INCUBATING A SPACE STRATEGY: THE ROLE OF EDUCATION

BY

ELISABETH K. WHITE

A THESIS PRESENTED TO THE FACULTY OF

THE SCHOOL OF ADVANCED AIR AND SPACE STUDIES

FOR COMPLETION OF GRADUATION REQUIREMENTS

SCHOOL OF ADVANCED AIR AND SPACE STUDIES

AIR UNIVERSITY

MAXWELL AIR FORCE BASE, ALABAMA

JUNE 2017

APPROVAL

The undersigned certify that this thesis meets master's-level standards of research, argumentation, and expression.

_____

MICHELE E. JOHNSON, COL, PhD

_____

THOMAS A. HUGHES, PhD

DISCLAIMER

The conclusions and opinions expressed in this document are those of the author. They do not reflect the official position of the US Government, Department of Defense, the United States Air Force, or Air University.

ABOUT THE AUTHOR

Major Elisabeth White received her commission through the Reserve Officer Training Corp at University of Minnesota in 2002, where she majored in business management. She entered active duty as an acquisition officer managing launch vehicles and satellite systems. She left active duty in 2006 and became an Individual Mobilization Augmentee in the reserve. Her 15-year career as a Citizen Airman has taken her to a variety of assignments including working with joint partners in Southwest Asia and interagency partners in Estonia. Her last position prior to attending school was as the IMA to the Director, 14th Air Force analyses, assessments and lessons learned at Vandenberg AFB, CA. She is a graduate of Pepperdine University receiving a masters in business administration and in-residence Air Command and Staff College receiving a masters in military operational art and science. She is an award-winning writer, receiving honorable mention in the 2015 General Bernard Schriever essay contest for her essay entitled, "Reconsidering the Cyberspace Human Capital Strategy." Major White is a program manager for a system engineering company in her civilian life. After graduation, she will be assigned to Air Force Reserve Command as a strategic planner.

ACKNOWLEDGMENTS

I would like to acknowledge several people that helped me during this rigorous year of professional military education. First, my husband for taking up an untraditional role in following his wife across the country to pursue her military career. As one of the few women in this advanced studies group, my husband continued to stand by my side and never doubted my abilities even when I doubted my own. Thank you for taking our child with you on many adventures this year as I stayed behind to study. Second, I would like to thank my father for the many discussions we had on national security issues. He has always instilled in me a desire to read, think and write. More importantly he has taught me the importance of having the courage to share my ideas. Third, I would like to thank my mother. She has been with me every step in my military career, from taking me to visit ROTC detachments in Minnesota, to my first move to Los Angeles AFB, to helping watch her grandchild as I worked abroad at the US Embassy in Estonia. Without her support and encouragement, I may have never served. Lastly, I would like to thank my daughter. You didn't have a choice in joining the military. Unlike your parents, you were drafted. I can only hope that my service in the military will eventually create a better and more welcoming environment for the phenomenal woman you will become.

I also would like to thank the faculty of SAASS especially my advisors Colonel Michele Johnson and Dr. Thomas Hughes. Their experience and insight have been valuable to my research and keeping me on track.

ABSTRACT

The national strategic issues confronted by the United States during the interwar period led to the creation of the Air Corps Tactical School at Maxwell Field Alabama, the birthplace and nurturing ground for American air doctrine and strategy. In the same way today, due to aggressive actions by adversaries, the United States faces a similar dilemma with regard to developing space doctrine and strategy. The argument for specific or broad officer education all have merit, but the better approach will have lasting impact on the Air Force's preparedness in space.

This study comprises an analysis of the relationship between professional military education and space education. First, through an examination of three defining periods of space application, a problem in defining space doctrine and strategy is presented. Through a historical case study, the author assesses the role of the Air Corps Tactical School to World War II. The conclusion is that the Air Corps Tactical School provided the strategy for Air Force officers to successfully fly, fight and win. Next, the writer evaluates current professional military education, specifically Air Command and Staff College curriculum against space content. The results of this analysis reveal that although ACSC curriculum is steeped in air power history and joint doctrine the needed focus on space education is lacking. By examining the role of professional military education during World War II, and the positive link between education and air power, the author shows the need for the United States Air Force to develop a similar approach for space power. To address the identified gaps, several recommendations are presented, of which the most significant is a proposal for the formation of a Space Corps Tactical School.

CONTENTS

Chapter Page

DISCLAIMER ii

ABOUT THE AUTHOR iii

ACKNOWLEDGMENTS iv

ABSTRACT v

INTRODUCTION 1

1 THE EVOLUTION OF SPACE STRATEGY 12

2 AIR CORPS TACTICAL SCHOOL 24

3 AIR COMMAND AND STAFF COLLEGE 51

CONCLUSIONS 82

BIBLIOGRAPHY 92

Illustrations

Table

1 Curriculum Percentages Over First Five-Year Period at ACTS

2 ACTS Department Sections

3 Organizational Analysis of ACTS

4 AY16 ACSC Core Curriculum Comparison to Space Curriculum

5 AY16 ACSC Student Survey Recurring Valuable Comments

6 AY16 ACSC Student Survey Improvement Comments

7 AY15 and AY16 ACSC Student Space Research

8 Organizational Analysis of ACSC

9 Comparison of ACTS and ACSC Sub-systems Analysis

10 SCTS Recommendations

Figure

1 Air University Organization Chart

2 AY16 ACSC Total Force Representation

3 AY16 Air Force AFSC Student Body by Specialty Code

4 ACSC Faculty Space Qualifications

Introduction

> *A government is the murderer of its citizens which sends them to the field uninformed and untaught, where they are to meet men of the same age and strength, mechanized by education and disciplined for battle.*
>
> Major General Henry Lee

During my student experience at the premier professional military education school for mid-grade officers, Air Command and Staff College (ACSC), General John Hyten, the commander of United States Strategic Command, remarked that he hoped the curriculum had changed since he was a student. The ACSC curriculum when he attended in the mid-nineties devoted only a few days to fundamentals of space, mainly an introduction to satellite orbits. His remarks were reticent since space no longer is a peaceful domain. Today, the Air Force cannot take for granted the many capabilities that space provides to our warfighters, allies and joint forces, such as global positioning, navigation, missile warning, weather sensing, communication and reconnaissance. The heightened aggression from adversaries suggests that the Air Force must transform force development to keep up with the evolving and dynamic mission of providing space effects.

Research Question

This thesis seeks to explore whether the Air Force, structured around an examination of ACSC curriculum, is producing officers who can successfully understand the operational art of space and integrate space effects.[1] In the course of evaluating this research question, this

---

[1] One of ACSC's stated task is to: "Develop and enhance students' abilities to plan and execute the joint campaign planning process and air, space and cyber operations to support the joint force commander." ACSC webpage, accessed 10 March 2016 at http://www.airuniversity.af.mil/ACSC/Display/Article/922301

thesis explores the current state of space doctrine and strategy; evaluates historical precedence of military education on strategy; analyzes existing space educational approaches at ACSC; and considers the development of alternative education programs for mid-grade officers.

Background and Significance of the Problem

Today, the space environment is drastically different than it was in 1982 when the Air Force created Air Force Space Command (AFSPC). The launch of the Chinese antisatellite, a space weapon designed to incapacitate or destroy US (United States) satellites, in 2007 and Russia's antisatellite in 2016 highlight how US space capabilities are now targets.[2] For many years, the US operated in space with impunity. The barrier to entry in space was so large that no adversary could compete with the US command of space.[3] Today, the US is losing its competitive advantage in the space domain due to the decrease in launch and satellite costs.[4] The rise in commercial providers accessing space introduces additional security dilemmas for the US. The space race has resumed and the Air Force is now faced with a need to educate more people about the potential threats and benefits space provides. Accordingly, the challenge now lies in broadening the Air Force knowledge about space. The increase in adversary actions suggest that the Air Force must rethink a space strategy. Education is part of that process. By aligning education with US space priorities, the Air Force can

---

[2] Jim Garamone, "Work: Space Domain Presents Challenges, Threats, "DoD *News*, 16 April 2016, https://www.defense.gov/News/Article/Article/604475/work-space-domain-presents-challenges-threats.

[3] Jim Garamone, "Work: Space Domain Presents Challenges, Threats, " *DoD News*, 16 April 2016, https://www.defense.gov/News/Article/Article/604475/work-space-domain-presents-challenges-threats.

[4] Assistant Secretary of Defense for Global Strategic Affairs Madelyn R. Creedon, "Shared Challenges, Shared Opportunities" (speech, USSTRATCOM Cyber and Space Symposium, Omaha, NE, 15 November 2011).

ensure a space mindedness is instilled in all Airmen and regain the military advantage potentially lost through the proliferation of technology.

Eerily, the Air Force is at a critical inflexion point like the interwar period and the birth of the Air Corps Tactical School (ACTS).[5] World War I demonstrated the potential of a new weapon, the airplane. Concurrent with this recognition came the requirement to develop air power doctrine, capabilities, tactics and strategy all by educating officers. General Billy Mitchell saw the possibilities of the airplane, "The time has come when aviation must be developed for aviation's sake and not as an auxiliary to other existing branches. Unless the progressive elements that enter into our makeup are availed of, we will fall behind in the world's development."[6] His comments came during a period of intense debate surrounding the newest domain: the air. Nearly a century later, the military is confronted with a similar dilemma. Today, according to the former AFSPC commander General William Shelton, the United States Air Force (USAF) could be "caught unprepared for a battle in space."[7] The space environment is no longer uncontested. Adversaries such as China and Russia are adapting their strategies in denying the high ground the Air Force maintains while tensions increase.

As the Air Force continues to transform space operations based on national security threats, basic assumptions and paradigms of how to educate officers about space at ACSC may need adjustment. This thesis

---

[5] Senior Airman William J. Blankenship, "Innovating education: New Commander of Air University Challenges Airmen," *U.S. Air Force News*, 23 November 2014, http://www.af.mil/News/Article-Display/Article/554844/innovating-education-new-commander-of-air-university-challenges-airmen/

[6] William Mitchell, *Winged Defense: The Development and Possibilities of Modern Air Power— Economic and Military* (1925; reprint, New York: Dover Publications, Inc., 1988), x.

[7] Jim Sciutto, *US Military preparing for the next frontier: Space War*, 2016, CNN report, YouTube video, 41:58, https://www.youtube.com/watch?v=j-ZBLFhb_lg.

analyzes the relationship between education and air power for officers through a historical comparative study. The question for this thesis is in the context of space: as the world changes, and the space domain develops, must education at ACSC change, or are these immutable fields? While the core missions of the Air Force have not changed since 1947, the additions of the space and cyber domains call into question the relevance of existing concepts, doctrine, and strategy that were solely for the air domain.[8]

Road Map

In chapter 1, the history of space in civilian and military applications are examined. Three periods of influence are relevant: the man on the moon era in the 1960s, the rise of space during Desert Storm and into the 1990s, and the present day of antisatellite technology. This paper reviews the evolution of space dependence on the development of space doctrine and strategy. After reviewing the existing national space strategy, it seeks to identify the problems that still exist in space by reviewing issues identified by scholars and professionals today. This chapter highlights recurring themes found within a variety of studies, pointing to the need for a space strategy for the US. It analyzes the problems and recommendations identified as well as the reasons for their persistence.

After problem identification, chapter 2 reviews a historical case study of the ACTS; the birthplace of airpower doctrine and strategy in World War II, setting a precedent for the role of education within the military. Through the organizational analysis framework developed by RAND authors John Arquilla and David Ronfeldt, this chapter examines the Air Force crisis in developing adequate forces, individuals who could fly and think, and how the school emerged as the catalyst in preparing

[8] General Marc Welsh comments to National Press Club, 2014, YouTube video, 57:47, https://www.youtube.com/watch?v=NqWvqaNdThg.

officers to wage war and advise commanders during a time of austerity. By examining a historical example, the important relationship between education and air power emerge. The central question of chapter 2 is what aspects of ACTS led to its success in producing air strategists?

Chapter 3 examines the contemporary relationship between education and space power at ACSC. Thus, the central question of this chapter is, are ACSC graduates able to successfully understand the operational art of space and integrate space effects? This question is tied directly to one of ACSC's stated tasks: to "develop and enhance students' abilities to plan and execute the joint campaign planning process and air, space and cyber operations to support the joint force commander."[9] Chapter 3 also employs Arquilla and Ronfeldt's organizational analysis to address this question by examining the strength of space education at ACSC across five levels of analysis: organization, narrative, doctrine, technology and social. Following this analysis and drawing on ACSC's organizational and mission briefings, publications by senior leaders, and the direct experience of the author in attending in-residence ACSC, an evaluation in how ACSC is fulfilling space education is determined.

Based on the overall analysis in chapter 2 and chapter 3, this research concludes with providing decision makers three possible approaches in incubating a space strategy and considerations for furthering research on space education.

Scope and Limitations

Space-related education, coupled with the need for technical expertise, is critical in developing and sustaining a space cadre.[10]

---

[9] One of ACSC's stated task is to: "Develop and enhance students' abilities to plan and execute the joint campaign planning process and air, space and cyber operations to support the joint force commander." ACSC webpage, accessed 10 March 2016 at http://www.airuniversity.af.mil/ACSC/Display/Article/922301

[10] *Report of the Commission to Assess United States National Security Space Management and Organization: Executive Summary*, accessed 5 January 2017, http://www.fas.org/spp/military/commission/executive_summary.pdf.

However, 35 years after the formation of AFSPC, senior military leaders insist that the Air Force lacks an adequate space strategy. Most notably, in the 2014 Space Strategic Portfolio Review senior pentagon officials, to include Deputy Defense Secretary Bob Work, argued the current National Strategy for Space does not meet the changes in the environment.[11]

The identification of a lack of an effective space strategy focuses this research on the role of education, not training. Air Force doctrine makes a key distinction between the concepts of education and training. Air Force doctrine defines education as "instruction and study focused on creative problem solving that does not provide predictable outcomes. Education encompasses a broader flow of information to the student and encourages exploration into unknown areas and creative problem solving."[12] In contrast, Air Force doctrine defines training as "instruction and study focused on a structured skill set to acquire consistent performance. Training has predictable outcomes and when outcomes do not meet expectations, further training is required."[13] The need identified by senior military leaders for a space strategy requires education, not training.

The scope of this thesis therefore examines one aspect of an officer's education, in-residence ACSC. This approach is taken because mid-grade officers in the military, deemed experts in their field, are expected to become strategic leaders in developing bold air power ideas, communicating and collaborating in the joint environment to strengthen

---

[11] Joan Johnson-Freese, "Stopping the Slide Towards A War in Space: The Sky's Not Falling," Breaking Defense, 28 December 2016, http://breakingdefense.com/2016/12/stopping-the-slide-towards-a-war-in-space-the-skys-not-falling-part-2/

[12] Curtis E. LeMay Center for Doctrine Development and Education, Air Force Doctrine Document (AFDD) 1-1, *Leadership and Force Development,* 18 February 2004, 74-76.

[13] Curtis E. LeMay Center for Doctrine Development and Education, Air Force Doctrine Document (AFDD) 1-1, *Leadership and Force Development,* 18 February 2004, 74-76.

national security.[14] ACSC is also akin to the ACTS, according to ACSC's webpage:

> ACSC traces its roots to the ACTS located at Maxwell Field from 1931 to 1942. After World War II, as the independent Air Force was formed, grew, and developed, the requirements and expectations of the school evolved to fulfill the service's educational needs. The vision of pre-World War II leaders has withstood the test of time. Although more than eight decades have passed since the founding of the ACTS, the present 10-month curriculum still focuses on expanding understanding of air and space power and on the growth of midcareer officers. In 1962, the school became known by its current name, Air Command and Staff College.[15]

Moreover, the Commandant of Air University describes Air University professional military education as:

> The ACTS of today, striving to be the epicenter of new ideas and the launching pad for Air Force, joint and coalition leaders prepared to prevail in today's fight and to respond effectively to the uncertain security environment we will face in the future.[16]

While training is important in producing space professionals, it is prohibitive to examine all aspects of training for the Air Force. For instance, this thesis does not examine how the National Space Security Institute teaches career-field specific space professionals to do their jobs effectively or examine the tactics and techniques at the Space Warfare Center. Evaluation of these schools, only available to space career fields, may prove useful in assessing the overall effectiveness of space training and education but is too broad for the scope of this research. In addition, the whole continuum of education for Airmen, to include enlisted education, squadron officer school, air war college, and non-resident professional military education programs are also beyond the

---

[14] ACSC webpage, accessed 10 March 2017 at http://www.airuniversity.af.mil/ACSC/Display/Article/922301

[15] ACSC webpage, accessed 10 March 2017 at http://www.airuniversity.af.mil/ACSC/Display/Article/922301/

[16] Air University webpage, accessed 16 March 2017 at http://www.airuniversity.af.mil/About/

scope of this thesis, but could prove vital in advancing thinking about space education across the total force.

Lastly, examining the overall effectiveness of ACSC students' space acumen after graduation would require extensive research. The time allotted in researching this thesis did not allow for gathering data from joint forces commanders and units in which ACSC graduates report to after ACSC. The availability of post-assessment student performance data could significantly illuminate the argument of this thesis.

The selected focus utilizing an analogy to compare ACTS to present day ACSC represents one approach in evaluating if the Air Force is producing officers across all career fields who successfully understand the operational art of space and integrate space effects. In keeping with the Chief of Staff of the Air Force's intent that everyone in the Air Force must understand the operational art and integration of space, the focus of this thesis examines a military school that educates across all career specialties rather than one.[17] Consequently, the conclusion introduces considerations for further study that will apply for all Air Force mid-grade officers regardless of Air Force specialty code.

