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Disaggregating the United States Military: An Analysis of the Current Organizational and Management Structure of U.S. National Security Policy as It Relates to Military Operations in Space

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DISAGGREGATING THE UNITED STATES MILITARY: AN ANALYSIS OF THE CURRENT ORGANIZATIONAL AND MANAGEMENT STRUCTURE OF U.S. NATIONAL SECURITY POLICY AS IT RELATES TO MILITARY OPERATIONS IN SPACE

A Master's Thesis

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In Partial Fulfillment

Of the Requirements for the Degree

Master of Science, Defense and Strategic Studies

By

Joseph Myles Zeman

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ABSTRACT

This thesis was written to provide the reader with a comprehensive assessment about the realities of the current organizational and management structure of United States national security policy as it relates to the conduct of military operations in space. To create an encompassing argument, this thesis considers the current organizational structure of United States space policy while acknowledging that space has, in fact, become a warfighting domain. A reorganization of this magnitude has the potential to generate a succinct chain of command for military space operations while condensing the space acquisitions process and ultimately providing military space operations with the attention and resources needed to keep America and its allies safe. However, this thesis examines if reconfiguring the current organizational and management structure of United States national security space components does, in fact, have the power to accomplish such objectives. This thesis relies heavily upon the testimonies and documentation derived from both the Department of Defense, as well as the United States Congress. In addition, it is acknowledged that U.S. policymakers have driven this issue into becoming one that is largely bureaucratic and inherently politicized. This thesis ultimately concludes that some degree of reconfiguration to the current organizational and management structure of United States policy as it relates to military operations in space has the potential to positively affect the national security space establishment.

KEYWORDS: space policy, organizational and management structure, deterrence, national security, space components, strategy

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I dedicate this thesis to our United States Servicemen and Servicewomen

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INTRODUCTION

"This is one of the most critical times in our national security space history – it will be seen as a strategic inflection point." – General John J Raymond (April 17, 2018)

On June 18, 2018, at a National Security Council meeting the 45th President of the United States of America, Donald J. Trump, publicly directed the Department of Defense (DoD) to begin creating a sixth United States military branch, a Space Force. At this same National Security Council meeting, President Trump leaned on General Joseph Dunford, Chairman of the Joint Chiefs of Staff, asserting "if you would carry that assignment out, I would be very greatly honored."[1] Despite the June announcement being somewhat of a surprise to the majority of the American population, the discussion of a separate "space branch" gained momentum in March 2018, during President Trump's visit to Marine Corps Air Station Miramar in California.[2] The decision to reconfigure the current organizational and management structure of U.S. national security policy as it relates to military operations in space has faced push back by both high ranking civilian and military officials. Former astronaut, John Kelly, asserted that "This is a dumb idea. The Air Force does this already. That is their job. What's next, we move submarines to the 7th branch and call it the 'under-the-sea-force?'."[3]

Even though opposition to President Trump's call for a sixth military branch is apparent, it seems that there is no better time to begin assessing the current organizational and

[1] Valerie Insinna, Aaron Mehta, "Trump Orders Creations of Independent Space Force – But Congress Will Have Its Say," Defense News, June 18, 2018.
[2] Hart, Benjamin, "Trump Announces 'Space Force' He Wants to be Sixth Branch of Military", *Nymag.com*, June 18, 2018.
[3] Dave Mosher, "Astronaut Mark Kelly Says Trump's Plan to Create a Space Force 'is a Dumb Idea'," Business Insider, August 10, 2018.

management structure of U.S. national security policy as it relates to military space operations. Throughout this thesis, an analysis will be provided to assess whether the current organizational and management construct of U.S. policy related to military operations in space is adequate for addressing the advanced threat from China, Russia, and other adversarial nations. Despite section 1601 of the National Defense Authorization Act (NDAA) for Fiscal Year (FY) 19 demanding that "With the Advice and assistance of the Chairman of the Joint Chiefs of Staff, the President, through the Secretary of Defense shall establish under the United States Strategic Command a subordinate unified command to be known as the United States Space Command (in this section referred to as 'space command') for carrying out joint space warfighting operations," the idea has faced opposition. There must be an appropriate degree of analysis for whether this will benefit the current organizational and management structure of U.S. national security space components.[4]

Chapter one will begin by providing a brief analysis of the National Security Act of 1947. This assessment will include an examination of the maturation processes of the U.S. Air Force, the U.S. Army, the U.S. Navy, and the National Reconnaissance Office (NRO). This chapter will also discuss some of the historical challenges that have plagued each organization throughout its time in operation. Chapter one will present a few of the arguments that have caused various administrations to demand analysis regarding the organizational construct of U.S. policy related to military operations in space.

Chapter Two will provide the reader with a foundation for why it is imperative that the U.S. maintain security of U.S. military and civilian space assets. This chapter will begin with an analysis of the theoretical construct of deterrence, primarily the 2011 National Security Space

[4] "National Defense Authorization Act for FY19," United States House of Representatives.

Strategy and why reorganizing U.S. space components would undoubtedly complicate the decision-making calculus of its adversaries. In addition, Chapter Two will provide a brief overview of earth orbits while examining the defense and civil space-based capabilities that the U.S. relies on for infrastructure, energy, communications, and defense applications. Also, this chapter will also provide an analysis of the threats and challenges that each space-based capability is currently facing. In conclusion, Chapter Two will re-examine why the protection of defense and civilian space-based assets is necessary.

Chapter Three will begin by examining the capabilities that have made space a warfighting domain. This chapter will provide a thorough analysis of the current adversarial counterspace capabilities that the U.S. is attempting to mitigate and ultimately defend. There will be an analysis of the two countries posing the largest threat to the operational capability of U.S. national security space assets, China and Russia. For each nation, there will be an analysis of their respective defense doctrines, followed by an assessment of their counterspace capabilities. Throughout this section, it will become apparent just how close the capability gap between the U.S. and its adversaries has become.

Chapter four will analyze the current political landscape of the U.S. and examine how heavily this has influenced the positions of various congressional members and defense officials. This chapter will also acknowledge that despite its national security implications, the decision to reconfigure U.S. policy related to military operations in space appears to be influenced by a combination of partisanship and a general lack of knowledge by congressional members. Chapter five defers to key individuals within each organization for its analysis. In conclusion, this chapter will utilize numerous congressional and DoD documents that have ultimately driven the process

of enacting change on the current organizational and management structure of U.S. policy related to military operations in space.

Chapter five will provide the reader with three of the largest policy issues plaguing the U.S. national security space enterprise. Upon presenting these policy positions, there will be an analysis of the potential actions that may be taken to mitigate these challenges. This chapter utilizes the analysis and research provided from previous chapters to make definitive conclusions as to why or why not certain reorganizing measures are both feasible and appropriate. Chapter five will conclude by providing sound reasoning for the presented recommendations and put forth a potential timeline for the organizational developments that should be executed to alter U.S. policy related to military operations in space.

Lastly, the final section of this thesis concludes by providing a summary of the recommendations provided within throughout this work. This chapter notes that the current administration's idea of reorganizing national security space components is an idea that has come to fruition. In conclusion, this chapter acknowledges the unfortunate and highly politicized landscape of the national security space enterprise.

CHAPTER 1: THE MATURATION OF SPACE ORGANIZATIONS RELATED TO U.S. NATIONAL SECURITY

"*We are the best in the world at space. Period" – Lt. Gen. John Thompson (June 10, 2018)*

Introduction

It is no argument that United States space operations were founded by extraordinary individuals with an overwhelming yearning to keep American citizens safe from the Soviet threat. The United States space story has both civilian and governmental achievements in research and development, primarily involving missile defense, satellite reconnaissance, and human space exploration. On account of cold war competition and some newly recognized aspirations for space superiority, both the U.S. and the Soviet Union expended time and resources during an era when each nation was recuperating from the terrors of WWII. Although the two countries fought alongside one another to suppress the axis powers of WWII, a shift occurred that put the two nations in opposition. A change in ideology initiated the western hemispheres fight to contain communism and began the U.S.' struggle with the Soviet Union. Also, missile technology developed by German physicists and the subsequent proliferation of their research was a primary concern for the United States. Not only was missile technology at the forefront of the debate, but a quickly developing nuclear capability and ever-expanding missile capabilities demanded both militaristic and academically influenced strategic thought. At a time when the destructive possibilities of weapons were seemingly endless, and great power competition was the norm, the U.S. began exploring ways to mitigate the Soviet threat.

The United States' ability to alleviate a portion of the Soviet threat came in the form of space-based missile defense, classified satellite functions, and space-based intelligence collection

methods. This grand story involves the U.S. Air Force, Army, Navy, and the intelligence community, specifically the National Reconnaissance Office. Through trial and error, reorganization and disaggregation, adequate funding and lack thereof, the structure of U.S. military space operations began to take shape. Examined below are the organizations that played a role in the execution of this process. Each organization is initially examined from a historical point of view, followed by an analysis of its more recent organization and management constructs. This section is by no means a comprehensive history of the entire U.S. national security space enterprise but rather introduces the argument from a historical perspective. In addition, this chapter is intended to provide a basis for where the current organizational and management structure of U.S. military space components originated. This section highlights the struggles that each organization felt throughout its maturation processes, but by no means encompasses the complete historical account of each entity. Whether it was a lack of funding, the transformation of leadership, or redistribution of resources and personnel, each organization experienced its challenges. This cyclical scenario subsequently describes how these challenges led to the delayed contribution of space to the United States war fighting equation.

The National Security Act of 1947

Signed on July 26, 1947, by President Harry S. Truman, the National Security Act of 1947 reorganized and modernized U.S. armed forces, foreign policy, and the intelligence community. Not only did this act cause a certain level of reorganization, but it also formed many institutions that the U.S. government would soon begin to utilize.[5] The act established the National Security Council (NSC), established the Central Intelligence Agency (CIA), merged

[5] "A Look Back… The National Security Act of 1947," *cia.gov*, July 31, 2008.

both the War and Navy Departments into the Department of Defense, and most importantly, it reorganized the Army Air Corps into an independent Air Force.[6] The "Declaration of Policy" of the 1947 act, or section 2. [50 U.S.C. 401] states that "each military department shall be separately organized under its own secretary and shall function under the direction, authority, and control of the secretary of defense… to provide for their unified direction under civilian control of the secretary of defense…and provide for the establishment of unified or specified combatant commands, and a clear and direct line of command to such command."[7] Section 2 of the 1947 National Security Act dictates that the U.S. Air Force will operate similarly to the other branches, by reporting directly to the newly created office of the Secretary of Defense. An aspect of the 1947 Act that is directly relevant to the central argument this thesis was the effect this reorganization had on the entire national military establishment (NME), including the various other national security-related departments and agencies. Like the 9/11 commission report, a key goal of the 1947 Act was to clarify lines of communication and promote a more transparent culture within the defense department. Nearly five decades before the devastating 9/11 attacks, the United States government was reconfiguring its structure with the goal of preventing unclear lines of communication, something that was addressed in both the 9/11 commission report and the Intelligence Reform and Terrorism Prevention Act (IRTPA) of 2004.[8]

While the contributions of the 1947 Act were monumental for the intelligence community, it was also clear to President Truman that the U.S. must confront a lack of resources for a domain that was becoming a key aspect in the warfighting equation, airpower. The similarities drawn between the creation of the U.S. Air Force and the possible creation of another

[6] Ibid.
[7] Ref Book- 1947 National Security Act, dni.gov, July 26, 1947.
[8] Intelligence Reform and Terrorism Prevention Act of 2004.

military branch, the Space Force, requires comparison. As noted in detail above, the U.S. typically begins to address its inadequacy after realizing that it has no other choice. The correlation between the construction of the U.S. Air Force in 1947 and the potential to create a sixth military branch devoted to military space operations in 2019, or soon after, clearly suggests that a symmetrical level of activity could occur. Congruent to how the end of WWII marked the creation of the 1947 National Security Act, the long-lasting conflict in the Middle East, and a reemergence of great power competition between China and Russia are driving the U.S. to consider how it can adequately address these threats. Even though the intricacies of creating a new military branch or reinstating a singular unified combatant command for space is not laid out in this section, these scenarios will be addressed later in this work.

The United States Air Force

Before the U.S. Air Force was created in 1945, the Air Force Scientific Advisory Group had noted that both long-range rockets and satellites were a "possibility." [9] Fast forward to the early 1950s and a power competition between two countries, the United States and the Soviet Union, began to drive space policy. Beginning as a study between the RAND Corporation and the Air Research and Development Command (ARDC), Project 409-40 "Satellite Component Study" soon to be renamed the more infamously recognized WS-117L program, was created. At a time when intelligence and deterrence were preeminent warfighting tools, attaining U.S. governmental cooperation in space remained an uphill battle. In the Spring of 1957 Maj General David D. Bradburn recounts working on the WS-117L program and brings insight to this argument. The WS-117L was a program that provided the Strategic Air Command (SAC), a

[9] Thomas A Sturm, "The USAF Scientific Advisory Board: Its First Twenty Years 1944-1964," *Historical Division liaison Office*, February 1, 1967.

tactical air command responsible for addressing the Soviet threat through United States airpower, with reconnaissance satellites. General Bradburn notes, "the project moved ahead slowly for a lack of money. Then in October, the Soviet Sputnik went into orbit and suddenly there was money all around."[10] Not coincidentally, the threat drove the Eisenhower Administration into action, something symmetrical to the presidential administrations of the 21st-Century. This same threat led to the creation of the National Reconnaissance Office, an intelligence-based entity that engulfed a large amount of USAF satellite reconnaissance programs.

However, between the 1960s and 1970s, the U.S. was involved in what would soon become known as one of the most controversial wars of the 20th century, the Vietnam War. Justified as a means for preventing the spread of communism, the Vietnam War was essentially a proxy between two great powers, the United States and the Soviet Union. The United States' intervention in Vietnam required an increase in intelligence collection, specifically in the form of geospatial intelligence (GEOINT). GEOINT happened to be a domain in which the U2 spy plane and various USAF military reconnaissance satellites could contribute. General Jerome O'Malley began to recognize the utility of military aerospace-related assets upon arrival to an operations center in Ton Son Nhut Air Base located in South Vietnam. General O'Malley arrived at the operations center and immediately asked "where did you get these? [referring to geospatial images laid out before him] I just returned from a mission up there getting my butt shot off trying to obtain the same pictures."[11] Brigadier General Earl. S. Van Inwegen recalls a member of the team stating "an SR-71 flew over and took them. The crew was not in any harm's way."[12] This

[10] Gen. David D. Bradburn, "Evolution of Military Space Systems,". 61. Maj. Gen. David D. Bradburn was assigned to the first USAF satellite project, WS-117L. He subsequently held positions of increasing responsibility in USAF space programs, including Director of Space Systems in Washington and Director of the Office of Special Projects in Los Angeles.
[11] Brigadier General Earl. S. Van Inwegen III, "The Air Force Develops an Operational Organization for Space," the U.S. Air Force in Space: 1945 to the Twenty-first century.
[12] Ibid.

statement of protecting the warfighter resonated with General O'Malley to such a degree that it had become the catalyst to his support for military space power.[13] By 1961, the USAF was responsible for approximately 90 percent of U.S. military space operations.[14] In addition to contributing to the military space domain, the USAF soon became the primary agent for the National Aeronautics and Space Administration (NASA) research and support initiatives.[15]

However, in March 1961, the Air Force Systems Command (AFSC) was created to address the disaggregated research, development, and acquisitions activities of the USAF. Six years later in July 1967, the Space and Missile Systems Organization (SAMSO) was created to consolidate USAF space and missile defense activities into a single organization. The following year in 1968, the Aerospace Defense Command (ADC or ADCOM) was the primary entity responsible for monitoring missile warning operations for the Air Force. However, on October 1, 1979, ADCOM was removed from service.[16] The end of ADCOM was the result of a space policy study named "the Navaho Chart."[17] The conclusion of the Navaho Chart led Brigadier General James Creedon to begin exploring the possible elimination of both ADCOM and the Northern American Aerospace Defense Command (NORAD).[18] However, the study's conclusions ultimately led to the decommissioning of ADCOM, leaving NORAD unharmed.[19]

In 1982, upon years of studies lead by both senior USAF leadership and the U.S. Congress, the Air Force Systems Command (AFSC) merged with the ADC, later known as the Tactical Air Command (TAC), to form the "Space Command." Not only did the U.S. Congress criticize the unorganized structure of USAF space activities, but a January 1982 GAO report

[13] Ibid.
[14] Defense Department Directive 5030.18, "DoD support of National Aeronautics and Space Administration" 89
[15] Ibid. 99.
[16] Brigadier General Earl. S. Van Inwegen III.
[17] Ibid.
[18] Ibid.
[19] Ibid.

concluded that the DoD must establish a Consolidated Space Operations Center (CSOC). The report also demanded that consideration for where the headquarters of a potential Space Command or Space Force should be established.[20] In 1985, the "Space Command" was renamed and merged into the Air Force Space Command (AFSPC), so that it would not be confused with the newly created unified combatant command, the United States Space Command (USSPACECOM). The consolidation of the ADC, SAC, AFSC, and the Air Force Communications Command (AFCC), was the first step in solving the decentralized structure of national security space operations within the USAF. The USSPACECOM was a direct product of President Reagan's 1983 Strategic Defense Initiative (SDI), and an attempt to more appropriately distribute military space operations amongst the various military branches. The AFSPC would remain the primary USAF entity serving USSPACECOM until its decommissioning in 2002, following the creation of USNORTHCOM.

Like the creation of many other great military organizations, the AFSPC experienced trial, and error. The USAF, contrary to popular belief, began its use of space-based systems far before the early 1980s. Space assets found their way into the strategic argument soon after the conclusion of WWII. Not dissimilar to the majority of opinions today, the idea of utilizing space assets during the late 1940s was a foreign concept, even to those within the Air Force Chain of Command.[21] General Ronald R. Fogleman, Chief of Staff of the United States Air Force, describes his understanding of United States Air Force (USAF) space assets as "embarrassing." General Fogleman goes on to assert that a lack of fundamental space knowledge was widespread throughout the entire USAF, and recounted that "Other servicemembers did not know about or

[20] Van Inwegen, 141
[21] Cargill Hall, Jacob Neufeld, "The U.S. Air Force in Space: 1945 to the 21st Century," USAF History and Museums Program, Washington D.C. 1998, 140.

understand them because they failed to recognize or take the time to learn just what they could do for the warfighter." [22] Not only was the USAF space mission seen as secondary to that of pilots, ground forces, and missile combat crew members, a universal lack of knowledge on space operations added to this common misperception.

