AU/ACSC/100/1998-03

AIR COMMAND AND STAFF COLLEGE

AIR UNIVERSITY

A STUDY ON CONTRASTS

SIMILARITIES AND DIFFERENCES BETWEEN

DEVELOPMENT OF AIRPOWER AND SPACE POWER

by

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A Research Report Submitted to the Faculty

In Partial Fulfillment of the Graduation Requirements

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Maxwell Air Force Base, Alabama

April 1998

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Preface

With the dissolving of the Cold War and the development of theater-level support capabilities during and since the Gulf War, space power has taken on new meaning and significance within today's Air Force. As early airpower grew, commercially and militarily, so too has space power. Just as airpower proved invaluable to allied success in World War II, and subsequent conflicts, space power has proven itself indispensable to military success. But, as America's military has developed a growing dependency on space power, is it positioned to successfully foster the continued growth of space power, and the capabilities space assets offer, should that dependency become threatened? This paper examines contrasts between the development of early airpower within the Army Air Corps, and development of space power within the Air Force, by examining similarities and differences in military applications, theoretical assertions, doctrinal concepts, and resource allocation associated with the advancement of each technology.

This project began to take shape several years ago during my initial indoctrination into space operations. As a Flight Commander in the 50th Space Wing, I met brilliant people who would enlighten me on the use of space today, and how it could revolutionize the military of the future. Two individuals had a particularly strong impact and stand out more than the others. The first was my Squadron Commander, Lieutenant Colonel "Hoops" Hoapili, who instilled in us the notion that space operators are indeed warfighters, not unlike our aviation brethren, and who drove us to institutionalize within

ourselves an operational mentality. The other individual is Colonel "Pete" Worden, then Commander of the 50th Space Wing, who during many late night discussions during my crew's shift rotation, would enlighten us on the future role that space was destined to play in our military. Not only is he a true space "visionary," he also made it clear that we, as junior officers, were at the prime point in our careers to make a difference in the development and advancement of "space power."

As I began my year of academia in the study of military history, and the contributions of airpower and space power, it became clear that there are striking similarities between the dawn of airpower and our present position in the development of space power. Being surrounded by the history of Maxwell Air Force Base, Alabama, where our Air Force fathers so earnestly devoted their careers to the advancement of the potential of airpower, made me realize the same opportunity exists for the advancing breed of space operators with their visions for space power. Today's space advocates in the Air Force have the example of early airpower development to assist them in blazing a pathway for the continued development and advancement of space power.

Throughout this effort, I received invaluable support and encouragement from Lieutenant Colonel Theresa Clark, my research advisor, who also served as my mentor and friend, and kept this project focused. I also wish to thank my Air Force Space Command sponsor, Lieutenant General Lance Lord, for his wisdom and sound advice. Finally, I thank my children, Sarah, Rachel, and Benjamin, and my wife Cathy for their love, encouragement, and unending support this entire year.

AU/ACSC/100/1998-03

Abstract

Space applications for military operations began in earnest in the late 1950's, but it wasn't until the Gulf War of 1991 that space power came to the forefront of the military mindset. While early airpower and current space power share similar foundations, and a common vision as to future applications, only airpower advanced to a combatant role, while space remains mired in a supporting role. Is the Air Force as committed to the continued growth and advancement of space power as the Army Air Corps was to the development and advancement of early airpower?

This study examines similarities and differences between development of early airpower in the Army Air Corps, and development of space power within the Air Force, as America becomes increasingly reliant on space assets and capabilities. In order to determine if the Air Force is poised to continue the growth and development of space power, this paper will review basic applications of the two technologies, depicting their roles in support of military operations. For airpower, the study focuses on the airplane's role during World War I and the turmoil its advocates faced in the post-war environment. For space, it will briefly discuss how the medium was used during the Cold War, but focus predominantly on the post Gulf War timeframe, especially in light of the growing operational advantages it provides the military. The paper then examines theoretical assertions regarding the relevance of airpower as discussed by Douhet, Mitchell and the Air Corps Tactical School between the two World Wars, and the contrast (if any) offered

by the present lack of accepted, and functional, space power theory following the Gulf War. Next is a comparison of doctrinal development as it pertains to early support for airpower, and the present state of space power. Doctrine provided early airpower advocates justification and validity for pursuing a technology not yet developed, lead-turning the future via their doctrinal concepts. Conversely, space power has largely operated without a doctrinal foundation outside inclusion as an inherent piece of airpower, or aerospace, doctrine. Space power received resources under nuclear deterrence strategy and its inherent position within airpower (or aerospace) doctrine and, therefore, did not need to pursue independent theory and doctrine to justify and validate its existence, or contribution, until now. The final focus of this study looks at the institutional commitment of resources, for both early airpower and space power, to determine whether or not Air Force advocacy for the continued development of space power is as strong as Army Air Corps advocacy was during the dawn of airpower. There is no financial data available to show a direct percentile correlation between overall U.S. Army budgets and that piece associated with the Army Air Corps. Instead, this study will examine Army Air Corps budgets from 1920-1934 and compare that to Air Force space budgets in the post Cold War timeframe to determine the level of resource commitment on the part of the institution.

Interestingly, many of today's military leaders and experts argue that space power is not receiving its just due following the Gulf War.[1] However, when compared to airpower's early struggles, space power is not as neglected as some would like to believe. Early airpower advocates used their perceived lack of institutional support as a catalyst to develop theory and doctrinal concepts, in hopes of demonstrating airpower's importance

and swaying increased institutional support in its favor. Meanwhile, space power has received institutional support in the form of consistent, if not increasing funding and senior-level commitment in spite of having no theoretical or doctrinal foundation. This study will examine the role of theory, doctrine, and resource allocation, in development of both early airpower and space power, to determine if the Air Force is poised to meet the challenging demands of furthering the continued growth of space power.

Notes

[1] John A. Tirpak, "The Rise of Space," *Air Force Magazine*, August 1997, 53. General Estes, Commander of U.S. Space Command stated, "Within the USAF you find those that think all this talk about space is interesting but a little bit irrelevant because they're dealing with real systems and problems today";

General Howell M. Estes, III, "The Air Force at a Crossroad," Address to Air Force Association Symposium on National Security, Los Angeles, CA, 14 November 1997. General Estes stated, "We must devote more Air Force science and technology dollars to key space enabling technologies…devote more Air Force dollars to support new satellite program starts, devote more Air Force dollars to building new communications infrastructures connecting all of our forces via space. But this potential will never be realized unless we begin as an Air Force to change our culture to fully accept the responsibility for the role of space and its importance to the future national security interests of our country. This has been a problem in the past, we have never really embraced space in the Air Force";

James A. Abrahamson, et al., to President, United States of America, Subject: Open Letter to the President (space threats and capabilities), 15 January 1998. In this letter to President Clinton, over forty retired general and flag rank military officers expressed their concern over the administration's lack of support for the advancement of space, especially a robust space control capability, aimed at protecting and defending America's growing military and commercial reliance on space systems;

Carl Builder to Lieutenant Colonel Tom Clark, Air War College, electronic mail, subject: Air Force Advocacy for Space, 24 February 1997. Builder, a noted expert on Air Force policy and issues with RAND stated, "I think the Air Force is mortgaging its own future by the way it approaches space. It is paying the subject a lot of lip service right now…too many folks (like General Moorman and me) have been warning the leadership that they will reap the whirlwind if they don't pay attention to space (and information systems) with the same zeal they now give to airplanes. The deeds, so far, don't reflect a deep commitment, and I don't think that will change easily or soon."

Chapter 1

Introduction

As oil was the fuel of the industrial age, space will be the fuel and engine of the information age.

—General Howell M. Estes, 3rd
Commander, United States Space Command

Military use of space began in earnest in the 1950's under the cloak of the nuclear umbrella for the purpose of strengthening national security. President Dwight D. Eisenhower launched America's space program following the Soviet success of Sputnik I, on October 4, 1957. He stated, "space objectives relating to defense are those to which the highest priority attaches because they bear on our immediate safety."[1]

Space assets, during their formative years, were employed under the auspices of nuclear strategy and airpower doctrine and performed the missions of surveillance, reconnaissance, communications, and early warning of ballistic missile attack. This strategic support role was vital to the safety and security of America's citizens, institutional foundations, and territorial integrity. As the use of space assets became more openly involved in military operations during the Gulf War of 1991, it became readily apparent that the role advanced space systems could play in theater support to the warfighters challenged the overarching stigma that space was a strategic asset only.[2] It was this conversion from a predominantly strategic role to that of theater warfighter support that elevated space capabilities to the forefront of the military leadership's

mindset and provoked the on-going controversy of how to best use space power in future scenarios.

