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HOW THE CURRENT VIEW OF THE AIR AND SPACE ENVIRONMENT INFLUENCES DEVELOPMENT OF MILITARY SPACE FORCES

by

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Preface

This is a paper on space written by an aviator and a logistician. We knew at the onset that we would need to invest a great deal of time simply to understand the issues surrounding space and space power development. Nevertheless, we chose this topic because it promised to be a fascinating project, and we thought our non-space backgrounds might bring a different perspective to the effort. We think the project has delivered on both counts.

First, we wish to thank our sponsor, Maj Gen Robert S. Dickman, DOD Space Architect. His interview and the doors he opened for other interviews provided much of the background information we used to develop our ideas. We are especially indebted to his executive officer, Lt Col Matt Brennan, who worked several issues for us during the interview process and offered sound counsel throughout this effort. We also wish to acknowledge Professor Dennis Drew, School of Advance Airpower Studies (SAAS), Maxwell AFB, for taking time to review our initial outline and draft documents. His recommendations helped refocus our effort at a critical point of development, and provided candid, perceptive, and practical input to the paper. We also want to thank Maj (Dr.) Roy Houchin, from SAAS, for his recommendations early on as we struggled to articulate the ideas of this paper, and later when he provided sound advice and direction following the submission of our first rough draft. His perspective and insight into the history of space power development helped mold the concepts we present.

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Finally, and most importantly, we wish to express our deepest thanks to our wives DeeAnn Rothstein and Trudy Anderson for their unwavering support and encouragement. We are truly blessed and thank them for enduring the long hours of research, the endless flow of outlines, and the constant review of draft documents.

We would be truly remiss if we didn't recognize the sacrifices our children made as well. Though too young to fully understand, Becca and Casey Rothstein were always patient and willing to wait for Daddy to finish that "one last thought." Nicole, Megan and Kyle Anderson, knowing that Dad was deeply entrenched in academia, took the time to encourage and to smile as Dad begrudgingly "went at it again."

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Abstract

Perceptions determine actions. The military's perception of the air and space environment influences the type of space forces it will develop in the future. This paper addresses this perception by answering the following question: How does the current view of the air and space environment influence the development of military space forces? The research method centered on surveying literature and interviewing DOD policy makers to develop the idea that the military's current organizational paradigm is a paradox that sees space as a medium, separate from air, while at the same time, bound to it physically, theoretically, and historically. This paradox creates a dilemma that influences the military's ability to advocate and justify requirements, and ultimately garner resources to develop a viable space force. The paper develops measures of merit to show organizational evidence of how these linking and separating positions of the paradigm express themselves within the military. This has both positive and negative aspects for space force development. It promotes a healthy climate for debate, but at the same time, frustrates DOD's ability to generate a healthy concept-pull environment. The paper concludes by opening the door to ideas for resolving the dilemma the current paradigm presents.

Chapter 1

Introduction

> *Air and space power is a critical—and decisive—element in protecting our nation and deterring aggression. It will only remain so if we as professional airmen study, evaluate, and debate our capabilities and the environment of the future. Just as technology and world threat and opportunities change, so must our doctrine. We, each of us, must be the articulate and knowledgeable advocates of air and space power.*
>
> —General Michael E. Ryan

Space is the next great arena for exploration and exploitation. One is limited only by imagination to the wonders, challenges and excitement the next century will bring. Already, civil and commercial sectors have invested billions of dollars in space and the nation's military recognizes its role to protect these interests. It also recognizes the potential space itself brings to war fighters around the globe. But debate within the military on how to best exploit this new medium continues. Basic questions still arise: why is space critical to the military, what type of military space force is needed, and who should control these forces? The answers to these questions will drive the future direction the military takes in space. Fundamentally influencing these answers is the military's organizationally held perceptions of the air and space environment itself. The military's view of this environment not only shapes the role the military sees for itself in space, but affects how it develops space forces necessary to support that role. The topic of this paper centers on this idea. More specifically, this paper answers the following

research question: *How does the current view of the air and space environment influence the development of military space forces?*

The research method used to answer this question and to develop the concepts of this paper revolved around the following key processes. The first consisted of a comprehensive literature search and review. This process served to educate the authors on the existing schools of thought with respect to the mediums of air and space and with respect to the development and application of airpower and space power. The second process involved interviewing personnel serving in key functional areas of responsibility within the Department of Defense (DOD), the Joint Staff, the Air Force and other services. Interviewees included the acting Deputy Undersecretary of Defense (Space), the DOD Space Architect, and the Secretary of the Air Force's director for space acquisitions (SAF/AQS). These interviews provided valuable insight into the issues surrounding the development of military space forces, and gave a glimpse into the mindset and thinking of space issues at higher levels of DOD leadership.

This paper explores the notion that a dilemma faces the military that directly influences its ability to advocate, identify and justify requirements, and ultimately garner resources necessary to develop a viable military space force. The paper presents this notion in the following chapters. Chapter 2 describes the military's current organizational paradigm, or framework of perceptions, of the air and space environment. This perceptive framework has a paradox inherent within it that sees space as a medium, separate and distinct from air, but at the same time, recognizes that air and space are bound physically, theoretically, and historically. Chapter 3 introduces three core questions the paper uses as measures of merit. Answers to these questions provide the

ability to measure how the current paradigm expresses itself within the military. Chapter 4 applies these measures of merit and describes the military's organizational positions within the context of the paradigm that in some instances tend to link air and space, while in others, tend to separate them. Chapter 5 evaluates the paradigm's influence on the development of military space forces by exploring how it has fostered both positive and negative aspects toward this effort. This chapter provides the answer to the paper's research question. Finally, chapter 6 draws conclusions and opens the door to ideas for resolving the dilemma that the current paradigm presents. Describing this paradigm is an appropriate place to start.