The United States Army

On October 3rd, 1957, the United States Army formally took its spot in history with its creation of the Redstone Anti-Missile Missile System Office (RAMMSO) in Alabama.[23] Stemming from the first successful launch of a Soviet Intercontinental Ballistic Missile (ICBM) in August of 1957, the Army Ordinance Corps created RAMMSO, an office that would be responsible for the research and development of United States missile defense and space capabilities.[24] On April 11, 1958, a mere seven months after RAMMSO was named an independent organization, it was deactivated. Like many other military space organizations, RAMMSO immediately began to experience growing pains. This maturation eventually led to the organization's consolidation into the Army Rocket and Guided Missile Agency (ARGMA).[25] While the primary mission of ARGMA was to field an Anti-ICBM missile, known as the "Nike Zeus," ARGMA's capabilities were limited due to a December 1956 presidential directive.[26] Even though creating an anti-ICBM missile was an immediate necessity, the 1956 presidential directive enacted a constraint on how far the Nike Zeus would be allowed to travel.[27] Not

[22] Gen. Ronald R. Fogleman, "The Air Force and the Military Space Program,". Gen. Ronald R. Fogleman was Chief of Staff of the United States Air Force (1994-1997). The general graduated from the U.S. Air Force Academy in 1963. Prior to becoming chief of staff, he was commander in chief of the United States Transportation Command and commander of the Air Force's Air Mobility Command.
[23] Jason B. Cutshaw, "SMDC Celebrates 60 Years of Defensing the Nation," *Army.mil*, December 12, 2017.
[24] "Russia Tests an Intercontinental Ballistic Missile,"
[25] Sharon Watkins Lang, "SMDC History: ARGMA Opens with a Blast," *Army.mil*, October 15, 2015.
[26] Ibid.
[27] Mark Wade, "Nike Zeus: Part of Spartan ABM Family".

surprisingly, following the Soviet Union's successful launch of Sputnik, the Nike Zeus' range constraint of 200 miles was removed. [28] As a result of the successful Soviet ICBM launch, the Department of Defense authorized the Army Ballistic Missile Agency (ABMA) to launch a satellite into space, giving the U.S. Army the ability to claim that they were "the first in space" amongst U.S. government agencies.

On December 11, 1961, in a reorganizing trend that continued to repeat itself, ARGMA and ABMA were no longer considered separate organizations but were directed to merge their personell and functions into the Army Ordnance Missile Command (AOMC) Headquarters.[29] A short time after the merger, the newly formed AOMC moved to the NASA Marshall Space Flight Center, a space research organization created during the Eisenhower administration.[30] Relocation to the NASA Marshall Space Flight center delayed operations and reprioritized some of the Army's brightest space scientists, and ultimately disaggregated Army space operations. This move to NASA between 1958-1961 hindered the Army's space efforts just as it did the U.S. Navy's. Despite a consistent waxing and waning scenario of the Army's space and missile defense operations, on July 19, 1962, the AOMC executed a successful intercept of a mock ICBM with a Zeus Missile interceptor.[31] Coming just in time for the October 1962 Cuban missile crisis, the Army's space and missile defense operations proved to be a vital aspect to the national security of the United States.

Not to be confused with ABMA, the Army's Advanced Ballistic Missile Defense Agency (ABMDA) was created on March 4, 1968. Initially formed out of a project between the

[28] Ibid.
[29] "AMCOM History;" *Army.mil*.
[30] Ibid.
[31] "A Chronicle of Missile Defense, from the Dawn of the Missile Age During World War II to the Present," *pbs.org*.

Advanced Research Projects Agency (ARPA), and the Nike –X Project Office, the follow-on to the Nike Zeus Anti-ICBM program, ABMDA was directed to provide technical assistance to the Army advanced ballistic missile defense program.[32] Until ABMDA's termination in 1974, many of its functions would be given to the Ballistic Missile Defense Advanced Technology Center or the Ballistic Missile Defense Systems Command, both of which would soon be condensed into the current U.S. Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT), more commonly known as SMDC.[33] However, the Vietnam War severely diverted the Army's focus and funding from space and missile defense to small arms and field ammunition developments.[34]

Between 1977 and 1992, U.S. Army space efforts began to reemerge as things like the Tactical Exploitation of National Capabilities (TENCAP), the Airland Battle Doctrine, and President Reagan's Strategic Defense Initiative (SDI) surfaced.[35] TENCAP, a program deriving from a 1977 congressional directive, was designed to utilize, were applicable, preexisting national strategic satellite systems to support Army corps commanders and Naval commanders during theater operations.[36] In addition, the Airland Battle Doctrine stressed the importance of having Army control over military space operations through real-time sensors for addressing the enemy threat.[37] Not dissimilar from today, a 1985 report, entitled the "Army Space Initiative Study," provided policy suggestions that enhanced the U.S. Army's use of space. [38] Many of the

[32] Sharon Watkins, "SMDC History: A-B-M-D-A," *army.mil*, March 15, 2018.
[33] Ibid.
[34] Joshua, Boehm "A History of United States National Security Space Management and Organization," *fas.org*.
[35] Edward John Mitchell, "Apogee, Perigee, Recovery: Chronology of Army Exploitation of Space," *RAND Corporation,* 1991, 61-65.
[36] Eddie Mitchell, "Apogee, Perigee, and Recovery: Chronology of Army Exploration of Space," *RAND Corporation*, 1991, 72.
[37] Ibid.74-75
[38] Ibid.

recommendations laid out within the 1985 report were implemented and proved to make positive contributions to the U.S. Army's overall space efforts.[39]

Throughout its lifetime, Army space and missile defense operations were reorganized, renamed, and reconfigured many times over. In 1997 the USASMDC/ARSTRAT became the primary Army component providing space and missile defense capabilities to United States Strategic Command (USSTRATCOM). It is noted that the SMDC's current mission is to conduct space and missile defense operations and provide planning, integration, control, and coordination of Army forces and capabilities to support USSTRATCOM missions like strategic deterrence, integrated missile defense, and space operations.[40]

The United States Navy

Following the conclusion of WWII, both the U.S Army and the USAF took on the challenge of researching and developing missile defense technologies. With pressing threats emanating from the Soviet Union, it was the U.S. Navy's task to understand spaces' atmospheric intricacies better. More than any other service, the United States Navy began academic-like research of the space domain through the Naval Research Laboratory (NRL), the Johns Hopkins Applied Physics Laboratory (APL), and the Applied Research Laboratory (ARL) at Pennsylvania State University.[41]

In addition to the research being conducted by the U.S Army, the U.S. Navy was heavily dependent upon the V-2 rocket. The V-2 was an extremely unreliable rocket system that the U.S. Army had seized from the German military in the late 1940s. Unlike the Army, the Navy's

[39] Ibid.
[40] "U.S. Army Space and Missile Defense Command/Army Forces Strategic Command: Mission," *U.S. Army.*
[41] National Research Council, "Navy's Needs in Outer Space for Providing Future Capabilities," *The National Academies Press*, 2005, 150.

mission was not missile defense, but rather its task was to explore how the United States could place satellites into orbit for intelligence purposes. On top of this, it was also the Navy's job to assess the potential for space-based communication capabilities. However, the mission of launching satellites for intelligence collection became a point of contention between the Army, the Navy, and the USAF. On September 9, 1955, despite disputes regarding which branch was a better fit for the job, the task of satellite "launch" was ultimately awarded to the NRL, dubbed "Project Vanguard." It's important to note that the USAF would have been responsible for conducting this mission, but the need to develop the Atlas rocket, the launch vehicle for ICBM's, took precedence. On March 17, 1958, just two and a half years since the program began, the NRL delivered a 3.5-pound satellite into orbit. This satellite launch kicked off the Naval Space Surveillance System (NAVSPSUR), a program that would remain a cornerstone for naval space operations and become the precursor to "The Fence," a program that is still in operation today.[42] Following the successful launch of the 3.5-pound "Minitrack" satellite, President Eisenhower began the formation of NASA, a move that would disrupt and divert naval personnel, resources, and research. The creation of NASA was a move that affected not only the U.S. Army and the USAF but also the U.S. Navy. Although the Navy began to lose resources and personnel to NASA, the DoD realized the need to harness Navy satellite technology. As a result of this apparent need, on April 10, 1962, the Navy Astronautics Group (NAG), was commissioned to operate the Navy Navigation Satellite System (NNSS), also known as "TRANSIT."[43] Despite losing a substantial amount of resources to NASA, just as the Army had, the Navy was able to continue executing vital research for satellite systems architecture throughout the 1960s.[44]

[42] Ibid.
[43] "Department of Defense. Department of the Navy. Naval Space Command. Navy Astronautics Group.," *catalog.archives.gov*.
[44] Ibid.

A key piece that allowed the Navy to continue its substantive research in space was a 1970 revision to DoD Directive 5160.32.[45] This 1970 revision allowed each of the services to continue developing various satellite systems for navigation, communications, mapping, meteorology, and various other mission sets.[46] For the Navy, the principal entity responsible for this research was NAG. NAG was primarily responsible for monitoring ultrahigh-frequency (UHF) and extremely-high-frequency (EHF) satellite operations, aspects that are still vital to global positioning satellites (GPS) and communications satellites today. On October 1, 1983, the Naval Space Command (NAVSPACECOM) was created, subsequently placing NAG under its purview. The relocation of NAG under NAVSPACECOM was an attempt to organize naval space operations more appropriately, an action that repeated itself just two years later. Upon the establishment of USSPACECOM in 1985, NAVSPACECOM began to serve as the primary naval space component to this command.[47] Again, in 1990 NAG was renamed the Naval Satellite Operations Center (NAVSOC).[48] However, it was the NAVSPACECOM that maintained the majority of USSPACEOM's workforce, and served as the Alternative Space Control Center of USSPACECOM's center located at Cheyenne Mountain Air Force Base, Colorado.[49] In conclusion upon the decommissioning of USSAPCECOM, NAVSPACECOM also dissapeared. The responsibilities of naval space operation currently fall under the purview of Space and Naval Warfare Systems Command (SPAWAR).

[45] "DoD Directive 5160.32, Development of Space Systems," September 8, 1970.
[46] Ibid.
[47] "Naval Space Command (NAVSPACECOM),".
[48] Gary C. Kennedy, Michael J. Crawford, "Innovations Derived from the Transit Program," Johns Hopkins APL Technical Digest, Volume 19, Number 1, 1998.
[49] Joshua Boehm, 23.

The United States Space Command (USSPACECOM)

On September 23, 1985, the United States Space Command was established at Peterson Air Force Base in Colorado Springs, Colorado. The USSPACECOM was responsible for overseeing all United States military space operations, including those belonging to the Navy, the Army, and the Air Force.[50] Between 1985 and 2002, the USSPACECOM grew substantially, acquiring different mission sets along the way. In 1990, USSPACECOM acquired responsibility for space launch, and soon after in 1993, it gained responsibility for the ICBM.[51] Throughout this time, the command began to inherit and transform many preexisting facilities into bases, such as the Space Operations Center at Schriever Air Force Base, Patrick Air Force Base, Cape Canaveral Air Force Station, and Buckley Air Force Base.[52] Despite the consistent and exponential growth of U.S. military space operations, USSPACECOM was deactivated on October 1, 2002. The deactivation of the USSPACECOM was a consequence of the newly established United Stated Northern Command (USNORTHCOM), which shifted space operations under the purview of USSTRATCOM, and created the need to redirect resources and attention to the fight against terrorism, de-emphasizing the role of military operations in space. Due to USSPACECOM's deactivation, all military space operations were reconfigured under the United States Strategic Command (USSTRATCOM), transitioning a large majority of the responsibility back to the Air Force's AFSPC. As noted before, a culture engulfed by reprioritization and reorganization has plagued the United States' military space community for decades. As we will see later, this trend continues to repeat itself, even today.

[50] Tom Roeder, "Space Force: A Timeline," June 25, 2018.
[51] Ibid.
[52] Ibid.

National Reconnaissance Office and the Intelligence Community

Established on September 6, 1961, as a classified agency in the Department of Defense, the National Reconnaissance Office (NRO) was a culmination of various military programs that eventually formed the intelligence community's first space organization. Heavily influenced by the Gary Powers U-2 shoot down, President Eisenhower demanded then Secretary of Defense, Thomas Gates to begin exploring options for space intelligence collection. Gaining its notoriety from the Navy GRAB program and the CIA CORONA program, the NRO was established to pursue the intelligence community's most heavily classified satellite programs.[53] Both the GRAB and CORONA program derived from the anticipated vulnerability of the U2 spy plane, which was reinforced by the May 1, 1960, shoot down of Gary Powers over the Soviet Union. Formed by direction of the Central Intelligence Agency's (CIA) Allen Dulles and the DoD's Robert McNamara, the NRO's roles and responsibilities toed a line that had yet to be drawn.[54] The Air Force Under Secretary, Joseph Charyk, was named the first director of the NRO.[55] However, before the NRO's establishment, an immediate issue facing the organization was an undetermined leadership structure. In response, there came a series of four "agreements" that ultimately contributed to the NRO's organizational structure. The first agreement established the National Reconnaissance Program (NRP), asserting that the United States Intelligence Board would set requirements for the organization.[56]

The second of the agreements established a few of the management and organizational constructs for the entity. On July 23, 1962, Dr. Charyk created what would become the basic

[53] Clayton D. Laurie, "Congress and the National Reconnaissance Office," *nro.gov*, June 2001.
[54] Dr. Bruce Berkowitz, "The National Reconnaissance Office at 50 Years: A Brief History," *Center for the Study of National Reconnaissance*, September 2011.
[55] Joshua Boehm, 34.
[56] Ibid.

organizational structure for the NRO, essentially splitting the organization into four distinct program areas. The four programs were project A, the Air Force's satellite reconnaissance program, project B, the CIA's satellite reconnaissance program, project C, the Navy's NRL program, and project D, a joint USAF, and CIA aerial and reconnaissance program.[57] The structure set forth by Dr. Charyk only reflects how decentralized the NRO was becoming. At its core, the NRO was unlike the Army's AOMC, the Navy's NAG, or the Air Force's ADC, instead, it was an organization that took the best pieces of each branch and oversaw only what was of interest to its goals; collecting intelligence on the Soviet Union and protecting against a nuclear war.

On March 13, 1963, the NRO was formally established as an agency within the Defense Department, but also managed to maintain a Deputy Director position, which would be filled by a CIA official. This agreement allowed both the Director of Central Intelligence (DCI) and the Defense Department to keep a close eye on NRO operations. Just two years later, on August 11, 1965, a fourth agreement reinstated influence back to the Defense Department, a decision that removed the requirement of the DCI to play a role in the Deputy Director position. This decision essentially removed any authority the DCI previously had in the decision-making equation and relinquished it to the Secretary of Defense. During the NRO's first decade of life, it would see many "agreements" or compromises between the Secretary of Defense, Robert McNamara, and the DCI. These agreements eventually lead to the Department of Defense's complete authority over NRO operations. However, the trend reversed once again. Primarily resulting from miscommunication, the Secretary of Defense, acting as the lead administrator of the NRO, began to see his attendance at Executive Committee (EXCOM) meetings as unnecessary. He began to

[57] Ibid.

send his assistant to the semi-annual EXCOM meetings, leading to his eventual disengagement with the organization. However, the EXCOM meetings were abolished in 1976. In addition to this, executive order 12036 gave the DCI "full and exclusive" authority over the National Foreign Intelligence Program (NFIP) budget, and as a result, the Director of the NRO began to report directly to the DCI, once again changing who was in charge.

In addition to a consistently changing leadership structure, the lines of communication between Congress and the NRO were virtually nonexistent. Classification levels and technical lexicon deterred many members of Congress from even attempting to understand the NRO's role in combating the Soviet threat.[58] General knowledge of NRO activities was widely viewed by member of Congress as unnecessary. The U-2 program director and CIA Deputy Director Richard Bissell recalled that "a few members of the Armed Services and Appropriations Committees in each chamber oversaw the activities on the Intelligence Community and virtually all oversight was conducted behind closed doors."[59] This universal lack of knowledge amongst congressional members was not an issue until the mid-1970s, when the U.S. Congress decided that there should be an increased amount of oversight on the intelligence community's activities, specifically the NRO. Unfortunately, the initiative for increased oversight was conducted by policymakers who were extremely unfamiliar with the NRO's programs. Though Congressional oversight of the NRO had increased, even today, there are many members of Congress that are uncertain of the role the NRO plays within the intelligence community.

In addition, a 1989 study entitled "NRO Restructure Study" and a 1992 study, "DCI Task Force on the National Reconnaissance Office," evaluated the current management and

[58]Clayton D. Laurie. 19
[59] Clayton D. Laurie. 7

organizational structure of the NRO, ultimately concluding that it was inadequate.[60] Despite the highly classified nature of the NRO, it is obvious that the organization suffers from an inability to be publicly understood. This overarching theme spans not just within the intelligence community, but within the various Military Service, as their relationship to the NRO has become hindered due to classification levels.

Chapter Conclusions

While restructuring the current organizational and management structure of U.S. national space components is not a novel idea, it is an initiative that transcends from the historical context that has been provided. The organizational and historical challenges that U.S. Military Services have experienced is not only a "space issue" but rather an issue that spans across many of the warfighting domains. While the historical perspective provided above contains an abundance of acronyms and instances of reorganization, this is both symbolic and symmetrical to the current U.S. national security space enterprise. In 1983, President Ronald Reagan called for a similar analysis, through the implementation of the Strategic Defense Initiative (SDI). The 1992 reorganization of NRO space assets argued that the organizational and management structure of the institution was inadequate to address the threat. Again, in 2001 Secretary of Defense Donald Rumsfeld led a commission in which he concluded that the U.S. was not prepared to defend both its civil and military satellite infrastructures. Also, in 2011 the Obama Administration produced the 2011 National Security Space Strategy, concluding that space had become increasingly congested, contested, and competitive. And finally, in 2017, the Congress through the National

[60] Report to the Director of Central Intelligence, DCI Task Force on the National Reconnaissance Office, Final Report.

Defense Authorization Act demanded an analysis of the current organizational and management structure of U.S. policy related to military space operations.

The overarching reason for current initiative to immediately reorganize U.S. policy related to military space operations is influenced by the historical context in which these components were brought up. In conclusion, this reorganizing initiative should not be executed simply for the "reorganizational" purposes that support a specific political agenda, but rather it should have positive implications and definitive goals to address the advanced adversarial threat. The bottom-line effect is that space has, in fact, become a warfighting domain.[61] This historical perspective must be applied and recounted throughout the latter sections of this thesis. To begin outlining the realities of a militarized space domain, the next section assesses various deterrence elements for the peaceful use of space, a number of unclassified space capabilities, acknowledges our reliance on these space-based architectures, and ultimately, addresses why we must protect these assets.

[61] Philip Yiannopoulos, "Inside the Epic Debate on Rethinking Our 50-Year-Old Outer Space Treaty," *fastcompany.com*, September 24, 2018.

