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COMMAND AND EMPLOYMENT OF SPACE POWER: DOCTRINE FOR THE ASYMMETRIC TECHNOLOGY OF THE 21ST CENTURY

by

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Preface

This paper is about keeping the vision of aerospace power alive, not in the first decade of the twenty-first century, but as we approach 2025. My purpose is to generate debate about the inevitable weaponization of space and the role of the USAF in this transition. My premise is that in order for the Air Force to keep its place as the nation's premier provider of aerospace power, it must not just participate in this process—it must lead the rest of the nation to this destiny. Operationally, we have not yet started to walk down this path. However, many of the technologies which will form the basis of the first weapons we will use in this environment are in development today. To ensure we get the combat capability the nation needs, we must develop the strategy and doctrine under which future Air Force warriors will employ these weapons. Otherwise, the technology we develop may not meet the strategic need and we may lack in the next war the technological asymmetry on which we have relied for victory since World War II.

I encourage the reader to do two things as he or she reads this paper. First, the reader must put himself or herself in the place of an aviator in 1920, looking at the promise of aviation and its capability to provide strategic airpower for the nation. Second, while keeping in mind the potential of strategic airpower to strike at the heart of the enemy nation, leave behind any personal prejudices as to the means for employing that power. This is not a discussion about bombers, or fighters, or missiles, or unmanned combat air

vehicles. It is a discussion about what we as an Air Force need to do now in order to provide aerospace power to our nation as we approach the middle of the next century.

I would like to thank Dr. William C. Martel of the Air War College faculty and Colonel (Retired) Ted Hailes, USAF for their coaching and support as I struggled to conceptualize my ideas for this paper as well as their patience in the editing process. Many of the good ideas you find here are the result of their prodding; the mistakes, of course, are mine, and mine alone.

Abstract

It is inevitable that mankind will weaponize space and likely this weaponization will take place in the next thirty years. The United States is in the early stages of a transition from using space assets to support combat operations on the surface of the earth to using space assets to conduct combat operations in space, from space, and through space. This paper discusses factors driving the United States to take its first steps to weaponize space. It is the time for the Air Force to start building the doctrinal framework for combat operations in, from, and through space to guide the technological development of space assets as the doctrine of strategic bombardment guided Air Force thought and aircraft development prior to World War II. This paper discusses the transition from an air to a space force by examining required changes to Air Force doctrine within the framework of its six core competencies if the Air Force is to organize, train, and equip aerospace forces to conduct combat operations in the space environment.

Chapter 1

Introduction

> *. . . seems to me [the United States is] the only nation in the world that waits until [it is] in a war to get ready for it.*
>
> —Will Rogers

More than seventy-five years have passed since the guns fell silent in the Meuse-Argonne. Before the ink was dry on the surrender instrument in the rail car at Compiègne,[1] historians were busy sorting out what had happened and why. Many were trying to assess how various forms of warfare broke the stalemate of the trenches and helped the Allies achieve ultimate victory over Germany.

Historians saw the triumph of land warfare. They noted the impact of technological advances, such as the tank, in restoring maneuver to the battlefield. The creation of this technical asymmetry was vital in overcoming the horrors of trench warfare. Historians also noted, in many cases parenthetically, the role of airpower. "To them it appeared as an auxiliary, preparing and supporting the main action without itself being center stage."[2]

Airpower advocates, on the other hand, believed the First World War validated the accomplishments of their fledgling systems and provided a vision of what airpower could become. As a spotter for field artillery, airpower was "a decisive factor in creating and maintaining the stalemate."[3] The fighter plane developed "according to the needs of battle, rather than according to a doctrine or in some deliberately chosen direction."[4] In

an escort role, it contributed to the defensive lull. In the pursuit role, it facilitated the offense.[5]

However, "[only] strategic airpower seemed to offer a real alternative to the bloody, indecisive collisions along a static front: the swift, deep, surgically precise stroke at just the right objective—what Clausewitz called the enemy's center of gravity—that would ensure his rapid collapse."[6] This strategic airpower doctrine—this vision of what airpower could become—served as the framework for airpower theorists and technological development through the inter-war period.

More than five years have passed since the guns fell silent along the Iraqi "highway of death." Before the ink was dry on the cease-fire instrument in the tent at Safwan,[7] historians were busy sorting out what had happened and why. Many were trying to assess how various forms of warfare helped the coalition achieve ultimate victory over the Iraqi army and the liberation of Kuwait.

Historians saw the triumph of joint and coalition warfare led by a decisive air campaign. They noted the impact of technological advances, such as stealth aircraft and precision guided munitions, in destroying the Iraqi command and control structure and removing the Iraqi capability to maneuver on the battlefield. The use of the existing technical asymmetry was vital in overcoming the potential horrors of fortified Iraqi defensive positions. Historians also noted, in many cases almost parenthetically, the role of space power. The index of the Air Force official history of the Gulf War, *The Gulf War Air Power Survey Summary Report*, addresses space assets on only one page.[8] The index does not reference the United States Space Command (USSPACECOM). Like

airpower in the First World War, space power in the Gulf War appeared as an auxiliary, that supported the main action; it was not itself at center stage.

Space power advocates, on the other hand, believed the Gulf War validated the accomplishments of their satellite systems. The Global Positioning System (GPS) was a star of the war in spite of the fact that it was not yet an operational system; only 16 of the 18 then planned satellites were in orbit.[9] Over 12,000 hand-held receivers were used by coalition forces in the Gulf.[10] Six Defense Meteorological Satellite Program satellites furnished high-resolution, near-real time meteorological information in the midst of the worst weather in the Persian Gulf in fourteen years.[11] Defense Satellite Communications System satellites provided in-theater and inter-theater secure communication. Three Defense Support Program satellites "scanned for and reported bright infrared 'events'—the exhaust glow from Scud launches. Two civilian satellites systems also provided imagery: the US LANDSAT and the French SPOT [Système Probatoire d'Observation de la Terre]."[12] Like their air-breathing counterparts at the end of World War I, space power advocates left the Gulf War with a vision of what their systems could provide to the nation given the technology and the political will to turn the vision into reality.

This essay examines that vision of space power. It argues that it is inevitable mankind will weaponize space and likely this weaponization will occur as certain technologies mature over the next thirty years. Warfighting in the United States is in the early stages of a transition from relying on space assets to support combat operations on the surface of the earth to depending on space assets to conduct combat operations in, from, and through space. The US ability to conduct combat operations in this environment will provide the technical asymmetry that the US will need to win the next

war, just as it used strategic bombers and the atomic bomb to win World War II and stealth technology and precision guided munitions to win the Gulf War.

To make this transition, the US must overcome current legal and political impediments to doing so. These impediments are discussed in Muolo's *Space Handbook: A Warfighter's Guide to Space, Volume I*[13]and is not discussed further. This paper assumes that with the political will to weaponize space, these obstacles will be overcome.

In addition to these hurdles, the USAF must overcome certain technical obstacles to make warfighting from space a reality. The Air Force Scientific Advisory Board's report, *New World Vistas: Air and Space Power for the 21st Century*,[14] outlines in great detail the technologies necessary to accomplish this objective.

Perhaps most difficult of all, the Air Force must overcome institutional and doctrinal impediments to the transition. Now is the time to start building the doctrinal framework for space combat operations that will guide the technological development of space assets in much the same way as the doctrine of daylight precision bombardment guided Air Force thought and aircraft development prior to World War II. The Air Force's six core competencies provide the framework to analyze how the Air Force as an institution must change the way it organizes, trains, and equips aerospace forces to conduct combat operations in the space environment. But first, a look at what will drive the United States to take its first steps to weaponize space.

Notes

[1]Larry H. Addington, *The Patterns of War Since the Eighteenth Century* (Bloomington, IN: Indiana University Press, 1984), 157.