Space Environment

The 2011 US National Space Strategy describes space as, "vital to US national security and our ability to understand emerging threats, project power globally, conduct operations, support diplomatic efforts, and enable global economic viability."[18] Space provides global capabilities across all the instruments of power that together enable the

[17] General David Goldfein, "An Interview with Gen David L. Goldfein Twenty-First Chief of Staff of the Air Force," Strategic Studies Quarterly, (Spring 2017): 7, http://www.airuniversity.af.mil/Portals/10/SSQ/document/Volume-11_Issue-1/Goldfein.pdf

[18] US National Security Space Strategy, accessed 1 February 2017, http://archive.defense.gov/home/features/2011/0111_nsss/docs/NationalSecuritySpaceStrategyUnclassifiedSummary_Jan2011.pdf.

US to maintain a competitive advantage over adversaries.[19] Space also enables economic growth, improved standards of living and increased communications that foster social and financial links indispensable in everyday life.[20] For instance, the global positioning system (GPS), accessed by more than 3.5 billion people a day, is only controlled by 12 airmen at Schriever Air Force Base, Colorado.[21]

As the number of space customers increase, the space environment is also changing. Around the globe, many nations and non-state actors have demonstrated technologies and tactics which provide them the capabilities to access, employ, and even contest the space domain, physically, and electromagnetically.[22] An attack on a US satellite could have devastating impacts both for military and civilian users. In a nightmare scenario, Peter Singer, the author of *Ghost Fleet,* outlines how a massive cyber-attack on key infrastructure can disable and destroy satellites putting the world in a stand still. Everything from traffic lights to laser-guided munitions would not work.

This nightmare scenario is not pure imagination. Within the last few years, US adversaries, primarily Russia and China, have extended their aggression on earth to the highest frontier. Russia and China are increasing US vulnerabilities in space with the advent of kamikaze satellite technology that can surprise and destroy US satellites providing critical capabilities including sensitive communication and nuclear

---

[19] US National Security Space Strategy, accessed 1 February 2017, http://archive.defense.gov/home/features/2011/0111_nsss/docs/NationalSecuritySpaceStrategyUnclassifiedSummary_Jan2011.pdf.
[20] US National Security Space Strategy, accessed 1 February 2017, http://archive.defense.gov/home/features/2011/0111_nsss/docs/NationalSecuritySpaceStrategyUnclassifiedSummary_Jan2011.pdf.
[21] Staff Sgt. Jarrod Chavana, "Airmen deliver GPS to the World," Air Force Space Command News, 9 September 2014, http://www.afspc.af.mil/News/Article-Display/Article/731234/airmen-deliver-gps-to-the-world/.
[22] Jim Sciutto, *US Military preparing for the next frontier: Space War*, 2016, CNN report, http://www.cnn.com/2016/11/28/politics/space-war-us-military-preparations/.

warning systems.[23] While the US military observes heightened aggression, the most senior ranking military leaders warn that the US military may not be ready to respond. General Ellen Pawlikowski, the former commander of the Space and Missiles System Center, characterized the US response to the Chinese antisatellite in 2007 as military ill-prepared.[24] Apparently, the US knew about the antisatellite test but could only observe and report.[25]

The access to space is also no longer restricted to great powers. The rise of billionaires, such as Elon Musk and Jeff Bezos, is creating a new paradigm for the military, one of advantages and disadvantages. The entry of new launch service providers, such as SpaceX and Blue Origins, is creating cost efficiencies and additional competitors to the space market. With reduced costs, more satellites may be placed into orbit, increasing congestion and the possibility for collision.

The space environment is drastically different than when the US entered it almost 60 years ago. The possibility of space warfare or potential mishaps are no longer science fiction. The US space community, along with every space-faring nation, can either adapt to the new environment and take proactive measures in mitigating risk or continue the status quo, potentially jeopardizing the remarkable advantages space provides.[26] The stakes could not be higher. How the US responds to this contested environment could determine who wins a defining conflict of the twenty-first century.

---

[23] Jim Sciutto, *US Military preparing for the next frontier: Space War*, 2016, CNN report, YouTube video, 41:58, https://www.youtube.com/watch?v=j-ZBLFhb_lg.
[24] Lieutenant General Ellen Pawlikowski, Doug Loverro and Colonel Tom Cristler, "Disruptive Challenges, New Opportunities and New Strategies," Strategic Studies Quarterly Journal, volume 6, number 1 (Spring 2012): 29, http://www.airuniversity.af.mil/Portals/10/SSQ/documents/Volume-06_Issue-1/Spring12.pdf.
[25] Pawlikowski, Loverro and Cristler, "Disruptive Challenges, New Opportunities and New Strategies," Strategic Studies Quarterly.
[26] Pawlikowski, Loverro, Cristler, "Disruptive Challenges, New Opportunities and New Strategies," 53.

Preview of the Argument

The space domain has changed significantly in the last few years. At the most general level, ACSC may not be meeting the purpose of officer professional military education in the area of space education. The link between space and education is potentially lacking. To remain relevant, the Air Force needs to educate officers who can advise commanders and develop effective space campaigns for the operational level of warfare. Based on this hypothesis, a formal school, like the ACTS in the interwar period, could contribute to the need for officers who can act as effective space power advisors to warfighting commanders.

This paper searches for ways to optimize the education system for all mid-grade officers attending ACSC. It identifies a need in developing space education, evaluates a historical approach in educating officers to achieve successful outcomes, highlights the deficiencies in existing ACSC curriculum with respect to space, and proposes alternative solutions. The proposal may alter the current ACSC approach in educating officers about space, developing a Space Corps Tactical School which officers from a wide range of career fields would attend.

Chapter 1

The Evolution of Space Strategy

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

General Henry H. "Hap" Arnold

Though the father of the Air Force penned those words nearly seventy years ago, they remain relevant today. In fact, the interwar period parallels the problem the Air Force continues to face after 50 years putting a man on the moon; developing critical thinking and instilling a vision about space. This chapter examines the history of space applications through three important periods: the man on the moon era in the 1960s, the rise of global positioning in Desert Storm and into the 1990s, and lastly through to present day of antisatellite technology. This chapter includes a review of the evolution of the US dependence of space capabilities throughout recent history. After review of the existing national space strategy, it identifies the problems that still exist in space by highlighting issues brought forward by scholars and professionals. This chapter points to the need for critical thinking and research concerning space strategy and concludes with an analysis of the problems and recommendations identified as well as the reasons for their persistence.

Man on the Moon Era

The space age began in the context of the Cold War. The launch of Sputnik in 1957 set off the space race between two powers, the US and the Union of Soviet Socialist Republics (USSR). Despite the USSR achievement with Sputnik, it was the US which rapidly took the lead in

space.[1] Whereas US photo-reconnaissance satellites began providing valuable information by August 1960, it took the USSR almost three more years before their Cosmos reconnaissance satellites were in regular operation.[2] The lure of space was recognized by the Kennedy administration. In an address at Rice University in 1962, President John F. Kennedy stated,

> Space science, like nuclear science and all technology, has no conscience of its own. Whether it will become a force for good or ill depends on man, and only if the US occupies a position of pre-eminence can we help decide whether this new ocean will be a sea of peace or a new terrifying theater of war.[3]

President Kennedy understood the benefits and risks of space and ushered in a defining space era for America. On July 21, 1969, Astronaut Neil Armstrong became the first person to step onto the moon, effectively ending the space race and fulfilling President Kennedy's national promise.

In the years that followed the first rocket launch, both superpowers researched and developed sophisticated capabilities for military application such as intelligence collection, missile warning, and communications.[4] Despite competition throughout the early days of the Space Age, the US and the USSR desired to keep space free of weapons. In 1967, both countries and others including the United Kingdom, signed the 1967 Outer Space Treaty. Today, 105 countries agree to the principles outlined in the treaty including: "outer space would be free for access, exploration, and use by all states; celestial bodies in space would be free from national appropriation or military bases, fortifications,

---

[1] P.B Stares, Space Weapons and US Strategy – Origins and Development. (London: Croom Helm., 1985), 62.
[2] Stares, Space Weapons and US Strategy, 62.
[3] Colonel John E Hyten, "A Sea of Peace or a Theater of War: Dealing with the Inevitable Conflict in Space." *Air and Space Power Journal*, (Fall 2002): http://www.au.af.mil/au/afri/aspj/airchronicles/apj/apj02/fal02/hyten.html.
[4] Pawlikowski, Leverro, and Cristler, "Space Disruptive Challenges, New Opportunities, and New Strategies," 30.

exercises, and testing; states would refrain from placing in orbit around the earth nuclear or other weapons of mass destruction."[5] This treaty continues to serve as the foundation for the space domain.

Access to space during the Cold War was limited to states that had the technical and economic power to get there.[6] The US exploited the space domain to resolve unique challenges in monitoring the USSR. Civilian leaders recognized the possibility for satellites to serve as an alternative to reconnaissance flights into Soviet airspace. Thus, space enabled competitive advantages. These competitive advantages provided an influx of information that could enhance status and overall battlespace awareness, exponentially superior to adversaries.[7] Space also provided the US a way to monitor treaties, warn of a nuclear ballistic missile attack, and connect the President to the nuclear retaliatory forces.[8] The Air Force spent the 1970s developing satellite systems to support strategic capabilities, nuclear and missile warning. Recognizing the size and scope of such an initiative, the Air Force established Space Command in 1982 to exploit "the ultimate high ground" in support of air power.[9] By the end of the 1980s, Air Force leaders referred to the responsibility of the Air Force as the lead service for military space. This designation normalized and operationalized space within and outside the Air Force, improving the visibility of space supporting the war fighter.[10]

---

[5] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, 27 January 1967, 18 U.S.T. 2410, T.I.A.S. No. 6347, 610 U.N.T.S. 205 (entry into force, 10 October 1967).
[6] General Robert Kehler, "Implementing the National Security Space Strategy," Strategic Studies Quarterly Journal, volume 6, number 1 (Spring 2012): 20, Spring 2012, 20, http://www.airuniversity.af.mil/Portals/10/SSQ/documents/Volume-06_Issue-1/Spring12.pdf.
[7] Kehler, "Implementing the National Security Space Strategy," 20.
[8] Kehler, "Implementing the National Security Space Strategy," 20.
[9] Air Force Space Command, "AFSPC Fact Sheet," accessed 19 Feb 2017, http://www.af.mil/AboutUs/FactSheets/Display/tabid/224/Article/104526/air-force-space-command.aspx.
[10] Bradley Spires, *An Air Force Vision for Military Space Mission: A Road Map for the 21st Century*, (Maxwell AFB, AL: Air University Press, 2006), 275,http://space.au.af.mil/books/spires/ch08.pdf.

Rise of Space in Desert Storm

Toward the end of the twentieth century, US space capabilities came full force during Desert Storm. Military historians and military leaders deem this conflict as the first space war.[11] Although no war was fought in space, the Gulf War validated the application of satellite systems to the warfighter. GPS, despite only being a partial constellation then, was essential throughout the war.

GPS came of age in the desert of the Arabian Peninsula by providing real-time, passive navigation updates to virtually every weapon system in-theater. Tanks, ships, planes, and cruise missiles relied on GPS to establish coordinates for location and employment of weapons. During the start of the war, only a few hundred GPS receivers were in theater; however, by the end, 4,500 receivers were in use. The use of space had become indispensable.[12]

Although the American public watched with shock and awe as the space-aged patriot missiles appeared to knock scuds from the skies and laser-guided munitions busted Iraqi bunkers, some leaders speculated that American and allied forces still failed to use space capabilities effectively. Beyond aiding navigation with GPS and limited theater missile defense, planners gave little consideration to space capabilities. For example, General Charles Horner, commander, US Central Command Air Forces, during the war and later commander of Air Force Space Command, admitted that American troops could have done more with space. A consensus among military leaders that the Department of Defense needed a more efficient means to bring space to the battlefield emerged after Desert Storm. General Donald Kutyna, commander of US

---

[11] United States Department of Defense, *Report of the Secretary of Defense to the President and the Congress*, (Washington GPO, February 1992), 85.
[12] Lieutenant General Thomas Moorman, "Space: A New Strategic Frontier," *Airpower Journal*, (Spring 1992):
http://www.au.af.mil/au/afri/aspj/airchronicles/apj/apj92/spr92/moor.htm.

Space Command during the Gulf War, stated in the June 1991 report on the use of space assets during Desert Storm:

> Space forces were there when required, but significant effort was needed to optimize their effectiveness. We may not have the luxury of a six-month build-up period to develop procedures or procure critical equipment in a future conflict…the capabilities of these systems must be thoroughly ingrained in our peacetime planning and training if we hope to exploit them fully in crisis or combat.[13]

The problem, General Horner noted, resided in the military's unfamiliarity with space-based force enhancement and application. "Many of us who went to Desert Storm," General Horner conceded, "were ignorant of what space could do."[14]

Subsequently, in a speech given at Maxwell AFB in June 1992, General Merrill McPeak, the Chief of Staff of the Air Force (CSAF), dramatically redefined the Air Force's mission to "defend the United States through the control and exploitation of air and space."[15] For the first time since former Air Force Chief of Staff, General Tommy White, began using the term aerospace in 1959, the Air Force underscored its commitment to both air and space as an uninterrupted dimension of military operations. The redefinition of the Air Force mission was intended to challenge existing paradigms within the Air Force about how to best employ air and space forces in the next century. In many respects, space was then at the same infant stage airpower was following World War I. Woven throughout McPeak's speech was his conviction that the Air Force must generate, along with a shared mission and identity, "a rebirth of the traditions associated with the Air Corps Tactical

---

[13] Air Force Space Command History (HQ AFSPC/HO, 1991), Employment of Space Forces in Operations Desert Shield and Desert Storm, 1.
[14] Lieutenant General Thomas Moorman, "Space: A New Strategic Frontier," *Airpower Journal*, (Spring 1992): http://www.au.af.mil/au/afri/aspj/airchronicles/apj/apj92/spr92/moor.htm.
[15] Gen Merrill A. McPeak, "Does the Air Force Have a Mission?" text of speech to a dining-in at Air University, Maxwell AFB, Ala., 19 June 1992, 5.

School."[16] It was no coincidence that General McPeak gave his speech at Maxwell AFB, where men like Hal George, Ken Walker, and Muir Fairchild laid the theoretical and doctrinal foundations for air power during the interwar period.[17]

The Air Force understood the potential of space from Desert Storm, but also understood the need for more knowledge about the domain. In General McPeak's 1993 address to the 9th Space Symposium in Colorado Springs he stated, "We need leadership, we need advocacy, and we need doctrine. Perhaps most of all, we need clear thinking about what the future holds for us in space." With the realization that space could and should do more for the warfighter, General McPeak chartered a Blue-Ribbon Panel on Space in the Air Force for the twenty-first century in the fall of 1992. The panel's mission was to review existing Air Force space policy, elucidate the Air Force's future role in space, and develop a strategy to meet that role.[18]

The findings and recommendations of the Blue-Ribbon Panel established the principles upon which Air Force space policy is built today. Lieutenant General Thomas Moorman, Jr., and the panel's 30 Air Force officer and civilian members found that American and coalition forces' reliance on space systems during the Gulf War indeed demonstrated the importance of space in modern warfare.[19] Desert Storm showed, the panel contended, that military space systems offer an opportunity to integrate command, control, communications, and intelligence support to the battlefield, while simultaneously denying or manipulating the enemy's information. The combination of space-based

---

[16] McPeak, "Does the Air Force Have a Mission?", 10.
[17] Lt Col Suanne B. Gehri, "The Air Force Mission," Airpower Journal, Winter 1992.
[18] Blue Ribbon Panel of the Air Force in Space in the 21st Century Executive Summary, prepared by Lieutenant General Thomas S. Moorman, Jr., (Washington, D.C. HQ USAF, 1992), 4.
[19] Blue Ribbon Panel of the Air Force in Space in the 21st Century Executive Summary, prepared by Lieutenant General Thomas S. Moorman, Jr., (Washington, D.C. HQ USAF, 1992), 5.

command and control and counter-technology could become, in the panel's estimation, "a potentially decisive 'silver bullet' for the theater commander."[20]

By the start of the twenty-first century, the de-facto monopoly the US and Russia shared disappeared. Advances in technology and commercial growth reduced the cost for nation-states and non-state actors to gain access to space and space capabilities. The Gulf War demonstrated to potential adversaries the tremendous dependence the US had on space to conduct major combat operations and the vulnerability it could exploit. Thus, adversaries sought to exploit the US overreliance on space by developing capabilities to prevent access and use of space capabilities.[21]

At the same time, civilian leaders grew skeptical of how the Air Force was managing space. Congress created the Commission to Assess United States National Security Space Management and Organization in 2001. Congress directed the Commission to consider four options for space forces within the Department of Defense: [22]

1) A space force within a new space military department

2) A space corps within the Air Force

3) An Assistant Secretary of Defense for Space

4) A dedicated space major force program.

The Space Commission delivered its report to Congress on 11 January 2001. Though the findings did not endorse a separate space force or a space corps within the Air Force, the report determined that a

[20] Blue Ribbon Panel of the Air Force in Space in the 21st Century Executive Summary, prepared by Lieutenant General Thomas S. Moorman, Jr., (Washington, D.C. HQ USAF, 1992), 21.