CHAPTER 2: THE CASE FOR SPACE SECURITY

"Dominating in space has now become kitchen table conversation. . . and that will benefit this country" – Heather Wilson, Secretary of the Air Force (September 27, 2018)

Four Deterrence Models of Space

Released in 2011, under the Obama administration, the National Security Space Strategy (NSSS), signed by both the Director of National Intelligence and the Secretary of Defense, acknowledged that space transitioned into a warfighting domain. Upon its release, the document acted as the United States' space policy for not only the Obama administration but the ensuing decade. The NSSS took into consideration and built upon the 2010 National Security Strategy, the 2010 National Space Policy, the 2010 Quadrennial Defense Review, and the intelligence community's National Intelligence Strategy.[62] Similar to other U.S. strategic DoD documents, the 2011 NSSS outlined what the environment, objectives, approaches, and challenges are in the space domain. A primary component to the 2011 NSSS is how the U.S. would begin to address the challenges it faced by analyzing how best to mitigate congestion, competition, and ensuring success within the contested space domain. To address the contested space environment, the NSSS promotes a multi-layered deterrence approach with the goal of preventing and deterring aggression. The NSSS's Multilayered concept relies on four primary deterrence methods,[63] 1.) Deterrence through norms; 2.) Deterrence through alliances/coalitions; 3.) Deterrence by denial/resilience; and 4.) Deterrence through aggression/response.[64] Each element of this overarching deterrence strategy is outlined below.

[62] "Fact Sheet: National Security Space Strategy,".
[63] Christopher Michael Stone, "Reversing the TAO: A Framework for Credible Space Deterrence," Missouri State University, December 2015.
[64] "Fact Sheet: DoD Strategy for Deterrence in Space,".

Within the NSSS, the first element of the DoD's space deterrence strategy notes that "A broadly-accepted set of international norms of responsible behavior will have positive effects on the safety, stability, and sustainability of the space domain."[65] The NSSS elaborates on this point by asserting that even if the reliable U.S. deterrence posture does not single-handedly prevent a bad actor from conducting malicious activities in space, it will at least produce a normative international structure that can identify what is considered malicious and what is not. It is interesting to note that almost eight years after the NSSS was released, U.S. military leaders and policymakers on Capitol Hill are having a similar argument regarding the establishment of international norms in another domain closely related to space, cyber. The strategy for establishing international norms may be academic and inherently theoretical, but it is an argument that proves to be timeless. While succinct and definitive international norms may never be universally accepted, due to the cultural differences of various nations, the discussion is one that must occur at an international level. The establishment of internationally acceptable military and civil space operations may not directly help in mitigating the adversarial threat but may aid in clarifying what is legal and what is not in this technologically advancing space domain. While space continues to become more contested, congested, and competitive the actions of U.S. allies and adversaries alike, in the space domain, each have repercussions. The mining of asteroids, the colonization of space, and satellite repair capabilities that possess inherently militaristic and potentially maleficent traits are all examples of actions occurring in space that demand international regulation. What the legality and the proposed solutions to these actions look like is beyond the scope of this thesis, however, it does raise the issue that action and international agreement must be reached so that U.S. may remain superior in the space domain.

[65] Ibid.

The second element of the NSSS's deterrence strategy, "Build coalitions to enhance collective security capabilities" mirrors what occurred on the international stage in 1945. [66] On June 26, 1945, in San Francisco California, the UN Charter was signed, becoming operational on October 24, 1945. Chapter 7 of the UN Charter addresses "Action with respect to threats to the peace, breaches, of the peace, and acts of aggression."[67] Article 42 of the UN Charter states that "members of the United Nations shall join in affording mutual assistance in carrying out the measures decided upon by the Security Council." This article essentially states that if the United Nations Security Council deems that military action against an adversary be made necessary, all United Nations participants may assist with that mission.[68] Similar to the UN charter, the second element of the NSSS also supports an idea similar to that of President Eisenhower's push for "massive retaliation." It asserts that "Instead, the aggressor must attack assets and forces of multiple countries, which expands the scope of a conflict and reduces the odds that a potential aggressor can achieve their desired outcome at an acceptable cost."[69] This specific strategy highlights the idea of "entaglement," noting that attacking a satellite architecture, whose capabilites and costs are shared amongst many allied naitons, will further complicate the adversaries decision making calculus, thus, increasing risk while simultaneously decreasing the benefit. This concept rests on the notion that the U.S. would be facing a "rational" actor or one that takes into consideration a cost-benefit analysis throughout their decision-making calculus. [70] As a result of coalition building, the second element of the NSSS relies on the idea that UN

[66] Ibid.
[67] "United Nations Charter,".
[68] Ibid.
[69] Fact Sheet: DoD Strategy for Deterrence in Space
[70] Theresa Delpech, "Nuclear Deterrence in the 21st Century: Lessons from the Cold War for a New Era of Strategic Piracy," RAND Corporation, 2012.

nations would, in fact, respond to an attack on behalf of their ally, making it less likely for an attack to occur.[71]

The third element of the NSSS's deterrence strategy is "Denying the benefit of aggression by enhancing the resilience of space architectures and ensuring that the Joint Force can operate effectively when space capabilities are degraded."[72] This particular element of the deterrence strategy happens to be a topic with numerous strategic implications. In the world of military space operations, the "resiliency" of a specific satellite architecture may be understood as the complete disaggregation of a satellite constellation, the nuclear hardening of a satellite, or even the implementation of "dummy" or non-vital satellite architectures in cohesion with civil satellites to confuse the adversary. Disaggregating certain satellite architectures is a method of reconfiguring certain satellites from "big juicy targets," into architectures that consist of a number of widely distributed mini-satellites.[73] The majority of the dialogue regarding military space operations is occurring within the top levels of DoD leadership, and not surprisingly, the USAF produced a white paper stating "Disaggregation is an innovative opportunity to stay ahead of our adversaries, to change their targeting calculus, and to mitigate the effects of a widespread attack on our space assets."[74] This USAF white paper also asserts that "resilience serves as a deterrent, which may be the best way to preserve our capability by avoiding an attack."[75]A prominent individual supporting the idea of disaggregation, is General John J. Hyten, Commander of USSTRATCOM. General Hyten noted that he will discontinue his support for

[71] Gregory Schulte, "Protecting Global Security in Space," Presentation at the S. Rajaratnam School of International Studies Nanyang Technological University, Singapore, May 9, 2012. 5.
[72] Fact Sheet: DoD Strategy for Deterrence in Space
[73] Sandra Erwin, "STRATCOM Chief Hyten: 'I will Not Support Buying Satellites that Make Juicy Targets'," spacenews.com, November 19, 2017.
[74] "Resiliency and Disaggregated Space Architectures White Paper," *Air Force Space Command*, 2013, 12.
[75] Ibid.

"big juicy targets," asserting that "we are going to go down a different path. And we have to go down that path quickly.", referring to a path of satellite disaggregation.[76]

In general, the ability to produce nuclear hardened satellites is a primary feature of creating resilient satellite architectures. The likelihood of an electromagnetic pulse (EMP), nuclear radiation, or any other man-made or natural phenomenon occurring in space, directly affects the United States' ability to function terrestrially. Nuclear hardening is a dire component for ensuring the proper functioning of a satellite and is an important component to resiliency. Lastly, the ability to divert the attention of our adversaries by denying and deceiving them with the use of faux, or civil satellites, is a means of resiliency. Unfortunately, the use of this deterrence strategy comes with a large financial cost and demands a high level of compliance with civilian companies who may be uninterested in participating with the militarization of space. While the cost of this deterrence strategy is great, it does possess the ability to protect critical satellite infrastructures.

Finally, the fourth component of the 2011 NSSS deterrence strategy is deterrence through response. This element supports the idea that should deterrence fail, and an attack on the U.S. or its allies occur, the U.S. would respond, but not necessarily symmetrically. The NSSS states that a response to an attack "may not be limited to the space domain, but rather will occur at the time and place of our choosing."[77] Similarly, a previously mentioned initiative created by the Reagan administration in 1983, the Strategic Defense Initiative (SDI), was a program that kept our adversaries, specifically Russia's Mikhail Gorbachev, questioning the true capabilities of U.S. missile defense systems. It was this level of uncertainty that displayed America's ability to

[76] Sandra Erwin, "STRATCOM Chief Hyten: 'I will Not Support Buying Satellites that Make Juicy Targets'," spacenews.com, November 19, 2017.
[77] "Fact Sheet: DoD Strategy for Deterrence in Space"

effectively deter the soviet threat. President Reagan's SDI instilled the idea that Americas ability to create a strategic defense so advanced, that it would be worthless for U.S adversaries to execute a first strike against it. The SDI set the tone that the U.S. would not only deny the first strike but would subsequently execute a retaliatory second strike that would be devastating to its adversary. The 2011 NSSS clearly defines that should a first strike occur on a U.S. space asset; a second strike would endanger the overall well-being of the attacking country. In addition, the 2011 NSSS asserts that should deterrence fail, the U.S. "will use force in a manner that is consistent with longstanding principles of international law, treaties to which the United States is a party, and the inherent right of self-defense."[78] The strategy utilizes the phrase "in a manner that is consistent" to relay the idea that the U.S. may not respond to an attack symmetrically, but with any means that are "consistent with longstanding principals of international law."[79] It is the current superiority, in many of the warfighting domains, that allows the U.S. to be decisive when considering which means to use when executing a second strike.

In general, the NSSS lays out the four elements of deterrence that can keep the U.S. and its allies safe from an adversarial attack. Although there have been no recent kinetic altercations occurring in space, other than China's anti-satellite test in 2007, there has been a dialogue regarding this possibility. While the U.S. has sought to reorganize U.S. policy related to military operations in space, China and Russia have also prioritized the reorganization of their national security space agencies. The growth of Chinese and Russian space agencies has provoked concern among U.S. policymakers and has been expressed in various congressional testimonies. U.S. leadership continues to advocate for the reorganization of U.S. policy related to military operations in space so that it may keep pace with the quickly developing organizational

[78] "National Security Space Strategy: Unclassified Summary," 2011.
[79] Ibid.

constructs and space-based capabilities of both Russia and China. It has been argued that the reorganization of U.S. policy related to military operations in space can strengthen the U.S.' deterrence posture. The reorganization of U.S. policy related to military space operations may improve U.S. deterrence by offering a more streamlined distribution of critical resources, a more efficient use of funding, and it may send an implicit message to its adversaries that space policy and superiority is a national priority.

What We're Protecting – Space-Based Capabilities

It's an inevitable fact that for many individuals, space is a mystery. This domain is inherently complicated to understand and widely misunderstood. While, there are Astronomers, Astrophysicists, and Aeronomists, all of whom can devote an entire career to the study of space, there is not a necessity within this thesis to assess the intricacies of space. Even though the complexities of space operations are not the focal point of this thesis' main argument, there must be a brief explanation of how space works from a non-technical perspective. The most important aspect of this explanation revolves around orbits and constellations. A constellation is typically known as a system of satellites that cohesively work together to accomplish specific goals. There are missions where a single satellite may be enough to accomplish the objective, but often, this is not the case. Once satellites are ready for launch, they are subsequently attached to their respective rockets or launch vehicles, and each put into a specific orbit, or location in space. Satellites are typically located in four primary orbits, Low Earth Orbit (LEO), Medium Earth Orbit (MEO), Highly Elliptical Earth Orbit (HEO), and Geostationary Orbit (GEO). Each orbit allows a satellite to take a path complementary to its mission.

LEO is known as the orbit between 600km and 1,200km above the earth. LEO is where the United States has, at an unclassified level, conducted the majority of its space operations. LEO is also where the International Space Station (ISS), communications satellites, and global positioning satellites (GPS) reside.[80] One benefit to LEO is its proximity to earth, making it easily accessible. Having a close proximity to earth becomes of importance when certain components need to be repaired, replaced, or in instances where humans may need to conduct research and return to earth in a relatively short amount of time. Unfortunately, satellites in LEO experience a great deal of drag due to the gravitational pull of earth. Not only is the gravitational pull a challenge for satellites in LEO, but so too is the minimal time a satellite spends over a specific area of the earth. A satellite in LEO can be expected to travel approximately 18,000 miles per hour or faster, orbiting the earth in less than 90 minutes. The means that the satellite is not able to monitor a specific area of the earth for long periods. This fact makes data collection, imagery, and weather monitoring unappealing for this orbit.

Unlike LEO, MEO is the orbit between 1,2000km and 37,590km above the earth. One obvious benefit of MEO is that its increased distance from earth allows a smaller constellation of satellites to monitor the same surface area of LEO. MEO also affords satellites the ability to monitor a specific area of earth's surface for a longer period.

HEO is known as the orbit that is 37,590km above the earth. Because the distance of these satellites from earth is so great, they experience less gravitational pull, atmospheric drag, and take longer to orbit than satellites in LEO or MEO. The downside of placing a satellite in HEO is the cost associated with getting it to its destination. Not only is the cost challenging, but

[80] Matt Williams, "What is Low Earth Orbit," *universitytoday.com*, January 6, 2017.

the logistics of maintaining enough onboard fuel for the satellite to utilize while in orbit is also difficult.

Unlike LEO, MEO, or HEO, GEO is also designated as a “high earth orbit”, but the difference with GEO is that satellites will mirror the orbital time of the earth, roughly 24 hours. While the satellite primarily stays over the same longitude, it may tilt and move either north or south throughout its orbital path. Although the tilting causes some variance in its location, a satellite in GEO allows various organizations in both the DoD and civil entities, like NASA and the National Oceanic Atmospheric Administration (NOAA), to monitor specific areas for longer periods. Listed below, Table 1 addresses the previously examined orbits and their accompanying characteristics.

While this thesis is not designed to address the scientific aspects of space, the primary questions one may want to ask are: what is the satellite's distance from earth, and how long does it take to orbit? These two components are heavily associated with a satellites capability and will help guide the reader to more fully understand why specific satellites conduct certain missions. These two questions are by no means a way to fully comprehend the overall capability of a satellite, but they do give the reader a foundational construct to return to throughout this section.

The following section addresses, from a capability, standpoint, what the U.S. is protecting in space and why these capabilities need to remain secure. While certain systems and programs will surface throughout this section, it is necessary to lead each section from a capability and mission standpoint rather than from the programs specific name; otherwise, this section becomes inherently polarized and biased towards specific aerospace defense contractors. Within each section below is an analysis of when, how, and why certain capabilities came to be, and what the threats and challenges facing these capabilities are. Throughout each section, it is

important to remember that not all of the capabilities mentioned have an inherent militaristic function to them, but they all do, in some aspect, contribute to the U.S. infrastructure.

Table 1. Orbital Specifications

Orbit Name	Orbital Initials	Altitude of Orbit (km)	Details of Orbit
Low Earth Orbit	LEO	200-1200	May rotate around earth in approximately 90 minutes
Medium Earth Orbit	MEO	1200-37590	Experiences less gravitational pull than LEO
High Earth Orbit	HEO	35790	Less gravitational pull, longer orbit times
Geostationary Earth Orbit	GEO	35790 +	Orbits once a day and rotates in the same direction as the earth

Position, Navigation, and Timing (PNT)

Inception of PNT. In 1960 the United States Navy initiated a program named "Transit", responsible for all-weather navigation for both military and civilian vessels, but most importantly, for naval submarine navigation.[81] Transit was a concept that began at the Johns

[81] Elizabeth Howell, "NAVSTAR: GPS Satellite Network," space.com, April 26, 2018.

Hopkins APL, and soon became the basis for all future satellite navigation systems. The first launch of a Transit satellite occurred in 1960, and only eight years later by 1968, there was a fully operational constellation of transit satellites.[82] Upon realizing that position, navigation, and timing capabilities could become a significant contribution to our society; efforts arose to establish the NAVSTAR- Global Positioning System (GPS), managed by then-Colonel Dr. Brad Parkinson of the USAF Missile Systems Organization.[83] This program was utilized up until 1996 when the DoD replaced it with the current GPS architecture.[84]

Not Just a Location Service. While many of us today take GPS for granted, it was originally a program created for the DoD but is now a service that is free to the civilian population. After recognizing GPS's potential benefits for both military and civilian populations, physicists and researchers alike retrofitted the previously created DoD satellites with two primary frequency's, an L1, and an L2 line with a signal on the L1 frequency for civilian use. Even though I cannot provide an exact number of individuals who utilize GPS today, a safe estimation regarding its number of users is in the billions. A common misconception of GPS is that it is primarily used for navigational operations. However, its applications are much more diverse. Other uses of GPS include agriculture, aviation, marine navigation, railroad operations, surveying and mapping, timing, meteorology, public safety, and disaster relief. When disaster strikes, GPS, in correlation with geographic information systems (GIS), use remote sensing technology to formulate maps of disaster areas for subsequent rescue and aid operations. Even though disasters may occur sparingly, the timing function of GPS ensures that communication

[82] "Transit Satellite: Space-Based Navigation," *Defense Advanced Research Projects Agency*.
[83] "History of the GPS Program," *American Institute of Aeronautics and Astronautics.*
[84] Ibid.

systems, power grids, financial networks, and nuclear facilities are all precisely synchronized for operational efficiency.[85]

Internal and External Challenges. At Schriever Air Force Base, just 10 miles outside of Colorado Springs CO, seven USAF airmen are responsible for maintaining U.S. GPS operations. These highly trained junior officers working for the AFSPC are responsible for the protection of the 31 on-orbit GPS satellites that provide GPS functions to their billions of users. Col. John Dorrian, USAF, discussed a classified report called "A day without Space" during an interview, while omitting any classified information, he conveyed the reports main point by saying, "…the gist of it was that there is no such thing", referring to a day without space, "Space capabilities, including GPS, are integrated into everything we do. People count on that capability being there."[86] Not only does the USAF ensure the operational integrity of GPS functionality, but the U.S. Department of Homeland Security has also called GPS "a single point of failure for critical infrastructure."[87] Even though scenarios of complete GPS inoperability are extremely unlikely, instances of GPS intervention are not. It is not uncommon to hear the phrases GPS "jamming" or "spoofing," both of which are words that describe the action of tampering with a GPS receiver.

The consequences of GPS jamming or spoofing has been recorded by the NASA Aviation Safety Reporting System (ASRS), reporting 90 or more incidents of GPS jamming around various airfields in less than a year.[88] While these events are typically incidental and are not intended to disrupt the overall functionality of vital GPS systems, they do have negative repercussions. These "jamming" incidents are typically caused by seemingly innocent

[85] Ibid.
[86] Joe Uchill, "Why GPS is More Vulnerable than Ever: The Space-Based Navigation and Timing System Faces a Growing Risk of Attack. But There is a Simple Solution.," *csmonitor.com*, January 8, 2016.
[87] "Prioritizing Dangers to the United States from Threats to GPS: Ranking Risks and Proposed Mitigations White Paper," *Resilient Navigation and Timing Foundation*, November 30, 2016.
[88] Guy Buesnel, Mark Holbrow, "GNSS Threats, Attacks and Simulations," *Spirent*, June 2017.

commercial drivers trying to avoid managerial oversight regarding speed limits and unplanned "fuel brakes." Martin Faga, former deputy secretary of the Air Force, says that "People who sell these devices," referring to GPS jammers, "say they only work for a few yards, which presumably is just enough for what the person buying the device is trying to hide."[89] However, Faga elaborates on this misconception, "But the reality is that most of them jam GPS' for a couple of miles, which creates problems."[90]

While jamming may not be the crux of GPS' issues, physical threats and potential intervention from an international adversary is a concern. During the same interview, Col. Dorrian spoke about his concerns with space becoming a highly contested domain and that the USAF is considering a change in the AFSPC staffing policy. Likewise, in that same interview, Col. Dorrian also mentioned that the GPS team at Schriever AFB is constantly rotating its staff of inexperienced officers, who are around the average age of 23.[91] While the age of these highly capable junior officers is not the central argument, Dorrian felt that it was important enough to surface. Col. Dorrian also notes that human error is, in fact, an inherent aspect to any military endeavor, and recounts that the USN's October 2015 initiative that began teaching its sailors celestial navigation if the GPS infrastructure were to become inoperable, solidified the DoD's concern with GPS' reliability. So, while the DoD focuses on mitigating threats to the GPS system from both international adversaries and U.S. citizens, it is simultaneously looking for ways to mitigate internal challenges as well.