Chapter 2

The Current Paradigm

> *Visions of the future always reflect the experience of the moment as well as the memories of the past. They are imaginative constructs that have more to say about the times in which they were made than about the real future, which is, ultimately, unknowable.*
>
> —Joseph J. Korn

To understand how the military's current paradigm of the air and space environment influences the development of military space forces, it is important to first examine the paradigm itself. A paradigm is the way one perceives, understands, and interprets an environment.[1] It provides the foundation that shapes and molds one's thinking with respect to that environment, and ultimately impacts how one chooses to act upon it. A paradigm can exist at individual as well as organizational levels. The military, as an organization, ascribes to a paradigm of the environment that includes both air and space. What is this paradigm?

Describing the Current Paradigm

The Relationship that Separates Space from Air

Current military thought suggests that space is a medium separate and distinct from the atmosphere with physical characteristics unique enough that a barrier forms between the two. The atmosphere is a realm of substance offering the advantages of protection

from radiation, thermal transfer of heat and the ability to produce and control lift and drag. These aspects of the air medium make it considerably different than the realm of space. Space is void of substance, offers no protection from harmful radiation, and allows only the balance between thrust and gravity with which to maneuver.[2] Space is widely considered a fourth medium—distinct from land, sea and air—through which military power can be applied.

Today, the military routinely operates within the atmosphere, but current technology does not yet offer routine and affordable access to space. The military has not yet been able to overcome the technological obstacles of space operations to a point where it can fully exploit the medium. Essentially, then, the different physical characteristics between air and space, coupled with the differing technologies required to operate within the two mediums, serve as continual reminders of the unique characteristics that separate them.

An example of the distinction organizations within the military tend to hold between the mediums of air and space is seen in the current United States Space Command (USSPACECOM) *Vision for 2020*. Forwarding the joint war fighter's perspective, the document describes the medium of space as "the fourth medium of warfare—along with land, sea and air."[3] Elsewhere in the document, to support its visionary statement of "dominating the space dimension of military operations," USSPACECOM states it will operate "in the space medium."[4]

The Air Force comes from a different organizational perspective but takes on a similar view in the Draft Air Force Doctrine Document 2-2, Space Operations. Chapter 3 of this document opens with an epigraph from Gen Ronald R. Fogleman, USAF that states:

> When you think about protecting this nation's global interests, you have to remember it starts with space. It's a presence with a real impact.… Because of what we do in the space medium, I would suggest that space is the fourth dimension of warfare.[5]

Draft AFDD 2-2 further addresses the role of space as a fourth medium by describing space force operations as controlling the "space environment."[6] Clearly, both USSPACECOM and the Air Force, as the military's two leading advocates of space, fundamentally recognize space as a fourth medium, separate and distinct from the atmosphere.

The Relationships that Link Air with Space

While space is accepted as a separate medium, there exists, however, a nagging perception that space and the development of space power is somehow linked or even unified with air and the development of airpower. This section addresses that relationship, showing how the two mediums are tied physically, theoretically and historically.

While the physical borders between the land, sea and air are readily evident, the physical border between air and space is not as clear. The atmosphere gradually disappears and space gradually starts. Furthermore, from a physical point of view, earth's entire connection to space is through the atmosphere. Every movement into space begins with movement through air. Thus, from a physical point of view, space is linked with air.

From a theoretical point of view, air and space both provide a vantage point above the earth that has tremendous military value. Exploiting the "high ground" is the focus for the development of airpower and space power. This "high ground" similarity carries inherent with it many of the same theoretical power projection and power application

capabilities. The physical ties and theoretical similarities between air and space provide an understandable connection that has developed historically over time.

From a historical point of view, space development is rooted in and sprang from the experiences and traditions of airpower development. While man's physical leap into space is marked in history with the Soviet launch of Sputnik I on 4 October 1957, American efforts to develop the realm were well underway prior to that date. The seeds for America's space effort were born in the mid-thirties within the professional relationship between Gen Henry H. "Hap" Arnold and Dr. Theodore Von Kármán.[7] Arguably these seeds were "sown" with the 1946 publication of a US Army Air Forces' sponsored Project RAND study on the feasibility of a "world-circling spaceship." Indeed, words from this document embody the historical perspective of air with a futurist's view for the potential of space and space power development:

> In making the decision as to whether or not to undertake construction of such a [space]craft now [1946], it is not inappropriate to view our present situation as similar to that in airplanes prior to the flight of the Wright brothers. We can see no more clearly all the utility and implications of spaceships than the Wright brothers could see fleets of B-29s bombing Japan and air transports circling the globe.[8]

A case can be made that the beginnings of space power arguably start nearly 200 years ago when man first defied the laws of gravity with balloons. The experiences of manned flight embodied in theories and doctrines of airpower today continue to influence space power development.

The Current Paradigm

The military's current view of the air and space environment seems to simultaneously focus on opposing relationships between the two mediums. Air and space represent two distinct realms; yet, at the same time, they are difficult, if not impossible, to

separate because of their similarities. These two relationships exist coequally and undeniably, and come together to form the following organizational paradigm of the air and space environment: *Space and the atmosphere represent two distinct medium environments physically different from each other; while at the same time, they are physically linked, and theoretically and historically tied.*

Consequence of the Paradigm

The organizationally held paradigm of the air and space environment presents a paradox—a situation that is seemingly contradictory or inconsistent—between air and space. Space is separate from, and at the same time, tied with air. This paradox raises a dilemma that shows itself in the debate over military space force development. Central to the thesis of this paper is the question of how this dilemma influences the development of military space forces. Before addressing this concern specifically, Chapter 3 establishes criteria to measure how the current paradigm expresses itself in the military.

Notes

[1] Stephen R. Covey, *The Seven Habits of Highly Effective People, Restoring the Character Ethic,* Simon and Schuster, Inc., New York, NY, 1989, 23.