[21] Blue Ribbon Panel of the Air Force in Space in the 21st Century Executive Summary, prepared by Lieutenant General Thomas S. Moorman, Jr., (Washington, D.C. HQ USAF, 1992), 21.

[22] Keith Kruse, et al., United States Space Management and Organization: Evaluating Organizational Options, Prepared for the Commission to Assess United States National Security Space Management and Organization January 2001), Chapter V.

realigned and re-chartered Air Force was best suited to organize, train, and equip space forces.[23] Regarding the military services, the Space Commission recommended that the Air Force become the designated executive agent for space within the Department of Defense.[24] The formal designation of lead agent for space enabled the Air Force to adequately align resources to space requirements.

The findings of the Space Commission were the first steps in professionalizing space development for officers. While the commission members did not conclude that a separate space service should be established, they left the possibility open, "a logical step toward a space development could be to transition from the new Air Force Space Command to a space corps within the Air Force."[25] Analogous to how the Army Air Corps existed during the interwar period as an incubator of air power strategy to the independent Air Corps, the panel members of the commission also intended Air Force Space Command to usher in a separate space corps. In sum, the commission report did not create a separate space force in 2001, but also did not close the door to further consideration.

Antisatellite Technology

While the Air Force has come a long way in organizing, training, and equipping a cadre of space professionals since the space commission in 2001, significant changes in space have transpired in the last couple of decades, leaving the Air Force in a state of unpreparedness. After the Chinese antisatellite missile test in 2007 and Russia's successful test of

---

[23] Keith Kruse, et al., United States Space Management and Organization: Evaluating Organizational Options, Prepared for the Commission to Assess United States National Security Space Management and Organization January 2001), 99.
[24] Keith Kruse, et al., United States Space Management and Organization: Evaluating Organizational Options, Prepared for the Commission to Assess United States National Security Space Management and Organization January 2001), 85
[25] Keith Kruse, et al., United States Space Management and Organization: Evaluating Organizational Options, Prepared for the Commission to Assess United States National Security Space Management and Organization January 2001), 93.

an antisatellite in 2016, space no longer remains an uncontested domain.[26] The challenge now lies in preparing the Air Force to think critically about how to deter and defend national assets in space.

Following the Chinese and Russian antisatellite tests, General Shelton, former AFSPC commander, testified before the Senate Arms Committee, highlighting the US militaries dependence on space capabilities:

> In space, our sustained mission success integrating these satellite capabilities into our military operations has encouraged potential adversaries to further develop counter space technologies and attempt to exploit our systems and information. Therefore, I believe we are at a strategic crossroads in space. We are so dependent on space these days. We plug into it like a utility. It is always there. Nobody worries about it. You do not even know sometimes that you are touching space. So, to lose our space capabilities it would be almost a reversion back to industrial-based warfare."[27]

More concerning was the admission of senior military leaders that the Air Force did not have the capability to respond to antisatellites. At the most senior military levels within the space community, chronicled that the only response military could take was one of awareness, not of action.[28] Apparently, the US military can observe adversary behavior in space but lacks the ability to deter and defend.[29]

The current CSAF, General David Goldfein, acknowledged the importance of space to the warfighter and prioritizing the Air Force for

---

[26] Edward Cody, "China Confirms Firing Missile to Destroy Satellite," *Washington Post*, 24 January 2007, http://www.washingtonpost.com/wp-dyn/content/article/2007/01/23/AR2007012300114.html; and Bill Gertz, "Russia Flight Tests Anti-satellite Missile," *Washington Free Beacon*, 27 May 2016, http://freebeacon.com/national-security/russia-flight-tests-anti-satellite-missile/.
[27] Yasmin Tadjdeh, "New Chinese Threats to U.S. Space Systems Worry Officials," *National Defense*, 5 July 2014, http://www.nationaldefensemagazine.org/archive/2014/July/pages/NewChineseThreatstoUSSpaceSystemsWorryOfficials.aspx
[28] Pawlikowski, Leverro, and Cristler, "Space Disruptive Challenges, New Opportunities, and New Strategies," 30.
[29] Pawlikowski, Leverro, and Cristler, "Space Disruptive Challenges, New Opportunities, and New Strategies," 30.

war in space. In a speech to the Mitchell Institute in February 2017, he highlighted the reality of war in space:

> War can extend into space, and it isn't a stretch to imagine how a terrestrial conflict can migrate to space. Our adversaries can now offensively threaten our space assets, as we saw when China launched an anti-satellite missile years ago, creating a debris field every nation will contend with for all time. As the Joint Chief responsible for organizing, training and equipping and presenting ready forces to combatant commanders, I believe it's my job to ensure that we maintain resiliency and options for the joint force and for the commander-in-chief. The way to avoid war is to prepare for it. Prepare for it we have, and prepare for it we will.[30]

Space Strategy

It is difficult to ascertain the level of preparedness within the Air Force to fight in space, but the remarks of senior Air Force leaders indicate that a comprehensive, coherent strategy to deter adversary action and protect space assets remains warranted. The 2010 National Security Strategy asserts that maintaining security means, "ensuring the US military continues to have the necessary capabilities across all domains."[31] The 2011 National Security Space Strategy states:

> Space capabilities provide the United States and our allies' unprecedented advantages in national decision-making, military operations, and homeland security. Space systems allow people and governments around the world to see with clarity, communicate with certainty, navigate with accuracy, and operate with assurance. Maintaining the benefits afforded to the United States by our operational capabilities in space is central to our national security.[32]

These documents codify the space roles of the secretary of defense and the director of national intelligence in accomplishing space policy

---

[30] General David Goldfein, "Space Power to the Warfighter," AFA Mitchell Institute, 3 Feb 17, http://www.af.mil/Portals/1/documents/csaf/020307migoldfeinv1.pdf.
[31] Office of the President, National Security Strategy (Washington, DC: White House, May 2010), 22.
[32] Secretary of Defense and Director of National Intelligence, National Security Space Strategy: Unclassified Summary (Washington, DC: DOD, Office of the Director of National Intelligence, January 2011), i.

goals. The guidance for conducting space operations is published at both the joint and service levels. Air Force and Army service space doctrine is linked to national-level space strategy through joint space doctrine*, Joint Publication 3-14, Space Operations*. These documents direct the US toward a cooperative, civilian, and commercial-oriented program overall, and a more traditional space security strategy of strategic restraint instead of offensive action. This cooperative approach though changed with China's antisatellite test into geostationary orbit, alarming the US national security community of the inherent need of self-defense.[33] These actions triggered a strategic portfolio review led by the National Security Council in 2014.[34]

Is the US postured for a potential war in space? Does the Air Force have a comprehensive, coherent strategy to deter adversary action and protect space assets? The National Space Policy and the National Security Space Strategy outline objectives intended to ensure the US continues to realize the significant national security benefits of space, but scholars indicate a comprehensive space strategy is lacking. In the 2009 *Air University Space Primer*, leading space theorists and professionals warn:

> Despite operating in space for 50 years, the US still lacks a comprehensive space strategy. The lack of a space strategy stems from a mantra that space should not be weaponized and should be used for peaceful purposes. While this is a noble position, the reality is that the US faces a decision to either continue to ignore air and sea history or adopt a proactive policy, including a space strategy that is designed to control space.[35]

---

[33] General John E. Hyten, "An Airman's Story," *Air and Space Power Journal*, (Winter 2015): 10, http://www.au.af.mil/au/afri/aspj/archivepage.asp?id=41

[34] Theresa Hitchens and Joan Johnson-Freese, "Toward a New National Security Space Strategy Time for a Strategic Rebalancing," *The Atlantic Council*, 17 June 2016, http://www.atlanticcouncil.org/publications/reports/toward-a-new-national-security-space-strategy-time-for-a-strategic-rebalancing.

[35] Major Burton Catledge and LCDR Jeremy Powell, *Space Power Theory*, *Space Primer*, (Maxwell AFB, AL: Air University Press., 2009), 39.

The US is once again at a critical crossroads similar to when Congress first examined how the military manages space in 2001. Most difficult of all, the Air Force must surmount institutional impediments to start developing doctrinal framework and strategy for space combat operations, much in the same way as the Air Force developed doctrine of strategic bombing prior to World War II. To support these efforts, an examination of how officers are educated on space power is needed.

Conclusion

The intent of this chapter was to develop a problem statement. Specifically, since the space race began, the US has become more dependent on space application, from precision-guided munitions to global commerce; yet, according to senior military leaders, the Air Force is found unprepared to deter and defend adversaries in space. Moreover, according to scholars and senior military leaders, the US still lacks a comprehensive space strategy. Through examining the evolution of US space capabilities, it is clear that the US no longer operates in space with impunity. The space domain continues to grow more congested, contested, and competitive while the US relies increasingly more on space capabilities for critical civil and national security activities. With this increased dependency on space comes increased vulnerability. The antisatellite demonstrations from near peer adversaries is requiring senior military leaders to sound the alarm in how the Air Force organizes, trains, and equips space forces. Assuring continued US and allied access to and use of space demands a broader strategic approach, one that is rooted in education. Based on these observations of senior leaders, this research suggests there may exist a need to change how the Air Force educates officers at ACSC about space.

In analyzing this need, the following chapter provides a historical example of how the Air Force solved a similar dilemma in developing air power doctrine and strategy during the interwar period at the ACTS.

Chapter 2

Air Corps Tactical School

The society that separates its scholars from its warriors will have its thinking done by cowards and its fighting done by fools.

Thucydides

There is historical evidence to show that the problem of developing doctrine and strategy for a new domain is by no means a recent one. When Japan attacked the US in 1941, America turned to the military for survival. Men and machines were thrown into winning the war, and in the end America prevailed. While contributions from the Navy, Army and Air Force all secured victory, the Army Air Force's contributions were significant. The birth of air power during the interwar period altered the nature of warfare and influenced defeat of the axis.

The promise of air power was realized from ideas that bore out heroism of individuals and advancement of technology. As history reveals, like other military capabilities, success depended upon ideas. Unlike theorists focused on sea and land, the Army Air Force could not rely on tested air theory. Through the centuries of warfare, time was on the side of the land and sea components to understand the battlefield and develop strategy. Clausewitz's ideas of warfare date the Napoleonic era; command of the sea dates back to the nineteenth century. Air power, however, did not have the luxury of drawing from past performance. The Army Air Forces had to quickly develop a plan for the survival of the nation.

The role of education is central to the story of how the pre-war Air Corps Air Force delivered the promise of air power. ACTS brought together a cohort of officers during the interwar period focused on developing ideas about how to best employ the air weapon. From

classroom drawing boards to classrooms in the skies, ACTS offered a learning environment for early airpower development and a testing ground for the refinement of proposed concepts and technologies. Students became teachers and vice versa, sharing ideas and concepts for nearly 20 years. By advancing air power thought, ACTS exerted a tremendous influence on how air operations were conducted in World War II. Pioneering aviators at ACTS brought forward bold thinking in the face of old ideas and stern opposition. After the attack on Pearl Harbor, America turned to the ideas developed at ACTS to wage war. The industrial web theory, birthed at ACTS, led to rise of American air power. This chapter provides a historical case study of ACTS, the breeding ground of airpower doctrine and strategy during the interwar period, through an organizational analysis. The central question of this chapter is what aspects of ACTS led to its success in producing critical thinkers of air power?

Relying on John Arquilla's and David Ronfeldt's organizational analysis framework in the book *Networks and Netwars*, this chapter examines the strength of ACTS across five levels of analysis: organization, narrative, doctrine, technology and social. While there is no standard methodology for analyzing organizations, Arquilla and Ronfeldt's approach indicates that the design and performance of organizations depend on interaction across five levels of analysis.[1] Through organizational analysis, the important relationship between education and strategy emerges. Between the two world wars, ACTS educated future Air Corps leaders and served as the focal point for air power strategy development. The theories created, taught, and practiced at ACTS played out in the air campaigns of World War II and forged the doctrine of the Air Force that still exists today.

[1] John Arquilla and David Ronfeldt, *Networks and Netwars: The Future of Terror, Crime, and Militancy* (Santa Monica, CA: RAND Corp., 2001), 323.

Organization

How was ACTS organized? And how did the organization best contribute to fulfilling its' mission? The examination of the organizational level of analysis includes two areas: the macro level and the micro level. First, the macro level of organization examines the origins of the school, the purpose, and the relationship to the wider Army. Second, the micro level of organizational analysis examines curriculum and faculty.

World War I demonstrated the use of air planes and the need for further research about how to best employ the air weapon for war. The Army Reorganization Act of 1920 created the Air Service as a combatant arm of the Army along with the Infantry, Cavalry, Field Artillery, Coast Artillery Corps, Corps of Engineers, and Signal Corps. The Army Air Service was responsible for the unique training, supply, and other support activities for military aviation, but tactical units remained under the command of supported ground commanders.[2] Frustration with the inability to see the great potential of the new air weapon grew among early airmen.

An educational system that would go beyond the academies and provide an opportunity for senior officers to develop theory and doctrine of warfare was needed. The need for advanced education of officers led to the creation of the General Service and Staff College and the Army War College at Fort Leavenworth.[3] These schools served as the capstone in the Army's educational system, where courses in military strategy prevailed and new ideas were tested. For several years, however, Army aviation remained as an adjunct to the Signal Corps and through this

---

[2] Thomas H. Greer, *The Development of Air Doctrine in the Army Air Arm, 1917-1941* (Maxwell Air Force Base, AL: USAF Historical Division, 1955), 4.
[3] Robert T. Finney, *History of the Air Corps Tactical School 1920-1940*, USAF Historical Study 100 (Maxwell AFB, AL: USAF Historical Division, Air University, 1955), 2.

supporting relationship, formal professional education of aviation was not given sufficient focus compared to infantry, cavalry, and artillery.[4]

The Army provided limited professional education for the US Army Air Service. The Army not only lacked a coherent, working set of propositions on the proper use of military aviation, but also a coherent theory, doctrine, and strategy upon which airmen could base the future development of American air power.[5] In keeping with army tradition of professional military education, the Air Service formulated plans to develop air power ideas through developing a separate school, an air service school.[6] Although junior officers learned the basics of discipline, drill, and staff work through experience, and although officers could acquire technical knowledge through specialized training, a need for developing air power theory and doctrine persisted. The Air Service Tactical School was created in 1922 and later changed its name to the ACTS in 1926. In 1931, ACTS moved from Langley Field, Virginia to Maxwell Field, Alabama.[7]

When the name of the school changed, so did the focus, scope, and intent of ACTS; it only became the guiding force for doctrine development after the move to Maxwell Field. Up until that point, the school's purpose was to prepare officers for command and staff duties in all Air Corps tactical units.[8] To achieve this mission, students were exposed to a wide range of air power problems, such as developing and employing an air operational plan in support of ground troops. The original course lasted nine months and consisted of instruction among a variety of

---

[4] Finney, *History of the Air Corps Tactical School 1920-1940*, 3.
[5] Peter R. Faber, "Interwar US Army Aviation and the Air Corps Tactical School: Incubators of American Airpower," in The Paths of Heaven: The Evolution of Airpower Theory, ed. Phillip S. Melinger (Maxwell Air Force Base (AFB), Ala: Air University Press, 1997, 185.
[6] Finney, *The History of the Air Corps Tactical School 1920-1940*, 8.
[7] Finney, *The History of the Air Corps Tactical School 1920-1940*, v.
[8] Walter R. Weaver, "Functions of The Air Corps Tactical School," *Aero Digest* (August 1939), 52.

subjects from observation, bombardment, pursuit, attack aviation, and hygiene to navy and army tactics and techniques.[9] For the first few years, since air power was in its infancy, a considerable amount of the instruction was spent on ground tactics and techniques. The curriculum was concerned primarily with the contribution that aviation could make as a supporting element to the ground campaign instead as a supported element.[10] The emphasis of instruction at Maxwell Field, however, shifted more exclusively toward air power topics, with bombardment aviation comprising the focus of study; the idea that air power could threaten a nation's ability to make war by bombing vital centers was born, while the technical subjects included in the curriculum were shortened considerably.[11] Students were now expected to be proficient in the technical aspects of aviation when they arrived, and then while at Maxwell focus their efforts in bringing about new ideas of air power employment.[12]

During the interwar period, ACTS existed to educate airmen about air power.[13] Compared to other military schools, there was no precedent or body of knowledge on which to base air power employment.[14] Therefore, the school's purpose centered on developing air doctrine.[15] The school's motto was: *Proficimus More Irretenti* (We Make Progress Unhindered by Custom).[16] Although the school was still under Army control, its ideas and teachings often strayed from official Army policy.

By the mid-thirties, the concepts that the Air Force was an indispensable part of the military establishment and that an air war, separate and distinct from surface engagements, would characterize

---

[9] Finney, *The History of the Air Corps Tactical School 1920-1940*, 10.
[10] Finney, *The History of the Air Corps Tactical School 1920-1940*, 20.
[11] Finney, *The History of the Air Corps Tactical School 1920-1940*, 64.
[12] Finney, *The History of the Air Corps Tactical School 1920-1940*, 21.
[13] Finney, *The History of the Air Corps Tactical School 1920-1940*, introduction.
[14] Finney, *The History of the Air Corps Tactical School 1920-1940*, introduction.
[15] Finney, *The History of the Air Corps Tactical School 1920-1940*, introduction.
[16] Finney, *The History of the Air Corps Tactical School 1920-1940*, introduction.

future warfare had become firmly entrenched in the ACTS curriculum.[17] Percentages of concentration on air power over the first five years at Maxwell indicated the increasing emphasis faculty placed on air matters (see Table 1).[18] ACTS eventually served as an incubator for developing airpower theory and doctrine.