[89] Joe Uchill, "Why GPS is more vulnerable than ever"
[90] Ibid.
[91] Ibid.

Satellite Communications

The Birth of SATCOM. By the early 1960s the DoD began development of a communications satellite program named ADVENT. The program was created by the Advanced Research Projects Agency (ARPA) in conjunction with the U.S. Army and the USAF. Two years into ADVENT, Secretary of Defense, Robert McNamara, canceled the program on account of high costs, inadequate payload capacity, and an unrealistic launch capability. All of these faults and inconsistencies lead to the creation of the Defense Communications Agency (DCA), now the Defense Information Systems Agency (DISA).[92] Before ADVENT's discontinuation on August 31, 1962, the U.S. Congress signed into law the Communications Satellite Act of 1962. The act was intended to "provide the establishment, ownership, operations, and regulation of a commercial communications satellite system, and for other purposes."[93] The DoD soon realized that satellite communications (SATCOM) capabilities were destined to become inherently commercialized. By 1961, NASA awarded AT&T, RCA, and the Hughes Aircraft Company contract's to begin production of space telecommunications satellites. By 1964, the three companies each had two operational communications satellites in orbit, thus placing a level of reliability on commercial capabilities. While the DoD has since created its own set of military communication satellites, the bureaucratic process and fragmented organizational structure of military satellite communications (MILSATCOM) has plagued the process. Nonetheless, programs like MILSTAR, the Advanced Extremely High Frequency (AEHF), the Ultra High Frequency (UHF), and many other military SATCOM programs, such as Wideband Global Satellites (WGS) have taken shape despite the challenging MILSATCOM landscape. Although

[92] David N. Spires, Rick W. Sturdevant, "From Advent to Milstar: The U.S. Air Force and the Challenges of Military Satellite Communications," History.nasa.gov.
[93] "Communications Satellite Act of 1962,".

the DoD satellite architecture has continued to advance the U.S.' capabilities, specifically, the U.S. Army, it still relies upon insecure commercial satellites for a number of its critical space operations.

Dependent Upon Communication. Put simply, the use of telecommunications satellites that can provide beyond the line-of-sight communications is one of the two most essential satellite applications used in military operations today, the other being GPS.[94] The speed and mobility of systems like the Navy's Multiple User Objective System (MUOS), and the capabilities of the WGS, speak for themselves. In addition, capabilities like Nuclear Command and Control (NC3), and Command and Control Battle management Communication's (C2BMC) are each a central tenant to both our offensive and defensive nuclear capabilities, each relying on communications. However, if these two previously mentioned systems were to be compromised, this may delay, disrupt, and potentially deny the U.S.' ability to relay critical information about adversarial activities to the warfighter and those in the nuclear command centers. Since the need for SATCOM is apparent, the need to protect these systems should be equally as obvious. As we will see in the section below, the need to protect MILSATCOM is not the only one aspect that must be addressed, but so too is the U.S.' dependence on supplemental unprotected commercial SATCOM.

The Challenges of Creating Cohesive Communications. Even though MILSAT's have their own systematically derived hardware challenges, this section deviates from these aspects and assess the issues from a broader perspective. As with most DoD space programs, the ability to phase out legacy satellites while simultaneously deploying new ones is an integral aspect on both the financial and operational fronts. To fully integrate a new constellation of MILSAT's, the

[94] Richard Kusiolek, "Peace of Operations Increases Demand on Satcom on the Move," Via *Satellite*, April 2010, 6

three previously mentioned segments, terminal, control, and space, must all be reconfigured to adapt to new technologies. Not only is backward compatibility a challenge but so too is the convergence of commercial and military systems. While one organization may surpass the other, typically the commercial industry over the governmental, each must create technologies that work in a cohesive manner. It sounds simplistic, but all three segments of SATCOM must be interconnected for them to work. A prime example of this challenge is the new "M-Code" capability. The USG fielded the new WGS program, a currently orbited satellite, but the national security space industry struggled to produce the necessary earth-based terminal components for this system to become usable. So, while the capability was fielded, there was still the challenge of connecting each component with one another.

Another argument lies within the USARMY's overdependence on commercial SATCOM. Major Andrew H. Boyd of the USARMY, reiterated that a critical threat regarding MILSAT is that "The U.S. Army's most critical vulnerabilities is its overreliance on SATCOM, one which most of its mission command systems depend."[95] As noted before, a key argument within this thesis is the advanced adversarial threat that the United States is facing in space, primarily from Russia and China. While the thought of a threat emanating from within the United States itself may seem far-fetched, Major Boyd states that "The increasing need for SATCOM bandwidth has led the U.S. military to channel its operational communications through the leased networks of commercial satellites; these lack adequate protection against jamming and are susceptible to state-actor influence."[96] Major Boyd's usage of the words "state-actor influence" can be taken a myriad of ways, but the language surrounding these words

[95] Andrew H. Boyd, "Satellite and Ground Communication Systems: Space and Electronic Warfare Threats to the United States Army," November 7, 2017.
[96] Ibid.

suggests that intervention of SATCOM within the commercial industry can come either internally or externally. Regardless of how much the USG attempts to overcome its dependence on commercial SATCOM, there will always be a need to supplement MILSAT bandwidth with commercial providers.[97] It is said that as much as 80% of all USG satellite communications traffic, including that for the military, is carried over commercial SATCOM systems.[98] During an interview, Colonel Earl Madison (Ret.), former Chief of Staff for National Security Space Architect (NSSA), responded to what he believed the largest issue facing MILSATCOM was by stating "There is no overall adult supervision on military space communications; now, reorganizing the current space management structure may not totally fix that, but hell, it's a damn good step in the right direction."[99] In addition, a report on the major policy issues in evolving space operations produced by the Mitchell Institute notes that "Early, clear, and public legal processes to indemnify all commercial and international space services and systems that support national security is essential to building resilient architectures with robust contribution from these [commercial] sectors."[100]

Space-Based Infrared Monitoring

The Beginning of Infrared. As early as 1948, scientists from the United States government began exploring the possibilities of detecting and tracking missiles by their heat signatures. The Weapons System 117 program (WS-117L), mentioned in chapter one of this thesis, became the primary DoD space-based reconnaissance and surveillance program

[97] Greg Berlocher, "Military Continues to Influence Commercial Operators," Via Satellite, September 2008, 6
[98] Ibid.
[99] Derived from a personal interview with Colonel Earl Madison (Ret.). When asked "What do you perceive as the largest issue with military satellite communications and does a reconfiguration of the current space management and organizational construct address this?", this is what he responded with.
[100] James A. Vedda, Peter L. Hays, "Major Policy Issues in Evolving Global Space Operations," *The Mitchell Institute for Aerospace Studies/Air Force Association*, February 2018.

spearheading this mission. By November 1958, the program had morphed into the Missile Defense Alarm System (MIDAS).[101] During the initial testing phase of the space-based infrared detecting capability, individuals within the MIDAS program were primarily interested in producing standalone satellites, with the possibility of successfully detecting a missile launch and or nuclear detonation. After years of trial and error MIDAS morphed into Program 949, then Program 647, and was finally named the Defense Support Program (DSP). A major difference between MIDAS and DSP was that MIDAS orbited in LEO, while DSP orbited in GEO.[102] Not only were the satellites orbital location a major difference to the program, but so too was the fact that the DSP would be the first interconnected constellation of space-based infrared monitoring satellites. The first of the DSP satellites was launched November 5, 1970, with the fourth and final satellite being launched in June of 1989. Between 1979 and 1995 a host of follow-on DSP programs were created and subsequently dismissed due to the conflict between the executive branch and Congress.[103] Programs such as the Advanced Warning System (AWS), the Boost Surveillance Tracking System (BSTS), the Follow-On Early Warning System (FEWS), and the Alert, Locate, and Report Missiles (ALARM) program, were all contributions to the dying breed of potential follow-on DSP's.[104] But, in 1995 the USAF announced its new follow-on program, the Space-Based Infrared System (SBIRS), pronounced 'sibbers", a program that is still in use today. After years of use, SBIRS is being reconfigured into what the 2019 National Defense Authorization Act (NDAA) calls the Next Generation Overhead Persistent Infrared Radar, or "Next-gen OPIR."

[101] Jeffery T. Richelson "Space-Based Early Warning: From MIDAS to DSP to SBIRS," *The National Security Archive*, November 9, 2007.
[102] Ibid.
[103] Ibid.
[104] Ibid.

A Dire Component to Missile Defense. Ever since the first V2 missile launches were conducted by Germany in the early 1940s, maintaining awareness of the ballistic missile threat has remained at the forefront of the United States' priority list. Even though ballistic missiles were once a primary concern for the U.S., and remain as such, its focus has begun to shift with the appearance of new weapons systems. Advanced air-launched cruise missiles, tactical nuclear weapons, highly maneuverable hypersonic glide vehicles, and an array of new technologies have demanded that the United States maintain a superior ability to accomplish birth to death tracking of these weapons systems. The lexicon surrounding missile defense, missile intercepts, and deterrence, sounds like that of the cold war. However, the major difference in today's landscape is that we are no longer directing our attention to a singular adversary, but many, all with differing capabilities. Because of the advanced capabilities of Next-gen OPIR, the U.S. remains ready to address the ever-changing threat landscape. As Lauren Thompson, national security contributor to Forbes and Chief Operating Officer at the Lexington Institute, wrote, "…for god's sake let's not do any harm to this program, because it really is crucial to America's survival in a world where the number of nuclear-armed nations is growing."[105]

Issues with Cost, Schedule, and Capabilities. While this section could easily have an entirely new thesis devoted to it, it is important to maintain an encompassing, yet surface level approach in describing the problems space-based infrared monitoring is facing. Issues stemming from cost, schedule, capabilities, and the need for nuclear-hardened payloads and busses are all aspects that have become points of contention for the Next-gen OPIR program. A consistent lack of clarity and a difference in opinions between the USAF, industry, and Capitol Hill have left the program with an estimated price tag in the two-billion-dollar range, only to get it to competitive

[105] Loren Thompson, "SBIRS: The Pentagon's Most Important Space Program for Preventing Nuclear War," forbes.com, June 8, 2015.

design review (CDR). Due to this difference in opinion, the program has nearly tripled in cost over the last two and a half years. Even though the Next-gen OPIR program has single-handedly been the cause of many questionable decisions regarding our missile defense capabilities, issues regarding data usage, compatibility of various ground systems, and capability, it is a system that the U.S. would dare not loose. When referring to "data usage," the OPIR program consumes a vast amount of data that is subsequently disregarded. The OPIR program, as noted before, is a highly complex, safeguarded, and classified program, for a good reason. While its primary role is to detect and track missile launches by sensing heat signatures, the satellite does much more than that. Unfortunately, these "other capabilities" quickly become classified. Even though there is little to say on the topic regarding next-gen OPIR's capabilities, we do know that the data gathered from the programs "other capabilities" is extremely difficult to utilize for actionable intelligence, specifically because of the amount that is collected.

Familiarity with the intelligence cycle, T-CPED, tasking, collecting, processing, exploiting, and disseminating, helps with understanding the difficulties the next-gen OPIR program faces in data processing. While the cycle may operate seamlessly, the extreme amount of data has become too much to utilize, subsequently leaving much of it unanalyzed. While both data collection and utilization are a constant challenge, so too is the satellites compatibility with its respective ground systems. As the satellites themselves evolve, so too must their ground systems, which are responsible for receiving the data captured by the satellite itself. Even though the situation possesses many facets, all the issues above are managed by the USAF and will become one of the first tasks that a separate space branch must address following its establishment. During an interview, Daniel P. Jordan, retired USAF Colonel and former commander of the 2d Space Operations Squadron, states "We fully support the Air Force's

efforts to increase capability, add resiliency, reduce costs, and increase the speed of delivery for our critical national security space assets. We also understand the urgent and increased threats facing our nation in space. Next-Gen OPIR will be an entirely new missile warning system with new payloads and sensors, offering new capabilities to the Air Force or any other newly created space entity."[106]

Weather Observation

The Genesis of Weather Monitoring. Once again, there is a need to return to a tense time in United States history, the Cold War. On February 17, 1959, the U.S. Navy's program, Project Vanguard, launched its first weather observation satellite, the Vanguard 2.[107] Project Vanguard was responsible for measuring the cloud cover distribution over the daylight portion of its orbit and providing information on atmospheric density throughout its time on orbit. Even though the scientific research gained from creating the Vanguard 2 was widely useful, the data gathered from the satellite was unfortunately unsatisfactory. To compensate for these unfavorable performance characteristics of the Vanguard 2, the Television Infrared Observational Satellite (TRIOS), the "Vanguard 2 follow-on", was launched on April 1, 1960, and is considered to be the first successful weather satellite in history.[108] By the end of 1965, NASA had launched a total of 10 TRIOS's and gained an approximate 450 useful images. Between 1965 and 1975 programs such as the Nimbus, Environmental Science Services Administration Satellite Program (ESSA), Polar-Orbiting Operational Environmental Satellite

[106] Derived from a personal interview with Colonel (Ret.) Daniel P. Jordan. When I had asked him "what do you perceive to be the largest issue with space-based infrared monitoring, or just the Next-Gen OPIR program in general and does the potential reconfiguration of the current organizational and management structure address this issue?", this is what he responded with.
[107] Anusuya Datta, "A Brief history of Weather Satellites," geospatialworld.net, November 19, 2016.
[108] Ibid.

(POES), Applications Technology Satellites (ATS), and Synchronous Meteorological Satellites (SMS), all contributed to the exploration of satellite weather observation.[109] On October 16, 1975, the Geostationary Operational Environment Satellite (GOES) was launched, beginning the lineage of the multi-million-dollar weather observation satellites still in production today.[110] While, satellite weather capabilities are typically the work of civilian organizations like NASA, the National Environmental Satellite, Data, and Information Service (NESDIS), and the National Oceanic and Atmospheric Administration (NOAA), in 1973, the Defense Meteorological Satellite Program (DMSP), a classified program, was revealed. The DMSP provides the Air Force Weather Agency (AFWA), the Intelligence Community, and the Navy's Fleet Numerical Meteorology and Oceanography Center with visible, infrared, microwave imagery, temperature, and moisture sounding data, and other specialized space environment data.[111]

More Than Just a Civil Service. Most importantly, the U.S. needs to collect terrestrial, space environment, and earth surface data.[112] Not only is satellite weather data collected and used for providing the civilian population with accurate weather information, but it is also used for protecting both U.S. space assets and their accompanying ground components. Occurrences like thermal flares, radiation emissions and other potentially harmful phenomenon's that may negatively affect U.S. space assets are monitored and addressed accordingly because of this capability. They provide intelligence to warfighters and strategic planners alike to ensure that missions may be conducted with little to no "surprise" regarding weather conditions. Space weather assets are responsible for monitoring hurricanes, the polar ice status, vegetation, and

[109] Ibid.
[110] Johannes Schmetz, W. Paul Mezel, "A Look at the Evolution of Meteorological Satellites: Advancing Capabilities and Meeting User Requirements," *journals.ametsoc.org*, July 1, 2015.
[111] "USAF Meteorological and Space Environmental Services," *United States Air Force*.
[112] "Defense Meteorological Satellite Program," *United States Air Force*, March 22, 2017.

oceanic hazards, all of which contribute to the national security and overall well-being of the United States.

Supplementing Weather Observation Services. Once again, while there is no dominant singular issue facing space weather, the capability is susceptible to several of the previously mentioned issues. A heavy reliance on commercial supplementation, susceptibility to adversarial intervention, and an array of other possibilities threaten space weather observation. One of the most notable issues has risen from the USAF's questionable ability to provide USCENTCOM with adequate weather data. The issue had risen such concern that the House Armed Services Subcommittee on Strategic Forces directed the Secretary of the Air Force, Heather Wilson, in the NDAA for FY19 to, "develop a plan to provide the United States Central Command with persistent weather imagery for the area of operations of the command beginning not later than January 1, 2026".[113] This directive stems from USCENTCOMs potential reliance on weather data collected from foreign governments. While USCENTCOM has augmented weather data from European nations for over two decades, the systems are aging, and as retired Navy Vice Adm. Conrad Lautenbacher states "Using an older satellite to cover the CENTCOM area of responsibility comes with the risk that aging instruments beyond their advertised life spans may fail."[114] In addition, Ralph Stoffler, the Air Force Director of Weather states that "The challenge in our business is that 95 percent of the data we use comes from the international community … We try to create a balance between what we get from international partners and commercial partners."[115] Furthermore, a 2017 high-risk report issued by the GAO analyzed a potential weather satellite data gap by concluding that "such a gap could negatively affect military

[113] National Defense Authorization Act for FY19
[114] Sandra Erwin, "New Concerns About U.S. Central Command's Access to Weather Satellite Data," *Spacenews.com*, April 26, 2018.
[115] Ibid.

operations that depend on weather data."[116] In conclusion, while weather data is typically seen by outsiders as researched-based data with minimal importance to the warfighter, it is, in fact, a dire component to the operational ability of U.S. Military Services.

Space-Situational Awareness and Space Traffic Management

Creating a Catalog. Contrary to popular belief, "satellites" don't necessarily have to be the manmade objects we commonly think of, but instead, a "satellite" is the description given to any object in space, natural or synthetic. Before the 1957 launch of Sputnik, individuals like Fred Whipple and Dr. G.M. Clemence began researching satellites in space, proving that there was debris in earth's orbit before humans had polluted it. It was not the 1957 launch of Sputnik that initiated space debris but instead was both the Vanguard 1 and the Vanguard 2 that begun contributing to the accumulation of space debris.[117] Because of these launches, the "space object catalog," managed by the Joint Space Operations Center (JSpOC), recently renamed in July 2018 as the Combined Space Operations Center (CSpOC) at Vandenberg AFB in California, was created. CSpOC, and specifically the space object catalog, is a specific USSTRATCOM center responsible for identifying and monitoring all objects in earth orbit.[118] In addition to CSpOC, the Air Force's 18th Space Control Squadron is responsible for operating the Space Surveillance Network (SSN), a network that monitors radar and optical sensors at sites located around the world.[119]

[116] "High Risk Series: Progress on Many High-Risk Areas, While Substantial Efforts Needed on Others," Government Accountability Office, Report No. GAO-17-317, February 2017.
[117] Loretta Hall, "The History of Space Debris," *Embry-Riddle Aeronautical University*, November 6, 2014.
[118] "Space Debris and Space Traffic Management," *Aerospace.org*, November 14, 2018.
[119] Ibid.

