domain. The weaponization of space impacts all elements of DIME and is an acceptable course of action that met FAS requirements. Although risky, the gained advantage outweighs the cost. Additionally, the weaponization of the domain will protect space assets and ensure freedom of access for all ranges of operations. This option meets the commander's intent and takes the initiative towards maintaining space supremacy.

The initial strategy is to develop a national policy focused on weaponizing space. The new weaponization policy demands proper coordination through all involved organizations, agencies, and departments. This policy requires presidential approval to ensure proper incorporation into subordinate documents such as the National Defense and National Military Strategies. The consolidated vision creates unified action towards weaponizing space and allows for the maximum use of resources and manpower.

The next phase is to use the information and economic domain to reinforce diplomatic efforts to ensure resources are available and the proper messaging announces

the United States intent to weaponize space. Diplomatic outrage will be significant, but the strategic shift is in the best interest for United States space policy. Weaponization is inevitable and the opportunity to get an advantage over adversary nations is a rare opportunity. The United States should reject any efforts to slow technological innovation that will enable the weaponization of space.

The final phase is for the military instrument of power to gather the resources and direction from senior leadership to design, develop, and maintain space based weapons. While systems enter the development phase, space operators will be required with advance training to properly operate the systems and develop new tactics, techniques, and procedures. The four instruments of power are independent functions, but the delineation between each variable is not clear-cut. A blurry barrier exists between the various combination of each variable that also drives continuous review to create flexibility and allow implementation of the proper strategy. The right tools must be use to fix the problem.

In order to meet the timeline for this thesis, many questions were left unanswered. The first major question is can the weaponization of space by the United States act a deterrent for further weaponization? The second major question is with the transition from President Obama to President Trump: what will be the new national space policy, and will it focus on more commercialization? Third, how long until space weapons can realistically be deployed? Fourth, should the United States military create a separate service for a space force? All these questions will play a critical role in providing more fidelity towards a national weaponization position for the space domain.

## Summary and Conclusion

There has been great hesitation to transition the United States space strategy from militarization to weaponization. Skeptics of weaponizing space argue that Pandora's Box will open, and diplomatic efforts can maintain space as a peaceful domain. On the other hand, there are five recognized warfighting domains: air, land, sea, space, and cyber. The only domain that has yet to see weapons is space. Space will follow the footsteps of previous domains and become weaponized. National strategy should capitalize on current domain advantages such as technological advancements and capability in order to achieve the commander's intent. Various levels of risk are involved with any decision, but the responsibility of a staff is to present to the commander all options with a proper risk assessment to allow the commander to make the best decision possible. The final recommendation of this thesis is to begin the transition from militarization to weaponization of space. To have a known strategic advantage over an enemy in a warfighting domain is rare. The U.S. cannot afford to squander this opportunity.

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