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ESCALATION OF THE SPACE DOMAIN

by

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PREFACE

How might the space domain be escalated along the continuum of conflict, and is that escalation similar in nature to air, land, and sea domains? This is a generalized question asked by United States Strategic Command (USSTRATCOM) to Air University (AU) in order to build a greater temporal understanding of the escalatory properties of space capabilities as they mature from concept to reality. The year-long space elective at Air Command and Staff College (ACSC) has given me a rare opportunity to delve into the mystery, mystique, and operational capabilities of this unique domain. Awakened with a greater understanding and mastery of the science behind the medium, I felt empowered and adequately prepared to research USSTRATCOM's question, and through retrospect, displace supposition with primary facts to build plausibility of escalating space capabilities, operations along a continuum of any given conflict. My "space empowerment" was not entirely of my own making, but was spawned and nurtured by my research advisor.

I would like to thank my classmates for their insight, depth, and breadth of space knowledge, which furthered my own base of space domain awareness. I also would like to thank our stellar instructors for their endurance in instructing me and empowerment to let me select a research topic which challenged me to think strategic about space and its enduring application within all other domains. Finally, I thank my family for their belief in me and the strength they gave me to finish this paper.

ABSTRACT

This paper seeks to build a conceptual model on how a combatant commander, USSTRATCOM in this case, can escalate space along the various levels of the military's conflict continuum. Military escalation is represented in "height, width, and depth" context, which allows for broader applications of space assets, and a broader approach on how to escalate operations within its domain – leading to true spacepower. Spacepower is inherent within the space domain when viewed through the lens of sea domain. Lieutenant Commander John Klein's seven dictums of spacepower provide an operational construct of spacepower from which a commander can then begin to determine which space-based assets or capabilities to escalate along the conflict continuum. Gulf War One represents a prudent example of spacepower and how it can escalate along a conflict continuum. However, to continue applying Klein's dictums, the U.S. needs to continue its dominance within the domain, which is predicated on its continued militarization, but not necessarily in its weaponization.

This paper espouses that the militarization of space will only continue well into the 21st Century. Space, viewed in this manner, has an omnipresent context, which can be escalated, in mass or by its separate parts, to facilitate the coercive effects the commander desires. An important note here is: Militarization of space is not synonymous with weaponization of space, and escalation of space should not be viewed solely in the context of weaponization. Weaponization of space should not be the "sine qua non" of spacepower or space escalation.

As air, land, and sea escalate along the continuum of military conflict, so, too, can space. Its ability to escalate in a coercive manner, raising the level of operational risk of an adversary, is not relegated to the need for direct kinetic effects; instead, its ability to escalate should be measured on its affect and/or support to other domains.

Chapter 1

Introduction

“One small ball in the air [Sputnik I]. I wouldn’t believe that at this moment you have to fear the intelligence aspects of this.”

- President Eisenhower, 9 October 1957

How might the space domain be escalated along the continuum of conflict, and is that escalation similar in nature to air, land, and sea domains? This question, proposed by USSTRATCOM, marks the foundation of this research paper, which sets upon the task to divulge the escalatory capabilities of space, and space assets, as it pertains to the range of military operations and phases: It seeks to answer the “how” space-based assets may be escalated along a conflict continuum. By way of theoretical analysis, a pragmatic approach will arise, which shows the applicability and plausibility of escalating space requirements, along the military escalation continuum of operations, without the presence or need to weaponize the domain. A common approach or language is required when seeking to develop an altruistic perspective on a complex and “deep of mind” aspect of space. This work endeavors to develop such language, thereby exhuming clarity of foresight to a single aspect of space, escalation, while balancing it against its physical and theoretical properties.

Escalation represents a set of pseudo prescribed acts, counter-act properties which evolve over the time-span of any given conflict or military operation and culminate in a grand final battle or total war.¹ The escalatory principles of both land and sea power grew from a preponderance of time where conflict tested act, counter-act capabilities could be understood by both sides of a conflict; hence, building a common language of escalation within the two

domains. Airpower, on the other hand, flashed upon the battlespace. Escalation of its capabilities were forged in battle and only refined during the inter-war years -- timeframe between conflicts. Oddly, spacepower has matured along a timeline similar to land and sea – slow, methodical, and often retrospective. However, the capabilities which space brings to a given conflict represent a trajectory similar to airpower, fast, multidimensional, and exponential in effects; hence, an understanding of spacepower, and those capabilities which represent it, becomes relevant and predictably necessary to dissuade these two diametrically opposed approaches to its future development and escalation.

John Sheldon and Colin Gray, with great ease and simplicity, state a fundamental element of space which helps ground its escalatory property to those of air, land and sea: “Space is a place.”² If space is a ‘place’ similar in relative use and punctuality to other domains, then it is suffice to say it, too, can be escalated much the same way as air, land, and sea. In order to escalate space, it becomes paramount to understand the elements of space and how spacepower is derived from them. Spacepower is thought to be an intangible element of the space domain much the same way gravity is -- one can sense its effects, but cannot touch those elements which make the effects. However, United States (U.S.) military space policy has clearly defined four unique space missions that are tangible and provide the foundation for understanding how space can escalate over the spectrum of conflict: force enhancement, support, control, and application.³ Separately, each mission area provides only a marginal element of capabilities for a conflict; however, together, they represent a profound function of space known as “spacepower,” which can then be holistically escalated along a diverse continuum of conflict engagements.

Spacepower, as a function of its entirety, brings forth synergistic capabilities which augment air, land, and sea operations. It not only escalates along the continuum of conflict, but

along the continuum of U.S. instruments of power: diplomatic, information, military, and economic. Space is a hostile, rigid domain, constrained more so by the laws of physics than air, land and sea; yet, its inalienable freedom of movement, over watch, and persistency subdue its rigidity and give it a measure of military operational flexibility which avers its rightful place alongside other domains and their ability to escalate to meet mission requirements. Space's ability to be escalated along the continuum of conflict and military operations is not solely based on the weaponization, or non-weaponization, of space; instead, it is based on the kinetic, coercive potential of space as a whole, as its parts fit within and augment other domains. This research paper will transform the entirety of spacepower into tangible multi-spectral set of capabilities which can be supplanted upon and escalated within any given conflict continuum. The escalatory capabilities of space which military strategists must know and understand are not only based on the physical attributes of space, e.g. the satellite, but on the dynamic qualitative benefits of the entire space domain: a global, ubiquitous presence.