The current space situational awareness (SSA) and space traffic management (STM) system, most typically known as the "Space Fence", is a surveillance network comprised of three aspects, a radar, a telescope, and a Space-Based Surveillance Satellite. Space Fence is a radar located in the Marshall Islands on the Kwajalein Atoll and is operated by the USAF.[120] The system provides CSpOC with a constant stream of data about objects in earth orbit.[121] As objects pass, the radar reports this information to computers located at CSpOC and can subsequently characterize, catalog, and ultimately monitor the object's trajectory.

Monitoring Potential Mishaps. Outlined in the *Joint Publication 3-14* doctrine, the four functional areas of SSA/STM are: Detect/Track/Identification; Characterization; Threat Warning & Assessment; and Data Integration and Exploitation.[122] One of the most commonly brought up debates with SSA is launch. To launch satellites into MEO, HEO, and GEO, one must go through LEO, an orbit that is becoming increasingly populated. In general, the ability to launch a satellite into orbit without it colliding into other space debris is known as lunch collision avoidance (LCOLA). In addition to LCOLA, SSA capabilities have begun to aid in deorbiting satellites, end-of-life/disposal, reentry, human space flight safety, and adversarial satellite detection.[123] SSA's relevance to space operations spans much wider than just its contributions to satellite monitoring; the capability continues to play a major role in ensuring the United States remains uncontested in the space domain.

The Jurisdictional Challenge. There are two primary debates typically associated with SSA and STM; first, the strategic implications and second, potential policy challenges. One of

[120] Debra Wener, "Lockheed Martin Prepares to Turn on U.S. Air Force Space Fence on Kwajalein Atoll," *Space News*, May 3, 2018.
[121] Roger Mola, "How Things Work: Space Fence: The New Early-Warning System to Protect Spacecraft from Orbiting Junk," *Air and Space Magazine*, February 2016.
[122] "Joint Publication 3-14: Space Operations," April 10, 2018,
[123] "Orbital Traffic Management Study, Appendix D, D-8," *Science Applications International Corporation*, November 21, 2016.

the most prominent strategic discussions tied to SSA and STM is the ability of the U.S. to monitor adversarial space assets as they continue to proliferate. As space technology continues to advance, the ability for U.S. adversaries to not only manipulate data coming to and from the satellite but their ability to physically alter U.S. space assets, has become a reality. Not only has the possibility of collisions increased, but so too has the potential for intentional kinetic adversarial intervention on U.S. space assets. However, the policy debate associated with SSA and STM is not dissimilar from that of a specific example mentioned within Chapter Two of this thesis, Satellite Communications. A large majority of the space policy community has advocated for shifting from a predominately DoD ruled SSA and STM structure, to transitioning the responsibility to a civil agency, like the Federal Aviation Administration (FAA), or the Department of Commerce.[124] This DoD vs. civil discussion tends to surface the inherently governmental aspects of SSA and STM; arguing that a civilian agency should not be entrusted with the level of responsibility that comes with SSA and STM. One side argues that the increased role commercial industry plays in space operations demands that the DoD remain intertwined with SSA and STM, and the other side argues that the need for transparency outweighs the necessity of a DoD presence. Whichever way the issue is analyzed, it's an uncontested fact that U.S. national security space assets rely on SSA and STM. While supplementing the DoD's effort in SSA and STM with civilian-based agencies is an option, if this information is to become publicly available, there are on orbit national security space assets that would be put at risk if this information were to become publicly cataloged. In conclusion, the argument remains, the challenge of supplementing national security for commercial capabilities is a challenge that has yet to be solved.[125]

[124] Major Policy Issues in Evolving Global Space Operations, 7.
[125] Ibid.

Chapter Conclusions

In conclusion, the most prominent piece of information gained from this chapter is just how fundamentally intertwined space is into U.S. military and defense infrastructures. Maintaining security of U.S. and allied space assets is not just a military endeavor but also civilian. The space-based capabilities that were previously examined are all targets for U.S. adversaries. Whether these threats emanate from within the organization itself or are susceptible to external influence, they are present. The next chapter seeks to examine the two countries that pose the largest threat to U.S. national security and commercial space assets, China and Russia. When examining the counterspace capabilities of our adversaries, we must continuously be reminded of what is at stake for the U.S. and its allies. While Chapter Three does take an inherently militaristic approach on space security, this topic is also intertwined with the various space -based civilian infrastructure's that the U.S. relies on each day.

CHAPTER 3: DEFINING THE THREAT

"Denying U.S. space capabilities is a central tenet of adversary strategies designed to diminish our prestige and raise the risks and costs of intervention in regional affairs"- (Ret.) Gen. Robert Kehler (April 2018)

Introduction

In 1967 the Treaty on Principals Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, most commonly referred to as "The Outer Space Treaty," was signed into law. The space treaty explicitly outlined that "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 in any other manner."[126] Despite adherence to the treaty following 1967, it has since been perverted, contorted, and outright disobeyed. The adversarial space threat has continued to evolve, and a vast majority of military space leaders involved in the fight have acknowledged this fact. Secretary of the Air Force, Heather Wilson, has stated that "We can no longer view space as a function; it is a warfighting mission. We have been charged with making sure America dominates in space, and that is just what we're doing."[127] In addition, General John 'Jay' Raymond, commander of the Air Force Space Command (AFSPC), has asserted that "This is one of the most critical times in our national security space history – it will be seen as a strategic inflection point."[128] And finally,

[126] "Treaty on Principles Governing the Activities of States in the Explorations and Use of Outer Space, Including the Moon and Other Celestial Bodies," *United Nations,* December 19, 1966.
[127] Heather Wilson, "The Air Force We Need," *Air Force Association Conference*, September 17, 2018.
[128] "AFSPC Commander Discusses Strategic Inflection Point for Space at 34th Space Symposium," Air Force Space Command Public Affairs, April 18, 2018.

General John J. Hyten, Commander of United States Strategic Command (USSTRATCOM), has said "I watch what our adversaries do. I see them moving quickly into the space domain, they are moving very fast, and I see our country not moving fast, and that causes me concern."[129] While the United States has not yet relinquished its superiority in space, it has fallen behind, and the previously mentioned testimonies justify this fact. This chapter seeks to examine the military doctrine and the space-based capabilities associated with the two countries currently posing the largest threat to United States space superiority, China and Russia. It's important to mention that while Iran, Syria, and North Korea all threaten the U.S., the largest of these threats comes from China and Russia.

Weaponizing Space

Before analyzing the counterspace capabilities of both China and Russia, we must first begin by assessing the technologies that make these nations a threat to the United States. The space technologies currently threatening the U.S. will typically be categorized as "counterspace weapons" and will most commonly be segregated into four distinct categories, kinetic/physical, non-kinetic, electronic, and cyber. In general, a kinetic/physical attack is what it sounds like; it is the destruction of a satellite through physical contact, typically through the use of an anti-satellite (ASAT) weapon. The long-term effects that physical attacks have not only on the satellite but the orbit as well, are extensive, as they can create a debris field within a specific orbit. A non-kinetic weapon, typically a laser, high-powered microwave(s), or an electromagnetic pulse may also have physical effects on a satellite. However, non-kinetic

[129] Sandra Erwin, "STRATCOM chief Hyten: 'I will Not Support Buying Big Satellites that Make Juicy Targets'," *Spacenews.com*, November 19, 2017.

weapons do not necessarily need to have physical contact with the satellite.[130] When referring to an electronic attack, the typical means of intervention are conducted by jamming and/or spoofing various radio frequencies (RF). As mentioned in Chapter Two of this thesis, jamming is the action of interrupting of a signal. Jamming can occur on both the uplink, the signal delivered to the satellite, or the downlink, the signal emitted from the satellite to the ground terminal.

However, jamming and or spoofing may not always have a permanent effect on the satellite, as the jammer may subsequently be turned on or off. Finally, and undoubtedly the most complex of counterspace weapons is an attack by cyber means. Without diving too deep into the technical jargon utilized to explain the cyber domain, it may be best to understand what a cyberattack could potentially do to a satellite instead of analyzing how an attack is orchestrated. It is best explained within the Space Threat Assessment produced by the Center for Strategic and International Studies; "if an adversary can seize control of a satellite through a cyberattack on the satellite's command and control system, the cyberattack could shut down all communications and permanently damage the satellite by expending its propellant supply or damaging its electronics and sensors."[131] Overall, the implications of a cyberattack on a satellite are wide-reaching and may differ on a case by case basis. In general, these four previously mentioned counterspace weapons are the primary means for executing an attack in space. However, these four types of attacks do not encompass the full scope of counterspace weaponry but merely scrape the surface of what is possible.

[130] Todd Harrison, Kaitlyn Johnson, Thomas G. Roberts, "Space Threat Assessment 2018," *Center for Strategic and International Studies,* April 2018. 3
[131] Ibid. 5

China's Military Doctrine

In a 2016 white paper published by the State Council Information Office of the People's Republic of China, it is stated that China's vision is to "build China into a space power in all respects" with the ability to "effectively and reliably guarantee national security" and to "provide support for the realization of the Chinese dream and the renewal of the Chinese nation."[132] In addition, the phrase "in all respects" is a pertinent aspect of this document. While it may not be immediately apparent what the repercussions of this statement are, this assertation directly effects how the U.S. will view and subsequently respond to China's actions in space. Whether the U.S. seeks to adopt a response that is either offensive or defensive, there is a certain level of action that can and will be taken. To understand how the Chinese space threat became so relevant in such a seemingly short amount of time, it's essential that we take note of the Persian Gulf War.

The U.S. military's performance throughout the Persian Gulf War altered the way the People's Liberation Army (PLA) viewed the relevance of information enabled weapons and the lethality of precision-strike capabilities.[133] It was this war that initiated a change in China's military doctrine, noting that the nation would most likely face a "local war under high-technology conditions."[134] Throughout the 1990s China recognized that a war occurring before 2020 was highly unlikely. It was this strategic vision that provided the nation with a "period of strategic opportunity," or more clearly known as a time for military and economic growth.

[132] "China's Space Activities in 2016," The State Council Information Office of the People's Republic of China, December 27, 2016.
[133] "China Military Power: Modernizing a Force to Fight and Win," Defense Intelligence Agency, 2019, 2.
[134] Ibid.

Throughout this timeframe, it has been president Xi Jinping's goal to reaffirm the PLAs overseas role and to provide substantial military growth beyond traditional PLA capacities.[135]

The most recent and relevant developments in Chinese military power occurred in 2015 with President Xi Jinping's structural and organizational reformation of the PLA. This series of military reforms ordered by President Xi Jinping instituted joint theater commands, a new Joint Staff Department, and disassembled the previously existing four general departments of the PLA and separated them into 15 Central Military Commission (CMC) departments.[136] This structural reform also elevated China's missile force into a stand-alone service by establishing the PLA Rocket Force, a move that unified China's space and cyber operations under the strategic support force.[137] In addition, in October 2017 President Xi Jinping outlined China's military goals for the next couple of decades within a report provided the 19th Party Congress. The three primary objectives noted by President Xi Jinping were: evolve China into a mechanized force with increased informative and strategic capabilities by 2020, fully modernize the force by 2035, and become a worldwide first-class military power by mid-century.[138] While one can speculate as to why China felt it was necessary to elevate its military space operations to such a level through the institution of a "Rocket Force," the answer most likely lies within China's threat perception of its external environment.

In May 2015, the State Council Information Office of the People's Republic of China published China's Military Strategy, a doctrine asserting China's near and long-term military objectives. An alarming aspect of this document is the intense level of concern that China has

[135] ZD, "China Focus: 'Be Ready to Win Wars,' China's Xi Orders reshaped PLA," Xinhua in English, August 1, 2017.
[136] "Annual Report to Congress; Military and Security Developments Involving the People's Republic of China 2016," *Office of the Secretary of Defense*, April 2016.
[137] "Annual Report to Congress; Military and Security Developments Involving the People's Republic of China 2017," *Office of the Secretary of Defense*, May 5, 2017.
[138] ZD, "Full Text of Xi Jinping's Report at 19th CPC National Congress," Xinhua, November 3, 2017.

given to "maintaining peace." Located directly in the preface of this 2015 report is China's prioritization of peace and the seemingly "defensive" military posture it wishes to maintain. However, this 2015 report notes that "A prosperous and stable world would provide China with opportunities, while China's peaceful development also offers an opportunity for the whole world."[139] Throughout this report, the importance placed on the word "peace," specifically for China's development, is alarming. However, it is not necessarily the word "peace" that is most alarming, but rather it is the blatant contradictions outlined within the report that are both thought provoking and concerning. While the report attempts to argue that a "strong national defense and powerful armed forces" for China offers opportunity for the whole world, it really only seeks to ensure that China's "adaptive" new armed forces "firmly follow the goal of the Communist Party of China (CPC)," not the entire world.[140] Even though the 2015 report states that it is China's goal to maintain global peace, it also acknowledges that China seeks to "achieve the great rejuvenation of the Chinese nation," regardless of the effects this mission may have on external nations.[141] This "rejuvenation" is exemplified through China's digital silk road initiative, its belt road enterprise, and more generally, its increased influence abroad. China's perception of its external environment is categorized within the report as being "generally favorable," despite noting that territorial disputes over the South China sea have created "grave concerns," and that globalization and revolutionary military affairs (RMA) have "posed new and severe challenges to China's military security."[142] It seems as though "peace" is the least of China's concerns, instead, security by any means necessary takes precedence.

[139] "China's Military Strategy," The State Council Information Office of the People's Republic of China, May 2015.
[140] Ibid. 2
[141] Ibid. 3
[142] Ibid. 4

It would be naïve to discredit the importance and strategic utility of the words within the 2015 report; however, it must also be noted that it is generally the objective of most rational nations to ensure the security and prosperity of their people. Even though this may be the case with China, there is a certain level of skepticism that one must maintain when analyzing their military strategy. It is stated that China will pursue a national defense policy that is defensive and "will never seek hegemony or expansion."[143] Nevertheless, the same report states that the PLA Air Force (PLAAF) seeks to "shift its focus from territorial air defense to both defensive and offensive", and that to "expand and intensify its preparation for military struggle (PMS), China's armed forces must meet the requirement of being capable of fighting and winning."[144] Each one of these quotes, located within the same 2015 report, directly contradict the assertation that China "will never seek hegemony or expansion." While we must not become too overly analytical of China's defense doctrine, as its unspoken goal is to maintain a certain level of ambiguity and clout, we must also refrain from discrediting the importance of this document. In conclusion, China's military doctrine does acknowledge that both "Outer space and cyberspace have become new commanding heights in strategic competition," and that "China will keep abreast of the dynamics of outer space… and maintain outer space security."[145] As we will see below, China has, in fact, begun to stay abreast of the dynamics of space through its development of advanced space-based capabilities, both offensively and defensively.

[143] Ibid. 4
[144] Ibid. 17
[145] Ibid. 12

China's Counterspace Capabilities

The goal of Chinese space operations is to achieve space superiority by "ensuring one's ability to fully use space while at the same time limiting, weakening, and destroying an adversary's space forces."[146] Since the beginning of 2000, China has modernized its space-based Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) capabilities as well as increased its overall number of satellites from a just a few, to 181 by mid-2016, second only to the United States.[147] It is Chinese belief that in order to maintain a symmetrical level of power to that of the United States, it must also produce similar forces. It has been stated by Chinese scholars that "Whoever is the strongman of military space will be the ruler of the battlefield; whoever has the advantage of space has the power of initiative; having 'space' support enables victory, lacking 'space' ensures defeat."[148] Beginning 2000 China stated its plans to establish a 24-hour, all-weather remote sensing satellite along with an operational global satellite navigation system by 2020. Since this declaration, China has launched 22 navigational satellites, 34 civil, military, commercial communication satellites, and has updated its ground terminal infrastructure.[149]

Despite these seemingly harmless advances in space, the nation has also enhanced its ability to conduct "space attack and defense operations."[150] The most apparent and widely discussed example of these advances occurred in January 2007 when China conducted a successful kinetic ASAT test.[151] The test was performed on an inactive Chinese meteorological

[146] Jian Lianju,Wang Liwen, eds. "Textbook for the Study of Space Operations," *Beijing: Military Science Publishing House*, 2013.
[147] "UCS Satellite Database: In-Depth Details on the 1,459 Satellites Currently Orbiting Earth," Union of Concerned Scientists, last revised January 9, 2019.
[148] Jian Lianju and Wand Liwen, eds., 2013, 1.
[149] Kevin L. Pollpeter, Michael S. Chase, Eric Heginbotham, "The Creation of the PLA Strategic Support Force and Its Implications for Chinese Military Space Operations" RAND corporation, 2017, 8.
[150] Ibid. 9
[151] 2018 Space Threat Assessment.

satellite, located in LEO, and confirmed that China can destroy space systems in LEO. Not only did this test prove that China could attack various satellite architectures in LEO, but it also created a great deal of debris.[152] Despite the test being a success for Chinese counterspace operations, it directly affected the international community by producing an estimated 3,000 pieces of debris, a repercussion that continues to threaten the International Space Station (ISS) and other LEO based satellites architectures.[153] Following the 2007 ASAT test, China launched an ASAT system capable of reaching GEO, an orbit that contains a large number of missile warning, military communications, and ISR satellites.[154] China has also conducted numerous non-debris producing tests in October 2015, December 2016, August 2017, and February 2018.[155]

On top of the previously mentioned ASAT tests, China has also begun experimenting with another increasingly concerning system, the SJ-12 satellite. While the satellite was most likely used to test remote proximity maneuvers near other satellites, jamming, and other counter-space operations, there is speculation that the satellite may have been a preliminary test for a successive 2016 satellite launch, the Aolong-1 space craft. The Aolong-1's publicly acknowledged purpose was to explore options for removing space debris from various orbits, a task that justified a robotic arm being placed on the satellite. Even though there has been a great deal of speculation regarding the mission of the Aolong-1, the technology could more realistically be utilized to damage or disassemble other satellites.[156] In addition to the Aolong-1

[152] Thomas Sean 'T.S'. Kelso, "Analysis of the 2007 Chinese ASAT Test and the Impact of Its Debris on the Space Environment," *Center for Space Standards & Innovation*, 2007.
[153] Brian Weeden, "2007 Chinese Anti-Satellite Test Fact Sheet," November 23, 2010.
[154] U.S.-China Economic and Security Review Commission, "2015 Report to Congress of the U.S.-China Economic and Security Review Commission," uscc.gov, November 2015, 293.
[155] Bill Gertz, "China ASAT Test Part of Growing Space War Threat: DNI Outlines Growing Danger to Satellites from Beijing's Missiles, Lasers and Robot Spacecraft," *freebeacon.com*, February 23, 2018.
[156] "China's New Orbital Debris Clean-up Satellite Raises Space Militarization Concerns," *Spaceflight 101*, June 29, 2016.

were China's remote proximity maneuvers near an older Chinese satellite in 2010, displaying the nation's ability to enter an orbit and subsequently come into close contact with another satellite. This fact, in correlation with the robotic arm placed on the Aolong-1, has caused grave concern.