[2]Lee Kennett, *The First Air War: 1914-1918* (New York: The Free Press, 1991), 217.

[3]Kennett, 221.

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[4]Kennett, 218.

[5]Kennett, 221.

[6]Kennett, 221.

[7]Dr. Richard P. Hallion, *Storm over Iraq* (Washington: Smithsonian Institute Press, 1992), 239.

[8]Thomas A. Keaney and Elliot A. Cohen, *The Gulf War Air Power Survey Summary Report* (Washington: U.S. Government Printing Office, 1993), 194.

[9]Hallion, 314.

[10]Sir Peter Anson and Dennis Cummings, "The First Space War: The Contribution of Satellites to the Gulf War," in *The First Information War*, ed. Alan D. Campen (Fairfax, VA: AFCEA International Press, October 1992), 127.

[11]Hallion, 314.

[12]Keany and Cohen, 194.

[13]Major Michael J. Muolo, *Space Handbook: A Warfighter's Guide to Space, Volume One* (Maxwell Air Force Base: Air University Press, 1993), 1-47.

[14]USAF Scientific Advisory Board. "Summary Volume." *New World Vistas: Air and Space Power for the 21st Century.* Report to the USAF Chief of Staff. (Washington, DC: Government Printing Office, December 1995).

Chapter 2

The First Steps to Weaponizing Space

> *An asymmetric strategy significantly increases the role of air power in times of peace, crisis, and war.*[1]
>
> —General Ronald R. Fogleman
> Chief of Staff, USAF

Just as the role of US military operations in space has gradually shifted from scientific interest, through intelligence collection, to robust combat support, so it will continue to shift inevitably toward the weaponization of space. In discussing the expanding role of the military in space, the term weaponization implies an increase in the capability to conduct warfare in, from, or through space. It is appropriate to use the term weaponization, rather than militarization, because both the United States and Russia have already militarized space. Since man's earliest days in space, intelligence and communications satellites have had military missions. What space has not been, at least to this point, is weaponized. Examining the reasons weaponization occurred in the other three warfare media—land, sea, and air—point to the conclusion that the weaponization of space is inevitable. Results from these case studies clearly show that although man's initial involvement in the land, sea, and air media was not for military purposes, militarization, and ultimately weaponization of each medium followed due to the

necessity to protect resources in these environments. Then by extension, the causes for weaponization of these media are applied to space.

Selected Examples

The development of combat forces on land predates recorded history. "In prehistoric and early historic times, armies as such did not exist; armed forces consisted of groups engaged sporadically in combat for the purpose of defending or acquiring land desired for hunting or pasture."[2] As people acquired more to protect, the need for land forces increased. "The rise of permanent settlements . . . in the Tigris-Euphrates Valley and along the Nile, was paralleled by the employment of citizen-soldiers to protect them."[3] The history of the militarization of land then, is the history of civilization itself. As civilization advanced, so too did its resources and the nature of the armies which guarded their security.

As with armies, the development of navies precedes recorded history. By 1100 BC the Phoenicians were the "most notable traders and sailors of the ancient world."[4] Their navies sailed the Mediterranean to protect Phoenician commerce. In 404 BC, Athens was the preeminent naval power in the Mediterranean given the need to protect the maritime empire which dominated the economy of the Aegean.[5] But it was Sparta's ability to change their traditional land power strategy and to use their navy to project power that led to the ultimate defeat of the Athenian army in Sicily in the third phase of the Peloponnesian War.[6]

The same trends continued in more modern times. "The age of exploration and nationalism beginning in the 15th century coincided with the development of larger and

[more maneuverable] sailing ships, as well as with the invention of gunpowder and navigational instruments that enabled sailors to venture out of sight of land. The discovery of sea routes to India, China, and the Americas in the 15th and 16th centuries led to a growing volume of trade, and national rivalries for control of these routes created the need for navies."[7] As with land forces, the need to protect vulnerable resources led to the development of navies. As the resource needing protection moved further from home, the ability to project power against the enemy also increased.

Culminating a centuries old desire to fly, the Wright Brothers invaded the sanctity of the air with powered flight in 1903. Within six years, they had signed a $30,000 contract with the US government to produce biplanes for the Army.[8] The weaponization of the air had begun. Early attempts at the weaponization of the air were unsuccessful. Winchester rifles strapped to the struts of 1st Aero Squadron aircraft in Mexico proved inadequate.[9]

Even at the beginning of World War I, the weaponization of the air was not complete. "The relationship of opposing pilots of observation aircraft was quite friendly at first. As they crossed the front lines each morning, the German and French pilots usually waved and returned friendly smiles. This, however, did not last long. As the fighting dragged on . . . more and more aerial incidents took place as bricks were thrown and a few shots from hand guns exchanged. Hand dropped bombs were developed, making the airplane a real offensive weapon."[10] By the end of the war, opposing forces expanded the weaponization of aircraft to include machine guns firing through the propeller arc.

Weaponizing Space

The oceans are a vast, but finite resource. Due to the locations of the continents and the nature of commerce between trading partners, some portions of the oceans are busier than others. Chokepoints exist through which there is less space for trade to flow. The result is competition for limited resources and an opportunity to control the seas by controlling the chokepoints. Space, as currently used, is also a finite resource. The view space provides and the capability to pass information through space at the speed of light from one point to another on the surface of the earth makes certain satellite orbits more valuable, and hence busier than others. This leads to chokepoints in space.[11] As in the case of the sea, the result is competition, and with competition will come conflict; from conflict, the necessity for space control.

The United States is extremely dependent on space assets.[12] The average US citizen depends on space assets each day for telephone communications, cable television, weather forecasts, and other information. American business is increasingly reliant on satellites for information transfer, to locate natural resources, to plot maps, to measure growth, etc. The number of business uses for space will only increase over the coming decades. The plan for business consortia such as Iridium and Teledesic to orbit satellite constellations (providing world-wide cellular phone and Internet access via satellite) will inextricably link daily activities of businesses and ordinary citizens with space assets. With every day that passes, the United States becomes more reliant on the assured connectivity that space resources provide.

The United States military is no less dependent on space assets. Key intelligence, surveillance and reconnaissance, strategic and theater level warning, weapon's guidance,

communications, command and control, and environmental monitoring functions are migrating to space.[13]

As an increasing number of these critical resources and capabilities migrate to space, the need increases to protect these resources, in peace and war. As prehistoric peoples developed armies on land to protect their resources, as the Phoenicians developed navies to protect their trade routes in the Mediterranean, and as nations developed air forces to protect their resources from attacks in the third dimension, space will become a warfighting arena. Having been militarized virtually since the beginning of man's experience in this medium, mankind will weaponize space as he perceives threats to his ability to gather information, communicate, and trade in, from, or through space. The question is not if he will do so, but when, and in response to what stimulus.

Control of space is not only important to ensure access to satellites but to support military operations on the earth. Just as control of the air is a precursor to effective operations on the land or sea, control of space is a prerequisite to effective operations in all terrestrial media (land, sea, and the air). Any disruptions to military access to space could jeopardize American military activities as reliance on space assets is increasingly becoming a strategic center of gravity for the United States.

Recognizing that political and diplomatic alternatives will be limited if the United States does not control access to space,[14] President Clinton's space policy "directs the nation to maintain its pre-eminent position as the world's number one space power."[15] General Estes, "[the] Commander-in Chief, US Space Command (USCINCSPACE), is already tasked with the missions of space control and force application in support of the joint warfighter."[16] As General Estes recently stated, "control and access to the benefits

of space . . . spacepower must be maintained and protected. Even today, terrestrial land and sea operations can only be conducted successfully by those who control the air and space above the battlefield."[17] These comments show the increasing importance of assured access to space to the security of the United States. Further, they show the increasing willingness of national leaders to openly discuss the weaponization of space.