[2] The School of Advanced Airpower Studies, *The Paths of Heaven: The Evolution of Airpower Theory*, edited by Col Phillip S. Meilinger, Air University Press, Maxwell Air Force Base, Alabama, 1997, Chapter 13, 540–563. In this chapter, Maj Deblois offers a detailed discussion of a realm comparison between air and space concluding that the two mediums are indeed separate and distinct—an argument that furthers the issue of the paradigm being discussed here.

[3] *United States Space Command Vision for 2020,* United States Space Command, Peterson Air Force Base, Colorado, 1997, 3.

[4] Ibid., 7.

[5] Air Force Doctrine Document 2-2 (Draft, March 1998), *Space Operations*, Air Force Doctrine Center, United States Air Force. Available from http://www.hqafdc.maxwell.af.mil. 15.

[6] Ibid., 5.

Notes

[7] David N. Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership,* Air Force Space Command, United States Air Force, Peterson Air Force Base, Colorado, 2.

[8] *Preliminary Design of an Experimental World-Circling Spaceship,* Douglas Aircraft Company, Inc., Santa Monica Plant Engineering Division, Report Number SM-11827, Contract number W33-038 AC-15105, 2 May, 1946, 1.

Chapter 3

Measures of Merit

The current paradigm, as discussed in chapter 2, describes the way the military, as an organization, views the relationship between air and space. This chapter presents three core questions to evaluate the paradigm: *who* should advocate and lead the development of a military space force, *why* does the military need a space force, and *what* should the military do in space? While basic and not all-inclusive, these questions strike at the heart of the issues surrounding space force development. Their answers focus specifically on advocacy, or who will act as lead agent; justification, or why it's needed; and requirements or what is needed.

These questions serve as measures of merit that provide a means to assess the influence and effectiveness of the current paradigm. As their answers describe the conceptual foundation upon which military space forces are built, they offer an objective means with which to evaluate the current paradigm.

The questions are also useful to objectively assess alternative paradigms that may shift or broaden views about the relationship between air and space. The strength of these alternative paradigms rests on the degree of congruency that exists among the answers generated from these core questions. A better paradigm is one that fosters more

congruency among the arguments that advocate, justify and identify requirements for military space forces.

The first section of this chapter presents each of the core questions and discusses their relevance as measuring tools. The second section focuses on how using these questions together will determine the value of the current paradigm.

Core Questions

The Question of "Who"

Who should lead and develop military space forces? This question addresses the need to focus on finding the best organization, or mix of organizations, to advocate a military space force. Military space advocates must be able to justify—on military grounds alone—the necessity of military forces in space. These organizations are the stewards that provide both administrative control over the forces that support military space power, and the war-fighting control of these forces during employment of that power. A space force advocate embraces and promotes the ideals for a military space force, and garners the support necessary to establish such a force.

The Question of "Why"

Why does the military need a space force? The answers to this question shape military space force development by providing a sense of long-term direction, describing how such a force would serve national interests, and prescribing a force structure to fulfill that need. They are foundational answers that ultimately form the basis for space power theory and enable the military to articulate and justify reasons for a military space force. As the military more clearly articulates why space forces are needed, the better it is able

to identify specific requirements necessary to achieve those forces. Thus, this question and the next are closely tied together.

The Question of "What"

What should the military do in space? The answers to this question bring the focus from broad to specific. They help formulate the functions and missions of a military space force, and provide the framework for establishing detailed force requirements.

Significance of the Questions

Collectively, these core questions provide a firm basis for evaluating the current paradigm. Their answers describe the foundations of a concept-pull environment where ideally, long-term vision and direction drive requirements and resource allocation.

A healthy concept-pull environment is critical for three reasons. First, it directs technology growth by supplying clearly defined needs upon which this growth can focus. Second, it saves dollars by bringing efficiency to the development process. Finally, it generates a sound platform from which the military can articulate to Congress the reasons for funding these requirements. A healthy concept-pull environment insures that in something as complex as the development of military space forces, the short-term and pragmatic resource allocation process is efficiently linked to the long-range vision and planning process.

Today, the necessity of this concept-pull environment is critical to any federal program's ability to survive and mature within the context of the national budget system, where the total dollar value of requested requirements exceeds the resources available to fund them. Therefore, resource allocation decisions rest heavily, or arguably entirely,

upon how well the advocates of any program can articulate and justify the program's requirements. In other words, the more clearly the *why* and *what* is understood and delivered by the most appropriate *who*, the more likely programs will receive Congressional funding and ultimately succeed within the resource allocation process.

To summarize, the answers to the question of *who* establish the advocates for a military space force development. The answers to the questions of *why* and *what* together develop and identify long term direction, and offer short-term input to the resource allocation process. The next chapter examines the answers to these core questions in the context of the current paradigm and its inherent paradox.

Chapter 4

Measuring the Current Paradigm

As previously described the military's current organizational paradigm of the air and space environment presents a paradox. On one hand, space is a physically distinct medium separate from the atmosphere, while on the other, space is physically linked, and theoretically and historically tied to it. This paradox clearly expresses itself within today's military when one applies the questions introduced in the last chapter and analyzes the various organizational answers that exist to these questions.

The discussions that follow use the core questions of *who, why,* and *what* to measure the organizational positions and trends concurrently existing or developing within the military that, in some instances, bind air and space together, while in others, push them apart. In no way is the attempt made here to judge these positions; instead, the purpose is to objectively show how both sides of the paradigm reveal themselves within today's military. The first section of the chapter describes the linking aspect of the paradox by highlighting the organizational positions that tend to bind air and space. The second section focuses on the dividing aspect and examines the current positions that tend to separate them.

Conditions that Link Air and Space

There is supportable evidence across all three measures of merit to show that organizational tendencies are currently at work within the military to bring air and space together into one realm. The principle driver of these tendencies is the United States Air Force. The Air Force, as space's service advocate, has recently established a vision for the future that tends to unify air and space under the theoretical umbrella of airpower theory. This fact further expresses itself in the specific functions formally associated with air forces, which now seem to apply to space forces as well. The following discussion provides more detail of these linking conditions.