A key piece to China's non-kinetic counterspace capabilities is its ability to utilize directed energy technologies to "blind or damage sensitive space-based optical sensors, such as those used for remote sensing or missile defense," as outlined in a recent report from the U.S. Director of National Intelligence (DNI), Dan Coats.[157] Not only has the U.S. asserted what it perceives to be the largest space-based threat from China, but a paper produced by the China Electronic Technology Group Corporation solidifies the assumptions made by the U.S. The authors of the report state that U.S. space technologies like the "Advanced Extremely High Frequency (AEHF), Wideband Global Service (WGS), and the Global Broadcast Service (GBS)" satellite constellations would be susceptible to China's advanced counterspace capabilities.[158] While the report was merely a piece produced by Chinese academics, the 2014 attack on the National Oceanic and Atmospheric Administration's (NOAA) weather systems removed any doubt of China's counterspace capabilities. The attack was initially revealed to the public as "unscheduled maintenance" by Representative Frank Wolfe, former Chairman of the House Appropriations Commerce, Justice, Science Subcommittee, but was subsequently acknowledged as an attack by Chinese hackers. Overall, the 2014 Chinese attack disrupted the flow of NOAA imagery for approximately two days and displayed Chinese counterspace cyber capabilities.

[157] Daniel R. Coats, Statement for the Record, "Worldwide Threat Assessment of the US Intelligence Community," *dni.gov*, February 13, 2018, 13.
[158] Lin Jin-shun, Wu Xianzhong, Lu Shengjun, and Jiang Chunshan, "Countermeasure Technology for MMW Satellite Links," Aerospace Electronic Warfare, October 2012, 20–22; as Quoted in David D. Chen, "Opening Statement of Mr. David Chen," 82.

Concluding Remarks on China

Space has inevitably become "a commanding height in international strategic competition" for China.[159] The nation "will keep abreast of the dynamics of outer space" and will "maintain outer space security."[160] Perhaps the most solidifying aspect of these facts was displayed on December 31, 2015, with the creation of China's Strategic Support Force (SSF). With the creation of this force, China has highlighted the importance of both space and information operations. The SSF's creation was predicated on implementing a more streamlined and effective fighting force. It was an attempt to create a force structure that promotes joint operations across the PLA. Ren Xu, China's national defense spokesperson, asserted that the SSF was created to provide "strong strategic, foundational, and sustainment support to carry out the integration of capabilities" with the ability to "optimize the structure of the military forces and improve comprehensive support capabilities."[161] Yin Zhuo, a retired admiral of the Chinese Navy, described the SSF as "an important force in joint operation whose actions will be integrated with the Army, Navy, Air Force, and Rocket Force."[162]

It appears that the creation of the SSF was in direct response to an unconsolidated and dysfunctional Chinese military force structure. As different as our nations may be, and as opposite as our strategic and military doctrines are, there is a symmetrical issue happening within U.S. force structure. The creation of the SSF in 2015 sparked concern amongst U.S. policymakers and defense professional's alike. It should be concerning that even though the SSF was stood up approximately three years ago, the U.S. is just now beginning to reorganize its

[159] *China's Military Strategy*, 2015.
[160] Ibid.
[161] Upon finding references pointing to this source, it was mandatory that I utilized google translate to format this into English. Ren Xu, "Ministry of National Defense Spokesperson Takes Media Inquiries on Deepening National Defense and Military Reform" January 1, 2016.
[162] Yao Jianing, "Expert: The Strategic Support Force Will Be Critical for Victory During the Entire Operation" China Military Online, January 6, 2016.

national security space components. The previously mentioned testimonies at the beginning of this chapter regarding the U.S falling behind its adversaries in the space domain, specifically China, are not unsubstantiated claims but they are facts supported by the creation of the SSF.

Russia's Military Doctrine

While the Russian and U.S. space relationship is rich in history, we must focus our attention after the fall of the Soviet Union. Despite the intricacies and potential contributions that a historical perspective may provide a better understanding of Russian space history, this analysis is not a historical one, but rather an assessment of the current space environment. Released in 2010, the Military Doctrine of the Russian Federation solidifies a centuries-old Russian threat perception. A general understanding of how Russia views its external environment can be found at the beginning of Russia's 2010 military doctrine. The document from 2010 promptly begins by listing "the military dangers and military threats to the Russian Federation."[163] It does not begin by providing a general assessment of the current geopolitical environment nor does it begin by assessing aspects of Russian military strategy, but rather, it commences with an assessment of what it perceives its "main external military dangers" to be. Among these external threats are an expanding NATO presence, an ever-increasing western influence, violations of international treaties, and the militarization of outer space.[164] Not only does the doctrine immediately address these external threats, it subsequently dives directly into what it's "main military threats are."[165] The document notes that a deteriorating military-political situation and a slew of threatening military exercises near Russia's border are "impeding on the

[163] President of the Russian Federation "2010 Military Doctrine of the Russian federation," February 5, 2010, *carnegieendowment.org*.
[164] Ibid.
[165] Ibid.

operation of systems of state and military command and control" to include "the disruption of the functioning of its strategic nuclear forces, missile early warning systems" and "systems for monitoring outer space."[166]

Despite being published nearly a decade ago, the 2010 document notes that the characteristics of contemporary military conflicts are evolving. It addresses that an increased reliance on information warfare and proliferated "resources operating in airspace and outer space" are contributing to this evolving threat landscape.[167] Before the release of the document, on February 12, 2008, both China and Russia submitted a treaty proposal entitled "Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force Against Outer Space Objects (PPWT)" to the United Nations Conference on Disarmament.[168] However, the United States dismissed the proposal, dubbing it "a diplomatic ploy by the two nations to gain a military advantage."[169] The treaties denial may have contributed to the aggressive language related to outer-space within Russia's 2010 military doctrine. Even though the treaty proposal may have been an attempt to make peace, this was not the case; as we have witnessed by both Chinese and Russian counterspace activities.

Almost symmetrical to China's reorganization activities, just one year later on December 1, 2011, Russia consolidated its air-defense and space forces into a new branch of service known as the Aerospace Defense Forces (ADF).[170] Four years after this merger, the nation once again reorganized its space organizational structure by combining its Air Force and Aerospace Defense Forces into the Russian Aerospace Forces.[171] The reorganization of these forces is most likely in

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[166] Ibid.
[167] Ibid.
[168] "Proposed Prevention of an Arms Race in Space (PAROS) Treaty," *Nuclear Threat Initiative,* last updated September 29, 2017.
[169] Ibid.
[170] "History: Aerospace Defense Forces," *Ministry of Defense of the Russian Federation*.
[171] Matthew Bodner, "Russia Merges AF with Missile Defense, Space Commands," *Defense News,* August 8, 2015.

response to the 2008 PPWT denial and adherence to the direction provided by the 2010 Russian military doctrine. The differences between Chinese and Russian military doctrine is rooted in the two nations cultural differences. During a recent Center for Strategic International Studies (CSIS) panel featuring Lt. Gen. Samuel Greaves, Director of the Missile Defense Agency (MDA), and Mr. Dave Trachtenberg, Under Secretary of Defense for Policy (USD(P)), the two gentlemen noted that the major variance between the two nations is Russia's propensity for action. The panelists asserted that despite Russia's weak economy, it's inherent inclination to act in both an offensive and defensive manner are as equally alarming as the advanced Chinese capability.[172] Both Lt. Gen. Greaves and Under Secretary Trachtenberg noted that Russia's external threat perception is alarming, concluding that their decision-making calculus is heavily influenced by how the nations percieves its place on the international stage.

Taking into consideration the 2010 military doctrine and the reorganization of Russian military space components, we may be correct in assuming that the nation is actively seeking defensive mechanisms for space that err on the side of the offense. Listed below are the capabilities, tests, and instances supporting why Russia's space presence poses a threat to U.S. national security.

Russia's Counterspace Capabilities

Unlike China's ASAT capabilities, Russian kinetic counterspace weapons begun in the early 1960s. Between 1963 and 1982 Russia had successfully conducted 20 ASAT tests with its Istrebitel Sputnikov, or "satellite destroyer."[173] Throughout the 1980s, '90s, and early 2000s,

[172] "The 2019 Missile Defense Review: What's Next?," *Center for Strategic and International Studies*, February 1, 2019.
[173] Asif A. Siddiqi, (1997). The Soviet Co-Orbital Anti-Satellite System: A Synopsis," JBIS - Journal of the British Interplanetary Society. 50. 225-240.

Russia had been experimenting and fielding its most powerful ASAT weapon to date, known as the Naryad. Since then, the system was relocated to Tajikistan in the early 2000s and has since undergone numerous hardware and software updates.[174] Most recently the nation has been engaging in what is known as rendezvous and proximity operations (RPO), similar to China's remote proximity maneuvers. A 2018 Secure World Foundation report notes that Russia has conducted various classified RPO activities since 2013, some of which could potentially be threatening.[175] However the most recent of Russia's counter-space weapons may not exactly be classified as "counterspace," but rather "counter-aerospace." The nation has begun to rely on its S-300 and S-400 surface-to-air-missiles and subsequently sold them to its neighboring nations, including Turkey so that the system may be placed along the Syrian border.[176] Not only has there been a discussion on what will come of the S-400 system, but the Deputy Commander-in-Chief of the Russian Air Force noted that the S-500, the follow-on system to the S-400, would be made available shortly.[177]

In addition to its kinetic counterspace capabilities, Russia has also developed and tested directed-energy and laser weapons systems. Most recently, photos leaked from a 2011 show indicate that the counterspace laser system(s) would be mounted on an aircraft capable of flying at extremely high altitudes and used to interrupt the functionality of various satellites. In addition to directed energy capabilities, the nation has shown its affinity for GPS jamming technologies, specifically those witnessed during the 2014 annexation of Crimea. Reports emanating from Ukrainian intelligence noted that phones reliant of GPS, radios, and remotely piloted aircraft

[174] "Sourcebook on the Okno, Okno-S, Krona and Krona-N Space Surveillance Sites," *Fas.org*, November 19, 2014.
[175] Brian Weeden, Victoria Samson, "Global Counterspace Capabilities: An Open Source Assessment," *Secure World Foundation*, April 2018,
[176] Burak Ege Bekdill, "Turkey Defense Minister Announces Timeline for S-400 Deployment," *Defense News*, October 26, 2018.
[177] John Pike, "S-500 Samoderzhets," *Global Security*.

were all affected as a result of Russia's intervention.[178] While not directly related to Russian space capabilities, that nation has shown a knack for cyber warfare. Witnessed during both the 2014 Crimean conflict, the 2016 U.S. presidential election, and potentially the 2018 mid-term elections, Russia has displayed its ability to utilize cyber means as a way of warfare. Even though the attacks were not directly aimed at U.S. space systems, it is safe to say that Russia does possess cyber capabilities that pose a significant threat to the United States.[179]

Concluding Remarks on Russia

As noted earlier in this chapter, it is not necessarily the capabilities of Russian space assets that are most alarming to U.S. policymakers, but rather the nation's inclination for action. In addition, rhetoric surrounding the potential re-weaponization of space through weapon systems like the RS-128, a thermonuclear-armed ICBM with an expected deployable date sometime in 2021.[180] Even though Russia is operating within a struggling economic environment, its threat perception of its outside environment displays the nations dire concern with western influence. Russia has continuously attempted to create distance between itself and the west along its borders. It is this ideology that seeps not only into the sea, land, and air domains but space as well. If the nation is willing to go to such lengths to maintain a safe distance from western influence along its borders, it is safe to assume that this applies to space as well.

[178] Sergey Sukhankin, "Russian Electronic Warfare in Ukraine: Between Real and Imaginable," *Real Clear Defense*, May 26, 2017.
[179] *Space Threat Assessment*, 15.
[180] Franz-Stefan Gady, "Russia to Test Fire RS-28 Sarmat ICBM in Early 2019," The Diplomat, October 3, 2018.

CHAPTER 4: POLICY POSITIONS

"You need to identify, each of you, the key decision makers, the chains of command and empower them to decide quickly" -Dr. Michael Griffin (August 8, 2018)

Introduction

Thus far we have evaluated the historical framework that has made military space operations possible, we have assessed why protecting U.S. national security space assets is necessary, and we have analyzed the space capabilities and the potential intentions of both China and Russia. There has been an adequate presentation of the policy issues plaguing specific space capabilities, and we have looked at a few of the challenges regarding the current organizational and management structure of U.S. national security space components. Although specific policy positions and issues will be analyzed, we must begin by assessing the perceptions of the two most powerful players in the space domain, Congress and the Department of Defense. While the U.S. Intelligence Community, specifically the NRO, plays a large role in the current organizational structure of national security space components, the opinions and testimonies coming from the NRO are rarely made available to the public, as their reasons for reorganizing specific national security space components remain classified.

The following section addresses the overall position each organization takes on reorganizing U.S. policy regarding military space operations. While the positions taken by the individuals within each organization differ, we must attempt to evaluate the entities perception in its entirety. One key aspect to consider with Congress is the position of partisanship. This issue of a potential "space force" has become an inherently political development, as the administration mandating this change has been unlike any other. Case in point, Doug Loverro,

former Assistant Secretary of Defense for Space Policy, notes "This has become a partisan issue. I have been saying it shouldn't be, but unfortunately it has become a partisan issue."[181] Despite the political divide and the potential gridlock, this idea will create, it's worth analyzing the position of both Congress and the DoD's on the issue through analysis of key documents and testimonies.

The United States Congress

To begin analyzing where the direction to assess the current organizational and management structure of the U.S. policy relate to military space operations came from, we must rely on two pertinent documents, the "OMB Report on the Leadership, Management, and Organization of the Department of Defense's Space Activities"[182], and the "Final Report on Organizational and Management Structure for the National Security Space Components of the Department of Defense."[183] These two reports, while conducted by two separate entities, were presented to the same cohort of individuals that comprise the various congressional defense committees. These committees included the House and Senate Armed Services Committees, the House and Senate Appropriations Committees, their accompanying subcommittees, and the House and Senate intelligence committees. It must be noted that these reports may have potentially been the basis for forming the opinions of many key congressional members. Despite a common belief, the pressure for the OMB report originated in the Obama Administration, not the Trump Administration. The OMB report was produced in response to section 1616 of the

[181] Sandra Erwin, "Political Odds Stacked Against Space Force. Proponents Brace for Long Fight," *Spacenews*, November 14, 2018.
[182] "OMB Report on the Leadership, Management, and Organization of the Department of Defense's Space Activities," Office of Management and Budget, December 4, 2017.
[183] "Final Report on Organizational and Management Structure for the National Security Space Components of the Department of Defense," Department of Defense, August 9, 2018.

NDAA for FY17, which would have been largely influenced by the Obama administration. While the Trump administration has had a large influence on assessing the current national security space structure, it is important to note that it was per the guidance of officials from the previous administration. In addition, Congressman Mike Rogers (R-AL) addresses this topic by stating "People that were not paying attention think the President's Space Force idea came out of nowhere. No. Congress spent the last three years studying this."[184] And a general lack of historical context happens to be a point that is often overlooked.

Section 1616 of the NDAA for FY17 required the director of the OMB to provide recommendations to "Strengthen the leadership, management, and organization of DoD with respect to the national security space activities of the Department…"[185] The report was produced in response to an already fractured and disaggregated space organizational and management structure. The response, a December 4, 2017, OMB report, asserts that the first recognition of a problematic national security space enterprise was acknowledged by the GAO in 1994 when it asserted that there were "fragmented responsibilities" within the organizational structure.[186] It goes on to note that reports conducted after the 1994 GAO report acknowledge that the national security space structure had "Scattered authorities, conflicts of interest, and a lack of consolidated space cadre."[187]

However, the 2017 OMB report produced three key findings. This first finding asserts that DoD space acquisitions management and oversight is fragmented with many organizations having significant responsibilities.[188] The second finding notes that the DoD has generally not

[184] Sandra Erwin, "Rep. Mike Rogers: Space Force Will be done 'Responsibly' with Minimal Disruption," *Spacenews*, June 21, 2018.
[185] National Defense Authorization Act for FY17, Section 1616
[186] "National Space Issues: Observations on Defense Space Programs and Activities," General Accounting Office, August 16, 1994.
[187] Office of Management and Budget report from December 4, 2017, 4.
[188] Ibid. 7

made significant changes to space leadership over the past two decades.[189] And lastly, the report concludes that a fragmented leadership structure has contributed to poor coordination and lengthy decision-making.[190] Given these facts, it is not surprising that the Trump administration has begun to lay the groundwork for the reorganizing the current space management structure, as it would be borderline negligent for the administration not to do so. However, the December 4, 2017 report was not the only piece of analysis provided to Congress that concluded that there were major issues within the management structure of national security space components.

In addition to the 2017 OMB report, section 1601 of the NDAA for FY19, ordered the Deputy Secretary of Defense to "conduct a review and identify a recommended organizational and management structure for the national security space components of the Department of Defense, including the Air Force Space Command, that implements the organizational policy guidance expressed in this section and the amendments made by this session."[191] We must remember that it was acknowledged by both Congress and the executive branch that there were challenges within the current U.S. national security space organizational and management structure, all of which occurred before President Trumps March 13, 2018 speech at Marine Corps Air Station Miramar. It is necessary to surface this fact only because the public dialogue regarding a "Space Force" was largely influenced by this speech, not by the OBM nor the DoD reports. The DoD report responding to section 1601 of the NDAA for FY18 was entitled the "Final Report on Organizational and Management Structure for the National Security Space Components of the Department of Defense" and published on August 9, 2018.[192]

[189] Ibid. 7
[190] Ibid.
[191] National Defense Authorization Act for FY18
[192] "Final Report on Organizational and Management Structure for the National Security Space Components of the Department of Defense," Department of Defense, August 9, 2018.

The August 9th report provides a four-pronged approach for obtaining the Trump administrations goal of establishing a sixth military branch, a space force. Within this document, it is recommended that a Space Development Agency be created, followed by a Space operations Force, then an entity for Services and Support, and lastly, a Space Command. In response to the congressional guidance provided in the NDAA for FY19, the report notes that the DoD "will take immediate steps to implement the President's direction where authorities exist and seek legislation from Congress to realize the President's vision."[193] This statement is not merely the DoD arguing on behalf of President Trump wishes but rather it is an attempt to convey the very real threat that our nation is facing in space. It is noted within this report that "Congress has also made its intent and support clear, providing direction and significant funding to enhance national space capabilities."[194] Despite the apparent recognition of the threat on behalf of Congress, the idea of a "space force" has been met with opposition throughout its development.