As it did in the Cold War, space power will continue to play a critical role in the future. This is true for two reasons. First, the military reliance on space-based capabilities for strategic and theater-level support makes space power crucial to successful military operations and second, the burgeoning economic investment from both civil and commercial enterprises places inherent responsibility on the military space community to protect and defend these vital national interests.[3] Eisenhower's vision about the role space would play in the defense of the nation proved to be prophetic. The growing economic and military investment in space continues to bear on national security and weighs heavily on the United States' ability to execute its current national security objectives of enhancing security, promoting democracy abroad, and bolstering America's economic prosperity.[4] How to protect America's economic growth in space and the military advantage it provides over any potential adversary is the key dilemma facing leadership today. Is a theoretical and doctrinal roadmap being developed, and are enough resources being committed, to ensure a credible capability within the Air Force to continue pursuing the development and advancement of space power, aimed at defending and protecting America's ever-growing reliance and dependency on space systems, both military and commercial?

This study examines the differences between Army Air Corps development of early airpower and Air Force development of space power by reviewing the four key areas of military applications, theoretical assertions, doctrinal concepts, and resources committed for each technology. This entails a review of basic applications of early air and current

space technologies, depicting their role(s) in support of military operations. This encompasses reviewing airpower as it was used during World War I. The paper briefly examines space capabilities during the Cold War. However, the predominant focus is on how the Air Force has embraced the operational advantages of space since the Gulf War, as it seeks to evolve from an Air Force, to an Air and Space Force, and finally to a Space and Air Force.[5] The study will then look at theoretical dissertations on the relevance of airpower and how it was envisioned as a military mechanism during and following the First World War, and contrast that to the current lack of accepted, and functional, space power theory. This is followed by a synopsis of how doctrine evolved in support of airpower, providing the justification and validity needed to pursue a technology not yet developed, lead-turning the future via doctrine. Conversely, space power has largely operated without an independent doctrine, using the Cold War as its catalyst and foundation. Space power received resources under the nuclear deterrence strategy and did not need to pursue independent theory and doctrine to justify and validate its existence, or contribution, until now. The final test to determine if the Air Force is positioned to continue fostering development and advancement of space power is found in the commitment of resources. There is no financial data available to show a direct percentile correlation between overall U.S. Army budgets and that piece associated with just the Army Air Corps. Instead, this study will examine historical Army Air Corps budgets (1920-1934), retrieved from the Air Force Historical Research Agency. These figures are compared to Air Force space budgets, from the Reagan Administration defense buildup through projections for the year 2003, to determine the level of resource commitment on the part of the institution.

Notes

[1] United States Space Command, 1997, n.p.;on-line, Internet, 9 November 1997, available from http://www.spacecom.af.mil/usspace/history.html.

[2] Ibid.

[3] "Milspace Maturing Into Warfighter Roles," *Aviation Week and Space Technology*, 1 September 1997, 47. General Estes, CINC USSPACECOM stated, "there is such an economic investment in space that it will soon be a vital national interest, and certainly an economic center of gravity, for the U.S.";

"The Rise of Space," *Air Force Magazine*, August 1997, 53. Here General Estes stated, "A tremendous amount of our economic strength is migrating to space. Within a decade, government agencies and private concerns are going to put 1800 satellites into orbit, valued at a trillion dollars or more. Dependence on these satellites will be akin to US dependence on foreign oil and will represent a target too tempting to an enemy. We as a nation are going to protect the investment. One of the main reasons for having a military is to make…sure that economic investment survives."

[4] President, "National Security Strategy", 1996, i.

[5] Department of the Air Force, "Global Engagement: A Vision for the 21st Century Air Force," 1996, 7.

Chapter 2

Applications

> *Just as armies were developed to protect landlines of communication, navies to protect sea lines, and air forces to protect air routes, the same thing is going to happen in space. There are going to be threats to our national security as we put things in space…and we may find the only way to protect ourselves…the best way to protect ourselves…is to go to space to do it.*
>
> —General Howell M. Estes, III

To determine if the Air Force is as prepared to foster the evolution and growth of space power, as the Army Air Corps was to the advancement and development of early airpower, this paper first examines similarities in the way each technology was applied in support of military operations.

The Advent of Airpower

The airplane's military history began over the battlefields of Europe during World War I. This was the first real test, on a grand scale, of the airplane in support of military operations. B. H. Liddell Hart, in his book titled *The Real War, 1914-1918*, stated that aircraft "formed a thread running through and vitally influencing the whole course of operations, rather than a separate strategic feature."[1] He further surmises that appreciation of military applications of airpower was a slow process and early airpower advocates had an uphill struggle for recognition. Liddell Hart refers to the preponderance

of military thought regarding the airplane when he quotes General Foch prior to the war, who said, "…for the army the aeroplane is worthless."[2] In the early stages of the war, airplanes were relegated to the mission of visual reconnaissance but no provision for air combat or bombardment was made. Allied aircraft proved invaluable on several occasions at rendering German maneuvers futile.[3] Slowly the role of airpower grew to include observation of artillery targets, communications via colored lights and wireless telegraphy, and aerial photography. Airplanes were also used for battlefield situational awareness, whereby commanders were informed of the situation of their own infantry during the course of battle, and of threatened counter-attacks by the enemy. This is the first instance of aerial assets being used in rudimentary semblance of command and control functions.

The Rise of Space Power

Similar to early airpower, spacecraft performed the same mission from orbital platforms.[4] Space was first used for observation during the Cold War to gain intelligence on Soviet ballistic missile capabilities. These missions were expanded and improved during the space race of the 1960-1980's, providing support to military operations in the form of intelligence, communications, navigation, ballistic missile early warning, and weather.

Just as airpower's vast potential was not immediately recognized, neither was that of early space power. Liddell Hart's assessment of airpower intertwining itself throughout all facets of military operations during World War I is in step with the application of space power during the Gulf War, which found space technologies and capabilities intrinsically and synergistically applied across all coalition operations. The Gulf War,

writes Colonel Alan Campen, former director of Command and Control Policy at the Pentagon, "is the first instance where combat forces largely were deployed, sustained, commanded, and controlled through satellite communications."[5] This strong theater support role served as the catalyst that brought space out from under the nuclear strategy umbrella and into the forefront of military designs regarding the battlefield of the future.

The Difference

Although strikingly similar in the way each technology was used during military operations, there is one key difference. Airpower was relegated to the supporting roles of observation and signal only until those missions became so valuable as to convince the military leadership of the need to provide aerial combat support. The defining moment for the future role of airpower came when, in an attempt to thwart each other's aerial support capabilities, each side began resorting to air fighting, first with pistols and rifles, and later with mounted machine guns. The fight for air supremacy had begun. Decades later, airpower advocates still pursue the ultimate airplane, capable of achieving and maintaining air supremacy through technological advancements aimed at flying higher, faster, farther, and with more kill capability than any potential adversary can muster in exchange.

Critical to understanding the underlying difference between airpower and space power is the fact that the airplane began as a combat support mechanism and, due to the necessity of the information it provided to battlefield awareness, evolved to a combatant platform itself. For the same reason that the airplane, and the information it could provide, required self-defending armaments, some of today's leaders argue that space must be given the same considerations.[6] The rush to protect America's space assets and

capabilities, across military, civil and commercial systems, has become a topic of senior-level discussion since the Gulf War.

The ability to defend America's space interests is termed space control, which means protecting one's own satellites and ensuring access to space while denying a potential adversary the same capability. This mission should not be taken lightly. Eliot A. Cohen writes "in the Gulf War we faced no attempts to blind or disable our satellites. It is now…clear that in the future the first thing any regional power involved in conflict with the United States will do is try to scratch out its eyes in the sky. Ironically, because the United States is the most dependent on its space-based assets…it is also the most vulnerable to any adversary who can successfully disable or sabotage them."[7] This is precisely why, in April 1993, USAF Chief of Staff General McPeak, during testimony before Congress, declared "we simply must find a way to get on with the construction of capabilities aimed at ensuring that no nation can deny us …our hard-won space superiority." He argued that we would need a "toolbox" of capabilities, to include anti-satellite technologies.[8] Numerous retired senior military leaders, in an impassioned plea to the President, agree with the need to enhance America's space control capability.[9]

The approach the Air Force has chosen, while emphasizing the need for space control, has not directly challenged any of the administration's overall desires against the weaponization of space. Instead, it suggests accomplishing space control via a posture of space defense or space protection, by negating and destroying an adversary's terrestrial targets rather than challenging them directly in, from, or through the space medium.