Scope and Limitations of this Research

The main focus of this research paper is on what escalatory properties the space domain has when supplanted upon a conflict continuum replete with military application: From Phase 0, shaping the environment, to Phase 4, stabilization efforts.⁴ By having the scope of this paper reside firmly in the realm of military operations, it inherently limits the research to just those areas of space application and power which support military-centric operations during a conflict. According to a 2013 Federal Aviation Administration (FAA) report, the commercial segment of space is inherently pushing past that of the military,⁵ which indicates an evolutionary shift not only in the non-military use of space, but how the military gains and maintains space as an

advantage. Minimizing the militarization of space limits the side lobe benefits space brings to the entirety of an operation.

Additionally, escalation encompasses the entire range and influence of a nations' instruments of power, diplomatic (D), information (I), military (M), and economic (E); hence, excluding the D, I, and E-properties of which space enhances or directly supports does not provide the full picture of how space can amass, or escalate, during a conflict. Space, much like cyber, is ubiquitous and permeates within all other domains. This permeation means that any subtle shift in escalation of another domain should equate to a similar, like shift in the space domain. The parallels which space subsumes from air, land, and sea are familiar to those who control and manage the domain within the scope of military operations, and within the "Military" instrument of national power; however, the lack of a real spacepower theory, and the known weaponization of space itself, limits a Clausewitzian-minded military from seeing the escalatory capabilities of space during a conflict.

Lastly, this research paper is theoretical in nature and based on a domain which lacks depth of usage when compared to air, land, and sea domains. Early airpower pundits, such as General William "Billy" Mitchell,⁶ were not only afforded the time to develop their airpower theory, but were also afforded the ability to put in practice those theories simultaneously as they were being developed. This is not the case for space due to the ever increasing cost of getting there and the dynamic hostility of its environment. Not every nation can get to space, which limits use and subsequent experience of the domain during conflict. Additionally, nations who utilize the space domain do so without the advantage of testing their theories, doctrine, or escalatory properties prior to sending a fully funded, and costly, satellite into space. This limits

the quantitative “knowledge” of the domain along with how it can be escalated along the continuum of conflict.

Organization of Research

The research contained within this study follows a sequential path starting with a fundamental definition and relative scope of escalation based on theoretical and military doctrinal context of the subject. From a foundation and common understanding of escalation, the study provides a current, rudimentary theory of spacepower to include its plausible coercion aspects and strategic effects based operations which set it part-in-parcel to other domains. Space weaponization, a subject which should not be discounted, runs parallel to spacepower, making it a subject of brief discussion in order to pose the “what if” plausibility of escalating spacepower in similar fashion as air, land, and sea domains. Issues and options for space escalation round out the report and establish a jumping off point for future research into both spacepower and its escalation along the continuum of conflict.

Chapter 2: Escalation 101. In order to provide context and understanding to USSTRATCOM’s question of space escalation, the research must first start with a firm understanding of what escalation is and how it derived from a standpoint of conflict, war. Adapted from this basic definition of escalation, the Department of Defense (DoD), and the Air Force (AF), developed a military-centric definition which contextually and graphically depicts the basic elements of the conflict continuum which the military instruments of power must escalate accordingly.

Chapter 3: Generalized Spacepower Theory. Spacepower may mean a variety of things to civilian and military personnel; therefore, this report starts with a fundamental analysis of it in context with another domain -- the sea. Shifting from this generalized, foundational theory of

spacepower, this chapter moves into the realm of how space is a strategic asset by providing a brief history of space and its application over time and events. Although not all inclusive, the space history provides a foundation for discussion on the similarities of space and sea power, at the strategic level, and how, from this similarities, spacepower can begin to escalate its coercive capabilities during a conflict. Finally, spacepower is viewed through the lens of past military operations to show how the fundamental mission areas of space were escalated to meet the spectrum of conflict.

Chapter 4: Militarization and Weaponization Options for Space. How deep and far has the U.S. gone to militarize and/or weaponize space? It is understandable how the US has militarized space by virtue of its dominance of the domain and historical [military] application of it during conflicts; however, the debate continues on the appropriateness to weaponize it in order to continue its dominance within it. To add balance and perspective to the research, this paper reviews the militarization of space and theoretical aspects of weaponizing it, either offensively or defensively, along with the challenges of doing so from a policy perspective. Additionally, if the path of space escalation is through the continued militarization and possible weaponization of it, then options are needed which operate within the current framework of space treaties; yet, do not limit the amount, timing, or escalation capabilities of it.

Chapter 5: Conclusion. Launching from a foundational understanding of escalation, spacepower, militarization and weaponization, and options for space escalation, this paper proposes an iterative conclusion on the “how” and/or feasibility of escalating space along the continuum of conflict in comparison to the air, land, and sea domain. The weighted value of space during any conflict is large, but its coercive value is not fully known or been measured. This gap in analysis leaves a misunderstanding of how to escalate space during a conflict in a

similar way as with other domains; however, space's ability to be escalated, along the continuum of conflict and military operations, is not solely based on its singularity of use; instead, it is based on the coercive potential of space as a whole, as its parts fit within and augment other domains.

This brief research into the escalation of the space domain, from both a civilian and military vantage point, is not meant to be an in-depth, all inclusive perspective on the topic. Instead, it is a brief interlude on the surface of escalation where the theory of escalation can form and provide context as the research moves towards spacepower – what is meant by spacepower and how might its elements be made available for escalation.

Chapter 2

Escalation 101

“We sleep safely at night because rough men stand ready to visit violence on those who would harm us.”

- Winston S. Churchill

Renowned geostrategist Herman Kahn (1922-1983) provided an eloquent, yet simple definition of escalation, in a broad, un-complex context, as being “a ‘competition in risk-taking’ or at least resolve, and a matching of local resources, in some form of limited conflict between two sides.”⁷ This rise in conflict, between two sides, leads to a rise in the use of military assets and/or capabilities from which one side seeks to overpower and dominate the other; to force the other side to forego its will to fight. Not only can a nation escalate during a conflict, but it can do so prior to the start of a conflict.