Advocacy (Who)

The Air Force has assumed the role as the military services' lead agent in space, and with it, the responsibility within DOD for organizing, training, and equipping space forces for the war fighters.[1] As such, the Air Force becomes a leading military advocate for space force development. While there are some subtle elements of Air Force advocacy that work to affect a separation of air and space (discussed later in this chapter), the advocacy role of the Air Force shows stronger evidence as a linking mechanism between the two mediums.

The Air Force is strengthening its embrace of space. This movement is showing itself throughout its current literature and doctrine but nowhere is it expressed more clearly than in the Air Force's current vision for the future—*Global Engagement: A Vision for the 21st Century Air Force*:

> Ensuring that air and space power continues to make its unique contributions to the nation's Joint Team will take the Air Force through a transition of enormous importance. We are now transitioning from an *air*

> force into an *air and space* force on an evolutionary path to a *space and air* force (original italics).[2]

This vision naturally works to link the two mediums together. If the Air Force were to support a separation of air and space, it would be advocating a position contrary to its vision. But, vision alone does not indicate organizational intent. A theoretical position exists that allows the Air Force to justify this vision. This position also provides evidence of a tendency to link the two mediums.

Theory (Why)

Theory, in large part, justifies the need for military forces. But while the theoretical writings of Clauzewitz, Mahan, and Douhet (among others) support the existence of the Army, Navy, and Air Force respectively, a military theory for space has not yet been developed. Perhaps in recognition of this void, or perhaps in deference to it, there are strong indications that the Air Force's organizational position is to use airpower theory to fill the military space theory vacuum. This too, clearly works to link air and space.

One indication of the Air Force's theoretical belief is actually found within the first sentence of the *Global Engagement* vision statement quoted above. This first sentence establishes the conceptual foundation on which the Air Force rests its vision:

> Ensuring that air and space power continues to make its unique contributions to the nation's Joint Team will take the Air Force through a transition of enormous importance.

A closer look at this sentence makes the point. The sentence does not say that "…air and space power *continue* to make *their* unique *contributions…*"—implying that airpower is a concept separate from space power. Instead, it says, "…air and space power *continues* to make *its* unique *contribution*—" Air and space, in this context, expresses the idea of a single power.

The grammatical construction of this sentence is as intentional as the theoretical position it supports. Draft Air Force Doctrine Document 2, *Global Engagement: Air and Space Power Organization and Employment*, literally poses this question: "Why 'air and space power' as opposed to 'airpower and space power,' or 'aerospace power?'" It then answers:

> The United States Air Force recognizes that air and space represent two different mediums, each with its own unique characteristics. The term "airpower" describes military force that is governed primarily by the laws of aerodynamics, and requires an atmosphere to maneuver in. "Space power," on the other hand, is governed by the laws of astrodynamics, particularly those concerning orbital mechanics. Thus, "aerospace is a misleading word that tries to connect two separate operating environments. However, both air and space power are forms of military force governed by the same principles of war, and the effects of both are similarly focused on warfighting results on the Earth's surface, and likely will remain so for the next several decades. **Both mediums enjoy the benefits of maneuver in the third dimension, which sets them apart from traditional land and sea combat** (original bold).[3]

The bolded part of this statement highlights not only the similar benefits air and space offer the war fighter, but also the theoretical common ground upon which the Air Force links the two.[4]

Further supporting this theoretical linking of air and space, *Global Engagement* articulates the inherent strengths of modern air and space power: speed, global range, stealth, flexibility, precision, lethality, global/theater situational awareness and strategic perspective.[5] These strengths were, in an earlier era, the fundamental capabilities upon which airpower established its uniqueness from land and sea power. Today, on the premise that space extends these "high ground" advantages over the earth's surface, the Air Force chooses to support the major theoretical similarities shared by air and space over the physical differences between them. And where the ideas inherent in airpower theory have previously provided the fundamental justification for military air forces, the

Air Force now embodies the term "air and space power theory" and uses these concepts to justify air and space forces.

Extending from this "broadened" theoretical framework, is current Air Force doctrine that also tends to link air and space together. Evidence of this emerges by analyzing some of the answers to the third measure of merit concerning what the military should to do in space.

Functions (What)

Title 10 of the U.S. Code assigns responsibility for roles and functions to the services. Given that, the functions the Air Force currently associates with its forces—the specific things air and space forces do—appear to be a direct reflection of the Air Force's position on its supporting theory. In the absence of a distinguishing or unique space power theory, and the tendency to use airpower theory in the interim, the functions airpower theory previously prescribed to only air forces have now expanded into space.

Air Force doctrine describes functions as the Air Force's broad, fundamental, and continuing activities of air and space power.[6] Remaining consistent with its theory position, the Air Force assigns no functions to space forces specifically. Instead, doctrine lists the seventeen "air and space power functions" collectively. In Table 1 below, the authors separate those functions that are undeniably specific to the air and space mediums alone. Though the categorization is subjective, what is apparent is that today almost all of the functions apply to both mediums. Some of them certainly tend more toward one medium than the other, and developing technologies will influence these tendencies, but what is clear is that the majority of functions are consistent with the Air Force's position on theory that air and space power is a singular concept.

Table 1. Air Force Functions Supporting Air and Space[7]

Air Only	Both Air and Space	Space Only
Airlift Air Refueling	Counterair Counterspace Counterland Countersea Strategic Attack Counterinformation Command & Control Special Operations Employment Intelligence Surveillance Reconnaissance Combat Search and Rescue Navigation and Positioning Weather Services	Spacelift

Thus, the functions currently described by Air Force doctrine can be considered a linking mechanism, drawing air and space together.