Early U.S. Army Air Corps advocates encapsulated their combative notions of airpower through the theories of Giulio Douhet, Hugh Trenchard, and Billy Mitchell, by

struggling through development of their own comprehensive theory at the Air Corps Tactical School. Research indicates that without an increased commitment of resources, the theoretical assertion regarding the potential of airpower was the only way to keep their vision alive. Similarly, today's Air Force leadership has struggled with developing, testing, proving, and accepting a theory with respect to space power. However, whereas airpower advocates used theory to fill the void of limited resources, space power has received a steady allocation of resources while void of space power theory. Are resources alone enough to ensure success in defending America's military and economic interests in space? Without a comprehensive space power theory, the roadmap for the continued growth of space power, and the manner in which it will be employed in defense and protection of America's growing space interests, remains uncertain.

Notes

[1] Captain B. H. Liddell Hart, *The Real War* (Boston, MA.: Little, Brown and Company), 1964: 314.

[2] Ibid.

[3] Ibid, 313-319.

[4] General Howell M. Estes III, "Space: Fourth Medium of Military Operations," *Defense Issues* 11, no. 98 (1996): 1-3. According to General Estes, "if we examine the evolutionary development of the aircraft, we see uncanny parallels to the current evolution of spacecraft."

[5] Alvin and Heidi Toffler, *War and Anti-War* (Boston, MA: Little, Brown and Company, 1993), 98. Sir Peter Anson and Dennis Cummings of Matra Marconi Space UK Ltd., in Britain, also state, "Space added a fourth dimension to the war. It influenced the general direction of the conflict and saved lives. Space…provided detailed images of Iraqi forces and the damage inflicted by allied air attacks. It gave early warning of Scud missile launches. Space provided a navigation system of stunning accuracy that touched upon the performance of every combat soldier, and on missiles, tanks, aircraft, and ships. Satellites identified targets, helped ground troops avoid sandstorms, and measured soil moisture, telling Schwarzkopf, the allied commander, precisely what parts of the desert could support tank movements."

[6] General Howell M. Estes III, "Space: Fourth Medium of Military Operations," *Defense Issues* 11, no. 98 (1996): 1-3. General Estes stated, "What began as a means of supporting military operations from orbital platforms has now taken on such…importance to national security that full protection capability of our space assets is

beginning to take shape, for military information and battlespace dominance, as well as for protection of national economic interests in space."

[7] Toffler, 103.

[8] Ibid.

[9] James A. Abrahamson, et al., to President, United States of America, subject: Open Letter to the President (space threats and capabilities), 15 January 1998. "This blue ribbon commission sought to address what it considered to be the greatest danger: an unwillingness or an inability to change our security posture in time to meet the challenges of the next century. …We are deeply concerned about your recent line-item veto of three technology development programs that will bear directly upon our military's future ability to exercise control of space in wartime. The Clementine II, Kinetic-Kill Anti-Satellite and Military Spaceplane programs are the technological seed corn for such crucial capabilities as space-based missile defense, neutralizing enemy satellites, and having prompt, reliable, and inexpensive access to and use of space. In our judgement, these are missions the United States military must be prepared to perform."

Chapter 3

Theory

> *Unrestricted use of space has become a major strategic interest of the United States. The next twenty years will see a dramatic expansion of space operations for a variety of purposes. We are in an era similar to the early development of aviation, in that breathtaking opportunities are there for those who can envision the possibilities and who possess the skills and determination to act upon them.*
>
> —National Defense Panel, December 1997

The dawn of airpower launched theories on existing and future applications of airpower and took visionary leaps forward in discussing technologies and capabilities that would be needed in support of the aviation mechanism of warfare. While early airpower and space power display remarkable similarities when comparing their integration to military operations, there continues to be no relative, widely accepted theory for space power. Space power has operated devoid of theory for nearly forty years, reaching its current operational capability under the nuclear deterrence strategy. Now, as the Air Force strives to incorporate space power more fully across military operations in the next century, development of a space power theory has become increasingly important. This chapter will examine the importance of theory in the evolution of airpower and review the implications that a lack of comprehensive theory has on the development and advancement of space power.

The Potential of Airpower

During World War I there was little thought given to the development of airpower theory or doctrine, since the primary role of the aircraft was in observation and signal, and eventually as an extension of the land-based artillery arm.[1] After the war, Italian General Giulio Douhet was the first to establish a premise for the potential employment of airpower. He suggested it could be used in a manner that would overwhelm an enemy by striking at key industries and population centers (via the "battleplane") as a means of removing the enemy's civilian support and will to fight.[2] His theory became the foundation upon which early American airpower developed.

American General William "Billy" Mitchell took Douhet's idea a step further. He developed a concept of pursuit and attack aircraft, used in concert with bombardment aircraft, for the purpose of attacking an enemy's vital centers for sustaining military operations. Pursuit aircraft would be used for bomber fleet defense and for negating enemy aircraft as they prepared to attack. Attack planes would be used to disperse and destroy enemy troop concentrations on the ground. Bomber aircraft would attack the vital military production and sustainment centers with the intent of destroying the enemy's ability to fight.[3] The Army Air Corps incorporated Mitchell's theory in World War II to successfully defeat the German Luftwaffe.

These theories were taken by faculty and students at the Air Corps Tactical School (ACTS) and expanded upon to create the "industrial web" theory. This theory aimed at attacking an enemy's key industrial centers to eliminate their ability to support continued military operations and to remove the ability to manufacture and develop products and provisions needed to sustain the lives of citizens in a highly industrialized society.[4]

Douhet said, "victory smiles upon those who anticipate the changes in the character of war, not upon those who wait to adapt themselves after the changes occur."[5] The ACTS enthusiasts readily adopted his concepts, due in large part to the fact that his theory was the only carefully integrated concept, including all constituent elements.[6] Similar to the beliefs of space power enthusiasts today, the ACTS community strongly believed that airpower, "with its own technology, its own doctrine, and operating in its own medium…could bring to warfare an awesome and perhaps decisive application of military might."[7] In the absence of resources (personnel and planes), the development of theory in support of early airpower was crucial to retaining institutional interest in the potential that airpower offered.

The Beginnings of Space Power Theory

Some would argue that space power has not suffered from the lack of a theoretical foundation. Space capabilities supported the strategic defense of our nation during the Cold War and were captured and institutionalized under the instruments of nuclear strategy and Cold War airpower theory. Space assets received a small percentage of the overall Department of Defense budget, but did so in the absence of space power theory. Given the context of the Cold War and the pace of technological change during that era, it is arguable whether or not space capabilities would have received stronger resource commitments had a separate space power theory been developed.[8] The bottom line is space assets received resource and technological commitment in the absence of a theory outlining the use of space for military operations. As space power advocates within U.S. Space Command and Air Force Space Command look to foster the continued growth of space power, the desire for a comprehensive space power theory has become paramount.

A theory for space power would contribute significantly to the development and expanded role envisioned for space power assets in future conflict, and to the interests of national security. The argument now centers on the content of space power theory.

The Gulf War put space assets on display for the whole world to see, rather than concealing them under the cloak and dagger secrecy of the Cold War. Operating in a theater support role, rather than a purely strategic one, the space community provided evidence that space was an added dimension to warfare and worthy of consideration in terms of the newly recognized "space power" it rendered. Cold War space capabilities were certainly vital to America and her allies under the strategic nuclear mission, but the Gulf War demonstrated how reliant America had become on space power, and added emphasis to the need for continued development of space assets and capabilities. The type of theory that develops concerning space power, especially space control, will be a key factor in determining Air Force institutional commitment to the development and advancement of space power, and must be crafted carefully. Various visionaries have made attempts to quantify such a theory.[9]

The underlying current driving any development of space power theory is the present interpretation of international space treaty implications against weaponizing space, and the current administration's policy against employing space for any other than peaceful means.[10] However, recent documented references to America's growing reliance on space, and its emergence as an economic center of gravity, by senior government and military officials, makes clear the underlying desire to employ space as a combatant arm. As Colonel Simon P. "Pete" Worden (USAF), Deputy Director for Battlespace Dominance (HQ AF/XORB), said, "you can't perform space control from the ground."[11]

He implies the day is rapidly approaching when American space power will need to engage an enemy in, from, and through the space medium. The *New World Vista's* study confirms Colonel Worden's perspective.[12]

America's reliance on space for military and economic advantage has left the door open for the eventual transition to a space combat mission as a means of ensuring space control. The National Defense Panel states, "as the flag follows trade (space), our military will be expected to protect U.S. commercial interests," and, "the U.S. cannot afford to lose the edge it now holds in military-related space operations."[13] While there is no accepted space power theory today after nearly forty years of using space in military operations, the United States Space Command has commissioned the development of a comprehensive space power theory to provide the theoretical foundation for the development of space policy and doctrine.[14] This document is to be completed by the end of 1998. The necessity for theory underpins all efforts at properly assimilating future applications of space power. As Major General (USAF, Ret.) William Jones, former Fourteenth Air Force Commander, states, "the necessity for theory can not be overstated. All else will follow…including doctrine."[15]

The Difference

During a period of decline in the military as an institution following World War I, early airpower advocates successfully developed a comprehensive airpower theory. This theory kept their vision for the potential of airpower alive and ultimately led to the development of airpower doctrine which, in turn, influenced training, organization and, once a viable threat to national security emerged, the commitment of resources.