Is Now the Time?

It is clear that man will weaponize space as an increasing number of high-value resources in the form of commercial and military systems migrate to space. The questions that remain are whether now is the time to begin the inevitable weaponization of space; whether, to protect its increasing space center of gravity, the US should be the first nation to do so; and the implications of doing so for the United States Air Force.

During the twentieth century, both to reduce the cost of maintaining large standing armies and to protect human life in battle, the US turned to technological superiority as the basis for success in warfare. In World War II, long range bombers, carrier aviation, and the atomic bomb provided the technological edge required to defeat the Third Reich and the Japanese Empire. Arguably, in Korea and Vietnam, technological superiority was present even if the will to use it was not. In the Persian Gulf War, the United States gained a decisive advantage through its ability to maintain technological superiority. Whether measured in terms of space assets, air refueling, precision guided munitions, or stealth, coalition forces led by the United States fought the war on a different technological level than their Iraqi opponents. This technological asymmetry allowed the United States to fight a short war with minimal casualties.

Technological asymmetry provides another advantage. It allows the United States to control crisis escalation. With technological superiority, America can threaten to escalate to prevent an unwanted turn of events (e.g., threaten to escalate to nuclear war against a non-nuclear adversary in response to a chemical attack). The United States never wants to fight a war from a position of technological parity or inferiority. To do so may well yield escalation dominance to the enemy—especially an enemy unconcerned with public opinion.

The problem with technological superiority is that it is never constant and never guaranteed. American forces were not the only ones to learn lessons from the Gulf War. Potential future adversaries also watched and learned. They saw the success of a well led coalition employing air refueling, precision guided munitions, stealth, and uncontested access to space assets. No doubt future adversaries are trying to robust their capabilities in these areas as well as develop countermeasures to reduce US effectiveness.

The United States cannot hope to fight another war with the same technology and achieve the same level of success as in 1991. The US must never again plan to face an adversary who does not contest its ability to use information gained from space assets. The playing field has once again changed and the US military must also change in order to defeat the next enemy.

The weaponization of space provides the asymmetric technology the US needs to win the next war. The United States is the only nation with the economic potential and the scientific community to make this technology a reality in the next thirty years. Techno-logical development of weapons which apply force in, from, and through space must continue with a goal of fielding weapons as the technology matures. Just as the doctrine

of daylight precision bombing guided the development of the long range bombers of World War II, today's Air Force must develop doctrine for the employment of space weapons. This space version of strategic bombardment doctrine will serve both as a guide to technological development and to plan long term Air Force force structure. If no war comes, US space-based capabilities will have proven an effective deterrent force; if war does come, as the inevitable result of competition on earth or in space, technological asymmetry will once again be a large factor in the US winning a decisive victory. To be effective however, institutional and doctrinal change must accompany this technological asymmetry.

Notes

[1]General Ronald R. Fogleman, Chief of Staff, United States Air Force, quoted in Air Force Policy Letter Digest. "A New American Way of War." Headquarters USAF, April 1996, n.p.; on-line, Internet, 26 November 1996, available from http://www.dtic.mil/airforcelink/pubs/policy/letters/pl96-04.html.

[2]*Microsoft Encarta Multimedia Encyclopedia*, 1994 ed., s.v. "Army", CD-ROM, Microsoft Corporation, 1994.

[3]Ibid.

[4]*Microsoft Encarta Multimedia Encyclopedia*, 1994 ed., s.v. "Phoenicia", CD-ROM, Microsoft Corporation, 1994.

[5]William P. Snyder, "An Introduction to the Peloponnesian War," (Air University, Maxwell AFB AL, April 1993 in Air War College Associate Programs, Vol I, LSN 1, 4th edition), 30.

[6]Thucydides, *The Peloponnesian War*, trans. Benjamin Jowett, (Air University, Maxwell AFB AL, April 1993 in Air War College Associate Programs, Vol I, LSN 1, 4th edition), 71-79.

[7]*Microsoft Encarta Multimedia Encyclopedia*, 1994 ed., s.v. "Navy", CD-ROM, Microsoft Corporation, 1994.

[8]*Contrails: The Air Force Cadet Handbook*, Vol 20. (USAF Academy, Colorado, 1974), 14.

[9]*Contrails*, 16.

[10]*Contrails*, 17.

[11]This term is used extensively in Lt Col David E Lupton,. *On Space Warfare: A Space Power Doctrine* (Maxwell Air Force Base, Alabama: Air University Press, 1988).

[12] Gen Howell M. Estes IV, Commander, US Space Command, address to the Air Force Association Annual Symposium, Los Angeles, CA, 18 October 1996, n.p.; on-line,

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Internet, 30 November 1996, available from http://www.spacecom.af.mil/hqafspc/contents/library/speeches/18Oct96.html.

[13]US Air Force Long Range Plans Division. “Global Engagement: A Vision for the 21st Century Air Force.” Briefing Script. 12 November 1996; on line, Internet, 26 November 1996, available from http://www.af-future.hq.a.fmil/21/indext.htm, 6.

[14]Gen Estes.

[15]Gen Estes.

[16]US Air Force Long Range Plans Division, 6.

[17]Gen Estes.

Chapter 3

The Air Force Must Adapt to the New Means of Strategic Bombardment

> *Victory smiles upon those who anticipate the changes in the character of war, not upon those who wait to adapt themselves after those changes occur.*[1]
>
> —Air Marshall Guilio Douhet
> *Command of the Air*

Large bureaucracies are notoriously slow to change. The government is probably the slowest of these large bureaucracies, because unlike a corporation facing major change, it has no profit motive.[2] These large bureaucracies are also slow to divest themselves of portions of the organization which are no longer relevant to their operations in a new environment. As Major General (Retired) Perry M. Smith said in his book, *Taking Charge*: "[in] government, divestiture is a more difficult process because the obsolete areas are harder to identify and more difficult to exorcise from the organization."[3] In making the transition to weaponize space, the Air Force may find that the most difficult set of impediments to overcome are those internal to the Air Force itself.

Crossing the bridge to allow combat operations in space will be a difficult decision for the Air Force, both because of the new method of warfighting it creates and because those new methods will, at some point, replace old ones which have been the foundation of the institution since its inception. The change may not be immediate, but once the

threshold is crossed, there will be no going back. Just as there are no longer any knights in shining armor or cavalry soldiers on horseback, one day there will no longer be bomber or fighter pilots. However, unlike the disappearance of these older forms of warfare, the decision that the time is right to move from an air force to a space force will likely be made by Air Force leaders who grew up in the organization, living and breathing the types of fighter and bomber aviation which space warfare will ultimately replace. More important, unlike the cavalry which only disappeared after it had clearly been rendered obsolete (e.g., The Charge of the Light Brigade), the Air Force needs to act proactively, and delete such warfighting systems before they become obsolete. Funding constraints and the need to preserve human life will force such a path.

Making the transition to warfighting in the space environment will take fortitude, vision, and, most of all, timing. Fortitude to make the decision to move away from a means of applying air power that has matured since the promise of aviation first showed itself in World War I and one that arguably only lived up to that promise in the Gulf War. Vision, to realize that in doing so, only the means of airpower are changing. The ends—the capability to bypass the horrors of a prolonged ground war by immediately attacking the enemy's strategic center(s) of gravity, will not have changed; in fact, they will be enhanced by the new means.[4] Timing, to make the decision as the technology matures. Decide too late, and the capability for space warfare will not be available when needed; the Air Force would have to fight a war at this time without the technological asymmetry space offers and upon which the nation depends. Decide too early, and there will be a gap in the capability to provide aerospace power today because the requisite space technologies will not have matured.