Table 1: Curriculum percentages over first five-year period at ACTS

	1930-1931	1931-1932	1932-1933	1933-1934	1934-1935
Air subjects	43.6	48.8	46.3	50.9	52.9
Ground subjects	29.8	33.6	31.9	26.6	25.4
General subjects	26.5	17.6	21.8	22.5	21.7

Source: Robert Finney's book *The History of the Air Corps Tactical School*

In changing the focus of the school to more air subjects, the departments also changed. The school was re-organized into three sections comprising: Department of Air Tactics and Strategy, Department of Command, Staff and Logistics, and Department of Ground Tactics.[19] A variety of subjects fell under each department in Table 2.

Table 2: ACTS Department Sections

Department of Air Tactics and Strategy with sections on:	Department of Command, Staff and Logistics with section on:	Department of Ground Tactics with sections on:
• Air Force	• Combat Orders	• Antiaircraft
• Attack	• Communications	• Cavalry
• Bombardment	• Logistics	• Chemical Warfare
• Observation	• Military Intel	• Combined Arms
• Pursuit	• Staff Duties	• Field Artillery
• Naval Operations		• Infantry
• Air Navigation		

Source: Robert Finney's book *The History of the Air Corps Tactical School*

[17] Finney, *The History of the Air Corps Tactical School 1920-1940*, 55.
[18] Ltr, Lt Col John F. Curry to TAG 22 May 1934, (Maxwell AFB, AL: Air Force Historical and Research Agency, 2017)
[19] Finney, *The History of the Air Corps Tactical School 1920-1940*, 36.

According to both faculty and students, the most important department was the Air Tactics and Strategy.[20] Initially concerned with combined employment of aviation, as the course developed greater emphasis was placed on pursuit, bombardment, and attack concepts. Although instruction in Air Tactics and Strategy was dominant, instruction in the other departments demonstrated that ACTS curriculum was not limited to air matters.[21] Instruction in broad ranging subjects was given to "round out complete education as an Air Corps officer, especially where he will have close relations with other branches and arms of all the armed services as well as positions other than those dealing directly with air tactics and strategy."[22]

Robert Finney's book, *The History of the Air Corps Tactical School,* conveys that the faculty consisted of a high caliber of officers. The commandants, assistant commandants, directors, and individual instructors were men of discerning minds, and they possessed a keen curiosity regarding the impact of airpower on war.[23] Many faculty members rose to the rank of general and played prominent roles in the development of air power in World War II. For example, Major General Donald Wilson had a longer direct association with the school than any other officer: he served as instructor in 1929-1930, attended as a student in 1930-1931, and returned to the school in 1936 to serve as director of the Department of Air Tactics and Strategy. General Hoyt Vandenberg was an instructor in the pursuit section in 1936, and General Muir Fairchild served inside the Department of Air Tactics and Strategy in 1940. For the most part, the school was a precursor to additional levels of responsibility within the Air Force. Other services also appointed capable officers as their representatives to the school.

---

[20] Finney, *The History of the Air Corps Tactical School 1920-1940*, 37.
[21] Finney, *The History of the Air Corps Tactical School 1920-1940*, 38.
[22] Finney, *The History of the Air Corps Tactical School 1920-1940*, 38.
[23] Finney, *The History of the Air Corps Tactical School 1920-1940*, 40.

Until 1924, faculty consisted of only Air Service instructors. Soon after, representatives from other arms and services were gradually added to teach subjects. By 1936, infantry, cavalry, artillery and navy representation was at the school on a full-time basis. Major Ira Eaker noted it was, "apparent that the other branches have selected their instructors with great care, as the type of instruction is of a high order."[24] An assignment to Maxwell Field indicated an officer was above average.[25]

During World War II, ACTS graduates dominated the Army Air Force (AAF) leadership. At the close of the war, 261 of the 320 general officers remaining on active AAF duty graduated from ACTS.[26] Further, the three four-star generals--McNarney, Kenney, and Spaatz--and 11 of the 13 three-star generals--Emmons, Brett, Yount, Eaker, Giles, George, Cannon, Vandenberg, Stratemeyer, Twining, and Whitehead had graduated from ACTS.[27] Additionally, many more graduates served with distinction, but were either retired or killed prior to the end of the war. These officers all shared a common formative experience and contributed to air power's success in World War II.

The macro and micro organizational levels of ACTS contributed in preparing officers to think strategically about how to employ the air weapon. Up until 1931, the Air Corps lacked the necessary means to focus on air matters. After the formal establishment of a separate air school, the organization could develop curriculum, departments, and faculty, bringing forward a new way of thinking about warfare.

Narrative

Organizations are held together by narratives or stories that people tell.[28] The decisive air power narrative introduced by General Gihlio

---

[24] Finney, *The History of the Air Corps Tactical School 1920-1940*, 41.
[25] Finney, *The History of the Air Corps Tactical School 1920-1940*, 41.
[26] Finney, *The History of the Air Corps Tactical School 1920-1940*, 43.
[27] Finney, *The History of the Air Corps Tactical School 1920-1940*, 43.
[28] Arquilla and Ronfeldt, *Networks and Netwars: The Future of Terror, Crime, and Militancy*, 328.

Douhet and General Billy Mitchell provided ACTS a foundation that bound the school together. These leaders played a crucial role in the school forging doctrine for the future of American air power. The early role of air power supported only the ground element. A new vision of strategic air power was needed to appreciate the unique role of air power in battle and to put an end to wars of attrition which hampered World War I. It is through the narratives of Douhet and Mitchell that air power theory developed at ACTS.

The record of World War I was one of promise rather than results, and ACTS was concerned with undoing a bad performance. In between the wars, many people saw the promise air power could bring as an offensive weapon. The most noted theorist was Douhet. In his 1921 book, *Command of the Air*, he set forth many principles of how air power could change the fundamental nature of warfare.[29] His basic premise was:

> To have command of the air means to be in a position to wield offensive power so great it defies human imagination. It means to be able to cut an enemy's army and navy off from their bases of operation and nullify their chances of winning the war. It means complete protection of one's own country, the efficient operation of one's army and navy, and peace of mind to live and work in safety. In short, it means to be in a position to win. To be defeated in the air, on the other hand, is finally to be defeated and to be at the mercy of the enemy, with no chance at all of defending oneself, compelled to accept whatever terms he sees fit to dictate.[30]

Douhet opposed the Army in their use of what he called "auxiliary aviation." He deemed this viewpoint as "useless, superfluous, and harmful" because it detracted from the number of aircraft which could be allocated to decisive airpower operations.[31] The command of the air concept and independency were ideas that airmen endeavored for a more

---

[29] Giulio Douhet, *Command of the Air*, (Tuscaloosa, AL: University Alabama Press, 2009), 22.
[30] Douhet, *Command of the Air*, 23.
[31] Douhet, *Command of the Air*, 215.

effective approach which exploited the great speed and flexibility possible in the air domain.

Mitchell was another influential theorist advocating air power. Mitchell advocated his ideas on air power at the same time Douhet published his book, *Command of the Air*. Mitchell's formative years influenced his ideas of air power and his zealotry for independence. As Assistant Chief of the Air Service from 1920 to 1925, Mitchell so fervently pushed his narrative that he was court martialed for insubordination. Mitchell was concerned that as an auxiliary service to the Army, air power would hamper air power doctrine, budget, and administration.[32]

The differences between the two theorists was of strategic perspective. Mitchell wrote from an American strategic air power perspective than Douhet, who adopted a more focused, regional approach. Mitchell and Douhet also differed in their ideas about which aircraft would be best suited for air force missions. Douhet believed almost entirely in the battleplane, while Mitchell saw benefit in three types of airplanes: pursuit, bombardment, and attack.[33]

Were the narratives of Douhet and Mitchell the pre-cursor to the industrial bomb theory? Douhet had a direct impact on ACTS. The curriculum included his book, *Command of the Air*.[34] His book, The War of 19XX, was published in 1930 and appeared in the ACTS library one year later.[35] General Ira Eaker, a student of ACTS in 1935 stated, "Douhet exercised considerable influence. He created a great deal of interest, and he developed partisans in this country. We read all of his

---

[32] William Mitchell, *Winged Defense* (Tuscaloosa, AL: University of Alabama Press, 2009), 112-13.
[33] Mitchell, *Winged Defense*, 181-198.
[34] Ronald Schafer, *Wings of Judgment* (New York: Oxford University Press, 1985), 24.
[35] Schafer, *Wings of Judgment*, 24.

books."[36] Douhet's ideas allowed the ACTS students to think critically about target selection.[37] One study concluded:

> While the School throughout the period 1920-1935 was of course subject to various influences of an intellectual order, there was none so pervasive or significant as that of Douhet. The very fact that his was a carefully integrated theory, with all constituent elements derived from and dependent upon his philosophy of strategic air warfare, helps account for his penetrating influence there. For the school embraced during the decade 1925-1935 his unique counter-air force strategy, battle plane concept, minimization of pursuit, conversion of observation and attack roles to support bombardment, rationale for concentrating all possible resources on the striking force, self-sufficiency of the air organization—including dispersal for security, and passive air defense, as well as his war-winning formula for using massed air power to destroy the most vulnerable elements of the enemy nation.[38]

Mitchell's ideas also influenced creative thinking and development of doctrine at ACTS. Brigadier General Lawrence Kuter stated in 1942, "Mitchell's notes on the Multi-Motored Bombardment Group, Day and Night, was the basis of instruction in the Air Corps Tactical School from its inception."[39] According to the official ACTS history, "When instructors at the school began to graft the concept of the primacy of the bomber onto the concept of air warfare and strategic air operations, they were consciously or unconsciously providing the covering for the skeleton built by Mitchell."[40] Concepts formed at ACTS regarding airpower shaped the doctrine used to create planning documents for the war, AWPD-1 and AWPD-42. The ideas formed and taught at ACTS such as strategic bombardment; industrial web theory; high-altitude, daylight precision

---

[36] AF Office of History Interview with Ira Eaker, 1974 (Maxwell AFB: Historical Research Agency #K239.0512-918).
[37] Raymond R. Flugel, *United States Air Power Doctrine: A Study of the Influence of William Mitchell and Giulio Douhet at the Air Corps Tactical School, 1921 - 1935* (Norman: University of Oklahoma, 1965), 95.
[38] Flugel, *United States Air Power Doctrine: A Study of the Influence of William Mitchell and Giulio Douhet at the Air Corps Tactical School, 1921 – 1935*, 254.
[39] Finney, *The History of the Air Corps Tactical School 1920-1940*, 65.
[40] Finney, *The History of the Air Corps Tactical School 1920-1940*, 57.

employment; and bomber invincibility all shaped the common thought of US airmen during World War II. The significance of both Douhet and Mitchell's narratives forged integrating bodies of concepts into theory, a valuable contribution not only to the Air Corps but the nation.

Doctrine

What doctrines grew out of ACTS? This level of analysis is important for explaining how members of the organization operated strategically and tactically.[41] The performance of an organization depends on the existence of shared principles and practices that span the organization and to which the members subscribe in a deep way.[42] Such a set of guiding principles and practices – a doctrine can enable an organization to be all of one mind.[43] The following section describes the members of ACTS that brought forward doctrine.

The military defines doctrine as "fundamental principles by which the military forces or elements thereof guide their actions in support of national objectives. It is authoritative but requires judgment in application."[44] Doctrine is explained further by the Air Force as, "a body of carefully developed, sanctioned ideas which has been officially approved or ratified corporately, and not dictated by any one individual. Doctrine establishes a common frame of reference including intellectual tools that commanders use to solve military problems. It is what we believe to be true about the best way to do things based on the evidence

---

[41] Arquilla and Ronfeldt, *Networks and Netwars: The Future of Terror, Crime, and Militancy*, 333.
[42] Arquilla and Ronfeldt, *Networks and Netwars: The Future of Terror, Crime, and Militancy*, 333.
[43] Arquilla and Ronfeldt, *Networks and Netwars: The Future of Terror, Crime, and Militancy*, 333.
[44]Curtis E. LeMay Center for Doctrine Development and Education, Joint Publication [JP] 1-02, Department of Defense Dictionary of Military and Associated Terms US Air Force, Basic Doctrine Volume 1, 27 February 2015, 1, https://doctrine.af.mil/download.jsp?filename=V1-D02-Doctrine-Defined.pdf.

to date."[45] Doctrine is a guide for how the military can best contribute to war. For military forces, doctrine is the bridge between theory, strategy, and operations. It stems from military theory and provides strategic options to military planners. Doctrine reflects the judgment of military professionals regarding what is possible and necessary to conduct operations.

Following World War I, the US Army looked to renew the doctrine that led to the bloody stalemate of trench warfare. The doctrine of maneuver warfare began to emerge as the answer to long, costly wars of attrition.[46] The inherent speed, mobility, and flexibility of air power showed promise in augmenting ground force maneuverability in battle. By the mid-thirties, the concepts that the Air Force was an indispensable part of the military establishment and that an air war, separate and distinct from surface engagements, would characterize future warfare had become firmly entrenched at ACTS.[47] The school recognized aviation as a distinct specialty within the Army, and served as the center for doctrinal thinking on airpower.[48]

Throughout the interwar period, there were differences of opinion on the proper employment of air power. The Army viewed the airplane as an extension of the ground force, "a highly mobile and powerful combat element which…conducts the operations required for carrying out army missions."[49] Airmen, however, were convinced that war in the future would be increasingly dependent on airpower, more than simply a

---

[45] Curtis E. LeMay Center for Doctrine Development and Education, Joint Publication [JP] 1-02, Department of Defense Dictionary of Military and Associated Terms US Air Force, Basic Doctrine Volume 1, 27 February 2015, 1, https://doctrine.af.mil/download.jsp?filename=V1-D02-Doctrine-Defined.pdf.
[46] Walter E. Kretchik, *U.S. Army Doctrine: From the American Revolution to the War on Terror* (Lawrence, KS: University Press of Kansas, 2011), 145.
[47] Robert T. Finney, *The History of the Air Corps Tactical School 1920-1940*, 55.
[48] Robert F. Futrell, *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force 1907-1960* (Maxwell Air Force Base, AL: Air University Press, 1989), 62.
[49] Robert T. Finney, *The History of the Air Corps Tactical School 1920-1940*, 55.

complement to ground forces, but rather a superior branch of warfare.[50] Stemming from Mitchell's ideas, airmen believed in basic air principles: control of the air is mandatory for successful surface or air operations; to be effective, airpower should be employed in mass; air units should be commanded by competent airmen who understand not only the capabilities and limitations of the air weapon, but also personnel problems peculiar to flyers.[51] ACTS served as a think tank to these basic air principles and transformed them into doctrine. Major Harold George, director of the Department of Air Tactics and Strategy, explained the importance of the school:

> We are not concerned with fighting the past war; that was done 18 years ago. We are concerned, however, in determining how air power shall be employed in the next war and what constitutes the principles governing its employment, not by journeying into the hinterlands of wild imaginings but by traveling the highway of common sense and logic. In pursuing this purpose, we realize that air power has not proven itself under the actual test of war. We must also realize that neither land power nor sea power has proven itself in the face of modern air power. The question for you to consider from today on war, to have constantly before you as you continue your careers, is substantially this: Has the advent of air power brought into existence a method for the prosecution of war which has revolutionized that art and given to air forces a strategical objective of their own independent of either land or naval forces the attainment of which might, in itself, accomplish the purpose of war; or has air power merely added another weapon to the waging of war which makes it in fact only and auxiliary of the traditional military forces?[52]

Students at ACTS were encouraged to critically think about the philosophy of war and if air power changed its nature. The value of the school grew to include being a sounding board for new ideas. Despite the absence of concrete evidence of the capabilities of the air weapon, ACTS gave considerable thought to the possibilities of air power in the

---

[50] Robert T. Finney, *The History of the Air Corps Tactical School 1920-1940*, 55,
[51] Robert T. Finney, *The History of the Air Corps Tactical School 1920-1940*, 56.
[52] ACTS Lecture, *An Inquiry into the Subject of War*, 1935, in 248.11-9.

future. ACTS texts and lectures from 1920 through 1927 on the employment of airpower in World War I recited the operational record.[53] However, in 1928, the lectures began to challenge the students to consider alternate ways airmen could have used airpower during World War I. This shift toward critical thinking marked the beginning of a debate that still influences Airmen today.

In 1928, ACTS faculty changed their curriculum and helped prompt an air power revolution. Thus far, the curriculum taught the experience of World War I. In that war, the air plane supported ground observations through observation and pursuit.[54] Lieutenant Colonel Clarence Culver, the school's commandant, pursued a curriculum that reinforced the World War I view of air power's support of ground forces. However, Major General James Fechet, Chief of the Air Corps, refuted this commonly held idea by stating, "the objective of war is to overcome the enemy's will to resist, and the defeat of his army, his fleet or the occupation of his territory is merely a means to this end and none of the them is the true objective."[55] As a soldier of World War I, Fechet noted that the future entailed a different utilization of air power. His leadership brought forward critical thinking to ACTS cadre and student body.

The key proponents of new thinking at ACTS were Clair Chennault, Kenneth Walker, Haywood Hansell, and Harold George.[56] Collectively they influenced the air doctrine for World War II, and individually, each of them played a significant role in shaping ideas at ACTS. The following paragraphs document their contributions.