Again, Herman Kahn gives another meaning to escalation which goes beyond the basics of force-on-force application of the military instrument of power:

“A nation may also escalate for prudential as well as coercive reasons: to prevent something worse from happening, to meet a problem, to prepare for likely escalations on the other side, and so on.”⁸

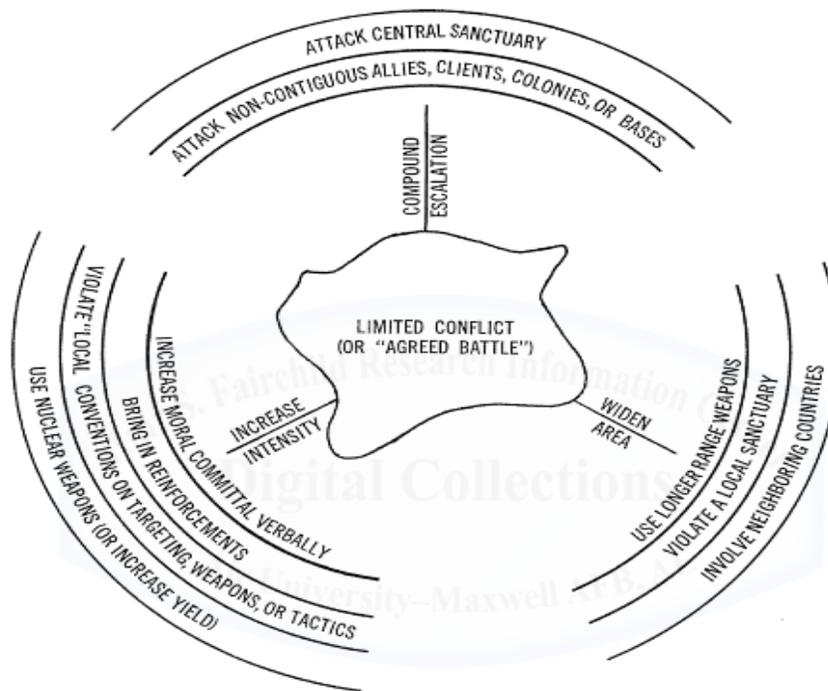


Figure 1.1. Three ways to escalate a limited conflict. (Adapted from Herman Kahn, *On Escalation* (2010), pg. 5.

Figure 1.1 is a graphical representation of Kahn’s rudimentary escalation model. It gives three broad ways a nation may escalate during limited conflicts. In each case, nations seek to overwhelm or overpower the other side with a preponderance of force; whether it is diplomatic, information, military, and/or economic.⁹ By moving outward from the center, where the conflict is relatively stable and both sides are seen to be equal, nations escalate by increasing their level of conflict intensity; who their intended target needs to be; and finally, the area of intended

operations. Escalation of each element, along this continuum, may occur in series or in parallel depending on the desire and force generation capabilities of the escalating nation.

The bottom line of this research is simply: Nations do not need to escalate just their military IOP nor do they need to coerce with force to bring an adversary to a culmination point where they forego further hostilities. This reduction in the need to apply direct force application during escalation opens the door for spacepower to be applied and escalated along what the military views as the conflict continuum.

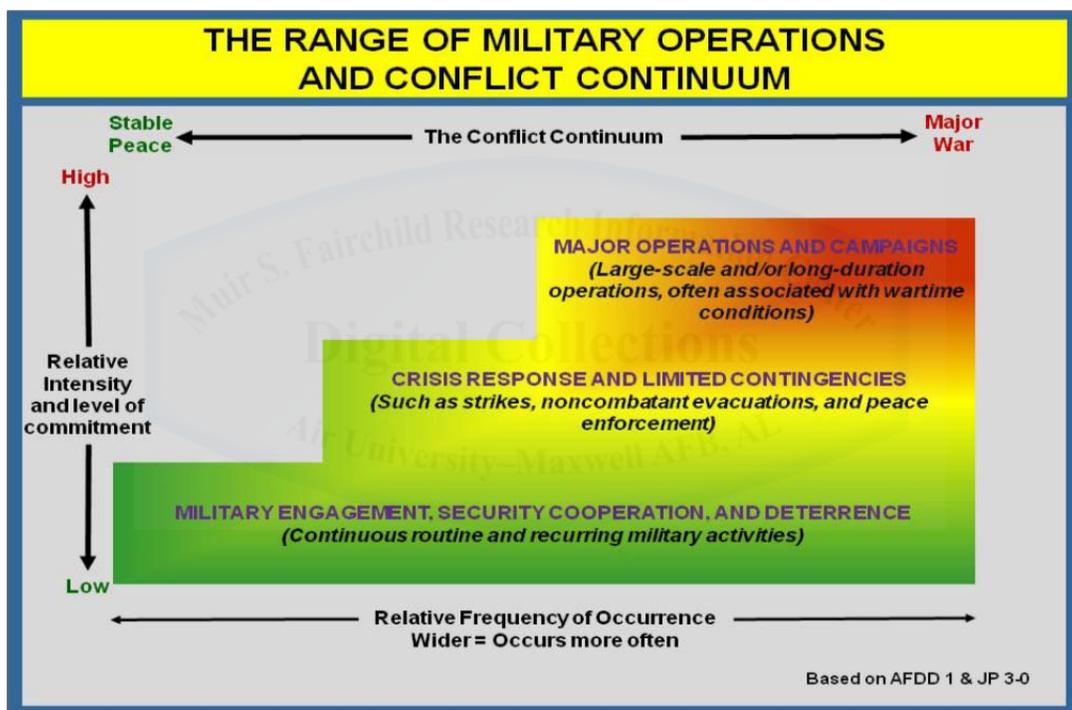


Figure 1.2. Range of Military Operations. (Adapted from AFDD-1 (2012), pg. 2.

Figure 1.2 diverges from Kahn’s escalation model by focusing only on the range of military operations along the conflict continuum. Based on AF Doctrine Document (AFDD) 1 and Joint Publication (JP) 3-0, the military’s model of escalation encompasses a three-dimensional perspective on an x, y, and z-axis: (x) relative frequency of [military] occurrence, (y) relative intensity and level of [military] commitment, and (z) the conflict continuum.¹⁰ By

giving military escalation height, width, and depth, the DoD escalation model (Figure 1.2) provides a wider aperture of operational characteristics which do not focus solely on the kinetic application of spacepower, due to its limited kinetic force, but on non-kinetic spacepower that is derived from the domains ubiquitous nature: spacepower is everywhere and involved in all other kinetic, non-kinetic applications generated from the other four domains. In order to conceptualize how space might be escalated along the conflict continuum a generalized understanding of spacepower is necessary.

Chapter 3

Generalized Spacepower Theory

*“Space is a warfighting medium on equal footing with air, land, and sea.”*¹¹
- General Lance W. Lord

The Soviet Union’s launch of *Sputnik* in 1957 became the basis for space power theory, and international debate immediately emerged on potential applications of an enemy satellite orbiting the earth. Theories ranged from dropping nuclear weapons from space to peacefully overflying countries for treaty verification.¹² Operations Desert Storm, Allied Force, Enduring Freedom, and Iraqi Freedom gave military theorists a glimpse into the application of space power; however, the validity of their theories has yet to be extensively tested. Theorists continue to search for strategies to interpret and employ space power.