The Air Force, in its role as DOD's service advocate for space, has clearly indicated an organizational position subordinating the physical differences between air and space in favor of promoting their theoretical similarities. Its current vision embodies this concept, its position on "air and space power theory" justifies it, and the basic functions the Air Force sees for its forces, strongly support the aspect of the current paradigm that air and space are inextricably linked. There is, however, an equal amount of organizational support within the military furthering the paradigm's alternative perspective separating the two mediums.

Conditions that Separate Air and Space

Evidence also exists across all three measures of merit that show organizational tendencies within the military working to drive air and space apart. The following

discussions centering on advocacy, theory, and functions more closely examine these tendencies.

Advocacy (Who)

There are two points relevant in the discussion involving military space advocacy positions that tend to separate air and space. The first is found in USSPACECOM's position as the advocate for joint operational war-fighting requirements with regard to space forces. The second point involves the service perspective. Here, the subtle effects of cultural elements internal to the Air Force frustrate its official efforts to link air and space. Both serve as examples of organizational tendencies within the military that foster a division of the mediums.

The position of USSPACECOM, as the primary war-fighting advocate for space, is unique with regard to other unified commands.[8] It is the only unified command with its fundamental interest tied to a single medium and, as such, its position alone establishes a natural separating force between air and space. The current Commander-in-Chief of USSPACECOM supports the Air Force's claim to space, and says "…we are evolving toward becoming a Space and Air Force because space power and airpower are inextricably linked as components of the vertical dimension of warfare."[9] USSPACECOM's organizational position, however, speaks otherwise. The impact of this position is clearly seen throughout USSPACECOM's vision document *Vision for 2020*—arguably today's most articulate military vision for the space environment. For example, the document opens with the following discussion:

> Historically, military forces have evolved to protect national interests and investments—both military and economic. During the rise of sea commerce, nations built navies to protect and enhance their commercial interests. During the westward expansion of the continental United States,

> military outposts and the cavalry emerged to protect our wagon trains, settlements, and railroads.
>
> As air power developed, its primary purpose was to support and enhance land and sea operations. However, over time, air power evolved into a separate and equal medium of warfare.
>
> The emergence of space power follows both of these models. Over the past several decades, space power has primarily supported land, sea, and air operations—strategically and operationally. During the early portion of the 21st century, space power will also evolve into a separate and equal medium of warfare. Likewise, space forces will emerge to protect military and commercial national interests and investment in the space medium due to their increasing importance.[10]

Because USSPACECOM's interest lies purely in space it is not surprising that such a position would emerge as the basic premise for its vision document. USSPACECOM's very existence establishes an advocacy position that supports the separation of space from air.

The second point is found in cultural issues internal to the Air Force that compromise its ability to wholly advocate a linking of the two mediums. These issues tend to subtly work toward driving air and space apart. It is a problem apparent to the highest levels of Air Force leadership, and lies at the very heart of its institutional identity. At the October 1996 CORONA conference, the Air Force's long-range planning forum, one of the debated issues concerned how the Air Force should organize and integrate space forces within its organization. The official issue paper on this debate highlighted key factors that would affect any decision on this issue. Number one among them was the recognition that as the importance of space continues to grow within the context of ever-present budget uncertainty, advocacy for space capabilities becomes critical.[11] The discussion then recognized the following internal institutional issues that serve to undermine the Air Force's ability to advocate space:

- [Air Force] culture is generally dominated by an air-oriented [perspective] (operate and sustain manned aircraft at a fixed base, fly somewhere to perform a mission, return to base); space operations have not fit neatly into this [perspective].
- Air Force personnel tend to think only about segments of space capabilities. Although important, they are viewed as peripheral and not mainstream capabilities.
- The institutional Air Force does not fully understand and somewhat resents the cost of being the "steward" for space–too much of the Air Force Total Obligation Authority (TOA) goes to space activities in support of other communities or missions.
- Current 'operator' definition equates to aeronautical rating.[12]

In essence, the highest levels of Air Force leadership recognize that culturally driven factors, internal to the organization, generate resistance that undermines the Air Force's ability to advocate a unification of air and space.

Others, concerned with the Air Force's inability to responsibly advocate space have also begun to recognize the effects of this resistance.[13, 14] Some resolve the problem of this inability by supporting an independent space service to function as its own advocate,[15] or by returning space advocacy to each of the existing services.[16] Thus, internal advocacy problems within the Air Force promote the tendency to separate air and space. Further evidence of this tendency emerges when one looks at the *why* measure of merit.

Theory (Why)

Currently, a fully developed space power theory does not exist. USSPACECOM, recognizing the void, has commissioned Dr. Brian R. Sullivan as lead author to develop this theory.[17] The initial abstract of his effort is currently in circulation around the Air Force; but, it is still too early to tell what his effort will produce. Thus, the current evidence of separating trends resulting from the analysis of the *why* measure of merit is somewhat indirect.

In lieu of a developed space power theory, what seems to be USSPACECOM's interim justification for military space forces appears throughout its vision document. *Vision for 2020* uses the Chairman of the Joint Chiefs of Staff's overarching foundational concept of information superiority as a basis to justify military space forces.[18] In fact, it is arguably the strongest single theme expressed in this document. *Vision for 2020* states that "information superiority relies heavily upon space capabilities,"[19] and continues to support this position in a detailed discussion on each of USSPACECOM's four operational concepts. *Control of Space* is required to protect the information sources space systems provide.[20] A cornerstone of *Global Engagement* is the worldwide surveillance and information dominance capability that space systems offer.[21] *Full Force Integration* is "the integration of space forces and space-derived information with land, sea, and air forces and their information."[22] And, *Global Partnerships* is defined as the "leveraging of civil, commercial, and international space systems … for the opportunity [it offers] the U.S. to gain increased battlespace awareness and information connectivity."[23] These ideas arguably reflect a USSPACECOM position that the need for military space forces is primarily to achieve and maintain information superiority.