---

[53] Robert T. Finney, *The History of the Air Corps Tactical School 1920-1940*, 21.
[54] Robert T. Finney, *The History of the Air Corps Tactical School 1920-1940*, 21, 67.
[55] Robert Futrell, *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force 1907-1960,* (Maxwell AFB: AL, Air University Press, 1989), 63, http://www.au.af.mil/au/aupress/digital/pdf/book/b_0031_futrell_ideas_concepts_doctrine.pd .
[56] Finney, *The History of the Air Corps Tactical School 1920-1940*, 38-39.

While Mitchell promoted the decisiveness of air power and the need for independency, his former subordinates reported to ACTS as instructors who carried forward Mitchell's ideas into practice. In 1932, Lieutenant Kenneth Walker joined the ACTS faculty. Walker shared Mitchell's view and as his former aid. As an instructor in the Tactics and Strategy department, Walker promoted Mitchell's ideas about bombardment in the classroom.[57] Walker argued that bombardment would lead the way in the Air Force. Even though anti-aircraft could threaten bombers, it could not eliminate attacks.[58] Bomber performance rivaled if not exceeded enemy fighters. By adding defensive guns to bombers, Walker believed that bomber formations could reduce the threat of enemy aircraft. Walker's most renown lecture emphasized, "a determined air attack, once launched, is most difficult, if not impossible, to stop when directed against land objectives."[59]

Unlike Walker, some instructors believed there was more to air power than just bombing. Captain Clair Chennault was another important ACTS instructor from 1931-1936 and advocated for the introduction of pursuit aviation.[60] Pursuit aviation includes employing fighter planes to gain air superiority in support of ground forces. This employment of aviation was introduced during World War I, but ACTS brought forward new thinking regarding the decisive capability of bombing. Chennault's advocacy of pursuit was an outlier among the views of the majority of ACTS faculty.[61] He argued that defense was more important than offense and that the bomber would not always get through.[62] He often spoke to faculty about the idea that bombardment

---

[57] Finney, *The History of the Air Corps Tactical School 1920-1940*, 21.
[58] Phillip S. Meilinger *Bomber: The Formation and Early Years of Strategic Air Command*, (Maxwell Air Force Base, AL: Air University Press: 2012), 18.
[59] Phillip S. Meilinger *Bomber: The Formation and Early Years of Strategic Air Command*, (Maxwell Air Force Base, AL: Air University Press: 2012), 64.
[60] Finney, *The History of the Air Corps Tactical School 1920-1940*, 76.
[61] Finney, *The History of the Air Corps Tactical School 1920-1940.*, 77.
[62] Meilinger *Bomber: The Formation and Early Years of Strategic Air Command,* 19.

was flawed, "This lack of regard for hostile opposition is a theory which has no foundation in experience."[63]

Chennault's arguments indicated a limitation in ACTS perspective regarding bombing. Most of ACTS faculty believed that the bomber would always get through on theory rather than fact. Compounding the lack of evidence, at the time, technology did not exist to provide strategic bombing.[64] Not only were there no long-range bombers, but the capabilities of pursuit aircraft could not exceed bomber's air speed.[65] The bombardment versus pursuit debate continued until Chennault left ACTS. In 1936, after Chennault's departure, bombardment dominated ACTS curriculum.[66] After the development of the B-17, ACTS declared any idea that included "bomber's being escorted by pursuit would have to be based on a fighter aircraft that did not exist," and was therefore unfounded.[67] The bomber fanaticism and the "cult of the offensive" solidified. ACTS therefore focused effort in developing theory on targets with the certainty that bombers would always get through.

In the late twenties, an ACTS document entitled, *Employment of Combined Air Force*, proposed a new idea of how to employ the air weapon that challenged the traditional support role for aviation. The argument proposed using air power to target vital points of a nation's industry rather than targeting opposing tanks or enemy soldiers in a war of attrition.[68] This idea, crystalized the industrial web theory, meant:

> The economic structure of a modern highly industrialized nation is characterized by the great degree of interdependence of its various elements. Certain of these elements are vital to the continued functioning of the modern nation. If one of these elements is destroyed the whole of the economic machine ceases to function.

---

[63] Claire Chennault, Captain, "Pursuit Aviation," ACTS lecture, September 1933, AFHRA, file 248.101-8.
[64] Finney, *The History of the Air Corps Tactical School 1920-1940*, 67.
[65] Finney, *The History of the Air Corps Tactical School 1920-1940*, 67.
[66] Finney, *The History of the Air Corps Tactical School 1920-1940*, 67.
[67] Finney, *The History of the Air Corps Tactical School 1920-1940*, 68.
[68] Finney, *The History of the Air Corps Tactical School 1920-1940*, 63.

> Against a highly-industrialized nation air force action has the possibility for such far reaching effectiveness that such action may produce immediate and decisive results.[69]

This provocative idea meant air power alone could be decisive and departed from early theories of warfare, mainly Clausewitz's employment of military forces to achieve three broad objectives: annihilation of enemy forces, occupation of territory, and defeat of the enemy's will to fight.[70] ACTS promoted critical thinking in how war would be fought in the future. Instead of annihilating enemy forces and holding land, airpower could be decisive in destroying the enemy's will to fight.

The way to collapse an enemy's will to fight would be destroyed was through air power. ACTS focused on identifying the vital centers of a country that would prove critical in waging war. Through examination of what countries relied upon to fight a war and sustain human life, air power could target central nodes and therefore render a country helpless.[71] In order to understand the intricacies of the industrial web theory and its application in Germany for instance, ACTS faculty and students analyzed infrastructure across four major US cities: Pittsburgh, Boston, New York City, and Cleveland. Results surmised that 100 strategically targeted bombs could render a region 75 percent demolished in electrical generating capacity.[72] Identifying meaningful infrastructure targets across the US remained a staple in the ACTS curriculum. For instance, in 1935, Lieutenant Laurence Kuter taught a course in bombing probabilities.[73] Kuter argued that not only identifying vital

---

[69] Finney, *The History of the Air Corps Tactical School 1920-1940*, 33.
[70]Clausewitz, Carl von, Michael Howard, Peter Paret, and Bernard Brodie. *On War.* (Princeton, N.J.: Princeton University Press., 1984), 90.
[71] Finney, *The History of the Air Corps Tactical School 1920-1940*, 37.
[72] Meilinger, *Bomber: The Formation and Early Years of Strategic Air Command,* 28 note 72.
[73] ACTS, Bombardment Aviation course, "Bombing Probabilities," 18 October 1935, AFHRA, 249.222, 2.

centers were important in winning the war, but precision bombing was equally important by teaching:

> Where the objective is a large industrial center, individual bombers must hit specific buildings or areas or the mission may be a failure. It is thus evident that the destruction of material objective—the reason for the existence of our arm—depends on the ability of bombardment to hit small targets.[74]

Kuter's instruction indicated that the panacea in winning the war involved the ability to penetrate targets accurately. The focus ACTS placed on the industrial web theory through daylight precision bombing would remain the height of airpower strategy through World War II.[75]

The doctrine analysis of ACTS reveals that basic principles and beliefs of airpower, originating from Billy Mitchell and Giulio Douhet, shaped thinking at the school. Air power theory was highly valued throughout the curriculum and faculty instruction. ACTS took hold of strong air power concepts and refined them through application, leading to the industrial web theory and pursuit aviation. Not hindered by the past, ACTS brought forward intellectual thought linked with commanders applying ideas in war.

Technology

How well did technology support the organization's narrative and doctrine?[76] During the early twenties, the Air Corps operated with scraps from leftover aircraft from World War I and with few improved airplanes.[77] Congress was hesitant to allocate funding to aircraft production and alternatively developed a wait-and-see attitude.[78] The

---

[74] ACTS, Bombardment Aviation course, "Bombing Probabilities," 18 October 1935, AFHRA, 249.222, 2.
[75] Tami Davis Biddle, *Rhetoric and Reality,* (Princeton, NJ: Princeton University Press., 2002), 131.
[76] Arquilla and Ronfeldt, *Networks and Netwars: The Future of Terror, Crime, and Militancy*, 339.
[77] Major H. Dwight Griffin et al, *The Untold Story of the ACTS*, (Maxwell AFB, AL: Air University Library, 1995), 27.
[78] Griffin, *The Untold Story of the ACTS*, 27.

only real increase in airplane production was the development of the Barling NBL-1 bomber, "The Barling was supposed to carry a payload of about ten thousand pounds and possess a cruising radius of around one thousand miles."[79] Cost overruns and technical difficulties, however, caused the program to be cancelled. The advocacy and development of bombers grew from airmen's beliefs that the bomber would always get through.

Throughout the 1930s, military leaders advocated for a high-performance bomber for coastal defense of America. Alternatively, the ACTS bombardment department advocated for offensive action and recommended two models of airplanes, a light model capable of carrying a bomb load of 1,200 pounds and a heavy model with a minimum load of 2,500 pounds.[80] ACTS instructors also advocated for the need to raise aircraft altitudes and increase the rate of climb.[81] Once the requirements could be understood, technological solutions could be implemented. The bomber would be invincible.[82] In 1932, the technology demand was met by the Martin B-10, a mid-wing, all metal monoplane with retractable landing gear.[83] The operational capacities of the B-10 served as a stimulus to the theorists at the tactical school: in this way, the development of bombers and advanced views at the school coincided.[84]

As new bombers became available, instructors at the school thought about advanced capabilities for improved range and bombing capacity. In 1933, as requirements improved and demand increased, a development request for a new bomber was issued to manufacturers. The XB-17, a four-engine bomber, provided the range, bomb-carrying capacity, armament, service ceiling, and rate of climb for the Army Air

---

[79] Griffin, *The Untold Story of the ACTS*, 27.
[80] Finney, *The History of the Air Corps Tactical School 1920-1940*, 66.
[81] Finney, *The History of the Air Corps Tactical School 1920-1940*, 66.
[82] Finney, *The History of the Air Corps Tactical School 1920-1940*, 66.
[83] Finney, *The History of the Air Corps Tactical School 1920-1940*, 67.
[84] Finney, *The History of the Air Corps Tactical School 1920-1940*, 67.

Corps.[85] By 1940, bombardment technology appeared to have finally caught up with ACTS doctrine, matching both rhetoric and reality. As Robert Finney describes in his book *The History of the Air Corps Tactical School*, "now the Army Air Corps had…an airplane that could penetrate the enemy's interior and bomb his industry, transportation, and supply depots; an airplane that could wither his vitals to the point where his capacity for armed resistance was fatally weakened."[86]

As the need to provide better range and bombing capacity grew, so did the need for precision technology. In ACTS curriculum, the argument was continually made that the bombing inaccuracy of World War I against targets as bridges could have been improved with better bombsight equipment.[87] The 1931 edition of the bombardment curriculum noted that because the bombsight was the most important part of the fire control system of the airplane, effort should be made to develop the most efficient bombsight possible.[88] As a result, the Norden company developed an electrically-stabilized gyroscope to alleviate precision problems.[89]

The development of bomber aircraft such as the B-10 and the B-17 provided the vehicle for ACTS to realize their strategic bombing theories and plans. Because of the technological advances and the serious thought given to the question of the employment of airpower in war, at the outbreak of World War II, ACTS had both the nucleus of a modern air force and a body of concepts to guide its use.[90] The technological advances, in concert with bombing theory, provided the Air Force a viable strategy in connecting ends, ways, and means during World War II.

---

[85] Finney, *The History of the Air Corps Tactical School 1920-1940*, 68.
[86] Griffin, *The Untold Story of the ACTS*, 31.
[87] Finney, *The History of the Air Corps Tactical School 1920-1940*, 68.
[88] Finney, *The History of the Air Corps Tactical School 1920-1940*, 68.
[89] Historical office, Air Technical Service Command, comp., "Case History of the Norden Bombsight and G1 Automatic Pilot," January 1945 (Maxwell AFB: HRA #202.35)
[90] Finney, *The History of the Air Corps Tactical School 1920-1940*, 59.

Social

The last level of analysis examines how well an organization is connected internally and externally. This social analysis identifies the strength of relationships that lead to high functioning organizations.[91] During the mid-twenties, Mitchell recognized that the rise of American air power would require a whole of government approach. In order to see the fruits of air power, it would require civilian and commercial interests as well as military advocacy. As much as Mitchell wanted America to have an independent air force, he realized that the strength of that argument lied in the economic well-being of the nation. He wrote, "While aviation is still expensive and somewhat dangerous, this is being overcome every day; and it is increasingly evident that the future national defense, future predominance in commerce, and the future economic development of a country lie in the air."[92]

America was at a critical inflection point. Air power was in its' infancy, having been put to use in World War I primarily for observation in support of ground forces. In order to move beyond observation and increase the role of air power, both society and military needed to become "air-minded," acknowledging the advances in transportation, communication, commerce, and governance that the use of air could bring to the nation. In essence, Mitchell recognized that a strong air force was linked to the future strength of the American economy.

An attitude of air-mindedness within and outside the military led to the growth of American air power. According to the Oxford English Dictionary, which cites its first use of the term in 1927, "air-minded" means to be "interested in or enthusiastic for the use and development of

---

[91] Arquilla and Ronfeldt, *Networks and Netwars: The Future of Terror, Crime, and Militancy*, 341.

[92] William Mitchell, Our Air Force: The Keystone of National Defense (New York: E. P. Dutton & Co., 1921), 222–223.

aircraft."[93] Historian Michael Sherry characterized this interest in his book *The Rise of American Air Power:*

> The airplane was the instrument of flight, of a whole new dimension in human activity. Therefore, it was uniquely capable of stimulating fantasies of peacetime possibilities for lifting worldly burdens, transforming man's sense of time and space, transcending geography, knitting together nations and peoples, and releasing humankind from its biological limits.[94]

One example of the social movement towards air-mindedness was Charles Lindbergh's first solo transatlantic flight in 1927. Motivated by a prize of $25,000 and a sense of adventure, Charles Lindbergh's successful flight ignited financial and American support of aviation. Prior to his flight, the average citizen in 1927 still preferred to do his or her traveling by car, ship, or train.[95] Lindbergh's flight changed that tremendously. Americans gained a new confidence in air travel after seeing Lindbergh's success in operating an air plane over long distances. In 1929 more than 170,000 paying passengers boarded United States airliners, nearly three times the 60,000 that had flown the previous year.[96] Almost 3 million more, most of them businesspeople, traveled in private planes in 1929.

Even Mickey Mouse took to the air, mimicking Lindbergh's flight in the 1928 Walt Disney cartoon Plane Crazy.[97] Because of Lindbergh's flight, aviation stocks soared. As financial investors came forward, more

---

[93] "Air-minded," *Oxford English Dictionary Online*, accessed 6 March 2017.
[94] Michael S. Sherry, *The Rise of American Air Power: The Creation of Armageddon* (New Haven: Yale University Press, 1987), 2.
[95] RoAnn Bishop, "Lindbergh's Influence on Aviation," NCpedia.com, Fall 2003, http://www.ncpedia.org/aviation/Lindbergh.
[96] RoAnn Bishop, "Lindbergh's Influence on Aviation," NCpedia.com, Fall 2003, http://www.ncpedia.org/aviation/Lindbergh.
[97] RoAnn Bishop, "Lindbergh's Influence on Aviation," NCpedia.com, Fall 2003, http://www.ncpedia.org/aviation/Lindbergh.

and more fledgling airlines began to emerge. By the end of the 1920s, there were 44 US airlines.[98]

Another proponent of air-mindedness within the military was General Henry "Hap" Arnold. He served as a connector between the military and civilian manufacturers of airplanes. Unlike the abrasive Mitchell, Arnold had "an easy working relationship with all types of people, which none of his contemporaries did."[99] Not only did Arnold relate well to politicians, military officers, and civilian scientists, he had experience as an airline executive. He, along with Tooey Spaatz and Jack Jouett, created Pan American Airways in 1927 for national security reasons.[100] This experience gave him insight into the nuances of logistics chains, lead times, financing issues, and he became close friends with industry leaders including Don Douglas, a leading owner of an aircraft manufacturer.[101] Arnold understood that the herculean task of building the Air Force required social relationships with industry and scientists.

Arnold endorsed the importance of research and development. At his insistence, a forward-thinking perspective on science and technology became an integral part of the identity of the Air Force, which permitted it not only to win in World War II, but to remain the world leader in military technology.[102] Arnold established the Scientific Advisory Group and the National Defense Research Committee, both government scientific think tanks, during the interwar period under orders from the President. The members of these groups included the president of MIT, the president of Bell Laboratories, and Dr. Theodore von Karman, lead military engineer originally from Hungary.[103]

---

[98] RoAnn Bishop, "Lindbergh's Influence on Aviation," NCpedia.com, Fall 2003, http://www.ncpedia.org/aviation/Lindbergh.
[99] Bill Yenne, *Hap Arnold The General Who Invented the Air Force*, (Washington, DC: Regnery History., 2013), 50.
[100] Yenne, *Hap Arnold The General Who Invented the Air Force*, 51.
[101] Yenne, *Hap Arnold The General Who Invented the Air Force*, 77.
[102] Yenne, *Hap Arnold The General Who Invented the Air Force*, 266.
[103] Yenne, *Hap Arnold The General Who Invented the Air Force*, 268-269.