In the end, the question may not so much be whether the nation is ready to overcome the legal, economic, and political hurdles to conducting combat operations in space, but may instead be a question of whether the Air Force is ready to change its institutional mindset to meet the new strategy, ultimately giving up fighter and bomber aviation in the process. As the nation's primary provider of air and space power, the Air Force must adapt to the strategic needs warfare in, from, and through space will bring to the nation. To examine these changes the reader must assess the strategic setting in which the Air Force will operate, the Chief of Staff's strategic vision for the Air Force at the change of the millennium, and the need for a comprehensive Air Force doctrine to guide the development of technology to meet this future reality.

The Future Strategic Environment

The breakup of the Soviet block significantly altered the international scene. In place of the bipolar world which governed international relations from the start of the Cold War until 1989, the United States now finds itself in a uni-polar world. This world, characterized by an unclear threat and a regional, rather than global focus, is not necessarily more stable than the bipolar world of the Cold War era. In places such as Yugoslavia, Africa, and the Middle East, the world has seen reemergence of centuries old hostilities, no longer held in abeyance due to the overriding concerns of superpower confrontation. The peace dividend, so ardently hoped for at the beginning of the decade, has yet to emerge.

President Clinton's national strategy calls for the United States to engage with other nations in an effort to "enlarge the community of . . . democratic nations."[5] Government

agencies support the national strategy using various instruments of national power to build regional partnerships with democratic and emerging democratic nations around the world.

The national military strategy supports the national security strategy through the use of the military instrument of national power. As currently structured, the national military strategy is "a defensive strategy that will prevent, that will deter, or that will defeat any adversary who threatens [the United States or its] allies."[6] Increasingly, this strategy is based on the employment of a continental United States (CONUS) based contingency force[7] since many of the forces deployed overseas during the Cold War have been brought home, or demobilized.

In 1996, General John M. Shalikashvili, the Chairman of the Joint Chiefs of Staff, published his vision for the United States military as it enters the first decade of the 21st century. His "Joint Vision 2010" provides a roadmap for the US military to follow in meeting the strategic challenges the military will face in this timeframe. In articulating his vision, General Shalikashvili outlined four key operational concepts that US military forces must possess in order to accomplish their objectives in light of the expected future threat and strategic setting. These are dominant maneuver, precision engagement, full dimensional protection, and focused logistics.[8]

A New Strategic Vision

The Air Force is following General Shalikashvili's lead in adapting to the needs of this new strategic setting. Through the announcement of *Global Engagement*, the Air Force identifies the ways in which it intends to meet the problems of tomorrow's strategic

environment. Dr. Sheila Widnall, the Secretary of the Air Force, recently identified these problems as globalization, international competition, proliferation of weapons of mass destruction, and doing more with less.[9] To meet the vision of *Global Engagement*, the Air Force must "renew and invigorate its core vision of aerospace power."[10] Through a revitalization process, the Air Force hopes to create for itself a "unified, coherent, compelling, vision of aerospace power"[11] which will guide the employment of strategic aerospace power in the 21st century.[12]

Global Engagement defines the Air Force's new core competencies as the "bridge between doctrine and the acquisition and programming process."[13] This is in error. It is more appropriate to think of doctrine as the bridge between the core competencies and the acquisition process. Joint Publication 1-02 defines doctrine as "[fundamental] principles by which the military forces . . . guide their actions in support of national objectives."[14] The core competencies delineate those skills which the Air Force must possess in order to support the commander in the joint battlespace of the future. The acquisition process, quite simply, provides the tools with which Air Force members accomplish those tasks. It is the presence of a viable service doctrine which forms the bridge between the delineated core competencies (what the Air Force must do) and the acquisition process (the means for getting the tools to do it). Without viable doctrine, there is a disconnect between the tasks and the means for accomplishing those tasks.

To put this in perspective, it is once again appropriate to reflect upon the historical example provided in the years prior to World War II. Airmen came out of World War I with the vision that airpower could take the war to the heart of the enemy nation without first fighting through the enemy army in the field. The core competency of strategic

bombardment was developed as an avenue to avoid a repeat of the carnage of the trenches. The doctrine these airmen developed called for daylight precision bombing as the means to accomplish the objective of strategic bombardment. This doctrine guided the development of the B-17 and the Norden bombsight as the technological means for accomplishing the objective.

The problem today is that even though the technologies such as ground-based lasers, space-based lasers, and kinetic energy weapons discussed in *New World Vistas* are undergoing research, there is no space doctrine to form a bridge between the core competencies and the acquisition process. Now is the time to develop space doctrine for the 21st century. It is not too early to think through this process. It is imperative that the Air Force expand its doctrine to provide the connecting link between the scientists and engineers who are currently developing the requisite space technologies and the operators who will one day employ them in combat. Done correctly, the development of this doctrine will result in a fighting force better organized, trained, and equipped to perform its mission.

A Doctrine to Meet Future Challenges

A significant section of *Global Engagement* is the identification of the Air Force's six core competencies. These competencies are brief statements of the major tasks at which the Air Force must be proficient to successfully provide air and space power to the nation. They "represent the combination of professional knowledge, airpower expertise, and technological know-how that, when applied, [produce] superior military capabilities."[15] The six core competencies are information superiority, air and space

superiority, global attack, precision engagement, agile combat support, and rapid global mobility.[16]

Space will play an ever-increasing role in the way America projects military power in the 21st century. To meet the nation's future needs through space, the Air Force must adapt to incorporate this new means of warfighting into the way it organizes, trains, and equips the service. Viewing these changes through the framework of the six core competencies highlights how the very nature of the Air Force's most basic tasks must change to conduct warfare in, from, and through space. Doing so allows the Air Force to build a doctrinal bridge between the core competencies and the acquisition and programming process. It will also provide a reference for scientists and engineers in the development of applicable technologies to ensure the product they field meets the operational need. Using the six core competencies as a lens, it is now possible to view the doctrinal changes the Air Force must make to facilitate the transition of its warfighting capability to space.

Information Superiority

"Warfare has always pivoted, to a large degree, on the adversaries' ability to gain information on each other, act on that information, and adjust their actions"[17] based on the information they acquire. This information provides the commander with a "comprehensive picture of the battlespace"[18] to aid decision making.

One of the coalition's largest advantages in the Gulf War was the information provided, in large part, by space assets. Coalition commanders made decisions based on information from space assets—information not available to Iraqi commanders or even the Iraqi national leadership.

Future adversaries will not allow the United States uncontested access to information from space assets. As a nation, the US is becoming more and more reliant on information technologies. The Air Force of the 21st Century must be able to act in a defensive role to protect the nation's means of observing the enemy; combine this information with other sources to deduce the enemy's capabilities and intentions; make decisions based on the available information; and carry out these decisions in a timely manner.

Offensively, the US must be able to deny this same capability to the enemy. In his seminal paper, *Counterspace Operations for Information Dominance,* Major James G. Lee recognizes that "proliferating space capabilities could provide regional powers with an advantage over US forces in any future regional conflict . . . by eliminating the US ability to achieve strategic and tactical surprise. The inability of US forces to achieve surprise could lead to protracted engagements."[19] This, in turn, could lead to increased casualties with an accompanying loss of public support. In recommending a space control strategy based on information dominance, rather than asset destruction, Lee states that the "actual threat [to US interests] is the information space systems provide; not the space systems themselves."[20] By controlling the flow of information to and from enemy satellites, the US could control the information on which future enemy commanders rely to make their strategic decisions.

In executing this strategy, information superiority becomes the cornerstone of space warfare. Emerging technologies must support the strategy of information dominance. Maintaining the capability to use our information technology while denying a similar capability to the enemy must be the primary objective of any future space control campaign.