Information superiority is a significantly different justification for military space forces than the justification provided by air and space power theory. This difference, in and of itself, does not work to separate air and space. What does is that USSPACECOM is only responsible for advocating space forces. Therefore, information superiority is not forwarded as a concept applying to the air medium, nor is it suggested as a justification for air forces. It is a unique concept that today applies primarily to space forces, and as

such, it tends to divide the two mediums. Examining functions and missions reveal further evidence of organizational tendencies separating space from air.

Functions and Missions (What)

The discussion of separating tendencies with respect to what the military should do in space begins in all fairness with returning to already covered ground. Because functions lay the foundation for the development and articulation of requirements, the name and the framework of ideas they conjure do indeed become important. In this respect, the Air Force functions previously developed as a linking mechanism in some instances are subtly inconsistent. When set against the theoretical concept of air and space power, and the singularity in the term "air and space," a question arises that cannot be ignored. Does separating the counterair and counterspace functions embody this concept or contradict it? The same question can apply to the functions of airlift and spacelift. Air Force functions that tacitly support adherence to two separate mediums will tend to drive the development of systems specific for those mediums and in effect work to stovepipe the mediums from one another. In this context, four functions of air and space power—counterair, counterspace, airlift and spacelift—indirectly work to separate air and space.

Similar logic can be applied to USSPACECOM's assigned mission~~s~~ of day-to-day space operations. The requirements derived from this mission, which include the four elements of Space Control, Space Force Application, Space Forces Support, and Space Force Enhancement, naturally serve to drive development of technologies and systems appropriate only for that medium.[24] This, along with USSPACECOM's other assigned

mission as space advocate for the war-fighting Commanders, means that two of its four assigned missions fundamentally support separating space from air.[25]

USSPACECOM, in its role as DOD's operational and wartime advocate for space, is by its very nature, a key agent driving to separate space as a distinct medium and military power. Its organizational position is one that highlights the physical differences space has with respect to air and half of its assigned missions further support the idea that space is a unique environment and harbinger of tomorrow's fourth military power. Furthermore, the separating effects generated from cultural friction within the Air Force, coupled with inconsistencies within its doctrine, subtly compliment these organizational forces.

Summary

Below, Table 2 summarizes the chapter's main points. When seen together, evidence emerges that the paradoxical nature of the current paradigm does in fact clearly express itself within the military. Again, this chapter has placed no value judgement on any of the tendencies that link or separate air and space forces; rather, it has simply described the ways the current paradigm shows itself within the military. Nor has the chapter looked at the collective effect of these tendencies. How they collectively influence the development of military space forces is the topic of the next chapter.

Table 2. Chapter 4 Summary Table

	Current Paradigm: *Space and the atmosphere represent two distinct medium environments physically different from each other; while at the same time, they are physically linked, and theoretically and historically tied.*	
	Links *(Space is inextricably linked to the atmosphere)*	**Separators** *(Space is separate and distinct from the atmosphere)*
Advocacy (Who)	• Air Force advocates air and space unity	• USSPACECOM advocates space as fourth medium/power • Air Force internal cultural resistance against official position
Theory (Why)	• The singular concept of air and space power theory justifies air and space forces	• Information Superiority justifies space forces
Functions and Missions (What)	• Air Force functions generally apply across both mediums	• Subtle inconsistencies in Air Force function names (counterspace, counterair, spacelift, airlift) • Two of USSPACECOM's four official missions

Notes

[1] The Commission on Roles and Missions of the Armed Forces recommended the Air Force be legally assigned responsibility for acquiring and operating multi-user space systems. *Directions for Defense: Report of the Commission on Roles and Missions of the Armed Forces,* John P. White, Chairman, 24 May, 1995, ES-5.

[2] *Global Engagement: A Vision for the 21st Century Air Force,* United States Air Force, 1997, 7.

[3] Air Force Doctrine Document 2 (Draft, Version 7), *Global Engagement: Air and Space Power Organization and Employment,* Air Force Doctrine Center, United States Air Force, 45. Available from http://www.hqafdc.maxwell.af.mil.

[4] Indications, at the time of this writing, are that the Air Force is moving to officially adopt the term "aerospace" to replace "air and space." If so, this paragraph may well disappear before AFDD 2 is actually released. While it dispels the point just made about the intentional singularity of the term "air and space," the term "aerospace" only furthers the idea that the Air Force as an organization is holding a position that works to link air and space together.

[5] *Global Engagement: A Vision for the 21st Century Air Force*, 7.

[6] Air Force Doctrine Document (AFDD) 1, *Air Force Basic Doctrine,* Air Force Doctrine Center, United States Air Force, September, 1997, 45.

[7] Ibid., 45.

[8] Gen Howell M. Estes, III, "Space and Joint Space Doctrine," *Joint Forces Quarterly*, Number 14, Winter 1996-97, 61.

[9] Gen Howell M. Estes, III, *The Air Force at a Crossroad,* speech to the Air Force Association, Los Angeles, California, 14 November, 1997, 5.

Notes

[10] *United States Space Command Vision for 2020*, United States Space Command, Peterson Air Force Base, Colorado, 1997, 2.

[11] *CORONA Issue Paper 6 on Organizing and Integrating Space*, United States Air Force Long Range Planning, October, 1996, 3-5.

[12] Ibid., 4-5.

[13] Interviews on 2-3 Dec 97 with Acting Deputy Undersecretary of Defense for Space and the Navy's Space Information Warfare Command and Control Directorate (N6).

[14] Gen Howell M. Estes, III, *The Air Force at a Crossroad*, 4-5. Gen Estes alludes to the Air Force's ability (or inability) to advocate funding for space in this article: "We will never become an Air and Space Force if we do not begin to invest greater sums in space. …The biggest mistake we can make today is to impede our development as a Space and Air Force. …It is time for action, and not rhetoric."

[15] Gen Charles A. Horner, *Rethinking National Security Strategy*, Speech to the Air Force Association Symposium, Colorado Springs, Colorado, 24 May, 1996, 6. Gen Horner alludes to the rationale for an independent space force in this article.