Air-mindedness and the connection to industry and academia also were present at ACTS. The contributions from civilian industry and academia ranged from theoretical ideals to targeting science to technological innovation. Two men cited in ACTS archives who influenced theory were Dr. James Hall of Harvard and an "eminent psychologist" quoted but never named.[104] These individuals contributed to understanding the impact of aerial bombardment on the morale of civilian population centers. Their guidance included the following:

> It is a fact fundamental in psychology that the state of war furnishes the most powerful of all stimuli to the social instinct…It sets up in a nation a tide of common feeling, by the power of which union and energy of purpose and self-sacrifice for the good of the social unit become possible to degree unknown under any circumstances. To be maximum in its stimulating influence, air power must involve a definite threat to the whole nation. This appears to be exactly the type of fear that an air force may carry to its enemy, the very kind of danger that will galvanize society with the strongest type of morale.[105]

In addition to consulting with academia regarding air power theory, ACTS consulted with civilian industry and other governmental agencies. ACTS gathered extensive information on interdependencies of key American strategic structures.[106] In 1934 and 1935, under the leadership of ACTS commandant Lieutenant Colonel John Curry, a request for target information was initiated.[107] These requests sought information about the US northeast industrial area, specifically in the areas of power, industry, transportation, and raw materials.[108] Requests to the US Department of Commerce, the Edison Electrical Institute, and Electronic World indicated there was no lack of information on such topics. Respondents not only provided information to the ACTS, but

---

[104] Griffin, *ACTS The Untold Story*, 35.
[105] "The Primary Objective of Air Forces," ACTS Lesson Plan, 13 April 1936 (Maxwell AFB: HRA #248.2017A-10), 4.
[106] Griffin, *ACTS The Untold Story*, 40.
[107] Griffin, *ACTS The Untold Story*, 47.
[108] Griffin, *ACTS The Untold Story, 47.*

passed on the requests to other agencies, such as the Northeast Super Power Committee, J.G. White Company, and Central Electric Light.[109]

Data collected because of requests to industry and other government organizations helped ACTS expand traditional thinking. Most of the information provided by external sources fell into three categories: study of the electrical power industry of the northeastern United States; a collection of open source information on New York City, and an extensive study of power, transportation, and industry called the Cullison Report of 1934.[110] All of this data culminated in ACTS curriculum and development of the industrial web theory.[111] Without the interaction of private industry, the faculty and students would not have understood the interdependencies between bombing and vital centers of gravity.

ACTS social connections originating from Billy Mitchell and Hap Arnold, while not startling, are important to the success of the school and development of theory. Military and civilian personnel, and governmental and industrial experts were consulted on a regular basis. The Air Force recognized that advancing air power required a belief in air-mindedness not only within the military but among civilians and the American public. ACTS also recognized that leveraging resources external to the school would allow a thorough understanding of the problem and development of diverse solutions.

Conclusion

The interwar period, like that of today, was accompanied by a sense of excitement that the future would be different. In the examination of ACTS, the sense of excitement was brought forward by young leaders who were not set in old ways of thinking about how to best employ air power. What aspects of ACTS led to its success in producing

[109] Griffin, *ACTS The Untold Story*, 48.
[110] Griffin, *ACTS The Untold Story*, 48.
[111] Griffin, *ACTS The Untold Story*, 48.

critical thinkers of air power? Specifically, this chapter identifies all levels of organizational analysis significantly influenced the victory air power achieved in World War II to include organization, doctrine, narrative, social and technology. Through the advocacy of leadership and connection with civilians, ACTS developed sound doctrine that led to air power's success in World War II. The Air Force delivered the promise of air power through the education instilled at ACTS, developing ideas about how to best employ the air weapon. From classroom drawing boards to classrooms in the skies, ACTS offered a learning environment for early airpower development and a testing ground for the refinement of proposed concepts and technologies. Table 3 summarizes this chapter's organizational analysis of ACTS.

Table 3: Organizational Analysis of ACTS

	ACTS
Organization	• Air power focus across curriculum and faculty experience • Fluid movement of faculty and staff
Narrative	• Douhet and Mitchell advocates thinking represented in curriculum • Metrics indicate air power focus more than ground
Doctrine	• Guiding force of ACTS • Challenge assumptions
Technology	• Bombardment technology incorporated into curriculum
Social	• Strong connections with private industry

Source: Author's original work

By advancing air power thought across all levels of the ACTS organization, ACTS exerted a tremendous influence on how air operations were conducted in World War II. The following chapter will

analyze how ACSC, the successor to ACTS is organized to bring forward critical thinking about contemporary issues regarding space.

Chapter 3

Air Command and Staff College

> *Although many of its individual courses, programs, and faculties are excellent, the existing PME system must be improved to meet the needs of the modern profession at arms.*
>
> Ike Skelton

The current demand in the Air Force for leaders who are versed in the operational art of space has never been greater. Speeches, articles, and books offer plenty of evidence over the last few years for a needed shift in how officers are educated at professional military education (PME) schools.[1] In response to the rise of antisatellites in space, the need for a change in how officers are educated about space is best summarized by General David Goldfein:

> Space can no longer be the responsibility of somebody that just wears space wings. It's got to be a responsibility of everybody who intends to lead in our Air Force to understand the operational art of the integration of space. That's a different development track. It means someone has to live it. When an Airman walks into a planning room and sits side by side with Sailors, Soldiers, Coast Guardsmen, and Marines, those joint team members must see an Airman who understands the operational integration of space and cyber into the campaign-design level of joint warfare.[2]

The words of the CSAF are not new though. In response to the space commission report in 2001, civilian and military leaders recognized "the security and well-being of the US, its allies and friends depend on

---

[1] Kevin P. Kelley, Joan Johnson-Freese, "Rethinking Professional Military Education," FPRI.org, 25 October 2013, http://www.fpri.org/article/2013/10/rethinking-professional-military-education/.

[2] General David Goldfein, "An Interview with Gen David L. Goldfein Twenty-First Chief of Staff of the US Air Force," *Strategic Studies Quarterly*, (Spring 2017): 7, http://www.airuniversity.af.mil/Portals/10/SSQ/documents/Volume-11_Issue-1/Goldfein.pdf.

the nation's ability to operate in space."[3] The commission concluded that, in order to sustain a level of distinct superiority in space, the military must "create and sustain a cadre of space professionals."[4] This chapter focuses on one of the three areas the commission identified as having a top priority in terms of improving space readiness within the military: education.

Effective integration of space into joint operations requires education of the entire force: space professionals charged with planning and executing operations in space and non-space professionals who will request space effects for joint operations. Thus, the central question of this chapter is, do ACSC graduates successfully understand the operational art of space and can they integrate space effects? This question is in fact tied to one of ACSC's stated tasks, to "develop and enhance students' abilities to plan and execute the joint campaign planning process and air, space and cyber operations to support the joint force commander."[5] Through the same organizational analysis used in chapter 3, this chapter addresses this question by examining the existence of space education at ACSC across five levels of analysis: organization, narrative, doctrine, technology and social. Following this analysis and drawing on ACSC's organizational and mission briefings, publications by senior leaders, and the direct experience of the author in attending in-residence ACSC, an evaluation in how ACSC is fulfilling space education is presented.

---

[3] *Report of the Commission to Assess United States National Security Space Management and Organization: Executive Summary* (Washington, DC: The Commission, 11 January 2001), 18, 47, http://www.fas.org/spp/military/commission/executive_summary.pdf.
[4] *Report of the Commission to Assess United States National Security Space Management and Organization: Executive Summary* (Washington, DC: The Commission, 11 January 2001), 18, 47, http://www.fas.org/spp/military/commission/executive_summary.pdf.
[5] One of ACSC's stated task is to: "Develop and enhance students' abilities to plan and execute the joint campaign planning process and air, space and cyber operations to support the joint force commander." ACSC webpage, accessed 10 March 2016 at http://www.airuniversity.af.mil/ACSC/Display/Article/922301

Organization

How is ACSC organized? How is the school aligned to best fulfill its' mission and tasks? This level of analysis identifies the macro perspective of organization examining the origins of the school and how it incorporates space education. The second level of organizational analysis examines the micro perspective of ACSC, examining curriculum and faculty in relation to space.

By the end of the second world war, Army Air Forces (AAF) leaders' decision to close ACTS was short lived. On 12 March 1946, ACTS graduates established Air University (AU) to fill the educational void left by the inactivation of ACTS and, more importantly, to analyze the war experience in development of doctrine and strategy.[6] Similar to ACTS, AU's mission was to educate Air Force officers in the strategies, tactics, and techniques of air power employment and to serve as a sounding board for ideas concerning the critical role of air power in future wars.[7] AU adopted the ACTS motto, *Proficimus More Irretenti,* a Latin phrase meaning we make progress unhindered by tradition. As Major General Muir Fairchild, the first AU commander, so eloquently put it, AU was created to produce airpower planners and leaders who would "design an Air Force so adequate it need never be used."[8]

Since the founding of AU in 1946, the University has been an education center, and has significantly expanded to serve all members of the Air Force, not just officers. Today, AU is the education component of

---

[6] Wesley Phillips Newton and Jerome A Ennels, "Air University Recovers from Vietnam and Regains Respect," http://www.au.af.mil/au/afri/aspj/airchronicles/apj/apj97/win97/newt.html, accessed 21 March 2017.

[7] Wesley Phillips Newton and Jerome A Ennels, "Air University Recovers from Vietnam and Regains Respect," http://www.au.af.mil/au/afri/aspj/airchronicles/apj/apj97/win97/newt.html, accessed 21 March 2017.

[8] "Welcoming Address by Maj. Gen. Muir S. Fairchild: Commanding General Congratulates Students at Air War College and Air Command & Staff School on Selection," *The Post,* 13 September 1946, 2.

Air Education and Training Command.[9] AU provides the full spectrum of Air Force education, from pre-commissioning to the highest levels of PME, including degree granting and professional continuing education for officers, enlisted, and civilian personnel throughout their careers.[10] The University's PME programs educate Airmen on the capabilities of air, space, and cyberspace power and their role in national security.[11] These programs focus on the knowledge and abilities needed to develop, employ, command, and support air, space, and cyberspace power at the highest levels.[12] AU's primary operating locations include Maxwell Air Force Base, Alabama, and the Air Force Institute of Technology at Wright-Patterson Air Force Base, outside Dayton, Ohio.[13]

The current AU commander, Lieutenant General Steven Kwast, explains that similarities between ACTS and AU still exist today:

> Much as the interwar-years, ACTS encouraged innovative and forward thinking that helped shape the successful planning and execution of military operations in World War II, the Air University strives to be the epicenter of new ideas and the launching pad for Air Force, joint and coalition leaders prepared to prevail in today's fight, and to respond effectively to the uncertain security environment we will face in the years to come.[14]

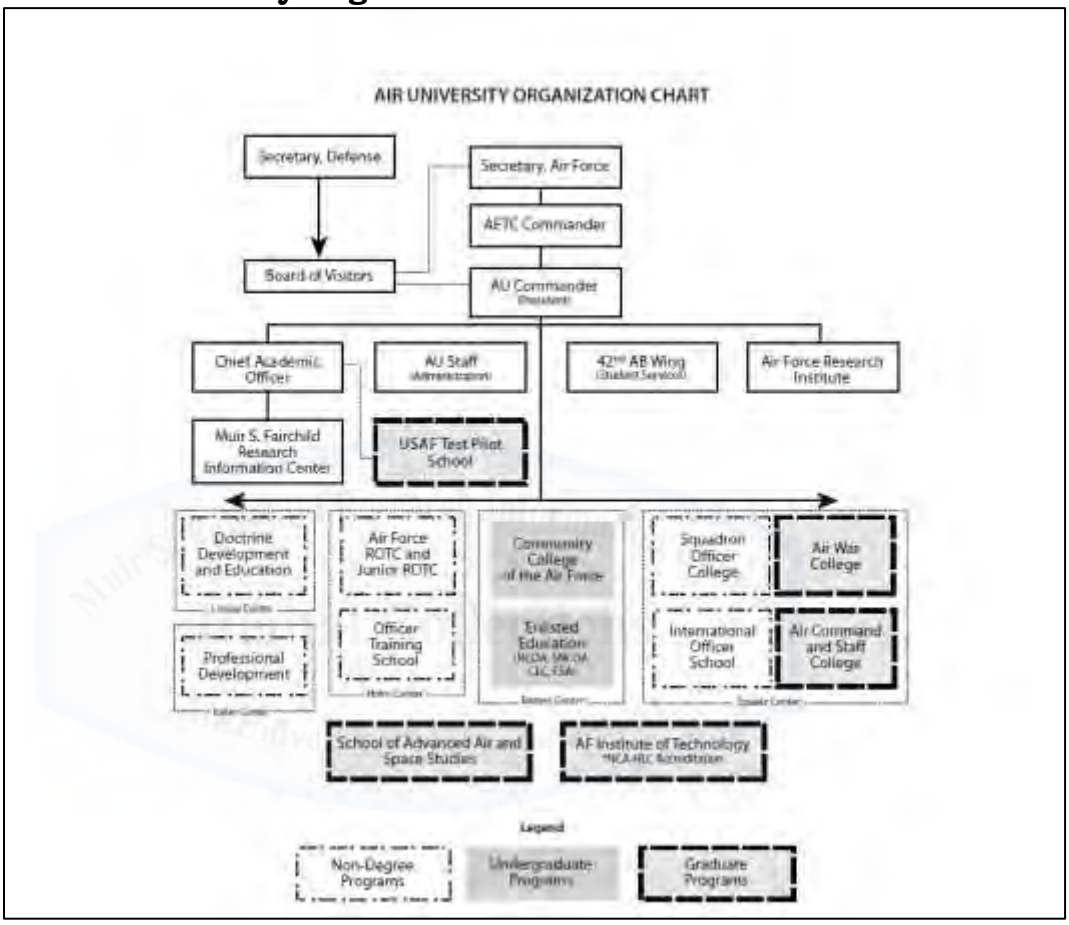
ACTS and AU share similar missions, but there are notable differences between the schools. ACTS was a single institution which offered instruction in command and staff functions, intelligence, logistics, the tactics and techniques of the various classes of aviation, theories of the employment of the air force, and the doctrines of the other services, plus many other subjects.[15] Today, AU divides the fields of study across various colleges from pre-commissioning to senior levels of

---

[9] Air University, *Education Digest*, 1 January 2015, 10.
[10] Air University, *Education Digest*, 1 January 2015, 10.
[11] Air University, *Education Digest*, 1 January 2015, 10.
[12] Air University, *Education Digest*, 1 January 2015, 11.
[13] Air University, *Education Digest*, 1 January 2015, 11.
[14] Air University, *Education Digest*, 1 January 2015, 11.
[15] Finney, *The History of the Air Corps Tactical School 1920-1940,* 84.

PME.[16] Since its creation, AU has been recognized as the doctrinal, educational, and research center of the Air Force.[17] Figure 1 depicts the current AU organization[18]

Figure 1: Air University Organization Chart



Source: Air University Catalog

ACSC is one of the reporting units to the AU commander. It is the Air Force's intermediate PME service school, charged with developing bold air power leaders.[19] Similar to AU, ACSC traces its roots directly

[16] Air University homepage heritage, accessed 24 March 2017, http://www.airuniversity.af.mil/About/
[17] Finney, *The History of the Air Corps Tactical School 1920-1940,* 85.
[18] Air University, *Education Digest*, 1 January 2015, 11.
[19] ACSC homepage, accessed 24 March 2017, http://www.airuniversity.af.mil/ACSC/Display/Article/922301/

back to ACTS from 1931 to 1942.[20] Although more than seven decades have passed since the founding of ACTS, the present 10-month curriculum at ACSC still focuses on expanding understanding of air power and on the growth of mid-career officers. In 1962, the school became known by its current name, Air Command and Staff College.[21]

The original mission statement that created ACSC was formed from the origination of AU. On 19 November 1945, the Army established the AAF School at Maxwell.[22] This was later incorporated into an AAF Regulation 20-61, and on recommendation of the Gerrow Board, the school was renamed AU.[23] It was to consist of three schools named Air Tactical School (later renamed Squadron Officer School), Air Command and Staff School (later renamed Air Command and Staff College), and Air War College (AWC). Air University opened on 3 September 1946.[24]

The mission of the schools was defined in informal guidance from the leaders of the AAF to General Fairchild. One such example of informal guidance was from General Carl Spaatz, commander of the AAF at the time:

> The purpose of the institution is to provide postgraduate education for Air Force officers in order to improve their professional capabilities and knowledge, to widen their vision and insure forward-thinking and adequate leadership for Air Forces, both in peace and war.[25]

---

[20] ACSC homepage, accessed 24 March 2017, http://www.airuniversity.af.mil/ACSC/Display/Article/922301/

[21] ACSC homepage, accessed 24 March 2017, http://www.airuniversity.af.mil/ACSC/Display/Article/922301/.

[22] Lt Col Richard L. Davis and Lt Col Frank P. Donnini, Professional Military Education for Air Force Officers: Comments and Criticisms (Maxwell AFB, Ala.: Air University Press, June 1991), 25.

[23] Lt Col Richard L. Davis and Lt Col Frank P. Donnini, Professional Military Education for Air Force Officers: Comments and Criticisms (Maxwell AFB, Ala.: Air University Press, June 1991), 26.

[24] Lt Col Richard L. Davis and Lt Col Frank P. Donnini, Professional Military Education for Air Force Officers: Comments and Criticisms (Maxwell AFB, Ala.: Air University Press, June 1991), 26.

[25] Lt Col Richard L. Davis and Lt Col Frank P. Donnini, Professional Military Education for Air Force Officers: Comments and Criticisms (Maxwell AFB, Ala.: Air University Press, June 1991), 28.