Air and Space Superiority

The development of the doctrine for daylight precision bombing offers a lesson in the development of future space doctrine. One of the deepest convictions of daylight precision bombing doctrine was that a well planned and conducted attack, once launched, was unstoppable.[21] In other words, the proponents of daylight precision bombing believed their bombers were invulnerable. This overriding belief in doctrine, when combined with the technological problems associated with building a fighter aircraft in the 1930s with performance that could match a bomber's range and altitude capability, meant American bombers entered World War II without long-range fighter escort.[22] The bombers were decimated by German fighters. Loss rates were as high as 16 percent of the bombers dispatched on the Schweinfurt raid in August 1943.[23] These horrendous loss rates forced Allied leaders to recognize that air superiority was a prerequisite to strategic bombing.[24]

Those developing the technologies and doctrines to weaponize space should not make the same mistake as those developing the doctrine for their air-breathing predecessors. Force projection satellites will need protection from enemy antisatellite (ASAT) systems. Whether protection occurs in the form of escort satellites or a terrestrially-based ASAT system is not important doctrinally. What is important is to learn from the mistakes of the past and never again send force projection assets into harm's way without air and space superiority. Space control will be a prerequisite for power projection from space.

In the next 30 years, space superiority will join air superiority as the most important core competency as the Air Force mission expands to "controlling the entire vertical

dimension of the battlespace."[25] Control of the air is currently a prerequisite for all force application, force enhancement and force support missions conducted not only by the Air Force, but by its sister services as well. Over the next 30 years, control of space will become an equally important prerequisite for projecting power on or above the surface of the earth. As discussed in Lt Col Michael R. Mantz's, *The New Sword: A Theory of Space Combat Power,* these space control missions may take the form of earth-to-earth or space-to earth attacks against space launch or space control systems as well as earth-to-space or space-to-space attacks against space-deployed platforms.[26]

As we enter this period of transition to warfighting in space, "the military is seriously lagging in its operational understanding and appreciation for exploiting the opportunities of space to military advantage."[27] According to General Michael Carnes, former US Air Force Vice-Chief of Staff:

> At least two conditions have brought about this situation. First, although space has been the new frontier, it has been developed and shaped for some three plus decades by functional specialties, not operators. For far too long, military space has been the . . . domain of national level intelligence, reconnaissance, surveillance, and warning. These are functional areas well known for secrecy and compartmentation, limited oversight, generous funding, restricted access, and narrow application. That must change and is changing. Second, the conditions that allowed this narrow development of space utilization also created . . . a hard shell that has prevailed beyond its time, even beyond the end of the Cold War. It took a warfighting event [Desert Storm] to crack the shell and force open the door. Warfighters, suddenly in charge, were often amazed at what they discovered behind the door and at what was available for improved battlefield situational awareness, for innovative operational maneuver inside the enemy's decision loop, and for vastly improved targeting and damage assessment tools. In the words of an old saying: once they've been to the big city, it's tough to get them back on the farm. The operator is not going back.[28]

The advantages the US gains from operations in space are such that any future potential adversary will feel obligated to target them. By the year 2000, 20 nations will have access to space.[29] Space will not be a passive sanctuary in future conflicts. It will be a warfighting theater. The United States has no choice but to weaponize space. If the US goal is "to keep [its] own freedom of action in space while denying it to the enemy,"[30] the US must develop the capability to disrupt, destroy, deny, and degrade enemy space systems and ground based control systems.[31] To reach this goal, the United States must have the ability to accomplish three missions: space surveillance, space negation, and space protection.[32]

To enhance space surveillance, the US must develop and maintain the capability to observe each satellite throughout its entire orbit. This global situational awareness will provide the US with knowledge of any enemy satellite which may be in a position to execute an attack against it. Awareness will lead to the ability for each US satellite to protect itself.

Second, the US must develop the capability to deny a potential enemy the use of his space assets. Limiting an adversary's access to space would be one way to accomplish this mission. A second method would be to deny the enemy the capability to control his satellites already in space, or to degrade an individual satellite's ability to sense the information the enemy tasks it to collect. The US must develop the capability to deny freedom of action to the enemy in each of these areas. Additionally, the Air Force should develop means to reverse the effects of at least some space denial weapons. This would offer the capability to restore an enemy's satellites to their pre-conflict status and restore regional balances.

Finally, the Air Force must develop the capability to protect US space assets from enemy attempts to control the space environment. This includes protection of both those assets physically in space and those segments of space systems which reside on the earth. Protection of ground segments of space systems is discussed later in this chapter.

Research must continue into technologies which can provide solutions to these strategic problems. Technologies recommended by the *New World Vistas* report[33] such as ASAT systems, space mines, uplink and downlink jammers, space decoys, and satellite signature reduction techniques may show promise over the next three decades. Some of these technologies exist or are in development. "The challenge is not to allow these technologies to atrophy or be forgotten."[34]

This section has primarily discussed the capability to control the space environment and protect critical space control facilities on the earth. When reading the next section on global attack systems which provide the capability to attack strategic targets on the face of the earth from or through space, realize that these same technologies will one-day offer a capability in an air superiority role to target air-breathing aircraft. When developed, these space systems will provide a means to accomplish the offensive counterair, defensive counterair, and suppression of enemy air defenses mission from space. By doing so they will reduce, and potentially eliminate the need to deploy air-breathing air superiority assets to an operational theater of war.

Global Attack and Precision Engagement

Proficiency in global attack allows the Air Force to attack targets rapidly with available munitions anywhere in the world. Precision engagement recognizes the importance of applying the desired level of force against a specific target without

damaging nearby facilities.[35] Combining these two core competencies in this discussion makes sense, in light of the trend towards precision engagement. Certainly, any application of force from space will be subject to such restrictions in order to minimize collateral damage.

Force application from space will allow new levels of responsiveness and lethality in achieving the goals of global attack and precision engagement. It will revolutionize the way the United States projects military power[36] by allowing the United States to apply force against any target on the face of the earth through the space environment. From a robust space-based laser system, or a ground-based system transiting space, the US will have the capability to conduct a strategic air campaign on the order of DESERT STORM in a matter of minutes[37] and do so without deploying forces. By extension, the capability will also exist to conduct an interdiction campaign, again without the need to deploy forces. In *The New Sword,* Mantz offers some ideas on possible target sets.[38]

To complete space-to-earth targeting will require the marriage of intelligence and operations. Determining the location of the target remains critical, but in the future, space assets will bear an increased share of the responsibility in this effort. Once located and identified, operators will attack targets virtually instantaneously. Lasers can attack fixed targets at will. Many mobile targets will essentially become fixed, as the time between acquisition and firing approaches zero and because laser energy travels at the speed of light.

The laser system must have the capability to attack short dwell targets. These are targets "that are vulnerable for a time short enough that their vulnerability is determined by the exposure time, rather than by characteristics of an attacking weapon."[39] Targets

such as mobile Scud or cruise missiles fall in this category. To be effective in this environment, designers and operators must minimize the time between target acquisition and weapon firing. Algorithms which allow autonomous attack of specific priority targets with verifiable signatures may be appropriate against short dwell targets in certain scenarios. This may involve taking man out of the firing loop against these fleeting targets once commanders have made the decision to engage this type of target.

A mix of space weapons will offer the capability to destroy various types of surface and sub-surface targets. "Continuous lasers deposit heat and kill by melting structural members."[40] On the other hand, "pulsed lasers vaporize material, produce impulse by recoil, penetrate surfaces, and break structural elements."[41] Kinetic energy weapons offer the capability to attack targets by "[penetrating] hundreds of feet into the earth."[42]

The technology required to make these directed energy systems a reality is coming to maturity. In some cases, the developing capabilities exceeds the initial projections for these systems.[43] Technologies to bring other ideas to fruition are still 30 years out,[44] but these ideas offer the greatest promise in reaching the goal of the application of instantaneous global strategic force. As these technologies mature, the United States will achieve the next asymmetry in warfighting technology.