[16] Interview, 3 Dec, 1997, with the Navy's Space Information Warfare Command and Control Directorate (N6).

[17] *Flash: "All You Ever Wanted to Know About Theory Development,"* United States Space Command, Volume I, Issue, 4 July,1997, 17a.

[18] Information superiority is defined as "the capability to collect, process, and disseminate an uninterrupted flow of information while exploiting or denying an adversary's ability to do the same." *Joint Vision 2010, America's Military: Preparing for Tomorrow*, Chairman of the Joint Chiefs of Staff, 1996, 10.

[19] *United States Space Command Vision for 2020*, 3.

[20] Ibid., 9.

[21] Ibid., 10.

[22] Ibid., 11.

[23] Ibid., 12.

[24] Gen Howell M. Estes, III, "Space and Joint Space Doctrine," *Joint Forces Quarterly*, 61. Footnoted here are the terms only and not the idea expressed.

[25] Ballistic missile defense and NORAD support, USSPACECOM's remaining two missions, do not necessarily encourage or discourage the separation of air and space. They are task-specific, relate to national defense as opposed to medium control or advocacy, and thus are not included in this discussion.

Chapter 5

Evaluating the Current Paradigm

The focus of this chapter is to evaluate the current paradigm. It answers the research question of how the military's current view of the air and space environment influences the development of military space forces. The chapter first examines the positive implications of the current paradigm and how they encourage space force development. It then discusses the paradigm's negative implications and how they hamper that development.

Positive Implications

Two general aspects of the paradigm itself are positive. First, it is intuitively acceptable. Building on the land, sea, and air concept, the paradigm supports and furthers the medium based framework upon which the military has traditionally divided the world. At the same time, however, the paradigm maintains focus on the obvious elements that tie the air and space mediums together. By acknowledging both realities—the physical differences that separate air and space, and the physical, theoretical, and historical elements that bind them—the paradigm is intuitively acceptable.

The second positive general characteristic of the paradigm is that, again, because of its medium based framework, differing perspectives can be logically justified within its context. For instance, if air and space can be at the same time either separate or unified,

then three exclusive but rationally acceptable "grouping" options emerge: the four mediums can exist separate and independent from one another; they can be sub-grouped into two-dimensional and three-dimensional mediums (surface and sky); or they can be grouped as terrestrial (land, sea, air) and extraterrestrial (space) mediums. Each option supports a fundamentally different perspective, but all of them are supportable within the context of the paradigm.

Together, the paradigm's realistic position, and the differing perspectives it allows, combines to provide a healthy forum for the debate of air and space issues. These are the general positive characteristics of the paradigm itself. There are also aspects of the paradigm that specifically encourage the development of military space forces.

How The Current Paradigm Encourages Military Space Force Development

The paradigm encourages space force development because it supports the existence of competitive advocacy positions. Two differing perspectives have emerged as evidenced in comparing the Air Force and USSPACECOM positions. Though not diametrically opposed to one another, in principle, the Air Force fundamentally furthers a linking of air and space, while USSPACECOM fundamentally supports their separation. This difference is positive because it works to insure those ideas and issues concerning space force development will be approached and debated from different viewpoints.

A further benefit of the paradigm, specific to space force development, lies in its flexibility, which enables the military to justify resource allocations among rapidly expanding technological capabilities. As various space technologies develop that are useful to the military, the opportunity to apply these technologies and further develop them is enhanced by the ability to justifiably "fit" them into the current force structure.

In effect, the flexibility of the current paradigm offers the military an ability to "harness" a formidable "technology-push" environment, which, because of space's heavy reliance on new technologies, is therefore encouraging to space force development.

The current paradigm's support of historical precedence is another encouraging attribute. The military has historically structured its forces around mediums. Armies dominate the land medium, navies the sea, and air forces the air. Although an implication becomes apparent here—that a fourth military space force is a logical conclusion—the encouraging aspect of the paradigm is that it allows for rational debate of the option based on historical precedence. The conclusion lies not in the potential result of the debate for or against an independent space force, or any other structure to support military space forces, but rather in the quality of that debate.

In summary, the current paradigm promotes a strong environment for debate within the military in the myriad of questions surrounding space force development. Its inherent paradox, and the accompanying flexibility the paradox allows, secures the potential for a diversity of perspectives. It also enables competing advocates to articulate and justify those perspectives. The current paradigm encourages space force development on the premise that debate is healthy and that from it, better decisions emerge.

Negative Implications

There are negative aspects of the current paradigm as well. The inherent contradiction it supports naturally brings with it a dilemma, where choosing one option means dispensing with relevant elements of the other. Dilemmas in a debate are not necessarily negative in and of themselves, but the stakes involved in this debate are high. Institutional identities, large amounts of invested interests, and, arguably, national

security, are all affected by its outcome. Attempts for both sides of the paradigm to exist coequally have resulted in expending large amounts of organizational energy. Because of the stakes involved, it can also be argued that the debate's focus might tend to shift away from finding common ground in favor of protecting parochial interests. One cannot help but wonder if protecting parochial interests inhibits the military's ability to "think outside the box" to discover innovative or alternative options. These general negative consequences of the paradigm—the energy expense due to the stakes involved, the tendency to focus away from working together within the paradigm, and the inhibited ability to generate alternative ideas—combine together in various ways to hamper the development of space forces.