Space power evolved under the nuclear deterrence strategy and Cold War airpower theory, receiving resource commitment commensurate with the level of importance relegated to space capabilities in meeting the Cold War threat. Following the Gulf War, in which space power became a catalyst across all military spectrums, the concept of developing a separate space power theory arose as a means of validating the need for an increased commitment in resources and support for the growing space power armada. Airpower theory drove increasing leadership support for the advancement of airpower while, conversely, leadership's support of space power appears to be driving the development for an acceptable space power theory. The lack of an agreed upon space power theory could undermine the Air Force's ability to develop the "roadmap" outlining how it intends to foster continued development of space power, to protect America's growing reliance and dependency on space power assets and capabilities.

Notes

[1] Major Dwight H. Griffin et al., *"Air Corps Tactical School: The Untold Story,"* Maxwell Air Force Base, AL: Air Command and Staff College, May 1995, 9.

[2] Giulio Douhet, *The Command of the Air* (Coward-McCann, Inc, New York: 1942), 49-61.

[3] General William Mitchell, *Winged Defense* (Dover Publications, Inc., New York: 1925), 181-198.

[4] Griffin, 17.

[5] Douhet, 30.

[6] Griffin, 12.

[7] Ibid, 17.

[8] Carl Builder, *Icarus Syndrome* (Transaction Publishers, New Brunswick, Conn., 1996), 32-37. Builder, a distinguished RAND airpower expert, alludes to those same conclusions. He implies that early Air Force leaders neglected the independent roles that long-range missiles and space-based assets provided to the concept of "airpower," the Air Force's sole reason for existence. Due to leadership's desire to push the advance of the airplane, the only proven form of airpower and the basis for existing theory and doctrine, the capabilities that space could offer to the advancement of airpower were sequestered under the supporting arm of nuclear strategy and policy.

[9] Major Earl D. Matthews, *U.S. Space Systems: A Critical Strength and Vulnerability,* Naval War College, Newport, RI, 12 Feb 1996, 1. Matthews asserts that

dependence on space systems is both a critical strength and vulnerability. During the Gulf War, space systems support provided the operational commander with two crucial ingredients to success that the enemy did not have; information and control. While space assets aided immeasurably to U.S. and coalition success via the information medium, it also acted as the key enabler for terrestrial munitions that relied on global positioning system navigational vectoring to strike their targets. Matthews suggests that just as we strike at the enemy's centers of gravity to maximize effect and gain advantage, it is undoubtedly certain that our next major conflict will find our space systems and capabilities the target of attack;

Lieutenant Colonel Michael R. Mantz, *The New Sword: A Theory of Space Combat Power*, Maxwell Air Force Base, AL*:* Air University Press, May 1995, 2. Mantz examines the mission of space combat in lieu of the current operational space missions of space control and force application. He defines space combat as "the hostile application of destructive or disruptive force into, through, within, or from space. This includes actions taken against space systems not in space. He incorporates three subordinate missions under the auspice of space combat, namely space denial, space strike, and space protection. Space denial is defined as "the hostile application or destructive or disruptive force against enemy space systems to deny the enemy's use of the space medium." Space strike is "the hostile application of destructive or disruptive force from space against natural-body-based (earth, moon, and asteroid) targets." Space protection is "the active defensive application of destructive or disruptive force to defend friendly space systems." When examining Mantz's concepts for space combat, there is a clear relationship to the airpower theory developed by Mitchell. Space protection, the defense of friendly space systems, mirrors Mitchell's concept behind pursuit aircraft aimed at defending the bomber formations that constituted the backbone of the Army Air Corps. Space denial, or negating the enemy's use of the space medium, relates favorably to Mitchell's idea of attack aircraft which aimed at dispersion and destruction of the enemy's massed land armadas, denying them the opportunity to gain superiority of the land medium. Finally Mantz's space strike mission joins up well with Mitchell's bombardment concepts, especially if used as a means to project power against terrestrial-based targets as Arnold first envisioned;

William B. Scott, "Space Control Shifting to Space Superiority," *Aviation Week and Space Technology* 146, no. 10 (10 March 1997): 57-58. Major McKinley, from Air Force Space Command's Long-Range Planning Division, supports this position stating, "we need to think beyond spacecraft destruction." She proposes a "campaign" approach aimed at influencing, deterring, compelling and defeating an adversary's space capabilities and desires, through terrestrial means. McKinley feels that this approach correlates well with the number of satellites being used not by a single nation, but by a consortium of nations and international agencies. This makes it difficult, at best, to ascertain which satellite, owned by whom, is being used for hostile purposes, and what international implications await the U.S. should it choose to destroy the satellite. The military's responsibility to control space is not to control the medium, but rather to control the adversary's ability to exploit and derive benefit from the medium;

Notes

Lieutenant Commander Thomas E. Nocenzo, *You Can't Spell Space Control "ASAT" Anymore,* Naval War College, Newport, RI, 6 March 1996, 11-12. Nocenzo asserts there may be other means of negating an adversary's use of commercial or consortium-based surveillance and imagery satellites in future conflicts, especially for commanders of ground troops, dependent on maneuver warfare as a means to gain strategic and operational advantage. He sees commanders protecting their forces by "capitalizing on gaps in satellite coverage, by relying on light, highly mobile forces to seize the initiative and create an operational tempo so fast that it negates the value of surveillance."

[10] AU-18. *Space Handbook: A Warfighter's Guide to Space,* Maxwell Air Force Base, AL, vol. I, December 1993, 55.

[11] Colonel "Pete" Worden, HQ USAF/XORB, to author, Air Command and Staff College, electronic mail, subject: How Leadership has Affected Space Technology, 2 December 1997.

[12] USAF Scientific Advisory Board, *New World Vistas: Air and Space Power for the 21st Century*, [Attack volume]: 8. The Scientific Advisory Board discusses space operations of the new millenium in offensive, combatant terms. This includes refinement of the space control mission in which they envision satellites being used to "inspect and/or neutralize enemy satellites at close range." They also present rationale aimed at circumventing existing treaty implications when they suggest, "neutralization of enemy satellites would occur after a declaration of hostilities, with the result that certain spacecraft would be designated "enemy," as opposed to "friendly" or "commercial." The term "enemy" eases the problem in that response to actions considered hostile, are not constrained by treaty implications. This alleviates, in part, the barriers McKinley suggests regarding development of a combatant means of space control.

[13] National Defense Panel Report, 38.

[14] United States Space Command, *All You Ever Wanted to Know About Theory Development,* "Flash," vol. 1, no. 4, July 1997.

[15] Major General William E. Jones (USAF Ret.). *White Paper: Space in the USAF*. Prepared for HQ USAF/XPX, 22 December 1997: 8.

Chapter 4

Doctrine

If you do not know where you are going, every road will get you nowhere.

—Henry Kissinger

Any Air Force that does not keep its doctrines ahead of its equipment, and its vision far into the future, can only delude the nation into a false sense of security.