General Fairchild's' vision for the individual schools focused on preparation, "this is not a post-war school system, it is a pre-war school system!"[26] He did not want to focus on history but on envisioning the future. He outlined this in his welcome letter to the first students:

> Our mission calls for the discarding of traditionalism and rigidity of thought and doctrine. Our whole thinking must be fresh, original, and oriented on the future. The dividing line here between teaching and learning will be nebulous indeed. The maximum contribution of every one of us is demanded, to the end that the Air University may produce a corps of officers and establish a system of concepts and doctrine adequate to the needs of the Army Air Forces in fulfilling its obligations to our nation.[27]

The current ACSC resident program annually educates approximately 500 O-4s and civilian equivalents from the US armed services, other federal agencies, and foreign countries.[28] ACSC's current mission statement is to "develop bold airpower leaders who think, communicate and collaborate in the joint environment to strengthen national security."[29] In support of the mission, the school performs the following five tasks:

1) Facilitate the air, space, and cyber minded thinking of students

2) Develop and enhance abilities for higher-level command and staff responsibilities

3) Enhance students' abilities to think critically about operational air, space and cyber concepts in a dynamic international environment

---

[26] Welcoming Address by Maj. Gen. Muir S. Fairchild: Commanding General Congratulates Students at Air War College and Air Command and Staff School on Selection," The Post, 13 September 1946, 2.
[27] Welcoming Address by Maj. Gen. Muir S. Fairchild: Commanding General Congratulates Students at Air War College and Air Command and Staff School on Selection," The Post, 13 September 1946, 29.
[28] Air Command and Staff College, "Mission Brief," AY16.
[29] ACSC homepage, accessed 30 March 2017, http://www.airuniversity.af.mil/ACSC/Display/Article/922301/

4) Broaden students' understanding of the nature of conflict and current and future threats to the United States and its allies

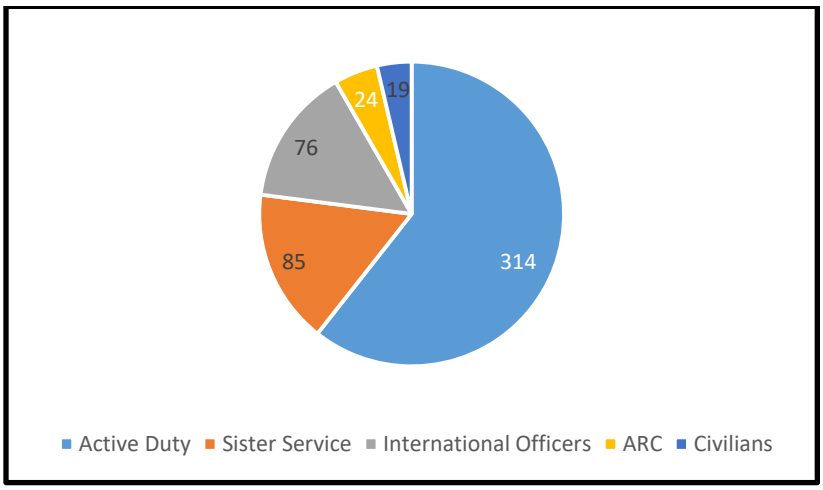
5) Develop and enhance students' abilities to plan and execute the joint campaign planning process and air, space and cyber operations to support the joint force commander.[30]

ACSC's stated mission and tasks indicate educating officers about space is a priority. Specifically, graduates should be able to communicate effectively to employ space effects for the Joint Forces Commander.

The ACSC student body represents a total force of active duty air force, sister services, reserve, guard, civilians, and international partners. All the students are competitively selected and are deemed the top 25 percent in their respective service. Students are also designated as having the potential to serve in positions of higher levels of command or staff in the Air Force. The selection to attend in-residence PME is considered a positive step toward increased levels of responsibility within the military. The diverse student backgrounds enhance the learning experience for students. Within the student demographics, multiple air force specialty codes are represented. Figures 2 and 3 provide a demographic composition of the AY16 ACSC student body.

[30] ACSC homepage, accessed 30 March 2017, http://www.airuniversity.af.mil/ACSC/Display/Article/922301/

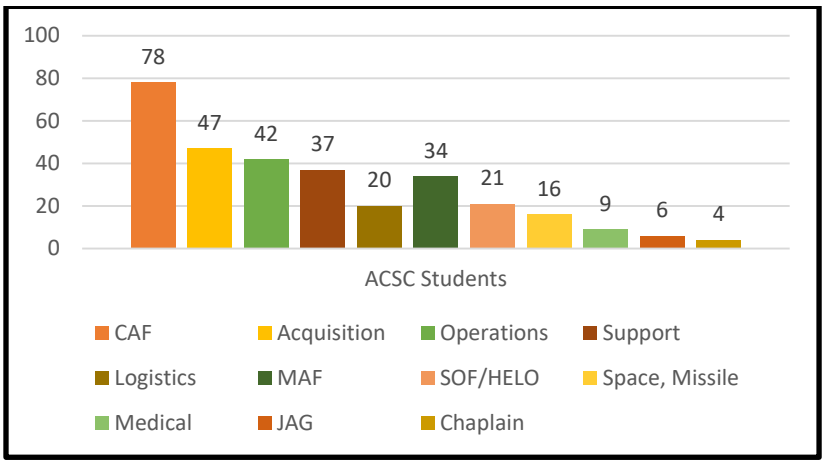
Figure 2: AY16 ACSC Total Force Representation



Source: ACSC Orientation Briefing (2015)

Out of a total of 518 students for AY16, only 16 students (3%) represented space and missile career fields in their primary career specialty, compared to the other career fields: Combat Air Forces (CAF) , Logistics, Medical, Acquisition, Mobility Air Forces (MAF), Judge Advocate General (JAG), Operations, Special Operations Forces/Helicopter (SOF/HELO), Chaplain, and Support. The majority of students attending ACSC are therefore not as familiar with space. This data would suggest that given ACSC stated tasks, the ACSC curriculum should be built around a thorough foundation of space knowledge and application given most students have not been working in space for the past 10-14 years.

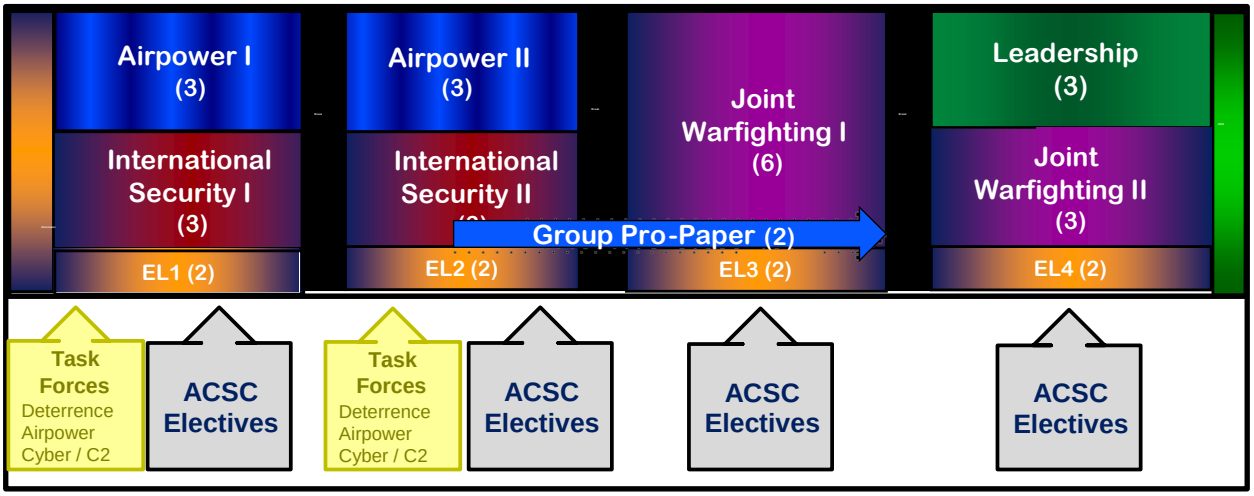
Figure 3: AY16 Air Force ACSC Student Body by Specialty Code



Source: ACSC Orientation Briefing (2015)

The overall ACSC program involves 33 credit hours of research, core, and elective coursework. The first semester is devoted to international security, the application of instruments of power, a historical look at the application of airpower, and future air power applications. The second semester transitions from theory to application with joint warfighting and leadership development. In addition to the core courses, students are required to take electives throughout the year and develop a thesis/professional paper. The capstone course is the Gathering of Eagles (GOE) merging year-long studies with testimonies.

Figure 4: AY16 ACSC Curriculum



Source: ACSC Orientation Briefing (2015)

Space is not a stand-alone core course at ACSC but found in three core courses. The ACSC core curriculum is summarized in Table 4 from the ACSC syllabus with a comparison to space.[31]

Table 4: ACSC Core Curriculum Comparison to Space Curriculum

Core Course	Description	Total number of books	Number of books related to space
International Security Studies 1	Analyzes regional and global security and assesses how these issues may affect US interests	16	0
International Security Studies 2	Introduces students to military theory, focusing on issues such as the nature of war, the range of military operations, military strategy, and operational art.	20	0
Air Power 1	Examines the emergence of airpower up to the advent of the atomic age and the emergence of the USAF.	12	0
Air Power 2	Analyzes the historical, current and potential future of air, space and cyber assets in military conflicts, with an emphasis on the history and development of American Airpower.	17	4
Joint Warfighting 1	Grounds students in joint force organization and capabilities and the planning processes across the range of military operations.	31	1
Joint Warfighting 2	Capstone course bringing together elements from the previous curriculum for applying airpower in a joint and coalition environment.	12	2
Leadership Course	Requires students to examine their strengths and weaknesses as leaders, hone their personal leadership philosophies, and prepare for future command and staff responsibilities	7	0

Source: Air University Muir Fairchild Research Information Center ACSC Student Support (2017)

Throughout the academic year, students are issued approximately 65 books. ACSC books related to space content consist of only 10 percent of the 2016 curriculum. Moreover, ACSC faculty members

[31] Air University Muir S. Fairchild Research Information Center, "ACSC Support Page," accessed 1 March 2017, http://fairchildmil.libguides.com/c.php?g=103765&p=673568.

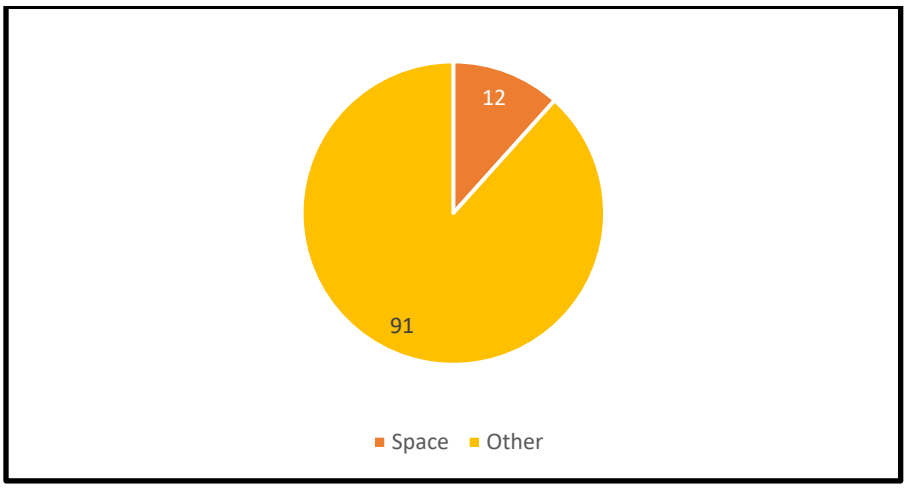
indicate that only 2 hours out of the 450 curriculum hours are devoted to space, 0.05 percent.[32] In contrast, ACSC's only space elective offered out of 114 electives, Space Horizons, provides a solid understanding of space capabilities and future applications.[33] The Space Horizons elective at ACSC employs Air University students, faculty, and staff to address issues of importance in the areas of space policy and strategy.[34] The topics range from technology, strategy and policy components of comprehensive space power, and the conduct of space-focused net assessment of US versus near-peer competitors to position the US optimally for long-term competition.[35] While Space Horizons provides additional space curriculum, during the 2016 academic year, the 20-week course, consisting of 60 hours of instruction, only reached 7 students out of 518.[36]

Similar to the student body, the faculty of ACSC represents a diverse population drawing on civilians, active duty, and reserve/guard members; however, faculty members with space experience and credentials are underrepresented. The faculty currently consists of approximately 103 instructors who teach across each core discipline.[37] Out of all the instructors teaching at ACSC, only 12 (11 percent) have direct experience supporting space operations or have a terminal degree in a space related field.[38] Figure 5 depicts the breakdown of faculty with space qualifications.

---

[32] As relayed by Representative Mike Rogers, "Remarks to 33rd Space Symposium," 4 April 2017, http://breakingdefense.com/2017/04/jicspoc-morphs-to-national-space-defense-center-what-it-means/.
[33] Air University Muir S. Fairchild Research Information Center, "ACSC Support Page," accessed 1 March 2017, http://fairchildmil.libguides.com/c.php?g=103765&p=673568.
[34] Air Command and Staff College, "Space Horizons Research Group Charter," AY16.
[35] Air Command and Staff College, "Space Horizons Research Group Charter," AY16.
[36] Air Command and Staff College, "Space Horizons Master Contact List," AY16
[37] ACSC homepage, accessed 15 March 2017, http://www.airuniversity.af.mil/ACSC/Display/Article/922301/
[38] ACSC homepage, accessed 17 March 2017, http://www.airuniversity.af.mil/ACSC/Display/Article/922301/

Figure 5: ACSC Faculty Space Qualifications



Source: ACSC Homepage Faculty Biographies (2016)

While demographics in space experience and education are underrepresented in both the faculty and the student body, a noted difference between the instructors and students is a perceived caliber of excellence. Most of the students attending ACSC go on to serve as colonels and some attain flag rank.[39] In stark contrast, an assignment to teach at ACSC can be a difficult task for the Air Force. A faculty assignment can be seen as a dumping ground for individuals who are "out of favor with the Air Force."[40] While some faculty do get promoted to the rank of Colonel, throughout the history of ACSC there has yet to be one faculty member promoted to the rank of brigadier general.[41] As a retired Colonel and former Commandant of the School of Advanced Air and Space Studies explains, "Air University students fare extraordinarily well after graduation, and selection for a school, as well as peer competition in elite company, serve to stratify their records and lead to

[39] Dr. James W. Forsyth Jr, Dr. Richard R. Muller, "We Were Deans Once…and Young," *Air and Space Power Journal*, (Fall 2011): 92, http://www.dtic.mil/dtic/tr/fulltext/u2/a562362.pdf.
[40] Tom Ricks, "Need a Budget Cut, We can start by Shutting the Air War College," Foreign Policy, 11 April 2011, http://foreignpolicy.com/2011/04/11/need-budget-cuts-we-probably-can-start-by-shutting-the-air-war-college/.
[41] Tom Ricks, "Need a Budget Cut, We can start by Shutting the Air War College," Foreign Policy, 11 April 2011, http://foreignpolicy.com/2011/04/11/need-budget-cuts-we-probably-can-start-by-shutting-the-air-war-college/.

promotion. Military faculty, on the other hand, typically retire as colonels and find research or teaching positions as civil servants. By not promoting these scholars, many of whom also have impeccable operational credentials, the Air Force deprives itself of intellectual throw weight in senior ranks and disincentivizes faculty duty for some of its most talented officers."[42]

The challenge in attracting and developing faculty at ACSC is an issue known throughout AU. In early 2014, the Process for Accreditation of Joint Education (PAJE) report noted that ACSC was the only joint intermediate-level college with primarily majors as faculty.[43] Exacerbating this issue was the fact that, between 2005 and 2014, the percentage of ACSC instructors who came from the Air Force at large to serve as ACSC as instructors had increased from only 12 percent to 70 percent, thus decreasing the percentage of ACSC instructors who had been recent resident program graduates or graduates of advanced academic degree programs from 78 percent to only 30 percent.[44] Although ACSC had some small successes in improving faculty quality, the Spaatz Center Commander in 2014 began working with SOC and ACSC to build a proposal for the Air Force to consider officer PME faculty duty as a developmental education assignment governed by the developmental education designation board process.[45]

In addition, the PAJE report noted the school was also 22 instructors short (32 percent of instructor authorizations) which

---

[42] Dr. Stephen D. Chiabotti, PhD, "Pensive Sword: Educating Officers in Austere Times," *Strategic Studies Quarterly,* vol 8, no 3 (Fall 2014): http://www.airuniversity.af.mil/Portals/10/SSQ/documents/Volume-08_Issue-3/Chiabotti.pdf?ver=2017-01-23-122109-607.

[43] Memo, "ACSC Program Review,"; eSSS, Lt Gen Seven L. Kwast, AU/CC, "Request to Implement the Limited Extended Active Duty Program at Air Command and Staff College (ACSC)," 19 May 2015; Memo, Brig Gen Brian T. Kelly, HQ AF/A1P, to AFPC/CC, "Air Reserve Component (ARC) Air Command Staff College (ACSC) Voluntary Limited Period of Active Duty (VLPAD) Program Implementation Guidance and Eligibility Criteria," 25 Sep 2015.

[44] Memo, "ACSC Program Review," 25 September 2015.