Connecting Space History to Space Power Theory

The development of space power theory is one that has both a rich past and an ever growing future. In Chapter 1, a brief look at space history is given in order to provide a grounding foundation of historical space events from which space power theory can, and does,

build from. To connect space history to space power theory, the following time-line of events is given which show how, and more importantly why, the U.S. sought the need to develop a coherent space power theory (it gives the “so what” behind historical space events):

- In 1945, Army Air Force Commander Hap Arnold recommends to the Secretary of War that the United States pursue the development of long-range missiles and "space ships" capable of launching missiles against terrestrial targets.
- The RAND Corporation, at the request of General Curtis LeMay, issues a report in 1946 on the "Preliminary Design of an Experimental World Circling Spaceship." The Navy and Army begin programs to develop launch capabilities and satellites.
- For the next 30 years, driven by its conflict with the Soviet Union, the United States refines and expands the range of satellite services available to support national security to include military communications, navigation and timing, intelligence collection, and reconnaissance.
- A legal framework for space activities is created in the 1960s, which states that national sovereignty does not extend limitlessly into space, and the right of overflight is established. There are parallels to international law as applied to the sea and to warships, but also some significant differences (discussed later in this chapter). There is significant ambiguity over the use of weapons—nuclear weapons are clearly forbidden; other classes of weapons are not.
- Threats by Soviet leader Nikita Khrushchev to deploy nuclear-armed orbital bombardment systems in 1959 lead to the first U.S. antisatellite program. U.S. efforts to develop antisatellite weapons are helped by work on missile defense.
- U.S. cancels the Air Force X-20 space plan project in 1963. This is a seminal moment

for space power and diverts it from the vision of Arnold and other Air Force pioneers. Manned flight becomes the domain of NASA, and the United States shelves the idea of an aircraft-like manned platform capable of delivering weapons from orbit.

- 1991 Persian Gulf War: The United States assembles a collection of space services that provide real advantages on the battlefield. The operation of space assets [hence space power] provides new capabilities and improved performance.
- The end of the Cold War eliminates the peer competition which drove much of the change in military and intelligence activities in space. [However] DoD begins to articulate a broader concept of space power and begins to change organizations and doctrine to take full advantage of space for national security.
- In 2000, the United States National Security Space Management and Organization concludes that "we [U.S.] are now on the threshold of a new era of the space age, devoted to mastering operations in Space." The United States leads all other nations in the use of space for national security.¹³

Each of these salient points highlights the interconnectedness of space power application and the domain of warfare.¹⁴ They represent a crescendo of historical points where space emerged from "behind the scenes" to become an integral facet of air, land, and sea power. Finally, they lay the foundational elements for deriving a strategic spacepower theory.

A Construct of Strategic Spacepower

Lieutenant Commander John Klein,¹⁵ U.S. Navy, proposes to define a theory of space power and operations, which at a granular level is dissimilar from sea power, but at the strategic and theoretical levels share many commonalities and provide a bridge which commanders may use to link space assets to military operations (listed below) in order to escalate space:

“National Power Implications. Space operations and activities utilizing space-based assets have broad implications for national power in peace and war, implications that include diplomatic, military, economic, technological, and information elements. Furthermore, military operations in space are extensively interrelated with national and political interests, and any action in space, even minor ones, can impact the balance of wealth and power among nations.

Interdependence with Other Operations. Operations in space are interdependent with those on land, at sea, and in the air. Space warfare is just a subset of wartime strategy and operations; accordingly, space forces must operate in concert with other military forces. Moreover, space strategy should work within the overall national strategy, since it is next to impossible for space operations alone to decide a war’s outcome.

Command of Space. Command of space is the control of space communications¹⁶ for civil, commercial, intelligence, and military purposes. The inherent value of space is as a means of communications; therefore, space warfare must work directly or indirectly toward either securing command of space or preventing the enemy from securing it. Command of space does not mean that one’s adversary cannot act, only that he cannot seriously interfere in one’s actions. Additionally, the command of space will normally be in dispute.

Space Communications. Space communications are those lines of communications by which the flow of national life¹⁷ is sustained in and through space. These include strategic lines of communication, critical to a nation’s survival, that serve the movement of trade, materiel, supplies, and information. By attack upon space communications, a nation can adversely affect another’s civil, commercial, intelligence, and military activities, thereby reducing that nation’s will to resist. The primary purpose of space warfare is to secure space

communications; enemy forces that are in a position to render them unsafe must be put out of action.

Strategic Positions. Strategic positions include launch facilities, up-and-down link systems, space bases or stations, and focal areas where operations and activities tend to converge. If correctly exploited, strategic positions allow a space force to restrict the movement of the enemy forces or information, thus improving the conditions for military operations. Since it will prove difficult to force an adversary into a decisive engagement, it is better to control strategic positions and threaten commerce and operations, thereby forcing the enemy to act on favorable terms. By exploiting strategic positions through occupation of the enemy's space lanes of communication and closing points of distribution, we destroy elements of the enemy's "national life" in space.

Blockades. Closely related to strategic positions are the methods of blockades, whether close or open. The close blockade for space operations equates to preventing the deployment of systems from launch facilities and to interfering with communications in the vicinity of uplinks or downlinks, as well as impeding the movement of vehicles near space-based hubs. Close blockade may be achieved by physical systems or vehicles or interference measures. In Corbett's model,¹⁸ suppressing operations at these distribution points obliges the adversary either to submit or fight. In contrast, a more capable space power can impose an open blockade, occupying or interfering with the distant and common space lines of communication, to force an adversary into action. Like the close blockade, methods include both physical systems and interference.

Cruisers. The object of space warfare is to control space communications, and therefore a means of establishing this control is required. Consequently "cruisers"¹⁹ are

needed in large numbers to defend the vast volumes occupied by space lines of communication. One possible implementation of the “cruiser” concept would be inexpensive micro-satellites designed to defend high-value space assets from attack or space-based interference. Space systems that perform purely offensive operations with negligible influence on space lines of communication are of secondary importance.”²⁰

Klein’s extrapolation of sea power into a prospective space power theory gives a glimpse of what space can bring to operations (in, thru, and from space) and how space is integral to the effective operations of all other domains. It also shows how space can be applied, or escalated, along the conflict continuum to produce coercive properties.