—General Henry H. "Hap" Arnold, 1945

Sun Tzu, the noted classical military strategist, said, "it is a doctrine of war not to assume the enemy will not come, but rather to rely on one's readiness to meet him; not to presume that he will not attack, but rather to make one's own self invincible."[1] How the Air Force chooses to assimilate space power into comprehensive and meaningful doctrine will determine its effectiveness at meeting future threats aimed at America's space dominance. Doctrine, based on theory, is the underlying linchpin that molds the military services into the roles they are chartered to perform. Joint Publication 1 defines military doctrine as a base of collective experiences that instill insight and wisdom for applying military technologies and capabilities as an instrument of national power.[2]

The means to achieving political (strategic) ends has always underpinned military doctrine. But have military leaders lost the ability to think in strategic terms regarding the proper employment of military assets to ensure national security objectives are met? Carl Builder, a highly regarded member of RAND, makes a convincing argument that

strategic thinking has vanished in the military. He suggests the military discusses the art of strategic conceptualization only in historic terms and has lost the art to look beyond the operational and tactical applications of warfare.[3] The history of warfare, until recently, has been largely based on massed land armadas determined to secure a strategic choke point, or stronghold, as a means to achieving victory. With the advent of airpower, and now space power, the dogma associated with protracted assault-type warfare has been admonished, largely because of the speed and flexibility that air and space forces bring to the fight. Builder suggests the first step in developing doctrine is in strategic thinking, and that doctrine drives the acquisition and resource process aimed at fostering the initial concepts developed through the strategic thinking process.[4]

In Pursuit of Airpower Doctrine

General Billy Mitchell felt similarly frustrated by the War Department's ineffective approach to developing airpower doctrine following World War I. He wrote, "Each year the leading countries of the world are recognizing the value of air power more and more. All of the great nations, except the United States, have adopted a definite air doctrine as distinguished from their sea doctrine and their land doctrine."[5] On January 26, 1926, the War Department published Training Regulation No. 440-15, Fundamental Principles for the Employment of the Air Service. This initial attempt at quantifying airpower doctrine could have severely limited the potential of airpower by stating, "the organization and training of all air units is based on the fundamental doctrine that their mission is to aid the ground forces to gain decisive success."[6] But airpower advocates continued to push the envelope past conventional wisdom of their day in order to fulfill the destiny envisioned for airpower. In the absence of resources, early airpower advocates had no choice but to

continue promoting the potential for airpower, through testing newly developed theories and doctrinal concepts with old airframes, until technology and funding became available to turn vision into reality.

How to Develop Doctrine

Before determining whether or not current leadership is willing to push the envelope for advancement and indoctrination of space power into a cohesive doctrinal application, this study will examine one expert's opinion on how to institutionalize change and effect the development of new doctrine.

General Donn Starry, former commander of the Army's Training and Doctrine Command (TRADOC), presents several factors he feels are needed before new doctrinal concepts can be incorporated into the military mindset and mainstream of operations.[7]

- There must be an institution or mechanism to identify the need for change
- The educational background of the staff…must be…rigorous…and relevant
- There must be a spokesman for change
- The spokesman must build a consensus
- There must be continuity among the architects of change so that consistency of effort is brought to bear on the process
- Someone at or near the top…must be willing to hear…arguments for change, agree to the need, embrace the new concepts and become at least a supporter, if not a champion, of the cause for change
- Changes proposed must be subjected to trials

Has the Air Force met the intent of General Starry's outline in reference to the development of space power doctrine? First, top-level documents such as the "National Security Strategy," "National Military Strategy," "Joint Vision 2010," "Global Engagement," "Quadrennial Defense Review," and the "National Defense Panel Review" have all identified the need to strengthen America's ability to control the space medium. Second, one must assume that as America moves to strengthen national resolve in

developing a meaningful space policy and doctrine, that the Air Force is equally committed to putting the most capable officers and enlisted personnel available to the task. Third, just as General Mitchell strongly advocated the need for change in adaptation of the capabilities and promise of airpower, so too must America have a visionary mentor of what space can bring to the military. USCINCSPACE is in the best position to serve as the catalyst for space advancement. However, it is unlikely that he would be willing to risk his career in pursuit of space power, as did General Mitchell in pursuit of airpower. Fourth, the immense amount of documented senior-level support for pursuing the development of more capable means of space control implies a strong consensus exists within the military establishment regarding the institutionalizing of space. Fifth, recent attempts have been made to begin "growing future space leaders." Distributing space-minded personnel throughout the Air Staff, and within other combatant organizations, contributes to this philosophy. This will provide assimilation between air and space power, and will significantly contribute to the desired continuity General Starry is referring to. Sixth, there are numerous examples of senior leadership, not only within Air Force Space Command, but throughout the Air Force and Department of Defense, embracing the need to institutionalize this change based on our growing military and economic dependence on space-based assets and capabilities. Finally, the military space community has made recent attempts to realign research and development efforts to pursue envisioned systems and future capabilities, like Clementine and the kinetic energy anti-satellite (KE-ASAT) system, needed to project a robust space control capability in the future. The administration, however, based on its policy regarding the use of space for peaceful pursuits only, fails to support these key enabling technologies.

The Need for Space Power Doctrine

On the surface, it appears the Air Force is meeting most of General Starry's assumptions regarding the ability and desire to institutionalize space power and foster its continued development. However, it still does not have the comprehensive space power doctrine needed to drive the acquisition, resource allocation, and training processes needed for space power to become fully integrated and institutionalized within the military establishment. Has the lack of space power doctrine affected the military's ability to procure and use space assets? The answer is no. But in an era of declining defense dollars and a growing dependence on space capabilities, doctrinal development could serve to solidify and validate the need for increased resource commitments and technology development.

Past and present Air Force doctrine assimilated space capabilities under the auspice of airpower, or aerospace power.[8] Given the way space assets were used during the Cold War, it was correct to include them within existent Air Force doctrine. Without separate space power theory, however, the argument for separate space power doctrine becomes a moot point. As theoretical foundations and doctrinal concepts develop regarding the advancement and application of space power as a separate and integrated instrument of national power, space advocates will be able to argue their case more ably for increased resource commitments and the continued development of space power. Theory and doctrinal development are the foundation needed to develop a space power roadmap, detailing the best avenue for ensuring a robust capability aimed at defending and protecting America's growing reliance and dependency on space assets and capabilities.

Notes

[1] Sun Tzu, *The Art of War,* (Oxford University Press, Oxford, England, 1971), 114.

[2] Department of Defense *Joint Publication 1.0*, 10 January 1995, vi. Military doctrine presents fundamental principles that guide the employment of forces. Doctrine is authoritative. It provides the distilled insights and wisdom gained from our collective experience with warfare. Doctrine facilitates clear thinking and assists a commander in determining the proper course of action under the circumstances prevailing at the time of the decision. Though neither policy nor strategy, joint doctrine deals with the fundamental issue of how best to employ the national military power to achieve strategic ends.

[3] Carl H. Builder, "Keeping the Strategic Flame," *Joint Force Quarterly*, Winter 1996-1997, 76-84.

[4] Ibid.

[5] General William Mitchell, *Winged Defense* (Dover Publications, Inc., New York, NY, 1925): 19.

[6] Major Robert E., Blaschke Jr. "The Historical Approach to Developing Doctrine: Does Our Experience in Space Support Current Doctrine?" Maxwell Air Force Base, AL, Air Command and Staff College, 1982, 1.

[7] Major General I. B. Holley Jr., (USAFR Ret.), "Fifty Questions for Doctrine Writers: Means Are As Important As Ends," *Airpower Journal*, vol. XI, no. 3, Fall 1997, 30-31.

[8] Air Force Manual (AFM) 1-1, *Basic Aerospace Doctrine of the United States Air Force,* vol. I, March 1992, 5. Air Force Manual 1-1 made an overt attempt to assimilate space with air, outside of strategic supporting roles, via use of the term "aerospace" in lieu of traditional airpower. It incorporated space and air operations under the mission areas of aerospace control, force application, force enhancement, and force support. Air Force Space Command still centers space operations within these four mission areas. This doctrine document insinuates an air and space "continuum" stating, "aerospace consists of the entire expanse above the earth's surface. Its lower limit is the earth's surface (land or water), and its upper limit reaches toward infinity."

Air Force Doctrine Document 1, September 1997, 7. Air Force Doctrine Document 1, September 1997, supersedes Air Force Manual 1-1 and clearly delineates the difference between air and space. It associates warfare with being fought via the four mediums of land, sea, air, and space. It alludes to space holding the ultimate high ground and being able to project a permanent presence over any part of the globe. In the future, commanders will need to be conversant on space power to insure the dynamic synergies that space power bears across all military operations is sustained. It also attempts to clarify the concept of space superiority, likening it to the concept of air superiority. Of final note is the fact that it defines the concept of "counterspace" in both offensive and defensive terms, but unlike air superiority, which involves aerial combat operations, combat to, through, and from space is not supported. Once again, only terrestrial-based operations aimed at negating an adversary's space advantage from the ground is earmarked.