Presented with the fact that technology in the 21st century will allow the Air Force to conduct strategic air and interdiction campaigns without deploying forces raises three collateral issues. First, the ability to conduct a strategic air or interdiction campaign without deploying forces obviates the need for overflight or basing rights. This, in turn, allows the United States freedom of action in the small number of occasions when political constraints do not allow the time or possibility of forming a coalition.

Second, if the Air Force does not need to deploy aircraft to conduct the strategic attack, interdiction, and air superiority missions will the US need these aircraft in its force structure after 2030? What are the associated impacts on logistics support structure and basing?

Third, the Air Force must consider whether close air support (CAS) is still an Air Force mission. Attacks against fixed targets outside the ground commander's area of responsibility will be relatively simple to coordinate and execute from the CONUS. Coordination of attacks from space against moving targets within proximity of friendly ground troops will be more difficult to coordinate and may not be appropriate due to the (real or perceived) risk of fratricide. Perhaps as the air superiority, strategic attack, and interdiction missions transition to space, the CAS mission (if still conducted by air-breathing assets) should revert to the US Army. Doing so would provide the ground commander with an integral fixed wing capability to provide firepower in support of his or her scheme of maneuver and relieve the Air Force of the need to deploy and sustain forces for the CAS mission.

While working to develop the offensive capability to apply force from space, the Air Force must not neglect a defensive capability against similar weapons. While studies on the strategic environment assume that the United States will not have a peer competitor for up to 20 years,[45] some of these technologies are that far away. It is true that "global presence with weapons capable of destroying or disabling anything that flies, in the air or in space, or anything on the ground or on the surface of the sea that is unprotected by armor, will drive a new warfare paradigm."[46] It is also true that "in that new paradigm, the very weapons that drive it will become threatened by their own kind, and the eternal

measure-countermeasure contest will be renewed with new dimensions of technology and tactics."[47]

Agile Combat Support

Participants at the Fall 1996 CORONA conference added agile combat support as a separate Air Force core competency. They did so to stress the "integral nature of deployment and sustainment to operations."[48] The transition to conducting warfare from space will not only make major changes in the Air Force with respect to warfighting missions, it will significantly alter the Air Force's support structure as well. Concepts of deployment, sustainment, and protection of aerospace forces will change as much, if not more than operational doctrine.

When warfare makes the transition to space, the deployment needs of the warfighting force will change drastically. Large deployment packages to the combat theater will not be necessary, because fewer (if any) fighter or bomber squadrons will deploy.

The ability to strike strategic targets from the CONUS will reduce the need to preposition or transport personnel and materiel to the theater. There will be large transportation savings since there will be no need to move bulky items, such as munitions for strategic targets to the theater. Logisticians will also see decreased sustainment requirements, because of the reductions of in-theater personnel. All of this is consistent with the USAF recognition that "the days of deploying masses of [materiel] to an overseas operation are coming to an end"[49] and the desire to reduce the mobility footprint of those units which do deploy.

The Air Force will also be able to significantly decrease its peacetime logistics tail due to the shift to space warfare. With the decrease in the number of fighter and bomber

units will come a commensurate decrease in the need to support these forces. The decrease in the number of Air Force aircraft combined with commonality of parts between the services on the remaining aircraft will cut Air Force depot requirements in half.

Agile combat support "includes not only 'lean logistics', but also force protection."[50] The transition to space operations will decrease the need for as many in-theater force protection assets. However, fighting the war from the CONUS means that protection for the force may be required at home when the focus of the contingency operation is halfway around the world. Mantz outlines several scenarios.[51] Especially important will be protection of satellite launch sites to ensure continued access to space. Equally significant will be the critical satellite uplink and downlink facilities through which the Air Force will execute space control and force application missions against enemy targets. As an increasing percentage of combat operations becomes CONUS and space based, US communications and intelligence gathering capabilities at home become more important to defend.

To prepare for this eventuality, the mission of Air Force security units must evolve past air base defense into a more robust capability for rear area security. This will involve integration of Air Force security units with units from its sister services, as well as local, state, and national law enforcement agencies. Responsibilities will overlap, especially during peacetime and short duration contingency operations.

Rapid Global Mobility

Rapid global mobility is key to the ability of the United States to project power and sustain that power once deployed. Mobility assets move to the combat theater the

personnel from all services, who along with their materiel, project force against the enemy.

At first glance, it appears the transition to warfare in space will only indirectly affect the Air Force core competency of rapid global mobility. As discussed earlier, the ability to conduct warfare from space will decrease the number of fighter and bomber squadrons which must deploy to the theater of operations. The decrease in the number of deployed units will reduce the demand on airlift since not as many forces need to move to the theater. There will also be proportional decreases in replenishment by air and sea since non-deployed units do not require in-theater replenishment. One result is that joint planners can then task airlift and sealift for other missions. A second is that the decrease in airlift requirements will enable the Air Force to more rapidly respond to other types of mission tasking (e.g., humanitarian airlift, special operations, support of Third World nations) within the available force structure.

There is, however, a second view. Space operators working with airlift planners will provide the key to keeping global mobility viable in the next century. Security of overseas lines of communication is a center of gravity for the United States. Without the ability to project forces across the oceans, and to sustain that combat power once deployed, the United States will be unable to accomplish its military objectives. Space technologies which protect mobility assets during loading, while en route to the operational theater, and while off-loading cargo at the destination would prevent an enemy from attacking this US center of gravity.

Modifications to sensor technologies might allow space assets to detect an impending attack on a mobility asset. Future force projection capabilities should allow space assets

to "de-louse" mobility assets under attack. The Air Force must develop technologies which offer full-dimensional protection from space to airlift and sealift assets throughout their mission profiles.

Field Manual 100-20: Command and Employment of Air and Space Power

The core competencies just discussed form the lens through which to view the changes the Air Force must make to adapt to the changes warfare in, from, and through space will bring to the nation. What is still missing is an overarching space doctrine to bridge the gap between these core competencies and the acquisition process. Looking again at the development of the Army Air Corps in World War II may provide insight to the type of doctrine the Air Force needs to facilitate future space operations.

Following the Allied landings in North Africa in 1942, the US Army Air Corps had its first chance to support ground forces in the European theater. Ground commanders "parceled out [US airpower] to support specific ground units with mission priorities set by supported ground commanders. With a divided force, airmen were unable either to seize control of the air or to provide effective support for the ground forces in the face of centrally controlled and concentrated *Luftwaffe* resistance."[52] To redress the "bitter experiences"[53] of North Africa, the War Department issued Field Manual (FM) 100-20 on 21 July 1943.[54] This document gave airpower a coequal status with land power and centralized control of theater air operations under the command of an airman.[55] As the Air Force celebrates its 50th anniversary, it is appropriate to return in the following paragraphs to the format and text of this landmark document[56] to provide a foundation for future Air Force space doctrine.

Relationship of Forces

Land power, naval power, and aerospace power are coequal and interdependent forces. Neither is an auxiliary of the other.

Doctrine of Employment

Gaining air, space, and information superiority is the first requirement for the success of any major military operation on the face of the earth. Air and space forces may be properly and profitably employed against enemy sea power, land power, air power, and space power. However, terrestrial military forces operating without air and space superiority must take such extensive security measures against hostile air and space attack that their mobility and ability to defeat enemy surface forces are greatly reduced. Therefore, air and space forces must be employed primarily against the enemy's air and space forces until air, space, and information superiority are obtained. Only in this way can destructive and demoralizing air and space attacks against surface forces be minimized and the inherent maneuver and firepower of modern land, sea, and air forces be exploited to the fullest.