Coercion, states noted military historian Robert Pape, occurs when a nation uses its instruments of national power to change the forthcoming behavior of an adversary.²¹ There are two distinct types of coercion: punishment and denial. Coercion via punishment boils down to inflicting great suffering and pain primarily on an adversary’s civilian population, but may also include his standing military forces.²² This is not the desired nor the applicable form of coercion space seeks to inflict upon an adversary, nor is it a true escalation model because it inflicts the maximum amount of risk upon a nation, which precludes any form of escalation. However, coercion by denial offers a more viable option for space, using Klein’s spacepower dictums above, as it allows for greater latitude of space application and escalation.

Coercion via denial utilizes military ends, ways, and means to “prevent the target [adversary] from attaining its political objectives or territorial goals.”²³ This represents a more military-centric approach to effect an adversary, and a more direct way in which space can be applied to create those effects. Denial does not solely represent a constant “force-on-force” application of military power; instead, it represents a gradual, escalating approach to coercion

where a state can, per Pape, “threaten, for example, to capture territory held by the opponent or to destroy enough of the opponent’s military power to thwart its territorial ambitions.”²⁴

Therefore, if space assets are used, in either a supporting or supported role, as other domains, to achieve effects based operations in or through a given battle space, by jamming an adversary’s communications (**blockade**), prevent their freedom of movement (**strategic position**), or position micro-satellites to defend orbital attacks (**cruiser**), then it becomes plausible to escalate spacepower along the continuum of military conflict in order to dissuade and undermine an adversary’s potential or real military strategy for continued aggression:²⁵ Escalating space in this coercive fashion raises the level of risk for an adversary, to either start or continue aggression, beyond an acceptable level. With a view of space as an equal in both direct military application, support, and escalatory application as the other domains the aperture begins to open on how space fits within full spectrum dominance.

Space and Full Spectrum Dominance

Joint Vision 2020 labels full spectrum dominance as the ability of U.S. forces “to conduct prompt, sustained, and synchronized operations with combinations of forces tailored to specific situations and with access to and freedom to operate in all domains – space, sea, land, air, and information.”²⁶ Space bridges the gap between desired effects and actual effects within any given domain. It synergizes domains within the military instrument of power and augments their ability to project power from, thru, and into a desired theater and across the full range of operations.

Space is also tied into our National Security Strategy via the 2010 National Space Policy. This policy document provides the strategic overarching goal of U.S. space objectives and our means of maintaining our superiority in the domain:

- It is the shared interest of all nations to act responsibly in space to help prevent mishaps, misperceptions, and mistrust. The United States considers the sustainability, stability, and free access to, and use of, space vital to its national interests. Space operations should be conducted in ways that emphasize openness and transparency to improve public awareness of the activities of government, and enable others to share in the benefits provided by the use of space.
- A robust and competitive commercial space sector is vital to continued progress in space. The United States is committed to encouraging and facilitating the growth of a U.S. commercial space sector that supports U.S. needs, is globally competitive, and advances U.S. leadership in the generation of new markets and innovation-driven entrepreneurship.
- All nations have the right to explore and use space for peaceful purposes, and for the benefit of all humanity, in accordance with international law. Consistent with this principle, “peaceful purposes” allows for space to be used for national and homeland security activities.
- As established in international law, there shall be no national claims of sovereignty over outer space or any celestial bodies. The United States considers the space systems of all nations to have the rights of passage through, and conduct of operations in, space without interference. Purposeful interference with space systems, including supporting infrastructure, will be considered an infringement of a nation’s rights.
- The United States will employ a variety of measures to help assure the use of space for all responsible parties, and, consistent with the inherent right of self-defense, deter others from interference and attack, defend our space systems and contribute to the defense of

allied space systems, and, if deterrence fails, defeat efforts to attack them.²⁷

Space enables full spectrum dominance across the breadth of military operations and conflict continuum so that the U.S. can maintain its global security and achieve its national objectives.

Example of Spacepower Escalation

Desert Shield and Desert Storm, 1990-1991, represented the first time the U.S. actively, purposefully used military satellites during a full-scale conflict. Airpower historian Ben Lambeth writes, in “*Unseen War*,” how prior to, and during Desert Shield, U.S. escalated its strategic assets, to include space-based capabilities -- satellites and personnel manning support for those satellites, to defeat and “takedown” Saddam’s regime.²⁸ The data for this escalation resides in the *Gulf War Air Power Survey*: Volumes 4 and 5.

As tensions escalated between coalition, U.S., and Iraqi governments over Iraq’s invasion of the sovereign Gulf nation of Kuwait, so too did each nations’ military capabilities. Volumes 4 and 5 of the *Gulf War Air Power Survey* show that along with air, sea, and land, space, too, was escalated to meet the needs of the growing conflict.²⁹ Due to the level of classification, a true understanding and measurement of how space was escalated during Desert Shield and Storm is unobtainable; however, Volume 5 does highlight the significant amount of communication, surveillance, guidance (GPS), and weather satellite capabilities which were incrementally applied (escalated) to meet the needs of the other domains as they, too, escalated.³⁰ This example from Gulf War One shows how Klein’s dictums fit within the realm of plausibility on how to escalate spacepower and how, by way of Pape, such subtle, yet coercive activities can, and did, hinder an adversary’s (Iraq’s) ability to move and maneuver -- raising its level of risk to continue hostilities.

What this quick vignette of Gulf War One shows is the plausibility and potential “how to” in escalating spacepower along the continuum of conflict. This escalation was done without the need to fully and/or directly weaponize space; however, weaponizing space is the possible “next step” for the space domain, which would increase its ability to overtly escalate.

Chapter 4

Militarization and Weaponization of Space

“However, few would argue that warfare will eventually come to the space domain. Where mankind endeavors, conflict has always followed.”³¹

- Dr. Dale Hayden, Colonel (ret), USAF

Theodore Roosevelt understood the implications of sea power and advocated for a robust U.S. Navy. He funded the Great White Fleet despite the protest of others in government who felt a more powerful Navy would heighten the risk of war; in regards to this sentiment Roosevelt wrote, “Preparation for war is the surest guaranty for peace. Arbitration is an excellent thing, but ultimately those who wish to see this country at peace with foreign nations will be wise if they place reliance upon a first-class fleet of first-class battleships rather than on any arbitration treaty which the wit of man devise.”³² This report would be incomplete without a discussion, similar to Roosevelt’s discussion with his administration, on the on-going militarization of the space domain and the possibilities to weaponize it.