Air Force Doctrine Document 2-2, *Space Operations (DRAFT*), February 1997, 6. This document outlines space control in similar fashion to other definitions of space

control referred to in this paper. However, it finally suggests that space control, via offensive counterspace, potentially "could" be carried out by space forces, but more than likely will remain a terrestrial-based function, aimed at air attacks against space system ground nodes or supporting infrastructure. It also suggests that defensive counterspace operations may include the "employment of lethal protection methods." Finally, it defines the concept of "application of force" as follows: "The application of force consists of attacks against terrestrial targets carried out by military weapon systems operating in space. Currently, there are no force application assets operating in space, but technology and national policy could change so that force application…can be performed from platforms operating in space. Such space systems will be used when it is consistent with national policy and the best method to achieve the military objective." While the overall wording within this document suggests the "potential" for space combat operations, it quickly emphasizes the airpower role meant to support the space control mission. Understandably, military leadership cannot exploit military methods outside those directed by the current administration. However, Builder seems supported in his premise that we've lost the ability to conduct "strategic thinking" and have made the conscious decision to hold at status quo, rather than push the envelope toward the future like our early airpower brethren did at the ACTS.

Chapter 5

Resource Allocation

> *I am sure the "fly boys' of old, so instrumental to the development of our Air Force, would support the view that the time for rhetoric has passed and we must replace it with action. We will never become an Air and Space Force if we do not begin to invest greater sums in space. It is not enough to maintain the given, fixed percentage of Air Force Total Obligation Authority for space. Space must expand and become a larger part of the Air Force budget every year.*
>
> —General Howell M. Estes, III

Since 1984, at the zenith of the Reagan defense buildup, the U.S. has undergone tremendous restructuring of its defense establishment in keeping with the sweeping changes occurring around the globe. America has reduced its defense budget by thirty-eight percent, force structure by thirty-three percent and procurement programs by sixty-eight percent. Today's DOD budget is $250 billion, fifteen percent of the national budget, and estimated at roughly three percent of Gross National Product. Today, $44 billion is devoted to acquiring new weapons from a smaller defense industrial base.[1]

This period of decline is remarkably similar to the post-World War I timeframe and the development of the Army Air Corps. Giulio Douhet captured the essence of the art of resource allocation when he said, "the state must make such disposition of its defenses as will put it in the best possible condition to sustain any future war. But in order to be effective, these dispositions for defense must provide means of warfare suited to the character and form future wars may assume. In other words, the character and form

assumed by the war of the future is the fundamental basis upon which depends what dispositions of the means of war will provide a really effective defense of the state."[2]

The early airpower advocates and current space power advocates share a common sense of frustration in a post-war era. Both met with declining defense establishments and limited resources for developing new technologies. The difference is that early airpower advocates used theory and doctrine to focus attention on their visions for airpower and to capture increased resources. Meanwhile, space power advocates, absent space power theory and doctrine, still managed to successfully garner levels of funding relative to the supporting role space power played in the nation's defense. Direct resource comparisons of parochial service budgets were not available to support this research. Instead, this analysis uses budgetary data for early airpower and space power to show contrasts between resources committed as a means of determining whether or not the leadership of each era was committed to the advancement of each technology. The manner in which resources were allocated is the critical tool used to assess institutional commitment to the continued growth and development of early airpower within the Army Air Corps, and space power within the Air Force.

Airpower Funding

Following World War I, the American defense establishment entered a period of declining budgets, with extensive personnel losses, and a limited amount of funds available for modernization efforts. Contributing to this military downsizing was the lack of a compelling threat capable of negating, or reducing, the effectiveness and influence the American military gained during the war. Also, Congress was unwilling to invest limited defense dollars toward emerging aircraft technology that was rapidly growing and

changing in the commercial sector, similar to the way space technology is evolving commercially in today's environment. This, however, did not extinguish the flame burning in the hearts of the early airpower advocates. Until new aircraft could be procured, the Air Corps honed their operational skills and practiced new theories and doctrinal concepts by using leftover vintage aircraft from World War I.

Although Congress passed a five year Air Corps improvement plan in 1926, titled the "Air Corps Act," by 1934 only 1,500 out of a promised 1,800 aircraft had been delivered. Of those aircraft now in the Air Corps, many were antiquated, inefficient, and of the wrong variant to be useful for desired Air Corps operations. Even so, the Final Report of the War Department's Special Committee on the Army Air Corps (The Baker Report, 1934) found that since the beginning of the Air Corps Act in 1926, roughly 18.6 percent of all defense spending was devoted to improving the Air Corps.[3]

Table 1. U.S. Army Air Corps Funding

Year	Funding ($M)
1920	60.34
1921	62.10
1922	47.55
1923	36.34
1924	40.67
1925	40.10
1926	45.96
1927	45.23
1928	53.87
1929	59.28
1930	70.67
1931	78.51
1932	76.81
1933	59.14
1934	52.22

Source: Final Report of War Department Special Committee on Army Air Corps. July 18, 1934, p. 81-83, 145.93-93A, in USAF Collection, AFHRA

Table 1 reflects the funding made available to the Army Air Corps, showing the relative decline in funding during the first several years following the close of World War I (1920-1925) and increases at the beginning of the Air Corps Act in 1926. The Baker Report states that the Air Corps Act failed to meet its obligations regarding delivery of the total number of aircraft requested (1,800) by the end of the five years. This stretched procurement an additional couple of years beyond initial projections. Interestingly, following the end of the Air Corps Act in 1932, the Air Corps suffered a dramatic decrease in funding, dropping over twenty percent from the previous year.[4]

Another tool for determining resource commitment is to review funding apportioned to research and experimental pursuits.

Table 2. U.S. Army Air Corps Research and Experimental Funding

Year	Funding ($M)	R&E Funding ($M)	R&E % of Total
1920	60.34	4.52	7.49
1921	62.10	5.93	9.55
1922	47.55	4.18	8.79
1923	36.34	3.15	8.67
1924	40.67	3.20	7.87
1925	40.10	3.00	7.48
1926	45.96	2.65	5.77
1927	45.23	2.18	4.82
1928	53.87	2.20	4.08
1929	59.28	2.26	3.81
1930	70.67	2.25	3.18
1931	78.51	2.29	2.92
1932	76.81	2.29	2.98
1933	59.14	3.00	5.07
1934	52.22	2.98	5.71

Source: Final Report of War Department Special Committee on Army Air Corps. July 18, 1934, p. 81-83, 145.93-93A, in USAF Collection, AFHRA

A closer look at research and experimental funding shows that funding was greatest in the years preceding the Air Corps Act of 1926. Funding trailed substantially during

the tenure of the Air Corps Act (1926-1932) and then increased slightly when procurement and personnel increases associated with the improvement plan were complete. Without all the necessary funding or the strong research base needed to develop their technological promise, early airpower advocates still envisioned, theorized, and practiced revolutionary new concepts involving combat aircraft and the ideas encompassing the potential of airpower. The ACTS students and faculty developed the Industrial Web Theory, based on Douhet's strategic bombardment concepts, in the years following the war. However, this new method of using airpower, untested in war, met resistance from traditional, conservative leaders of the Army Air Corps.

The basic problem concerning the testing and development of this new theory was that no aircraft existed to prove it could work. Even so, the school developed the theory and doctrinal concepts needed to support their ideas and even documented the technological capabilities that an aircraft needed to insure bombardment mission success.[5] The Air Corps, while continuing to develop its theory and doctrine in support of strategic bombardment, kept a watchful eye on commercial air developments and prepared a strategy to incorporate the latest technology when funding became available. While receiving funding commensurate with airpower's existing capabilities and the doctrine governing its use (support of ground troops), the ACTS never stopped theorizing and testing new concepts. This kept airpower potential poised to strike when technology, resources, and a threat finally emerged. It wasn't until the late 1930's, almost twenty years after World War I, that President Roosevelt, fearing emerging threats in Europe and in the Pacific, drove Congress to accommodate development of the B-17 long-range

bomber. Bombardment technology and funding had finally caught up to the theoretical and doctrinal developments of the ACTS.[6]

Space Power Funding

Just as World War I was the catapult that fired airpower to a position of support across a wide range of military operations, the Gulf War demonstrated how space power has become inextricably linked and vital to a preponderance of today's military missions and capabilities. The plight of the Army Air Corps in the decades following the introduction of airpower ties in closely with today's military space community, who are faced with the same obstacles in developing and advancing space capabilities. Similar to the post World War I timeframe, the aftermath of the Gulf War found America entrenched once more in a period of steep downsizing in the military establishment. Once more, this was based on the lack of a compelling threat capable of negating, or reducing, our military effectiveness and influence, especially in light of the end of the Cold War and our performance in the Gulf War.