How The Current Paradigm Hampers Military Space Force Development

From an advocacy standpoint, while the current paradigm fosters healthy internal debate within the military, the negative impact of this is that the debate's character weakens DOD's ability to clearly articulate its space position to Congress. The internal organizational stakes involved inhibit competing forces within DOD to "fall in" behind a collective position. In 1993, Congress "expressed concern over the apparent inability or unwillingness of the services to coordinate their space efforts, which [in turn leads] to delayed program implementation and budget overruns."[1] Today, interservice rivalries may have quieted somewhat but the military's two primary space advocates remain focused in two fundamentally different directions. Meanwhile, in the midst of budget reductions, Congressional focus on military spending has only intensified. As Congress ultimately controls the resources, Congressional perception of the military's inability to coordinate its position on space can only weaken an already questioned faith in DOD's

ability to efficiently utilize its resource allocations. Complimenting this advocacy problem, is the lack of space power theory from which to support the development of military space forces.

The void in space power theory is arguably due in part to limited experience in space, but the current paradigm also hinders theory development by allowing a justifiable premise for two differing bodies of thought. The Air Force, on the premise that air and space together comprise the "high ground," strongly indicates that airpower theory is "transferable" to space. USSPACECOM's position however, promoting the uniqueness of space, indicates information superiority may be the fertile basis for future space power theory. Two concepts, not necessarily opposed to one another, but different in focus nonetheless, together hamper the long-term development of military space forces by negatively impacting the military's ability to generate a clear, long-range vision, and to a lesser degree, a developed, overarching theory.

While the theory problem is a contributing factor to the military's inability to develop long-term focus, it is a fundamental problem influencing the military's ability to make short-term progress. Theory lays the foundation for a concept-pull environment. Not only does it provide the basis from which to generate and develop force requirements, it also enables the ability to articulate the need for these requirements. In that the current paradigm hinders the development of theory and allows the "survival" of two differing viewpoints on what that theory should be, the military's advocacy position to Congress is even further eroded. Development in the short-term is directly tied to the dollars that fund it; thus, the paradigm hampers the development of space forces.

To summarize, the current paradigm discourages the development of military space forces by stifling the military's ability to act. The paradox it establishes, and the dilemma that follows from it, generates internal institutional friction that inhibits the military's ability to collectively move forward with regard to space. With so much resting on the decisions to be made, organizations within DOD can dig their heels in behind the paradigm's conflicting perspectives. This, in turn, results in an inability of DOD to forge a unified position with which to approach Congress for funds to develop space forces.

The current paradigm of the air and space environment held within the military fundamentally influences the nature of the internal debate surrounding military space force development. This influence has both positive and negative aspects. On the positive side, the paradigm fosters a healthy internal climate for this debate by providing logical and well-grounded justification from which to base differing viewpoints. It also enables the flexibility to "latch on" to rapidly developing technologies. On the negative side, the paradigm frustrates DOD's ability to generate a healthy concept-pull environment from which it can lead technology with a clear and supportable long-range vision and with short-term requirements. It is now appropriate to draw some conclusions.

Notes

[1] Joan Johnson-Freese and Roger Handberg, "Searching for Policy Coherence: The DOD Space Architect as an Experiment" *Joint Forces Quarterly*, Number 16, Summer 97, 92.

Chapter 6

Conclusions

> *The biggest mistake we can make today is to impede our development as a Space and Air Force. We must all work together to reconcile our dreams and our vision for the future…to arrive at the most actionable and doable parts of our shared vision and to bring these to reality.*
>
> —General Howell M. Estes III

While a healthy climate for debate within DOD is important for space force development, the positive aspects of the current paradigm have outlived their usefulness and its negative aspects are beginning to challenge the military's ability to effectively develop a viable space force. As yet, DOD has been unable to present a unified position of advocacy with regard to space. Nor has it been able to develop an encompassing theoretical basis that fully incorporates all of the legitimate perspectives of what military space forces potentially bring to national defense. Worse still, Congress may already recognize this more clearly than the military itself and at some point see reason to take steps to force the military to prematurely act on a solution.

It is difficult to assess the impact wrought by the current paradigm. One can only wonder if DOD's inability to articulate a sound strategy for military space force development has resulted in an irrecoverable shortfall of dollars to military space programs. What is clear, is that the continued inability to articulate a strategy will only be magnified in light of external factors beyond DOD's control. Space force

requirements compete directly against other military requirements. But in the larger picture, because space requirements tend to be big-ticket items, they compete indirectly against other external non-military political interests also seeking government resources. On-going budget reductions and a generally perceived lack of military threat on the international front make this competition for funding even fiercer. The bottom line is that dollars are hard enough to come by without the military further compounding this reality by being unable to clearly articulate a unified position on space.

Within the framework of the military's current view of the air and space environment, the ability to generate a coherent, focused plan for space force development remains illusive. The many years of internal debate have yet to forge a common direction, and there is little indication that it will. Thus, the negative impact of the paradigm's inherent paradox is beginning to outweigh the healthy debate the paradox promotes.

Perhaps the best path toward effectively and efficiently developing military space forces lies not in finding a compromise position to the current dilemma, but rather in reevaluating, refining, or even replacing the current paradigm itself. The critical requirement of any alternative view must be to alleviate the paradox created by the current one. It must also be realistic, make sense, and be comfortable enough to garner institutional acceptance. A new paradigm must provide the framework from which a healthy concept-pull environment can emerge. In other words, the answers to the questions of *who, why,* and *what* must foster a higher potential for congruency among themselves than do the current paradigm's answers. This increases the likelihood of establishing a single position of advocacy and offers the ability for a universally

acceptable theoretical position to emerge. Only from such a foundation can DOD then hope to garner the funds required to develop and maintain a viable space force for the future.

The linking and separating aspects of the military's current paradigm frustrates military space force development and as such, stifles the military's ability to effectively and efficiently protect national interests and investments in space. But given the nation's emerging reliance on space and the vulnerabilities it incurs because of this, the nation's defense is increasingly demanding effective space forces. A new perspective might alleviate the current dilemma. It is time to pull back and examine the entire issue from a broader standpoint. The debate must turn to the fundamental reasons for the current impasse and away from the fragmenting issues themselves. Such a debate, and the possibilities it will surely bring, is in the best interest of the military and the nation as we forge ahead into the 21st Century.

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