Militarization of Space

The militarization of space, as shown in the previous chapter, is nothing new to the US. Noted political scientist Bert Chapman provides a deeper chronology of the “how and why” the militarization of space since the beginning with Project Corona (1960’s)³³ to today’s myriad of classified satellite launches which all add to and support the continued militarization of the

domain. Ann Robertson provides a simple, yet revealing definition of what militarization of space means, “Space becomes militarized when equipment based in outer space is used for military purposes.”³⁴ Robertson’s “militarization of space” has dominated the production and launch dynamics of the US for years; however, the private sector is beginning to surpass the military in both the number of launches, but in the amount of bandwidth and capacity being employed in/from space. This in no way diminishes the military’s use and continued militarization of space, which Joan Johnson-Freese writes is a given:

“The U.S. military demonstrated its powerful combat abilities during the first Gulf War, the wars in Bosnia and Afghanistan, and the twenty-one-day march to Baghdad in April 2003. Technology, including space technology, plays a large role. Space is embedded in the U.S. military’s way of doing business and plays a large part in its [continued] success.”³⁵

The militarization of space will only increase as the U.S. moves into the 21st century.³⁶ In a broader contextual framework, militarization space includes ANY instance where space-based assets are used for military operations; thus, if the military purchases bandwidth or time on a commercial satellite to support military operations, that satellite then becomes part of the militarization of space.³⁷ Aligning with Chapter 2’s example of spacepower escalation during Gulf War One, the militarization of space becomes synonymous with the escalation of space since the military will purchase or control civilian satellite bandwidth and/or capabilities “as needed” along the conflict continuum path. This continued proliferation of space militarization has kept within the bounds of the Outer Space Treaty; however, what are the implications if the inevitable path of the space domain leads to war, and weaponization.

Weaponization of Space

What constitutes the weaponization of space? Robertson provides an answer to this question: “Weaponization, in contrast, refers to the deployment of actual weapons into space, such as lasers, space-to-Earth attack weapons, or missile defense system components.”³⁸ Her list of space “weapons,” albeit, not all inclusive, provides an adequate representation of what space weaponization would look like. At first glance, an opponent to space weaponization would make note that the Outer Space Treaty (1967) prevents nations from weaponizing space. However, this is not entirely true, as Robertson writes: “The Outer Space Treaty builds on the U.S. position that space should be available for all humankind to use for peaceful purposes. Therefore, it bans deployment of weapons of mass destruction in space The weapons ban, however, does not cover conventional weapons.”³⁹ This opens the prospect for and the breadth of possibilities which constitute weaponization.

Barry Watts gives a descriptive analysis of how nations can move down a “slippery slope” of space weaponization and lists simple, Klein-type actions (from Chapter 3), which may weaponized acts:

- using earth-based lasers to dazzle the optical arrays of electro-optical imaging reconnaissance satellites;
- active jamming of imaging radar satellites;
- widespread jamming of Global Positioning System (GPS) location and timing information;
- positioning satellites in orbit in close proximity with the satellites of one’s military, economic or political competitors;
- the use of satellites with active, high-power radars to degrade the electronics of adversary satellites; and

- capturing or corrupting the data streams to or from competitor' satellites.⁴⁰

However tempting, or “trajectory based” the weaponization of space is, the reality of war in space is compounded not only by the hostile environment, but by the second and third order effects of kinetic operations with the domain.

Anti-Satellite (ASAT) weapons, although not space-based, represent a potential “slippery slope” a nation, such as China and US, are taking to hedge against,⁴¹ or use coercively⁴² to affect an adversary's space-based effects and capabilities, which ultimately affect their entire campaign objectives. Such capabilities are avenues nations may take or escalate in order to cause direct, kinetic effects against an adversary's space-based assets; however, the second and third order effects may cause un-intended consequences which affect the entire space domain (and the initiating nation). An example of would be China's 2007 ASAT test.

China's 2007 ASAT test, against one of their aging Fengyun-1C weather satellites,⁴³ was a dynamic demonstration of its ability to master the technical aspects of shooting down something in space, from earth; however, the second order effect, which was un-intended, was the extraordinary release of debris, which, according to Ann Robertson, is the “largest release of debris to date.”⁴⁴ Robertson states a third order effect from China's ASAT test, was the need for the US to “hastily” move its \$1.3 billion *Terra* satellite out of the way of the newly formed China ASAT debris field.⁴⁵

The research in this chapter shows that although the militarization of space is growing, and will continue to grow, the weaponization of space might not be a viable escalation option for the space domain due second and third order negative effects, which affect all space-based assets - friend and foe alike.

Chapter 5

Conclusion

“... a dream that became a reality and spread throughout the stars.”⁴⁶

- Captain James T. Kirk

This research paper sought to build a conceptual model on how a combatant commander, USSTRATCOM in this case, can escalate space along the various levels of the military’s conflict continuum. The “power” within spacepower does not reside in the need to weaponize the domain; instead, spacepower currently provides the capacity to escalate utilizing the domain’s entire depth, breadth, and range of capabilities that are now ubiquitous across all other domains.

To fully understand this conclusion, the research started with the theoretical background of escalation. Escalation equates to a rise in the level of effort one nation exerts upon another during a conflict. For the military, and U.S. Air Force, this escalation is represented in a three-dimensional perspective with relative frequency of [military] occurrence on the ‘x’ access, relative intensity and level of [military] commitment on the ‘y’ access, and the conflict continuum on the ‘z’ access.⁴⁷ This “height, width, and depth” view of a conflict allows for broader applications of space assets, which allows for a broader approach on how to escalate operations within the space domain. Such operations represent the real “power” within spacepower.

From the launch of *Sputnik* in 1957, the idea of what constituted spacepower has fascinated many space pundits. However, this paper espoused in the concept that spacepower is inherent within the space domain when viewed through the lens of military operational capabilities similar to those of the sea domain. Klein’s seven dictums of spacepower⁴⁸ (Chapter

3) provide an operational construct of spacepower from which a commander can then begin to determine which space-based assets or capabilities to escalate along the conflict continuum. A prudent example of such an escalation matrix is provided by those [space-based] actions taken before and during Gulf War One where the true measure of the space domain, and its relevant and applicable spacepower, was realized and matured. To apply Klein's dictums in order to militarily escalate the space domain, the U.S. needs to continue its dominance within the domain, which is predicated on its continued militarization, but not necessarily in its weaponization.