A closer review of Air Force space-related spending reflects that space power is hardly the forgotten commodity in today's downward spiral of defense spending. In reviewing historical expenditures on USAF space power applications, the trend for space spending is consistent. Table 3 indicates funding ranges from roughly nine percent to eleven and one half percent, with 1991 serving as the exception. Although detailed explanation for this drop in 1991 was unavailable, it was most likely due to meeting costs associated with operations during the Gulf War (1990-1991). Further examination of space funding reveals that apportionment remained relatively stable, from the zenith of

the Reagan Administration defense buildup (mid 1980's) to today's defense structure, which is thirty three percent less than it was in 1985.[7]

Table 3. USAF Space Funding

Year	USAF Funding ($B)	Space Funding ($B)	Space % (of USAF Total)
1984	85.31	9.97	11.69
1985	96.48	9.13	9.46
1986	93.89	9.27	9.87
1987	93.58	9.67	10.33
1988	89.32	9.04	10.12
1989	93.45	8.37	8.96
1990	92.09	8.05	8.74
1991	91.09	7.16	7.86
1992	82.77	7.79	9.41
1993	79.30	8.35	10.53
1994	74.56	7.67	10.29
1995	73.36	6.78	9.24
1996	73.95	6.54	8.84
1997	72.36	6.68	9.23
1998	74.87	7.15	9.55

Source: USAF Automated Budgeting Interactive Data Environment System (ABIDES). Prior Fiscal Year (FY) Updated Baseline data was used for 1984-1994. FY 1998 President's Budget Updated Baseline data was used for 1995-1998. Data received from HQ AFSPC/XPPP on 11 March 1998.

Table 3 reflects total USAF funding per year in column two.[8] In reality, however, a considerable segment is automatically removed from the annual USAF budget to pay for items such as Special Operations Command activities (SOCOM), the USAF share of the Defense Health Program (DHP), and the National Foreign Intelligence Program (NFIP). If those items were removed from this table, the percentage allotted for space-related activities would increase significantly.

In reviewing historical expenditures on USAF research and development for space power (table 4), as this study did for early airpower (table 2), research reflects space

received proportionately larger amounts for research than was apportioned for airpower research.

Table 4. USAF Space Research and Development Funding

Year	USAF R&D ($B)	Space R&D ($B)	Space % (USAF R&D Total)
1989	14.41	2.44	16.93
1990	13.52	2.33	17.23
1991	11.89	1.28	10.77
1992	13.05	1.77	13.56
1993	12.83	2.21	17.23
1994	12.18	2.18	17.90
1995	11.61	1.82	15.68
1996	12.51	2.03	16.23
1997	14.07	2.22	15.78
1998	14.45	2.26	15.64
1999	13.60	2.47	18.16
2000	12.60	2.32	18.41
2001	12.30	2.17	17.64
2002	12.80	2.37	18.52
2003	13.10	2.53	19.31

Source: USAF Automated Budgeting Interactive Data Environment System (ABIDES). Prior Fiscal Year (FY) Updated Baseline data was used for 1984-1994. FY1998 President's Budget Updated Baseline data was used for 1995-1998. Funding details for 1999-2003 is projections only. Data received from HQ AFSPC/XPPP on 11 March 1998.

This study assumes, once more, that declining funding for research and development during the 1991-1992 timeframe is associated with paying costs accumulated during the Gulf War of 1991. Excluding those two years, the Air Force has funded space power research and development at considerably higher levels (16-19 percent) than what was afforded to space funding overall (9-11.5 percent). In contrast the amount of funding the Army allotted to early airpower research and experimentation was dismal (table 2). Although early airpower, during its five year buildup plan, was apportioned a significant percentage of the overall defense budget (18.6%), it received significantly less funding in

the years prior to, and following, the Air Corps Act of 1926 (1926-1932).[9] Space power, on the other hand, has received relatively stable funding levels, not only in research and development, but overall as well. This occurred during an era of declining defense spending in which all programs were questioned regarding their contribution and validity.

Table 5. USAF Top Twenty Procurement Programs for 1997-2003 ($B)

Program	Aircraft-Related	Space-Related
F-22 Fighter	22.3	
C-17 Transport	21.1	
Space-Based Infrared System		5.4
Joint Strike Fighter	5.3	
E-8 Joint Stars	4.3	
F-15 Fighter	3.6	
Minuteman III ICBM		3.4
Titan Booster		3.3
Milstar Satellite		3.1
F-16 Fighter	2.8	
Evolved Expendable Launch Vehicle		2.6
Global Positioning System		2.4
B-2 Bomber	2.3	
B-1B Bomber	1.8	
E-3 Airborne Warning and Control System	1.7	
Electronic Combat	1.7	
Airborne Laser	1.6	
CV-22 Special Operations Forces Craft	1.5	
C-130 Transport	1.5	
Advanced Military Satellite Communications (MILSATCOM)		1.4
Total Funding	71.5	21.6
Total Percentage	76.8	23.2

Source: Grier, Peter. *The Materiel World.* Air Force Magazine, October 1997, p. 52

Table 5 reflects current procurement plans for the USAF and its space power programs. Although relative data regarding Army Air Corps expenditures for

procurement were not available, the space power procurement figures reflect a strong Air Force commitment to space. Although space power programs, overall, constitute roughly ten percent of the total USAF budget (before obligatory taxes like SOCOM, NFIP, and DHP), the amount of funding relegated to space program procurement reflects the growing reliance and dependency on space systems for military operations.

Some still are not convinced that the USAF is properly allocating its resources to meet the challenges awaiting it in the twenty first century. According to Builder, "it is not that we will not have enough of a military, but that we will have the wrong kind…in air, land, sea, and space…for the problems we will confront in the new world."[10] He adds, "the only way…changes will occur is when outsiders (like Congress) step in and realign the resources. President Roosevelt did it to the Army when he favored building up the Air Forces. Power will follow the money. Until outsiders redirect resources into space, it will remain in the shadows."[11]

On the surface Builder's argument appears unfounded, given the funding evidence presented above. However, what Builder is trying to say is that it is not enough to just spend money on space power applications. The right mix of space power applications must be funded to ensure America secures dominance of the space medium for many years to come. But even this can prove fruitless, given the recent power of the presidential veto.[12]

One area in which airpower and space power differ however, regarding resource allocation, is that while early airpower advocates had to wait for aircraft technology to catch up to the vision, space power advocates do not. Commercial space systems are just as capable, and in some cases more so, than existing or planned military space systems.[13]

This has led the military space community's push toward entering cooperative arrangements for technology development and commercial use of space systems for military missions.

While government spending on military space systems remains relatively constant, the commercial sector is experiencing annual growth approaching twenty percent.[14] This growth is fueling the military's desire to enter into leasing arrangements with commercial vendors for the missions of communications, imagery, and other sensory applications.[15] According to Lieutenant General Lance Lord, Vice Commander of Air Force Space Command, "the military, civil, and commercial sectors can partner together to leverage the dollars that are available."[16] This proactive arrangement of attaining desired space objectives until such time as a threat against our space assets emerges, or Congress allocates more funding for space, is another indication that the Air Force is wisely positioning itself to continue the development and advancement of space power. Such steps are necessary if the Air Force and its space power advocates hope to foster the continued growth of space power, needed to attain the ability to defend and protect America's reliance and dependency on its space assets and capabilities.

When looking at resource commitment, independent of theory and doctrine, the Air Force appears better prepared to foster continued development of space power than the Army Air Corps was for the development and advancement of early airpower. This conclusion is based on the trend analysis of total funding allocated, funding for research and development, and money allotted for procurement of major Air Force systems for space. Institutional commitment between early airpower on the part of the Army, and current space power on the part of the Air Force, appears to favor space power. But are

resources alone enough to launch an effective and robust development of evolving space assets and capabilities, aimed at securing America's dominant position in space in the new millenium?

Notes

[1] Secretary of Defense William S. Cohen, *Report of the Quadrennial Defense Review,* May 1997, iv.

[2] Giulio Douhet, *The Command of the Air,* 5.

[3] Final Report of War Department Special Committee on Army Air Corps, 18 July 1934, p. 81-83, 145.93-94A, in USAF Collection, AFHRA.

[4] John F. Shiner, *Foulois and the U.S. Army Air Corps, 1931-1935,* Office of Air Force History, United States Air Force, Washington D.C., 1983, 101-107. The five-year buildup plan (Air Corps Act, 1926) met with mixed emotions. The leaders of the Air Corps felt it wasn't enough to reach airpower's potential. Meanwhile, General MacArthur and the General Staff felt the Air Corps Act caused other branches of the Army and sister service to suffer undesirable setbacks and drove the military to a state of disrepair. General Douglas MacArthur, in 1931, told the Secretary of War…"that even though 2,950 planes were warranted for defense, he did not favor raising air strength above that specified in the 1926 Air Corps Act. In view of the present economic conditions, of the undesirability of further increasing the disproportion of our Air Corps to other arms of the service…it is recommended that our aircraft program be stabilized at approximately 1,800 planes gross." The General Staff opposed further increases for the Air Corps that would short change other aspects of the military services. The Army Air Corps, however, did not care about the purported need for a balanced military force. This rift between the Air Corps and the General Staff drove alienated feelings on the part of the Air Corps, and a feeling of over-zealousness on the part of the General Staff.