Command of Air and Space Power

The inherent flexibility of air and space power is its greatest asset. This flexibility makes it possible to employ the whole weight of the available air and space power against selected areas in turn. Such concentrated use of the aerospace striking force is a battle winning factor of the first importance. If this inherent flexibility and ability to deliver a decisive blow are to be fully exploited, control of available air and space power within the theater must be centralized, and command must be exercised through the joint force

air component commander (JFACC)—dual-hatted as the joint force space component commander.[57] Therefore, the command of air, space, land, naval, marine, and special operations forces in a theater of operations will be vested in the theater commander-in-chief (CINC), or as designated to a joint task force commander. This commander will exercise command of air and space forces through the joint force air force component commander and command of ground forces through the land component commander.

These projections of changes to the Air Force core competencies and doctrine offer one possible view of the future. It is not important that the Air Force accept this vision of the future. What is important is that the Air Force develop a doctrine to guide emerging space warfare technologies. It is not too early to begin. Research into applicable technologies is ongoing. Only by developing both the doctrine and the technologies in concert can the Air Force match the strategy of applying military power from space to the strategic requirements the coming century will bring.

Notes

[1]*Contrails: The Air Force Cadet Handbook*, Vol 20. (USAF Academy, Colorado, 1974), 186.

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[3]Smith, 121.

[4]My thanks to Dr. Carl Builder, RAND Corporation, for his inspiration in this area. His book *The Icarus Syndrome* helped put the ends and the means of airpower, and by extension space power, into focus.

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[6]General Ronald R. Fogleman, USAF Chief of Staff, "Global Engagement," Address. Smithsonian Institution, Washington, DC, 21 November 1996; on-line, Internet, 30 November 1996, available from http://www.dtic.mil/airforcelink/pa/speech/current/Global_ Engagement.html.

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[13]"Global Engagement: A Vision for the 21st Century Air Force." Slides and Notes. 12 November 1996, n.p.; available through Air War College Local Area Network, 26 November 1996.

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[15]US Air Force Long Range Plans Division. "Global Engagement: A Vision for the 21st Century Air Force," 6.

[16]US Air Force Long Range Plans Division. "Global Engagement: A Vision for the 21st Century Air Force," 7.

[17]The Honorable Sheila E. Widnall, Secretary of the Air Force, "Adapting to an Altered Strategic Environment," Address. Center for Strategic and International Studies, Washington, DC, 25 November 1996; on-line, Internet, 30 November 1996, available from http://www.dtic.mil/airforcelink/pa/speech/current/Adapting_To_An_Altered_Strategic_Environment.htm.

[18]The Honorable Sheila E. Widnall, Secretary of the Air Force, "Adapting to an Altered Strategic Environment."

[19]Major James G. Lee, *Counterspace Operations for Information Dominance.* (Maxwell Air Force Base, AL: Air University Press, 1994), 19.

[20]Lee, 27.

[21]Major General Hayword S. Hansell, Jr., *The Air Campaign that Defeated Hitler,* (Atlanta: Higgins-McArthur/Logino & Porter, Inc, 1972), 15.

[22]David MacIsaac, *Strategic Bombing in World War II,* (New York: Garland Publishing, Inc., 1976), 7.

[23]Major Victor B. Anthony, "The Combined Bomber Offensive in Europe" in *History 202: Modern Warfare and Society,* Edited by the Staff of the Department of History, United States Air Force Academy, USAF Academy, CO, 1976, 30-33.

[24]Sir B. H. Liddell Hart, *History of the Second World War,* (New York: G.P. Putnam's Sons, 1971), 591.

[25]The Honorable Sheila E. Widnall, Secretary of the Air Force, "Adapting to an Altered Strategic Environment."

[26] Lt Col Michael R. Mantz, *The New Sword: A Theory of Space Combat Power,* (Maxwell Air Force Base, AL: Air Univiersity Press, 1995), 36-46.

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[30]USAF Scientific Advisory Board. "Space Technology Volume," 8.

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[32]USAF Scientific Advisory Board. "Space Technology Volume," ix.

[33]USAF Scientific Advisory Board. "Space Applications Volume." *New World Vistas: Air and Space Power for the 21st Century.* Report to the USAF Chief of Staff. (Washington, DC: Government Printing Office, December 1995), xvii, xxii, 76, 115, 117.

[34]USAF Scientific Advisory Board. "Space Applications Volume," xvii.

[35]Precision engagement is more broadly defined in *Global Engagement*. However, only this capability of precision engagement will be possible in the next 30 years using space-based weapons.

[36]USAF Scientific Advisory Board. "Space Technology Volume," ix.

[37]USAF Scientific Advisory Board. "Space Technology Volume," ix.

[38] Mantz, 46.

[39]USAF Scientific Advisory Board. "Summary Volume." *New World Vistas: Air and Space Power for the 21st Century.* Report to the USAF Chief of Staff. (Washington, DC: Government Printing Office, December 1995), 40.

[40]USAF Scientific Advisory Board. "Space Applications Volume," xxii.

[41]USAF Scientific Advisory Board. "Space Applications Volume," xxii.

[42]USAF Scientific Advisory Board. "Space Applications Volume," 83.

[43]USAF Scientific Advisory Board. "Directed Energy Volume." *New World Vistas: Air and Space Power for the 21st Century*. Report to the USAF Chief of Staff. (Washington, DC: Government Printing Office, December 1995), v.

[44]USAF Scientific Advisory Board. "Directed Energy Volume," vii.

[45]General John W. Vessey Jr., "1996 Thayer Award Acceptance Remarks," *Assembly*, January/February 1997, 25.

[46]USAF Scientific Advisory Board. "Directed Energy Volume," xiii.

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[48]"Global Engagement: A Vision for the 21st Century Air Force."

[49]The Honorable Sheila E. Widnall, Secretary of the Air Force, "Adapting to an Altered Strategic Environment."

[50] General Fogleman, "Global Engagement."

[51]Mantz, 49-56.

[52]Air Force Manual (AFM) 1-1, *Basic Aerospace Doctrine of the United States Air Force*, vol. 2, March 1992, 113.

[53]AFM 1-1, vol. 2, 113.

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[54]War Department Field Manual 100-20, *Command and Employment of Air Power*, 21 July 1943.

[55]AFM 1-1, vol. 2, 122.

[56]The reader will note that the headings and text of the next three sections are taken in large part from the 21 Jul 1943 edition of FM 100-20, *Command and Employment of Airpower* and are modified with appropriate references to emerging space doctrine.

[57]It is important not only to maintain control of air and space assets in the theater, but on a global basis as well. The possibility exists that space assets will concurrently be supporting operations in more than one theater of operations. Just as the JFACC currently coordinates for out of theater long-range bomber aircraft with the owning command (e.g., Air Combat Command through US Atlantic Command) so he or she will task USSPACECOM as a supporting CINC when theater missions require satellites to provide air defense or kill terrestrial targets. This will be done through the Air Tasking Order process.

Chapter 4

Conclusions and Recommendations

> *Undoubtedly the most provocative subject in any discussion of the future of space is the subject of space weapons and the likelihood of their use. . . .: Space-based lasers to shoot down hostile ICBMs, space weapons that attack other satellites, or weapons released from space platforms that destroy terrestrial targets. Today, these kinds of systems clearly break the current thresholds of acceptability and introduce Anti-Ballistic Missile Treaty issues, social and political reservations. But the 21st century could well see a change. If there is a change, I believe it will be driven by the proliferation of greater and greater range ballistic missiles. If this threat materializes, space weapons will probably be considered as they are cost effective, accurate and less vulnerable than terrestrial options.*[1]
>
> —Gen Thomas S. Moorman, Jr.
> USAF Vice Chief of Staff

The intent of the arguments presented has been to spark discussion on the future of the United States Air Force as it begins the transition to warfighting in space. Similar to the state of airpower at the end of World War I, the Air Force has seen a vision of what space power can offer the nation in the coming decades if technology, doctrine, and strategy all advance.