This paper gave clear indication on the analytical belief in which the militarization of space will only continue well into the 21st Century. Why space will continue to militarize is represented by Joan Johnson-Freese's statement, "In simple terms, space technology provides 'see it,' 'state it,' and 'stop it' capabilities for the United States far beyond those of any other military."⁴⁹ Space, viewed in this manner, has an omnipresent context, which can be escalated, in mass or by its separate parts, to facilitate the coercive effects the commander desires. An important note here is: Militarization of space is not synonymous with weaponization of space, and escalation of space should not be viewed solely in the context of weaponization.

Weaponization of space, although not fully outlawed by the Outer Space Treaty, should not be the "sine qua non" of either spacepower or space escalation. Evidence has shown, as in the case of the Chinese ASAT test, where the weaponization of space would cause undesirable second and third order effects which could destabilize or degrade the space domain to a culmination point where it is no longer viable for any nation to operate in; thus, removing its escalatory properties.

Space is hostile in nature; yet, ubiquitous within all other domains. As air, land, and sea escalate along the continuum of military conflict, so, too, can space. Its ability to escalate in a

coercive manner, raising the level of operational risk of an adversary,⁵⁰ is not relegated to the need for direct kinetic effects; instead, its ability to escalate should be measured on its affect and/or support to other domains: The whole of space is greater than its parts, and escalation of space is plausible within the military conflict continuum.



Endnotes

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- ¹ Clausewitz, Carl von. *On War*. Edited and translated by Michael Howard and Peter Paret. New Jersey, Princeton University Press, 1989, pp. 75-182.
- ² Lutes, Charles D., Hays, Peter L., et al., *Toward a Theory of Spacepower: Selected Essays*. Washington, DC: National Defense University Press, 2011, Chapter 1, pg. 13.
- ³ Johnson-Freese, Joan. *Space as a Strategic Asset*. Columbia University Press: New York, 2007, pg. 83.
- ⁴ Joint Publication 5-0, Joint Operational Planning, 11 August 2011, pp. xxiii-xxiv.
- ⁵ Federal Aviation Administration, 2013. *The Annual Compendium of Commercial Space Transportation: 2013*. Retrieved from http://space.taurigroup.com/reports/FAA_Annual_Compndium_2013.pdf, (on 17 November 2014), pp. 89-148
- ⁶ Mitchell, William. *Winged Defense: The Development and Possibilities of Modern Air Power – Economic and Military*. Tuscaloosa, AL: University of Alabama Press, 2009, pp. 3-26.
- ⁷ Kahn, Herman. *On Escalation: Metaphors and Scenarios*. Transaction Publishers: New Brunswick, New Jersey, 2012, pg. 3. Work originally published by Praeger: New York, 1965
- ⁸ *Ibid.*, pg. 4
- ⁹ *Ibid.*, pg. 6
- ¹⁰ Air Force Doctrine Document 1, Annex 3-0, 9 November 2012, pg. 2
- ¹¹ Santee, Jay G., Colonel, USAF, “*Command and Control: The Future of Space*,” in *High Frontier* (Air Force Space Command Journal for Space and Missile Professionals), Vol 2, No. 3, 2006. Retrieved from <http://www.afspc.af.mil/shared/media/document/AFD-060524-003.pdf> (on 2 February 2-15), pg. 56.
- ¹³ Lewis, Andrew James, *Toward a Theory of Space power, Selected Essays: Neither Mahan nor Mitchell: National Security Space and Space power, 1945-2000*, (Chapter 14), 2011. Retrieved from <http://www.dtic.mil/dtic/tr/fulltext/u2/a546585.pdf> (on 1 October 2014), 277-280.
- ¹³ *Ibid.*, pp. 277-280.
- ¹⁴ *Ibid.*, 280.
- ¹⁵ At the time he wrote “*Corbett In Orbit: A Maritime Model for Strategic Space Theory*,” Lieutenant Commander John Klein (U.S. Navy) was the Navy Federal Executive Fellow at the Brookings Institution in Washington, D.C. He holds a bachelor’s in aerospace engineering (Georgia Tech), a master’s in aeronautical engineering (Naval Postgraduate School), and a master’s in national security and strategic studies (Naval War College), where he was also a Mahan Scholar. A naval flight officer (S-3B Viking) and a graduate Naval Test Pilot School, Commander Klein has gone on to author several articles on space-centric military strategy in addition to his follow-on book entitled: *Space Warfare: Strategy, Principles and Policy*, New York: NY, 2006.
- ¹⁶ Although Klein does not specifically state in his *Corbett in Orbit* article, “Command of Space” would, in today’s context, include other elements of space capabilities not just space communications (e.g., weather, imagery, Precision, Navigation, and Timing (PNT), etc.).
- ¹⁷ “National life” represents those key elements of a nation states ability to create, operate, and sustain lines of communications, similar in context to the lines of communications within the sea domain, which promulgate its ability to grow and maintain relevancy within a capitalistic environment.

¹⁸ Julian Corbett provides a detailed model of what blockade meant to him in regards to naval operations in his book: *Principles of Maritime Strategy*, New York, NY: Dover Publications (2004), original publication in 1911, pp. 184-208.

¹⁹ “Cruisers,” in this context, represent spacecraft’s which are similar in nature and application to those seen in science fiction movies or on television (i.e., Star Trek) that can provide direct kinetic support to any given space operation. This is similar to what naval cruisers provide to current naval operations in both “blue water” and littoral environments.

²⁰ Klein, John J. *Corbett In Orbit: A Maritime Model for Strategic Space Theory*, Naval War College Review 57, No. 1, Winter 2004, 66–69.

²¹ Pape, Robert. *Bombing to Win: Air Power and Coercion in War*. Ithaca, NY: Cornell University Press, 1996, 12.

²² Ibid., pg. 13.

²³ Ibid., pg. 13.

²⁴ Ibid., pg. 13.

²⁵ Ibid., pg. 20.

²⁶ Department of Defense, *Joint Vision 2020*, May 2000. Retrieved from www.fs.fed.us/fire/doctrine/genesis_and_evolution/source_materials/joint_vision_2020.pdf (on 3 October 2014), pg. 6.

²⁷ National Space Policy of the United States, 2010, pg. 3.

²⁸ Lambeth, Benjamin, *The Unseen War: Allied Air Power and the Takedown of Saddam Hussein*. Annapolis, MD: Naval Institute Press, 2013; pp. 59-146; 178-241.

²⁹ *Gulf War Air Power Survey: Volume 4*. Washington D.C., 1993, pp. 475-477; and *Gulf War Air Power Survey: Volume 5*. Washington D.C., 1993, pp. 125-133.