[5] Griffin, et al. *Air Corps Tactical School: The Untold Story*, 17.

[6] Ibid., 18.

[7] Cohen, iv.

[8] USAF Automated Budgeting Interactive Data Environment System (ABIDES). Prior Fiscal Year (FY) Updated Baseline data was used for 1984-1994. FY 1998 President's Budget Updated Baseline data was used for 1995-1998. Data received from HQ AFSPC/XPPP on 11 March 1998. The author realizes that funding associated with intercontinental ballistic missiles was merged with traditional space program funding in 1992, and is responsible for the minor increase in total space funding between 1991 and 1992.

[9] Shiner, 101-107.

[10] Carl Builder to author, Air Command and Staff College, electronic mail, subject: Air Force Leadership Affects on Space, 23 October 1997.

[11] Carl Builder to Lieutenant Colonel Tom Clark, Air War College, electronic mail, subject: Air Force Advocacy for Space, 24 February 1997.

[12] AFSPC/XPPL, *Legislative Update,* 1 December 1997.

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[13] Warren Ferster, "Military May Rely on Commercial Satellite Systems," *Air Force Times*, vol. 57, no. 14, 11 April 1996, p. 31. Special Defense Study reviewed possibility of replacing existing, expensive military communications satellites (DSCS, UHF) with cheaper commercial systems, at least for routine operations.

[14] Joseph C. Anselmo, "No End in Sight For Space Business Boom," *Aviation Week & Space Technology*, vol. 146, issue 11, 17 March 1997, 72.

[15] William B. Scott, "Space Control Shifting to Space Superiority," *Aviation Week and Space Technology*, vol. 146, no. 10, 10 March 1997, 57. Author asserts that constrained budgets and national policies dictate increasing military dependence on commercial and civil satellite systems for routine communications, weather, and imagery needs. Conversely, both civil and commercial vendors will rely on the military space capabilities for space defense and protection.

[16] Air Force Space Command News Service, "*Partnering With Industry Key to Future of Space,*" 10 February 1998.

Chapter 6

Conclusion

> *A pressing challenge is preparing for the time when an adversary will be able to use space to his advantage the same way we use it for ours. That day could be arriving earlier than we previously imagined. I guarantee, in the near future, that threat will emerge; it's only a matter of time.*
>
> —Robert Davis
> Defense Deputy Undersecretary for Space, 1996

The National Security Strategy formulates three key areas pertaining to America's military evolution and preparedness for the uncertain future. These areas involve fostering innovation in new operational concepts, capabilities and technologies, the modernization of forces, and taking steps to prepare to respond more effectively to threats on the horizon.[1] Undoubtedly, threats will emerge to test America's ability to control the space medium. Whether or not the Air Force has been as committed to fostering the continued development of space power, as the Army Air Corps was to the development of early airpower, has been the foundation for this study.

The historical similarities and contrasts between the development of early airpower and space power are striking. Both became known quantities during periods of war by supporting other spectrums of military operations, through employing similar tasks to the supported forces. Both entertained visionary ideas for use as an independent mechanism of war. Both were mired by periods of decline in military spending following their

wartime introductions. Both received rhetorical support during periods of minimal threat against the United States.

Although both began in supporting roles, affecting operations across the full spectrum of military conflict, only airpower was turned into an offensive platform. Herein lies the major difference between early airpower and today's space power. Even though early airpower advocates received a proportionately large share of the defense budget, they still yearned for more. In order to keep airpower, and the potential it offered, at the forefront of the military mindset, the airpower advocates continued to pursue new theories and concepts for the use of airpower, and practiced those concepts at every turn. When a threat emerged, and resources were made available, they were ready to turn vision into reality.

Space, on the other hand, has been relegated to a supporting role under existing airpower, or aerospace, doctrine, but still managed to receive consistent resource commitment during the past fourteen years. The future appears promising for increased resource commitment toward a growing space power arm for the twenty first century. But unlike their airpower forefathers, space power advocates have not been able to develop a comprehensive and agreed upon space power theory, or doctrine, to guide the desired increase in resources for the advancement of space power. The lack of space power theory and space power doctrine could curtail America's ability to retain its position of space supremacy and the advantages offered by control of the space frontier. General Fogleman, former Air Force Chief of Staff, in his vision of Global Engagement, stressed that any further development of space will be fueled by a change in national policy, or the emergence of threats moving through and from space against U.S. space

assets.[2] The same was true for early airpower in the 1920's and 1930's. But in the absence of resources, early airpower advocates pursued the theoretical and doctrinal roadmap needed to prepare for meeting potential threats to America's security interests. Will the Air Force, and the military space community, be fully prepared to defend America's space interests if necessary? Theory and doctrinal questions aimed at answering the questions of "how" and "with what" have yet to be answered.

Is the Air Force as committed to the advancement of space power as the Army was to the advancement of early airpower? Senior-level support has shown a commitment to the continued evolution of space power due to the growing military, civil, and commercial reliance America now has on space-based systems. USCINCSPACE believes "our potential for space will never be realized unless we begin as an Air Force to change our culture to fully accept responsibility for the role of space and its importance to the future national security interests of our country."[3] He also urged the Air Force to follow-up recent rhetoric with action by stating, "in this time of limited budgets, we don't have the money to continue with business as usual. We must not allow ourselves to be intimidated into taking the easy road for certainty's sake, intimidated by our immediate threats and daily operational problems at the expense of future systems."[4]

America's reliance on space systems, and the advantages they offer, has turned space into an "economic center of gravity" which must be protected. Some have argued that growing space resources are not aimed at the proper enabling technologies needed for America to maintain and sustain control of the space frontier.[5] However, the simple fact that resources devoted to space are growing, even slightly, implies a supportive, senior leadership commitment to the growth and potential of America's space power. As

Builder said, power will follow the money. But is money, by itself, enough to pursue the vision and potential of space power?

Is the Air Force as committed to the advancement of space power as the Army was to the advancement of early airpower? Yes, if looking only at resource allocation and not theoretical and doctrinal constructs regarding the potential of space power. But to fully prepare to meet emerging threats to America's space dominance, the Air Force and its space advocates must develop the theoretical and doctrinal roadmap for American space power. Without the roadmap, it will be difficult to obtain the increased level of resources needed to facilitate development and acquisition of space technologies aimed at ensuring America's space dominance in the new millenium. Today's space advocates enjoy a more stable resource environment, on the part of the institution, than did the Army Air Corps during development of early airpower. However, unlike the Army Air Corps, who developed the theoretical and doctrinal roadmap needed to foster development of early airpower, the lack of a prepared roadmap strategy for space power will curtail the vision regarding space power's potential, and constrain further development of space power assets and capabilities. This will limit America's ability to continue its control of the space medium, and the advantages that controlling space offers to America's economic and military security.

Notes

[1] President, National Security Strategy, 1996, 13.

[2] Department of the Air Force, *Global Engagement: A Vision for the 21st Century Air Force*, 1996, 7.

[3] General Howell M. Estes III. "Space Commander Believes Air Force at Crossroads," *Air Force News*, 18 November 1997.

[4] Ibid.

[5] Lieutenant Colonel Michael E. Baum, "Defiling the Altar: The Weaponization of Space," *Airpower Journal*, Spring, 1994: 52-62. Baum offers a futuristic scenario, set in

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2011, in which an enemy attacks America's space forces by destroying ground stations and launch facilities, as well as attacking our satellites via ground-launched anti-satellite systems and co-orbital platforms. As our eyes and ears in the sky are taken out of action, we are left blind, deaf, and dumb in our ability to visualize the battlefield and communicate throughout all levels of operations. The answer that the Chairman of the Joint Chiefs gives to the President when asked what our reconstitution capability looked like is prophetic. His response is that we chose, in the latter years of the twentieth century, not to invest in hardened, self-defending, better capable follow-on space systems, instead choosing to rely on existing platforms to continue our dominance in space because there was no prevalent threat that could negate our space advantage. We also did not prepare for a surge-lunch capability, instead choosing to rely solely on our existing launch capabilities. Finally, we have a non-existent on-orbit spare capability, because to do so was deemed too expensive at the time the choice needed to be made.

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