Chairman of the House Armed Services Committee (HASC), Representative Adam Smith (D-WA), asserted that he is "opposed to president Trump's proposal for a Space Force."[195] However, Congressman Smith proclaims that what he opposes "is a separate branch", simply because he doesn't "think a separate branch makes sense."[196] Not only have Congressional members of the Democratic Party opposed the idea but so to have Senate Republicans. Senator James "Jim" Inhofe (R-OK), Chairman of the Senate Armed Services Committee (SASC), stated in December 2018 that "time and time again, ever since this subject came up, I've said there are two things you have to answer. One is, is it going to do a better job than we're doing today? And

[193] Ibid. 3
[194] Ibid. 3
[195] Marina Koren, "Trump's Space Force Faces an Uncertain Fate," *The Atlantic*, November 9, 2018.
[196] Travis J. Tritten, "Rep. Adam Smith says he opposes Space Force," *Washington Examiner*, September 13, 2018.

then two, it's going to cost more—how much more money is it going to cost?"[197] Senator Inhofe went on to say that until he hears answers to those questions, he "will be opposing it, but that doesn't mean it's not going to happen."[198] Not only do the two gentlemen sit on separate sides of the aisle, Inhofe went as far as to say that he and Congressman Smith come from "two different backgrounds," but he thinks that "this is a good example of something that we agree on."[199] Despite this unification, the idea has become an inherently political one and is still heavily dependent upon personalities of key policymakers.

While opposition to the idea has been abundant, so too has support. Congressman Mike Rogers, sitting on both the Strategic Forces and the Readiness subcommittees for HASC, has stated that he wants "to get space out of the Air Force bureaucracy and out of a subordinate position."[200] Despite his advocacy for the idea, Congressman Rogers does note that the DoD will need "to do it responsibly," asserting that "we don't need to be too disruptive."[201] In addition, Congressman Jim Cooper (D-TN), Chairman of the Subcommittee on Strategic Forces for HASC, has been a long-time proponent for reorganizing national security space components.[202] Not only have the most recent developments in space reorganization gained congressional support, but in 2017, the idea of a space corps gained bipartisan support from Congressman Mac Thornberry, and his Democratic counterpart, Congressman Adam Smith.[203] While congressman

[197] Rebecca Kheel, "Senate Armed Services Chair Not Convinced of Need for Trump Space Force," *The Hill*, December 13, 2018.
[198] Ibid.
[199] Ibid.
[200] Sandra Erwin, "Rep. Mike Rogers: Space Force Will be done 'Responsibly' with Minimal Disruption," *Spacenews*, June 21, 2018.
[201] Ibid.
[202] Joseph Trevithick, "A Primer On The Raging Battle For A New Pentagon Space Corps," The Drive, July 12, 2017.
[203] Ibid.

Adam Smith has recently opposed the proposed "space force," he does acknowledge that strides must be made to advance the current space organizational and management structure.[204]

Given the various sides and opinions on a new space entity, it's important to remember that this objective was introduced during an inherently political climate. Due to the 2018 mid-term elections, a transition of power to the democratic party occurred. All the while, the U.S. is still operating under a republican lead Senate. This fact almost undeniably supports the notion that there will be gridlock on the idea when it comes time for Senate approval. It is also important to note that the 2020 election cycle is just around the corner and will be sure to complicate matters even further. In addition, the DoD is currently operating under the Budget Control Act (BCA) of 2011. This act severely hampers the DoD's ability to advocate for an entirely new military branch on account of a stringent budget cap. Even though a large majority of the FY20 appropriations, an estimated $170 Billion, will be designated under Overseas Contingency Operations (OCO), it will be difficult to find the necessary funding necessary to stand up an entirely new military branch.

In conclusion, congressional views on the topic vary. As mentioned previously, this topic is largely dependent upon the individual personalities of our nation's policymakers. While policymakers will never reach complete cooperation on the topic, we must hope that our lawmakers take into consideration the implications of this decision, U.S. national security. Even though congressional support for a "Space Force" seems to be unattainable, congressional support for reorganizing and more proficiently structuring our national security space components should be achievable. Also, despite this initiative being an inherently "Trumpian" idea, it is supported with historical examples like the 2001 Rumsfeld Commission and the 2010

[204] Ibid.

National Security Space Strategy that each call for some level of action to be taken regarding U.S. policy for military operations in space. In addition, the claim that standing up a Space Force would cost an estimated $13B has recently been subdued by the President's Budget Request for FY20 that requests approximately $72M worth of funding necessary to begin this initiative.[205] So, while both the current administration and the potential cost have each contributed to the congressional opposition of the idea, these are issues that our lawmakers will have to address when confronted with the Space Force proposal that will respond to the newly enacted Space Policy Directive 4. In conclusion, it is not the views nor the opinions of individual legislators that matter, but rather, what actions the institution will take that mean the most.

The Department of Defense

While the opinions of the DoD play a key role in reorganizing national security space components, it's important to remember that the department remains subordinate to the commander in chief and will ultimately execute the tasks that it is given. Just as we've seen with Congress, reorganizing U.S. national security space components is not an idea favored by all. But once again, at the direction of the executive branch, it is not the department's duty to have "opinions" on the topic, but rather assess how it can make a Space Force come to fruition. Also, section 1601 of the NDAA for FY18 directed the DoD to assess how it would stand up a Space Force.[206] The two documents that must analyzed regarding DoD's perception of a potential Space Force are a memorandum released on September 10th, 2018 by Patrick Shanahan, and a subsequent memorandum released on September 14th, 2018 by Secretary of the Air Force, Heather Wilson.

[205] "A Budget for a Better America: Promises Kept. Taxpayers First.," *Whitehouse.gov*, March 11, 2019.
[206] National Defense Authorization Act for FY18

On September 10th, 2018, Patrick Shanahan, Deputy Director of the DoD, published a memo entitled "Space Organization and Management Tasks."[207] The memo acknowledges that section 1601 of the NDAA for FY18 provided direction to the Secretaries of the Military Departments, the Chairman of the Joint Chiefs of Staff (CJCS), and the Office of the Secretary of Defense for tasks related to space organization and management. Within the memo, various Under Secretaries and DoD officials were tasked with addressing the authorities for space, implementing new secretaries for space, producing a proposed timeline for the creation of this branch, and creating potential legislative proposals.[208] Ultimately the report was a demand to key DoD officials to put forth their proposal for a space force. However, not all branches have produced a response to the request like that of the USAF.

In response to Patrick Shanahan's memo, the USAF produced a memo on September 14, 2018, entitled "The Air Force Proposal for a Space Development Agency and Transition to a Department of the Space Force."[209] One of the most prominent quotes derived from this report is located in the second paragraph, noting that "This changing environment affects all capabilities and Military Services. This is a strategic problem we must solve."[210] This excerpt explicitly addresses that this is an issue of national security. To further advance this point, the first section of the report rings similar to what was in the 2018 National Defense Strategy and is entitled "An Approach to a More Lethal Force."[211] This is necessary to note simply because the report doesn't begin with an assessment of what is wrong or what the organizational challenges are, but rather,

[207] Sandra Erwin, "New Pentagon Memo Lays Out Action Plan to Establish Space Force by 2020," *Exonews*, September 20, 2018.
[208] Ibid.
[209] "The Air Force Proposal for a Space Development Agency and Transition to a Department of the Space Force," September 14, 2018.
[210] Ibid.
[211] Ibid.

it outlines exactly why this objective is necessary, to build a more lethal force. The report begins with three immediate recommendations:

> 1.) Assign the Space Rapid Capabilities Office (Space RCO) the function of the Space Development Agency (SDA), using existing resources and authorities, with the mission of providing space superiority capabilities;
> 2.) Re-integration of defense space and the National Reconnaissance Office, under the Secretary of Defense's authority and following Senate confirmation; and
> 3.) Immediately plan for the resources to establish the Space Force Headquarters in fiscal year 2020[212]

Essentially these objectives address three key facts; an acquisitions cycle tainted by longevity, a disaggregated cadre operating under a disassociated force structure, and the need to devote an appropriate amount of resources to the national security space mission. These recommendations sound eerily similar to the reports above produced by the GAO, which concluded that our space organization and management structure has "scattered authorities, conflicts of interest, and a lack of consolidated space cadre."[213] While these points may seem monotonous to mention, it is pertinent to understand that these issues are not new developments, but challenges that have inundated the national security space structure for decades.

Despite the documentation and a congressional call to action, many within the department have staunch opinions, and some are opposed to the idea. General John J. Hyten, Commander to USSTRATCOM, has noted "I think that someday we'll have a Space Corps and a Space Force in this country. But I don't think the time is right for that right now."[214] However, as combatant commander, Gen. Hyten's may disagree with the commander in chief's idea of a potential Space Force. In addition, one of the more polarized answers derived from Gen. Hyten on the topic was his response to a SASC hearing that occurred in March 2018, noting that he was

[212] Ibid. 1
[213] 2017 OMB report.
[214] Lauren C. Williams, "STRATCOM Leader Pushes Back on Space Force Idea," *Defense Systems*, March 21, 2018.

"not too keen on" the idea of a Space Force, stating once again that this wasn't the appropriate time for this type of reformation.[215] While top DoD officials currently serving in the department may not have the luxury of overtly displaying their opposition to the idea, former officials do. In September 2018, former Secretary of the Air Force, Deborah Lee James, warned that creating a Space Force "will sap resources away that could otherwise go to capabilities."[216] She further ventured to speak on behalf of current Air Force leaders, asserting that "None of them are in favor of a Space Force – I say none of the top leaders – but they're stuck."[217] As mentioned earlier, prompting a top military leader to oppose an idea of the commander-in-chief publicly is a difficult task, as they will typically defer, divert, and outright disregard these types of questions. However, while opposition within the department is difficult to find, it's noteworthy to acknowledge that it does exist.

Despite opposition, many in the department are in fact "keen" on the idea. General David L. Goldfein, Chief of Staff of the USAF, noted in July 2018 that he's:

> got a president of the United States that's talking openly about space as a warfighting domain. I've got a vice president of the United States that stood up a National Space Council and is moving that. I've got Congress that's engaged and now interested in talking a lot about space. I've got the Secretary of Defense working space. I've got a Deputy Secretary. So, I see this as a huge opportunity right now that we've been given to have a national level dialogue about where we're going in space and so I love the fact that the president is leading that discussion.[218]

In addition, Under Secretary of Defense for Research and Engineering (USD(R&E)), Dr. Michael Griffin, spoke promisingly about reorganizing the current space organizational structure. In response to USD Patrick Shanahan's September 10th memo, Dr. Griffin provided a September

[215] Marcia Smith, "Hyten Not Ready to Endorse Space Force," *Space Policy Online*, March 20, 2018.
[216] Bryan Bender, Jacqueline Kilmas, "Trump's Space Force Struggling to Launch," *Politico*, September 17, 2018.
[217] Ibid.
[218] Matt Seyler, "Air Force chief of staff talks Space Force: 'I Love the Fact that the President is Leading that Discussion'," *ABC News*, July 18, 2018.

20th report, outlining his proposal for a Space Development Agency. Dr. Griffin asserts that "The Space Development Agency is one of the tools we offered up as a way that we're going to reenergize the space development culture, shorten the time cycles that we talked about, bring some new things to the table. That was part of our response back to Congress in the 1601 report."[219] Once again, Dr. Griffin's response directly addresses the latent acquisitions cycle in which the space industry is currently operating under, noting that he wishes to "shorten the time cycles that we talked about."[220] Whether the current congressional calls to action have created these proponents or if they are a result of the individual's honest opinions, is unknown. However, it is fair to assume that there are individuals within the department who believe that reorganizing national security space components will make a positive contribution to U.S. national security.

Chapter Conclusions

The positions of both Congress and the DoD play a large role in what will ultimately happen with U.S. national security space components. While congressional testimony provided by the DoD may have an impact on the current space organizational structure, this decision is largely reliant upon the choices that members of Congress will make. It is estimated by the USAF that the amount of funding necessary to stand up a Space Force is approximately $13 billion.[221] The estimated $13B in funding would cover the resources necessary to transfer mission functions, construct a headquarters, realign personnel, and create the necessary

[219] Sandra Erwin, "Griffin: Future of new DoD Space Agency 'Still up in the air'," *Spacenews*, November 13, 2018.
[220] Ibid.
[221] "The Air Force Proposal for a Space Development Agency and Transition to a Department of the Space Force," September 14, 2018.

installations and facilities.[222] Taking into consideration the current political climate, the implications of the 2011 BCA, and the scrutiny this idea will face before a Congress that is inadequately versed on space, the reorganization of national security space components will not take place without a struggle. However, Congress must continuously be urged on the seriousness of this issue and reminded that while it has become politized, U.S. national security outweighs the political success, or lack thereof, of a single administration.

[222] Ibid.

CHAPTER 5: POLICY POSITIONS AND RECOMMENDATIONS

"In my 34-year career in the Air Force, I've never seen such agreement on the importance of space"- General John J. Raymond (May 24, 2018)

Introduction

Despite what a large majority of the public rhetoric conveys, the argument for reorganizing national security space components is more so a demand for policy change than a call for creating an entirely new military branch that complicates the already fractured and difficult bureaucratic processes of preexisting Military Services. However, if changes to U.S. policy regarding military space operations are going to be implemented, it is an undeniable fact that some level of force restructuring would have to occur. And, while sensible administrative reforms are helpful in any endeavor, in the highly technologically complex area of space applications, advancement of R&D, streamlined acquisitions processes, and preparation of a qualified cadre may be directly affected by the following suggested bureaucratic adjustments. Taking into consideration the threats and challenges mentioned in Chapter Two of this thesis, there are three specific policy positions that must be addressed to enhance the organizational and management structure of U.S. policy related to military space operations. Not only could these changes create clear lines of authority, but they may also allow for an increased role of both U.S. allies and commercial industry. As a result of these policy changes, the U.S. national security space establishment would be better fit to address the advancing adversarial threat. These three recommendations were chosen as a result of the research and analysis provided throughout this thesis. While not all of the threats and challenges mentioned throughout this thesis will be addressed, the greatest of these challenges will. Throughout this section, when suggestions

regarding the reorganization of various space activities are given, there has not been an analysis regarding the movement or reassignment of specific individuals within the chain of command. An analysis of this type is simply out of the scope of this thesis. While the following discussion will address the newly created Major Force Program (MFP) for space, this will largely be assessed as a means for more clearly transitioning space activities from one organization to the next. The following policy recommendations attempt to provide solutions to the major issues mentioned throughout this thesis.

Recommendation One: Re-instating a United States Space Command to Address the Disaggregated Environment

Re-instituting a United States Space command as an 11th functional unified Combatant Command is the first step in addressing the disaggregated nature of national security space components. Mentioned throughout this thesis, numerous reports have concluded that a non-unified military space community has dampened the U.S.' ability to remain superior in this domain. Since 2002, after the decommissioning of the USSPACECOM, national security space activities have fallen under the purview of USSTRATCOM. While USSTRATCOM has not by any means directly caused this seemingly diminished U.S. national security space presence, it has not given this domain the attention that a USSPACECOM could provide. During a recent congressional testimony, when prompted to speak on the transition of the space mission from USSTRATCOM to the new USSPACECOM, Gen. Hyten highlighted that as commander of USSTRATCOM, space will never be his number one priority. [223] Gen. Hyten went to assert the importance of having a new command with a leader that is focused on the military space mission

[223] John E Hyten, Terrence J. O'Shaughnessy, "Senate Armed Services Committee Hearing: United States Strategic Command and United States Northern Command", *Senate Armed Services Committee*, February 26, 2019.

"24 hours a day, 7 days a week."[224] As a result of this analysis, instituting a USSPACECOM is the first step in centralizing national security space activities. As outlined by Secretary Heather Wilson, re-instituting a USSPACECOM will:

- Integrate space planning and operations across military campaigns and contingency plans,
- Simplify the command structure by aligning operational forces to the commander responsible for joint space warfighting,
- Develop space doctrine, concepts of operation and space tactics, techniques and procedures (TTP)
- Establish enterprise standards to be adopted by the Military Services, ensuring interoperability of the joint force, and
- Utilize commercial practices and digitization to streamline the footprint and automate labor-intensive operations.[225]

In order to ensure a streamlined implementation of a USSPACECOM, both USSOCOM and USCYBERCOM should be assessed for how best to stand up this command. In addition to a USSPACECOM, a holistic approach to national security space activities should be taken. Defense entities such as the National Geospatial-Intelligence Agency (NGA) and the National Reconnaissance Office (NRO) should also be assessed for areas in which they could create transparency between the intelligence community and the Military Services. While coordination between the Joint Chiefs and Intelligence Community does occur, the potential creation of a Space Force would demand an increased amount of communication and integration. Even though it appears that this level of communication would already occur, we must recount that merely 15 years ago, upon the release of the 9/11 Commission Report, it was made public just how unconnected U.S. defense, civil, and intelligence agencies were from one another. Given this fact, it is not unreasonable to assume that a certain level of disassociation is still occurring.

[224] Ibid.
[225] September 14th, 2018, United States Air Force Memorandum.

However, even though creating an 11th functional unified Combatant Command may not be the answer to creating a holistic national security space environment, it is a step in the right direction. Not only would a combatant command help in the formulation and production of doctrines like the Space Warfighting Construct and the 2011 National Security Space Strategy, but it would also reinstitute a culture rooted in the military space mission.[226] In conclusion, while this policy recommendation has been discussed at length, a December 18, 2018 memorandum instructed the DoD to begin the establishment of a USSPACECOM as a functional unified combatant command.[227] Listed below, Figure 1 demonstrates the organizational change that a USSPACECOM would have on the current DoD organizational structure.

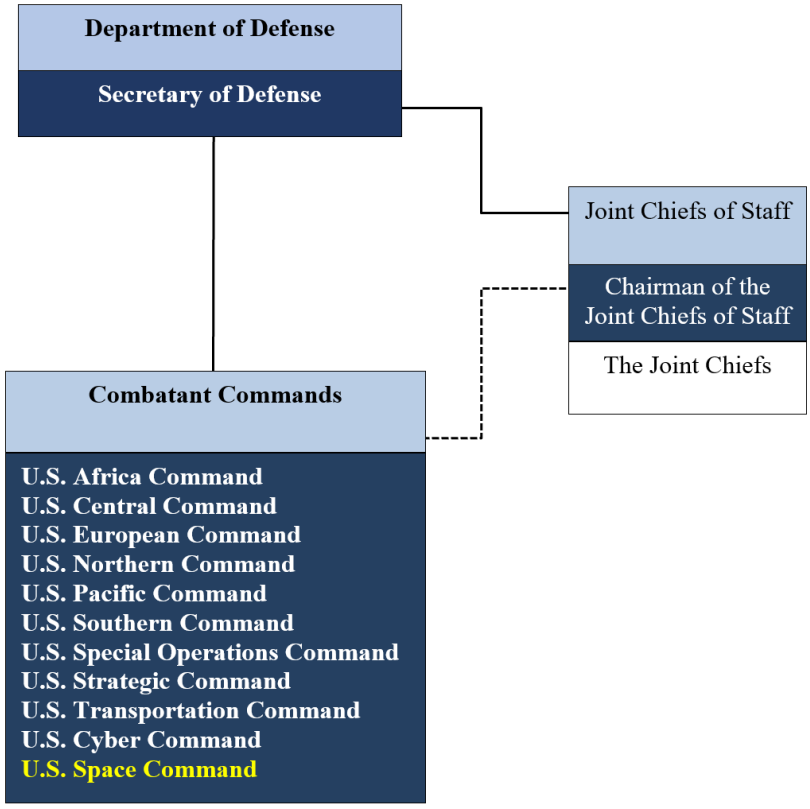

Figure 1. Proposed Addition to the DoD's Combatant Command Structure

[226] "Space Warfighting Construct," Air Force Space Command.
[227] Sandra Ewin, "Shanahan gearing up for space debate on Capitol Hill," *Spacenews*, January 29, 2019.