³⁰ Ibid., Volume 5, pp. 125-133.

³¹ Hayden, Dale L. *The Search for Space Doctrine’s War-Fighting Icon*, Air & Space Power Journal (November-December 2014), pg. 63.

³² Mario R. DiNunzio, *Theodore Roosevelt: An American Mind* (New York: Penguin, 1994), 174.

³³ Chapman, Bert. *Space Warfare and Defense*. ABC-CLIO, Inc. Santa Barbara, California, 2008, pp. 97-131.

³⁴ Robertson, Ann E., *Militarization of Space*, Infobase Publishing, New York: NY, 2011, pg. 8.

³⁵ Johnson-Freese, Joan. *Space as a Strategic Asset*, Columbia University Press, New York, 2007, pg. 82.

³⁶ Robertson, Ann E., *Militarization of Space*, Infobase Publishing, New York: NY, 2011, pg. 4.

³⁷ Ibid., pg. 4.

³⁸ Ibid., pg. 5.

³⁹ Ibid., pg. 19.

⁴⁰ Watts, Barry D. *The Military Use of Space: A Diagnostic Assessment*. Center For Strategic And Budgetary Assessments, Washington, D.C., February 2001. Retrieved from <http://www.csbaonline.org> (on 3 October 2014), pp. 117-118.

⁴¹ Robertson, Ann E., *Militarization of Space*, Infobase Publishing, New York: NY, 2011, pg. 28.

⁴² Pape, Robert. *Bombing to Win: Air Power and Coercion in War*. Ithaca, NY: Cornell University Press, 1996, 12.

⁴³ David, Leonard. *China's Anti-Satellite Test: Worrisome Debris Cloud Circles Earth*. Space.Com; February 2007. Retrieved from <http://www.space.com/3415-china-anti-satellite-test-worrisome-debris-cloud-circles-earth.html> (on 18 December 2014), pg. 1

⁴⁴ Robertson, Ann E., *Militarization of Space*, Infobase Publishing, New York: NY, 2011, pg. 12.

⁴⁵ *Ibid.*, pg. 12.

⁴⁶ "Whom Gods Destroy." *Star Trek* (original television series), Season 3, Episode 14, original air date, January 3, 1969.

⁴⁷ Air Force Doctrine Document 1, Annex 3-0, 9 November 2012, pg. 2.

⁴⁸ Klein, John J. *Corbett In Orbit: A Maritime Model for Strategic Space Theory*, *Naval War College Review* 57, No. 1 (Winter 2004), 66–69.

⁴⁹ Johnson-Freese, Joan. *Space as a Strategic Asset*. Columbia University Press: New York, 2007, pg. 82.

⁵⁰ Pape, Robert. *Bombing to Win: Air Power and Coercion in War*. Ithaca, NY: Cornell University Press, 1996, 12.



Bibliography

- Air Force Doctrine Document 1, Annex 3-0, 9 November 2012.
- Chapman, Bert. *Space Warfare and Defense*. ABC-CLIO, Inc. Santa Barbara, California, 2008.
- Clausewitz, Carl von. *On War*. Edited and translated by Michael Howard and Peter Paret. New Jersey, Princeton University Press, 1989.
- David, Leonard. *China's Anti-Satellite Test: Worrisome Debris Cloud Circles Earth*. Space.Com; February 2007. Retrieved from <http://www.space.com/3415-china-anti-satellite-test-worrisome-debris-cloud-circles-earth.html> (on 18 December 2014).
- Department of Defense, *Joint Vision 2020*, May 2000. Retrieved from www.fs.fed.us (on 3 October 2014).
- Federal Aviation Administration, 2013. *The Annual Compendium of Commercial Space Transportation: 2013*. Retrieved from <http://space.taurigroup.com> (on 17 November 2014).
- Gulf War Air Power Survey: Volume 4*. Washington D.C., 1993, pp. 475-477; and *Gulf War Air Power Survey: Volume 5*. Washington D.C., 1993.
- Hayden, Dale L. *The Search for Space Doctrine's War-Fighting Icon*, Air & Space Power Journal, November-December 2014.
- James Andrew Lewis, *Toward a Theory of Space power, Selected Essays: Neither Mahan nor Mitchell: National Security Space and Space power, 1945-2000*, (Chapter 14), 2011.
- Johnson-Freese, Joan. *Space as a Strategic Asset*. Columbia University Press: New York, 2007
- Joint Publication 5-0, Joint Operational Planning, 11 August 2011.
- Kahn, Herman. *On Escalation: Metaphors and Scenarios*. Transaction Publishers: New Brunswick, New Jersey, 2012.
- Klein, John J. *Corbett In Orbit: A Maritime Model for Strategic Space Theory*, Naval War College Review 57, No. 1, Winger 2004.
- Lambeth, Benjamin, *The Unseen War: Allied Air Power and the Takedown of Saddam Hussein*. Annapolis, MD: Naval Institute Press, 2013.
- Lewis, Andrew James, *Toward a Theory of Space power, Selected Essays: Neither Mahan nor Mitchell: National Security Space and Space power, 1945-2000*, (Chapter 14), 2011.

- Lutes, Charles D., Hays, Peter L., et al., *Toward a Theory of Spacepower: Selected Essays*. Washington, DC: National Defense University Press, Chapter 1, 2011.
- Mario R. DiNunzio, *Theodore Roosevelt: An American Mind*, New York: Penguin, 1994.
- Mitchell, William. *Winged Defense: The Development and Possibilities of Modern Air Power – Economic and Military*. Tuscaloosa, AL: University of Alabama Press, 2009.
- National Space Policy of the United States, 2010.
- Pape, Robert. *Bombing to Win: Air Power and Coercion in War*. Ithaca, NY: Cornell University Press, 1996.
- Robertson, Ann E., *Militarization of Space*, Infobase Publishing, New York: NY, 2011.
- Santee, Jay G., Colonel, USAF, “*Command and Control: The Future of Space*,” in *High Frontier* (Air Force Space Command Journal for Space and Missile Professionals), Vol 2, No. 3, 2006.
- Watts, Barry D. *The Military Use of Space: A Diagnostic Assessment*. Center For Strategic And Budgetary Assessments, Washington, D.C., February 2001. Retrieved from <http://www.csbaonline.org>, (on 3 October 2014).
- “Whom Gods Destroy.” Star Trek (original television series), Season 3, Episode 14, original air date, January 3, 1969.