Over the last four decades, the United States has become more and more reliant on space. So too, has its military. The eyes and ears of the nation are now firmly rooted in space; the military depends on satellites for robust combat support. As the United States becomes more reliant on space assets for its everyday existence—it becomes increasingly

vulnerable to adversaries, who unlike Saddam Hussein in the Gulf War, will try to take these eyes and ears away from US forces.

The vulnerability (whether perceived or actual) of United States space assets and those of our allies will inevitably drive the United States to militarize space, just as in bygone eras people who felt similar vulnerabilities to their homes, commerce, and way of life, militarized the land, the sea, and the air.

Now is the time for the nation and its Air Force to begin assessing the technology and the strategy for conducting warfare in this medium. Many of the systems which the US will need to make this transition are now, or in the next 30 years will be, technologically feasible. These include, but certainly are not limited to, space-based and ground-based lasers, and kinetic energy weapons.

From a national perspective, the United States must overcome political, economic, and legal hurdles as well as expand existing policy to facilitate military operations in space. The largest hurdles may be internal to the Air Force itself, as it sees its traditional means of employing airpower, the fighter and bomber aircraft, becoming outmoded technologically and disappearing. In light of this transition, the Air Force must reassess operational and doctrinal principles as it makes the inevitable transition of its warfighting medium from air to space.

To begin this transition, the results of this review indicate the Air Force should make the following changes:

Redesignate US Air Force Space Command as Space Combat Command. This new name more accurately reflects the developing mission of this command and demonstrates

to the Air Force, to the military, and to the American people the changing nature of Air Force operations in space.

*Energetically return to the roots of strategic airpower doctrine to form the bridge between its core competencies and the acquisition process***.** What the Air Force needs to aid its transition from an air force to a space force is an overarching strategy and coherent doctrine for space operations. By looking to its past, the Air Force will find that the strategy to guide this transition already exists. Only the means, not the ends, of airpower theory are changing. Whether using B-17s over Germany, F-117s over Baghdad, or ground-based lasers reflecting off space-based mirrors in the 21st century, the goal of air and space power remains to take the war to the heart of the enemy nation and attack his strategic center(s) of gravity without first having to fight through his fielded ground forces. As byproducts, this strategy must isolate the battlefield and provide full-dimensional protection to national and allied resources at home and abroad.

Doctrinally, the Air Force is in a better position to make this transition than many may imagine. The newly announced core competencies form the basis of the transition. Careful examination of each reveals they are as applicable to warfare in the high ground of space as they are to warfare conducted with air-breathing assets. The overriding need for global awareness and information access will form the basis for efforts to develop and maintain full-spectrum information superiority. Air and increasingly space superiority will remain a prerequisite for all other operations in the aerospace environment. Through space superiority, the US will take the initiative, protect our space assets and maintain freedom of action. Without air and space superiority, the US will yield freedom of action and allow the enemy to dictate the tempo of the war. The concept of global attack will

expand to include the capability to attack any target on the face of the earth in a matter of minutes and to engage that target precisely, with selective, yet decisive force. The accompanying transition to warfighting from the CONUS will increase the demand for agile combat support and full force protection at home. Finally, the decreasing need to deploy large numbers of fighter and bomber units will increase the ability of limited mobility assets to meet other transportation requirements.

Vigorously pursue space weapons technologies such as ground-based and space-based lasers, kinetic energy weapons, and others to support the strategy of strategic bombardment in, from, and through space.

Integrate air and space operators in the development of both space doctrine and technology. This is imperative to the successful transition from air to space warfare. The technology will not meet the need in an operational environment unless operators have been involved in its development, testing, and deployment. Those who ultimately bear the responsibility for employing the forces in combat must share the responsibility for the development of the appropriate employment doctrine. Security is no longer an appropriate reason to inhibit this process. It is past time to open the green door and let the warfighter in.

Meld at least portions of the requirements directorates at "Space Combat Command" and Air Combat Command. Doing so will ensure the concept exploration phase of the acquisition process for modification programs as well as future new starts fairly consider both airborne and spaceborne alternatives to military needs.

Include academics on both the subject of the military in space and on the desired ends (as contrasted with the means) of the strategic bombardment mission in the new

post-commissioning course of instruction at Maxwell Air Force Base. Some of the lieutenants going through this course in the next five years will become the general officers charged with implementing the ultimate change from an air to a space force when these technologies mature in thirty years.

Finally, Air Force leaders must pave the way for the nation and the Air Force to follow. Top-down leadership will be critical in helping both the Air Force and the American people understand the need for this transition. Recent speeches, many quoted herein, indicate this transition has begun and the leadership commitment is present. The haunting question at the end of this study is: can the Air Force make the internal changes necessary to enable the strategic application of airpower from and through space, even if it means giving up fighter and bomber aviation in the process?

Notes

[1] Gen Thomas S. Moorman, Jr. USAF Vice Chief of Staff, "The Challenges of Space Beyond 2000," Address. 75th Royal Australian Air Force Anniverary Airpower Conference, Canberra, Australia, 14 June 1996; on-line, Internet, 30 November 1996, available from http://www.dtic.mil/airforcelink/pa/speech/current/The_Challenge_of_Space_Bey.html.

Afterward

This assignment has given me a tremendous opportunity to think about the development of our Air Force to date and the future changes which must take place to assure the United States retains its technological superiority and therefore, combat edge as we move into the first half of the 21st century.

One of the questions many have asked as they have given of their limited time to review and provide comments on my efforts is whether I am advocating a separate space force to execute the doctrine outlined in this paper. I have attempted to leave this emotionally charged issue out of my paper, but feel it deserves comment. At this time, my answer is no.

Advocates of a separate space force state that the same arguments airpower advocates made in the 1930s and 1940s with respect to a separate air force are true today when applied to separation of a space force from the Air Force. In many cases this is true.

However, one thing has not changed as a result of conducting warfare in, from, and through space, and that one thing makes all the difference. That is the mission. The vision of airpower has always been to use the third dimension to take the war to the enemy's strategic center(s) of gravity, to destroy his capability or will to wage war, without first having to fight through his fielded forces. This was a different vision and mission from that of the Army in the 1930s and remains so today. What we see as space

forces in the next 50 years give the United States a new means to perform this mission—one that will be more effective, responsive, and will do so at less cost and with lower risk of human life. But it does not change the basic end—the nature of the mission. Just as naval forces currently operate on, above, and under the surface of the water to control sea lanes and project power ashore, air forces will soon project power from the media of air and space.

In the future, new missions for space forces may emerge—ones that provide a vision separate from that of air forces. I suspect that will come when space forces turn their attention away from the surface of the earth. When that time comes, our Air Force needs to be at the head of the line demanding the creation of a new and independent United States Space Force. To do otherwise would show a lack of vision; it would place Air Force leaders in the same position as Army leaders of the 1930s who were more interested in the sanctity of the organization than in providing the most effective combat power for the United States.

Glossary

AFM	Air Force Manual
ASAT	Antisatellite
AU	Air University
AWC	Air War College
CAS	Close Air Support
CINC	Commander-In-Chief
CONUS	Continental United States
DSP	Defense Support Program
DMSP	Defense Meteorological Support Program
DSCS	Defense Satellite Communications System
FM	Field Manual
GPS	Global Positioning System
JFACC	Joint Force Air Component Commander
SPOT	Système Probatoire d'Observation de la Terre
USAF	United States Air Force
USCINCSPACE	Commander-In-Chief, United States Space Command
USSPACECOM	United States Space Command

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