Recommendation Two: Creating A Space Development Agency to Provide Rapid Capabilities Development and Expedite Acquisitions through a Whole of Government Approach

The current space acquisitions cycle is a system that typically causes schedule delays and cost overruns. Many within the DoD make note that capability, regulation, and schedule, all of which are largely driven by cost, contribute to a slow space acquisitions cycle. Despite the opinions of many academics, defense policy is not only driven at the requests of combatant commanders and defense doctrines but is also heavily, if not entirely, influenced by what that year's defense budget is. At the end of the day, the DoD fields what it can, with the resources it has. While the U.S. operates under the world's largest defense budget, it has acquisition and procurement cycles that impede on the rapid fielding of necessary capabilities. The challenge to rapidly field capabilites is largely because of a review process that is extremely intensive and trivial. While addressing a room of defense contractors, Dr. Michael Griffin asserts he will be asking these companies every chance he gets "to look at what you're doing and find ways to either eliminate it or shortcut it.", referring to the acquisitions cycle.[228] During the same forum, Dr. Griffin once again targets the audience by saying "You need to identify, each of you, the key decision makers, the chains of command and empower them to decide quickly."[229]

Using the Air Force's Rapid Capabilities Office (AFRCO) and Space Rapid Capabilities Offices (Space RCO) as templates for a Space Development Agency (SDA) will set the precedence for instituting this organization. On September 17, 2018, Secretary of the Air Force Heather Wilson asserted that "The Space Rapid Capabilities Office, which was recently

[228] Sandra Erwin, "Mike Griffin's Tough Talk to Pentagon Contractors: Be a Team Player, Look at Your Own Red Tape," *Spacenew*s, August 12, 2018.
[229] Ibid.

established by Congress, provides a mechanism to continue to accelerate special programs of high national priority."[230] To achieve the desired effect, the SDA should move from a heavy dependence on key infrastructures to more proliferated and disaggregated satellite architectures, devote more attention for experimenting with prototypes, and shift from a clustered and overlapping acquisitions structure to a streamlined concentrated structure that generates speed.[231] In addition, the U.S. must first begin by altering the rigid culture and archaic practices of its own space community while simultaneously relearning how to build, deploy, and innovate more rapidly, at lower costs. While dialogue about "lowering costs" has plagued the national security space industry for years, this task is not unattainable. In order to lower costs, the SDA should engage in more Public-Private Partnerships (PPPs), Cooperative Research and Development Agreements (CRADAs), along with other commercial research initiatives. It is not the DoD who leads the industry in ground-breaking technology; instead it is University's, Federally Funded Research and Development Center's (FFRDCs), and innovative commercial markets. The security and efficacy attached to this argument will be analyzed below.

As mentioned in Chapter Two of this thesis the need to ensure interoperability of satellite architectures is a challenging task. The U.S. currently has architectures that, if afforded the ability to connect, would work seamlessly for various mission sets. However, while the USN may have a component of a space-based architecture, the U.S. Army may have the other, all the while, the USAF may have the backbone required to make the systems functional. The funding, time, congressional support, and necessity of these programs is far too great for technology to prevent them from being functional. Creating an SDA that not only centralizes authority but ensures that these scenarios do not continue to arise is a demand that

[230] Heather Wilson, "The Air Force We Need," Air Force Association Conference, September 17, 2018.
[231] Secretary of the Air Force September 14, 2018 Memorandum.

must be met. As mentioned in the September 14, 2018, USAF memo, the newly created Space Rapid Capabilities Office (Space RCO) and potential SDA will "consolidate existing efforts within the Air Force to develop key enabling capabilities, including effects, space situational awareness, command and control, and integrations with current operational assets."[232] As General John J. Raymond noted, the Space RCO signaled "a change in capabilities and capacity to get after what we need to do, and that's go fast."[233] Also, the development of an SDA could potentially enhance the Joint Requirements Oversight Council (JROC) process by addressing the issues within this organization that inadvertently slow down the fielding of new systems.[234]

In conclusion, the creation of an SDA, specifically one that is designated as a Combat Support Agency (CSA), has the potential to reconfigure a disruptive acquisitions cycle to a more idealistic one while simultaneously providing opportunities to engage outside entities for lower costs and advanced technologies. The creation of an SDA should take place soon after the USSPACECOM is re-established. Placing this agency directly under the Office of the Secretary of Defense (OSD) as an addition to the already established 19 Defense Agencies will ensure its ability to impact the U.S. national security space domain positively. While the exact cost of this agency is not available, the $13B worth of funding located in the September 14, 2018, USAF memo accounts for the establishment of this organization.[235] Listed below, Figure 2 depicts the organizational change that an SDA would have on the current DoD organizational structure.

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[232] Ibid.
[233] Wilson Brissett, "The Creation of a Space Rapid Capabilities Office," *Air Force Magazine*, December 8, 2017.
[234] Jane Edwards, "Gen. John Hyten: DoD leadership Understands the Need for Faster Space Procurement Process," *ExecutiveGov.com*, March 22, 2018.
[235] Secretary of the Air Force September 14, 2018 Memorandum.

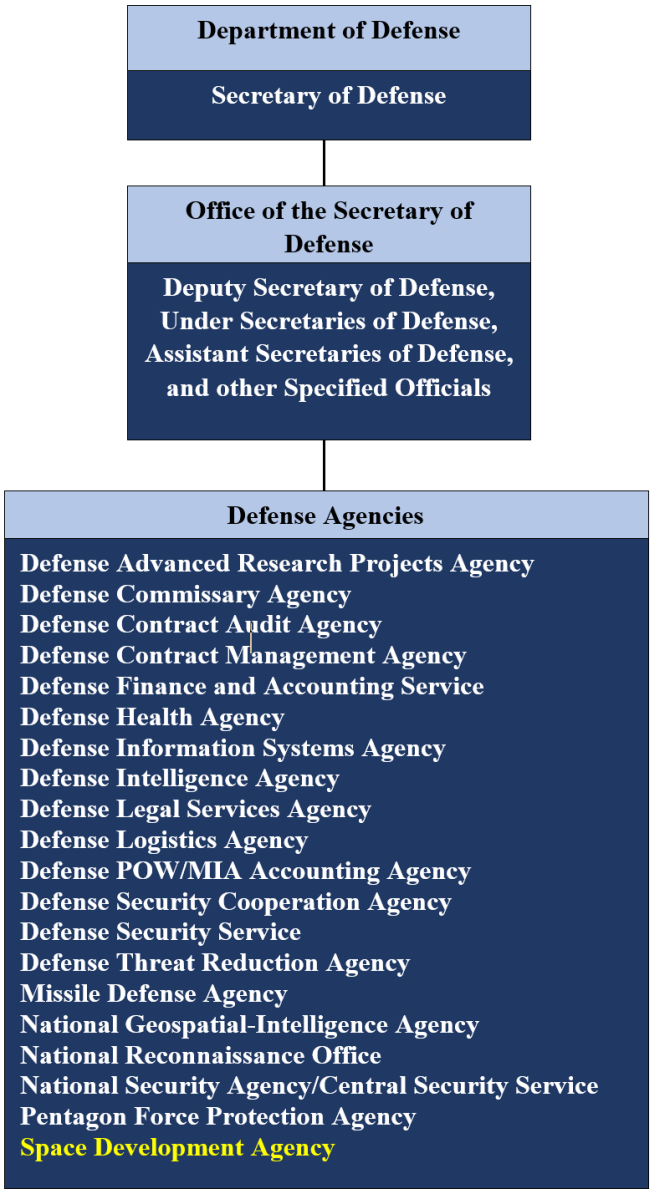

Figure 2. Proposed Addition to the DoD's Defense Agency Structure

Recommendation Three: Utilizing Secure National and Foreign Commercial Services to Expand Influence, Supplement Capabilities, and Enhance Deterrence

Ultimately, this policy recommendation suggests that supplementing current U.S. national security space capabilities with commercial services will better position the national security space establishment to address the advanced threat. While this recommendation does not

involve the creation of a new organization it does stress the importance of a USSPACECOM and an SDA. This section focuses on three primary actions, utilizing commercial industry for secure and protected innovative solutions, enhancing international cooperation to strengthen deterrence and expand influence, and most importantly, to address the advanced space threat.

First, finding ways to better utilize commercial space capabilities for national security purposes is a paramount objective for the U.S. and its allies. It is noted that commercial space capabilities can typically be produced three to five times faster than those of the DoD.[236] Furthermore, utilizing secure commercial satellite capabilities can augment the costly practice of Military Services creating, buying, and eventually fielding their own systems. Outlined in Chapter Two of this thesis are the capabilities that would benefit from supplementing secured commercial space-based capabilities. As outlined throughout Chapter Two, commercial industry has begun to play a large role in national security space activities, the protection of these systems must be met with an increased level of security. The potential to implement a Civil Reserve Air Fleet (CRAF) like system for space-based capabilities has been discussed. The CRAF system is a program that selects specific aircraft from U.S. airlines and subsequently uses them to augment DoD airlift requirements in times of emergency.[237] While the intricacies of the program would have to be altered for space-based capabilities, it does provide an adequate foundation.

Another goal that must be accomplished to advance national security space capabilities is the need to open free and fair competition to new entities and businesses. Streamlining the entrance of new and sometimes smaller players into the space industry, like SpaceX, is a necessity. For far too long the DoD has relied on defense giants that continuously struggle to

[236] Major Policy Issues in Evolving Global Space Operations, 52
[237] David C. Arnold, "SpaceCRAF: A Civil Reserve Air Fleet for Space-Based Capabilities," *United States Army War College*, May 2015.

meet both cost and schedule requirements. There is an array of companies with technologies like disaggregated architectures, smaller satellite buses, and advanced SSA and STM capabilities that would undoubtedly benefit our current national security space posture. The DoD must work to continue fairly competing for these contracts while incentivizing the entrance of new companies to enjoy an industrial and information advantage.[238]

Second, if the U.S. wishes to maintain some level of superiority in the space domain, it must engage its allies. Space incorporated missile defense programs like the Aegis Ashore, the SM3 Block IIA, and various space-based communications and weather monitoring capabilities rely heavily upon the cooperation of our allies.[239] In addition, providing deterrence and ensuring the protection of our international partners from adversarial nations will take the assistance of U.S. allies. Two key components necessary for maintaining a cooperative relationship in space are NATO and the Five Eyes Alliance. The Five Eyes alliance, consisting of Australia, Britain, Canada, New Zealand, and the U.S., provides coverage of missile tests, foreign satellite deployments, and simultaneously monitors the military activities of relevant Air Forces.[240] During a 2017 congressional testimony, Lt. Gen. David Buck, commander of the Joint Functional Component - Space for the U.S. Strategic Command, notes that in the operations center of the JSpOC, "we have our allied partners, Five Eyes partners on the OPS floor.", asserting that "they are doing to day-to-day, heavy lifting support to the terrestrial fight."[241] Not only will the sustainment of an array of alliances severely effective the decision-making calculus of U.S. adversaries, it will also provide the opportunity for augmentation of certain capabilities

[238] Major Policy Issues in Evolving Global Space Operations
[239] "Pentagon Officials Discussed the 2019 Missile Defense Review, With Recommendations on Space-Based Operations, Hypersonic Missiles, and the F-35 fighter," C-SPAN, February 1, 2019.
[240] J. Vito Tossini, "The Five Eyes – The Intelligence Alliance of the Anglosphere," *UK Defense Journal*, November 14, 2017.
[241] "House Armed Services Committee Hearing on Fiscal 2019 Priorities*," House Armed Services Committee*, May 5, 2017.

like those mentioned in Chapter Two of this thesis. While many of the countries that are members to both NATO and the Five Eyes Alliance don't contribute the necessary 2.0% of their gross domestic product (GDP), there is an opportunity for the U.S. to supplement the pre-existing space-based capabilities of these nations where necessary.[242] In addition to the United Kingdom, the U.S. can find an ally in Poland, as its President, Donald Tusk, states that the "U.S. doesn't have and won't have a better ally than the EU" claiming that "this is an investment in our security, which cannot be said with confidence about Russian and Chinese spending."[243] While the full cooperation of all NATO and Five Eyes alliance allies will not be attainable for ensuring U.S. superiority as it relates to military space operations, there are many U.S. allies who would, in fact, answer this call. In conclusion, deterrence is largely a team sport, and to address the congested, contested, and increasingly competitive environment of space, the U.S. must rely upon its allies that are willing to aid in this fight.

Tying It All Together

While no discussion of a Space Corp or Space Force has been mentioned, this does not mean that an entity of this kind would not positively impact the current national security space enterprise. It is my belief, like that of General John J. Hyten's, that a Space Corp and or Space Force will eventually come to fruition. However, given the analysis provided within this thesis, an entity of this sort would have to be implemented years down the line, and not in the expedient manner that this administration is proposing. However, the newly created Major Force Program (MFP) for space would make the transition to a Space Corp and or Space Force less disruptive

[242] Mark Armstrong, "NATO Contributions Country-by-Country," *Euronews.com*, November 11, 2018.
[243] Ibid.

for the national security space enterprise. Given the analysis provided throughout this work, a USSPACECOM should be reinstituted and operationally available by the end of FY20.

Subsequently, an SDA should be instated soon after that and before the end of FY21. To end a space acquisitions cycle consumed by longevity, an SDA possessing a culture rooted in rapid decision-making authorities, like those mentioned by Lt. Gen. Samuel Greaves for the MDA, and an affinity for space superiority, would positively benefit our current national security space organizational structure. In addition to these organizations, entities like the Commercial GEOINT Activities (CGA) partnership would aid in these developments. The CGA is a joint venture between the NRO and the NGA acting as an internet platform for companies to post their space-based and GEOINT related capabilities that are anticipated to be operationally available within 18 months of their posting date.[244] The institutionalization of these types of properly vetted entities would help in addressing and unveiling the momentous amount of talent that is willing to aid in U.S. national security space pursuits.

While the immediate implementation of a Space Corp or a Space Force may not be ideal, such developments may be unavoidable and would more than likely have a positive effect in the future. Like the remarks mentioned by Senator Inhofe in Chapter Four, we must ensure that the creation of a Space Corp or a Space Force will perform better than the organizational and management structure of U.S. national security space components that is currently in place. And while these answers may not be attainable simply through analysis, the U.S. should begin assessing the potential implications of these developments through the creation of a USSPACECOM, an SDA, and supporting organizations.

[244] "Commercial GEOINT Activity (CGA): Leaderboard 1.1 User Manual," *CGA*, April 13, 2018.

Chapter Conclusions

Lastly, and most importantly, the U.S. must reorganize its national security space components in a way that diminishes the adversarial threat. While there are no simple ways to outright remove the threat, through the previously mentioned policy suggestions, the U.S. can severely diminish adversarial advances by complicating their decision-making calculus' and creating an entity that ultimately strengthens U.S. deterrence posture. In general, deterrence is a game of chess, one that must be played with strategic moves and appropriate actions. The above policy suggestions are both strategically, operationally, and tactically beneficial to the national security space enterprise.

CONCLUDING REMARKS

"Now is the time for our nation to accelerate our efforts to gain and maintain space superiority." - Gen. John J. Raymond (May 24, 2018)

In conclusion, the superiority of the U.S.' national security space presence is being challenged. As we have seen throughout the historical analysis provided in Chapter One, the national security space enterprise has been reconfigured, repurposed, and outright neglected. In addition, throughout Chapter Two it was explained just how critical space is to not only the warfighting domain but also with civil society's most critical capabilities, including infrastructure, energy, information, and finance. And while U.S. space-based capabilities are central to this argument, so too is the threat that was mentioned within Chapter Three. It must be reiterated that the paramount objective here is to provide the U.S. with the necessary means and capabilities to address and deter the adversaries that are continuously attempting to undermine its superiority in space. While this idea may appear to resonate with many, it was outlined within Chapter Four that this is not the case. There must be active strides taken by industry, academia, and the private sector to constantly create engagement opportunities and cultivate interest for the national security space enterprise on Capitol Hill. These initiatives must be taken so that the DoD may lessen the number of congressional members unfamiliar with this debate. And lastly, while the threat may never fully be diminished and the U.S. may never have an organizational and management structure that allows national security space components to prosper like other warfighting domains, the recommendations outlined in Chapter Five would provide the best chance for this to happen.

The first step of re-instating a USSPACECOM to address the disaggregated environment and promote a whole of government approach is an action that is already in motion. This recommendation will ultimately lay the foundational work necessary to create a culture rooted in the military space mission while centralizing authority over national security space components. Secondly, creating a Space Development Agency to provide rapid capabilities development and expedite acquisitions, is a mission that must be met so that the DoD can provide seamless interoperability across all branches, for all capabilities. The need to expedite a lengthy acquisitions cycle is not only a call from Military Service members but also a demand from those within the top levels of DoD leadership, like Dr. Michael Griffin. In addition, utilizing secure national and foreign commercial services to expand influence, supplement capabilities, and enhance deterrence is a recommendation that inherently leans on U.S. allies. The demand for U.S. superiority in space must be met with help from its international partners, not only to help deter aggression from adversaries but to ensure the safety of U.S. allies.

In conclusion, while the recommendations provided are a result of the analysis displayed throughout this work, it must be stated that the policy positions that U.S. Congressional members decide to take, will ultimately drive them to decide what happens with the U.S. national security space establishment. While the reports produced by the GAO, the OMB, and the DoD may have surfaced findings that are unwelcome, they are not unwarranted. What the U.S. Congress decides to do with these facts is yet to be decided. Even though the newly released Space Policy Directive 4 (SPD-4) appears to begin laying the foundation for instituting these changes, it is merely a call to action for a construct that Congress will ultimately have to approve. While this administration may never see the establishment of a sixth military branch named the “Space Force”, it is undeniable that developments towards this idea have come to fruition. However,

while a complete reorganization of U.S. policy related to military operations in space may not occur, the national security space establishment must shed the politized debate that has consumed it while simultaneously receiving the attention and resources it deserves, as this is the real "national emergency" facing this great nation.[245]

[245] Lolita C. Baldor, "US Northern Command Leader Says No Military Threat on Southern Border," *Military Times*, February 26, 2019.

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