[45] Memo, "ACSC Program Review," 25 September 2015.

significantly increased the normal teaching rate for the remainder. To alleviate this situation, AU requested that the Air Force call qualified reserve or guard majors or lieutenant colonels to extended active duty through the Voluntary Limited Period of Active Duty program to serve as ACSC instructors.[46] Also, ACSC planned to convert 12 chronically short vacant military instructor positions to certified civilian faculty members.[47] HQ Air Force approved these requests to strengthen the ACSC faculty in time for the start of the 2015-2016 Academic Year.[48] While considerable efforts have improved the number of instructors and quality of instruction, the representation of instructors with space knowledge or experience remains underrepresented compared to other specialties such as air power history, international relations, leadership, and warfare studies.

Narrative

The second level of analysis examines the quality of space education at ACSC through what people think about the school. While the metrics discovered in the organizational analysis reveal important quantitative metrics in evaluating the role of space education across the curriculum, faculty and student body, a qualitative assessment of the school can also provide valuable insights into how ACSC values space. As Arquilla and Ronfeldt explain in their research, "organizations are held together by narratives or stories that people tell."[49] The story of professional military education has played an important part in the career development of Air Force officers since the creation of ACTS. Although PME is well established and considered a cornerstone in military development, the educational system has drawn much criticism over the years. Studies by external and internal agencies including the

[46] Memo, "ACSC Program Review," 25 September 2015.
[47] Memo, "ACSC Program Review," 25 September 2015.
[48] Memo, "ACSC Program Review," 25 September 2015.
[49] Arquilla and Ronfeldt, *Networks and Netwars: The Future of Terror, Crime, and Militancy*, 328.

General Accounting Office, the RAND Corporation, and Congress all point to the need to improve how the military delivers education.[50]

In response to criticism and Air Force direction, the AU Commander, Lieutenant General Kwast, after assuming command in 2014, outlined his priorities in transforming education across the colleges at Maxwell AFB. The transformation of education operationalized the 2012 Chairman of the Joint Chiefs of Staff Joint Education White Paper, the 2013 Air Force Vision, the 2014 Air Force Strategy, and the 2015 Air Force Strategic Master Plan. These four key documents drove Lieutenant General Kwast in prioritizing a more personalized, career-long approach to PME incorporating leading-edge methods, eliminating duplication, and valuing Airmen's time. In Lieutenant General Kwast's change of command ceremony he stated:

> We have a world in need of a generation of thinkers who can help us solve things in ways that the solutions in the past will not address. It is time, again, for the present generation of thinkers to innovate our way out of the problems of today and build this nation to a national power that helps us with ideological threats where information is used as a weapon.[51]

He further outlined his vision in transforming AU in the 2015 AU Strategic Plan, drawing parallels to ACTS during the interwar period:

> In December 2014, Air University began a journey of transformation. Opportunity drove Air University's revectoring, not failure. The Secretary of the Air Force and the Air Force Chief of Staff challenged the university to find new ways to improve the Air

---

[50] Independent Study of Joint Officer Management and Joint Professional Military Education (McLean, VA: Booz Allen Hamilton, 2003); Joint Officer Development Has Improved, but a Strategic Approach Is Needed, GAO-03-238 (Washington, DC: General Accounting Office, 2002); U.S. Congress, House Committee on Armed Services, Subcommittee on Oversight and Investigations, Another Crossroads? Professional Military Education Two Decades after the Goldwater-Nichols Act and the Skelton Panel, committee print, 111th Cong., April 2010, H. Prt. 111-4; Kristy N. Kamarsk, Goldwater-Nichols and the Evolution of Joint Professional Military Education (JPME), R44340 (Washington, DC: Congressional Research Service, January 13, 2016).

[51] Art, Ms. Lisa Warr, 42 ABW/PA, "Lt Gen Kwast assumes command of Air University," Air University News, 14 Nov 2014.

> Force's human capital, to think deeply and creatively about the challenges confronting the service, and to bolster connections with the communities the Air Force serves. As they outlined in the USAF Strategic Master Plan and the Air Force Future Operating Concept, the future force cannot rely solely on the tools and techniques of the past. New tools and techniques based on innovative ideas and technologies will be required to achieve success. Much as its Air Corps Tactical School forebears blazed the path for airpower's achievement in World War II, today's Air University must embrace its crucial role in shaping the people, concepts, and technologies essential for the Air Force to remain the premier air, space, and cyberspace force of the future.[52]

Framed by Air Force and major command guidance, the 2015 AU Strategic Plan provided a narrative on key efforts and future investment decisions. The narrative captured the AU Commander's intent on the future of AU and outlined how AU would transform operations. The plan included the following five priorities as the means to establish the University's success and achieve the commander's vision across the entire campus:

1) Deliver the best training, education, and leadership development opportunities possible to all Airmen and other Air University students.
2) Conduct research and analysis to make recommendations that address Air Force, national security, and leadership challenges of today and tomorrow.
3) Improve integration and outreach.
4) Execute robust lessons-learned and doctrine development, delivery, and education programs that underpin and guide Air Force and airpower strategies, concepts, and operations.
5) Build Air University's capability to deliver development opportunities, research/problem solving, outreach and doctrine.

A major decision in the AU transformation process was to focus transformation at ACSC. The AU Commander hired a new Dean of ACSC in February 2015 to begin implementing the transformation he envisaged. ACSC graduates impact a greater population of the Air Force

[52] Air University, *Strategic Plan 2015*, http://www.au.af.mil/au/audocs/AU_Strategic_Plan_Sept_2015.pdf, 4.

and for a longer period, generally another decade, as compared to other PME students. The return on investment is greater than at SOS or AWC. The priorities outlined by the AU Commander regarding the need to transform education shaped ACSC intent of operations when the new Dean took over in 2015.[53] The ideas of improved education, relevant research, and enhanced outreach were all themes of the academic year 2016 orientation.

Did the AU transformation narrative impact the ACSC student body? Narratives are not only important from leadership but also from within the populace of an organization. In accordance with AFI 38-501, ACSC performed exit student surveys for the 2016 academic year. Unfortunately, the AY16 ACSC exit survey did not receive enough respondents to form a high confidence level of the actual results. Only 38 percent of students responded to the survey. Moreover, the survey was designed based on evaluating an outdated mission statement and tasks. Nowhere in the survey were respondents asked to assess how well ACSC transformed education or assess how students critically analyze air, space, and cyber concepts in a dynamic international environment or how students' abilities improved in planning and executing joint air, space, and cyber operations to support the joint force commander. The quantitative metrics of the survey therefore do not represent accuracy of overall effectiveness of student outcomes.

Still, some of the recurring themes among 172 comments related to areas students felt were valuable parts of the program. In addition, 160 comments related to areas for improvement from the 2016 ACSC survey. Tables 5 and 6 include the prominent themes from these areas.

---

[53] Tech. Sgt. Sara Loicano, 42 ABW/PA, "Colonel Hastings to carry on ACSC transformation," 5 August 2015, http://www.maxwell.af.mil/News/Display/tabid/10067/Article.

Table 5: AY16 ACSC Student Survey Recurring Valuable Comments

Valuable Aspects of the ACSC Academic Year 2016
ACSC changed my perspective from a tactical to an operational view
Assembling complex ideas and articulating myself clearly
Instructors are the most important aspect
Critical thinking skills, theory, nature of warfare, profession of arms
Focusing on personal styles of leadership
Relationships with classmates in other career fields
Seminar discussions
International officers and culture

Source: AY16 ACSC Student Survey Report

Table 6: AY16 ACSC Student Survey Recurring Improvement Comments

Improvement Ideas for future ACSC Academic Years
Pro-paper/thesis should be assigned earlier in the program
A better rubric system and more standardization within faculty
In-class exams for all core courses instead of take home tests
Need to concentrate on the future more
More balanced curriculum (irregular vs conventional vs nuclear)
Raise the bar of evaluation and critique at ACSC
Make approximately half of the ACSC curriculum electives to empower students to tailor their education to their own needs

Source: AY16 ACSC Student Survey Report

In summary, students still value attending ACSC. The positive aspects of the program were in building relationships among other officers within the Air Force and from across the world. Students also improved their critical thinking skills across the curriculum where they moved from learning about tactics to operations. In contrast, students desired more insight into grading across the classes and better planning for the pro-paper and thesis requirements. In addition, students thought more focus should be placed in studying the future instead of history,

balancing the curriculum and including more choice based on student interests.

Doctrine

What doctrines grow out of ACSC? Unlike the informal doctrine development at the ACTS, doctrine development no longer occurs within AU colleges. In 1993, the Air Force constituted the Air Force Doctrine Center at Air University as the field operating agency for doctrine. In 2008, the Air Force re-designated it as the Curtis LeMay Center for Doctrine Development and Education. The mission of the LeMay Center is to develop and assess Air Force doctrine and advocate air power doctrine in joint and multinational arenas. Outside of the joint warfighting exercise at the end of the ACSC academic year, the LeMay Center does not collaborate directly with ACSC students.

Today, since ACSC is an accredited university granting master degrees, a thesis is required upon graduation. A thesis involves researching a topic, developing an argument, and providing observations or recommendations. Despite years of research required to develop a comprehensive theory and strategy of space warfare, it has been observed that such a strategic framework – one encompassing the essence of space operations and associated national interests – has yet to be formulated.[54] The need for space power theory is evident. However, over the 2015 and 2016 academic years, minimal student research has transpired in developing space thought or strategy at ACSC. Table 7 includes a compilation of thesis topics relating to space as provided by the Muir Fairchild Research Center.

[54] Colin S. Gray, "The Influence of Space Power upon History," Comparative Strategy 15 (October 1996): 293.

Table 7: AY15 and AY16 ACSC Space Research

AY2015 ACSC Space Thesis/Pro Paper
Canadian space launch exploiting northern latitudes for efficient space launch
Escalation of the space domain
Space-based counterforce in the second nuclear age
A persistent perch: USSOCOM's use of organic space based ISR
Personnel recovery in space: A new venture for human space flight support
Mitigating cyber security risk in satellite ground systems
Air mission laser communications for 2040
The fallacy of attribution to achieve deterrence in cyberspace
AY 2016 ACSC Space Thesis/Pro Paper
Planetary Defense

Source: Air University Muir Fairchild Information Center, ACSC Librarian

Out of approximately ~1000 theses submitted for ACSC AY15 and AY16, only 9 relate to space research. These low numbers suggest that development of critical thinking about space may not be occurring at ACSC or it is just a reflection of the low number of students from the space career fields attending ACSC. As of this publication, the available research might not be complete for AY16.

While official development of doctrine no longer resides within ACSC, this analysis reveals minimal collaboration between ACSC and the LeMay Center, as well as minimal research about space. Critical thinking and research regarding the development of space theory and strategy at ACSC appear to be lacking.

Technology

How well does technology support the organization's narrative and doctrine?[55] Space capabilities are vital to US national power, commerce, science, and prestige.[56] Space capabilities provide the US advantages in defending the homeland, military operations abroad, and national security. Since the cold war era, US leadership in the space race has produced tremendous advantages in scientific exploration, improved global commerce, provided increased national security, strengthened cooperation among international partners, and improved the way of life. Ensuring US space capabilities are manufactured and delivered on time is critical for military warfighters. Improving acquisition lifecycles, motivating research and development within the US space industry, enhancing technological innovation, and deliberately developing space professionals are critical enablers to maintaining US leadership in space. In the 2011 National Security Space Strategy, the role of technology and education is explicitly aligned together:

> The United States seeks to maintain and enhance access to global and domestic technologies needed for national security space systems. We will do so by expanding technology partnerships with the academic community, industry, U.S. and partner governments, mission customers, and other centers of technical excellence and innovation, consistent with U.S. policy, technology transfer objectives, and international commitments. People are our greatest asset. To support the range of national security space activities, we will develop current and future national security space professionals – our "space cadre" – who can acquire capabilities, operate systems, analyze information, and succeed in a congested, contested, and competitive environment. We will continue to encourage students at all levels to pursue technical coursework as a foundation for space-related career fields. Working with other departments and agencies, we will synchronize our science, technology, engineering, and mathematics (STEM) education initiatives with sound education investments to ensure an ample

[55] Arquilla and Ronfeldt, *Networks and Netwars: The Future of Terror, Crime, and Militancy*, 339.
[56] John J. Klein, *Space Warfare: Strategy, Principles and Policy*, New York, NY: Digital Printing. 2006), 10.

> supply of space professionals with appropriate skills and capabilities. We will encourage our space professionals to participate in STEM outreach and mentoring programs.[57]

Given this importance, what does the technology and operating environment look like at ACSC to promote space education?

Under the auspices of the Center for Strategy and Technology (CSAT) at AU, a select group of ACSC students participate in the Blue Horizons program during the academic year. In 1997, the Air Force created CSAT at the Air War College to engage in long-term strategic thinking about technology and its implications for U.S. national security. The Center continues to focus on education, research, and publications that support the integration of technology into national strategy and policy. The primary mission of CSAT is executing the Blue Horizons program. After nearly 10 years of increasing insight and influence, in 2015 the previous CSAF General Mark Welsh expanded Blue Horizons from a part-time elective into a full 10-month Intermediate/Senior Developmental Education program with the charter to explore issues of future geo-strategic and military-technological competition as they relate to building advantage for the United States.

Soon to be in its third year as an independent fellowship program, Blue Horizons receives an annual research question from the CSAF and conducts an in-depth study of the topic through academics and research. The overarching objective of Blue Horizons is to explore how the U.S. defense establishment can most effectively blend technology and strategy, 10 to 30 years into the future. Blue Horizons students explore this question through a combination of research, thinking, and writing that serves to inform technology and strategy related planning and decision making over the 10-30-year timeframe. After 10 months dedicated to crafting creative and independent perspectives to push the

[57] Robert M. Gates and James R. Clapper, *National Security Space Strategy*, 2011, 8.

boundaries of conventional thinking, the study's results are presented directly to the CSAF as well as key agencies.

In AY16, the program exposed approximately 10 ACSC students to the technology-focused curriculum. The question poised to Blue Horizons from the CSAF was: “What competitive strategy and associated capabilities, capacities, technological investments, and integrating concepts should the AF pursue to prevail in the highly-contested environment of 2040?” Officers spent the year in specialized academics spanning nine academic blocks of instruction, on topics such as metacognition, strategy, technology, international politics, military history, regional studies, and joint capabilities. In addition to rigorous academics, the program included a series of experiential future-focused wargames; guest speakers from across DoD, academia, think tanks, and industry; travel to national labs and innovation centers; and extensive time for individual research. The program’s facilities are in a SCIF at the Center for Strategy and Technology at AU, so the fellowship is conducted at the classified level. After a year of classified research, regular dialogue with senior leaders, and routine interaction with staff officers in the Pentagon, students presented their research to leadership on the Air Staff. For AY2016, a total of 10 papers were submitted, including one topic recommending improved employment of space power in the future.

The US National Security Space Strategy clearly prioritizes the need for the academic community to leverage technology partnerships and encourages students to pursue technical coursework as a foundation to space-related career fields. This level of technological analysis reveals that a small minority of individuals attending ACSC are partnering with technology centers and labs. However, most students at ACSC do not have the technological capability to engage in space conversations at a classified level and do not regularly interact with space representatives.

Social

The last level of analysis examines how well an organization is connected internally and externally. This examination explores the strength of ACSC relationships both across the military and beyond into the commercial sector. The strength of these relationships can lead to high functioning organizations.[58] Outer space is shared among countries, organizations, and businesses not just the military. This sharing includes not only highly valuable orbital positions, but also the frequency spectrum used by telecommunications industry for the transmission of data and information.[59] This common sharing is not unique to the space domain, since international waters and airspace also have a legacy of being shared among many users.[60] Nevertheless, the common use of space has important considerations when developing strategy and formulating national policy requiring public and private partnership.[61] Over the recent years, as evidenced in multiple events, ACSC has recognized the importance in building strong relationships with the local community, veterans of prior wars, international partners, and DoD organizations but not with private institutions, especially space partnerships involving the commercial sector such as SpaceX or Blue Origins. Outside perspectives regarding space research and technology were not brought in during the 2016 academic guest speaker series. Out of approximately 45 guest speakers during the 2016 academic year, only two spoke about military space applications.[62]

ACSC has strong external ties to the local community. In 2011, ACSC initiated the Honorary Director of Operations (HDO) program to foster a broader working relationship with local community and to

---

[58] Arquilla and Ronfeldt, *Networks and Netwars: The Future of Terror, Crime, and Militancy*, 341.
[59] Klein, *Space Warfare*, 10.
[60] Klein, *Space Warfare*, 10.
[61] Klein, *Space Warfare*, 10.
[62] ACSC 2016 Commander Speaker Series (CSS) Calendar.

increase public awareness and understanding of the military and the mission, policies and programs of the Air Force.[63] The program provides opportunities to showcase the proud, dedicated ACSC personnel to give civic leaders a greater understanding of the ACSC mission as seen through the eyes of faculty and students who are members of the local community. In 2016, ACSC had two HDOs from the local Alabama community who participated in opening ceremonies, seminar discussions, and large events.

Another strong link to the community is through the capstone event held at the end of every academic year, GOE. GOE was established in 1982 with the mission to provide a forum for men and women who have made significant contributions to air, space, or cyberspace power to educate and inspire the ACSC class, by connecting the past with the present.[64] Exceptional men and women, renowned for their contributions to air, space, and cyberspace power are nominated by the GOE student team and approved by the ACSC commandant. Some of the most famous eagles over the years have included Neil Armstrong, Jimmy Doolittle, Gail Halvorsen, Curtis LeMay, Robin Olds and Chuck Yeager.[65] Since the founding of GOE, over 450 distinguished air power pioneers have inspired ACSC students with their stories of courage perseverance and innovation.[66] The culmination of students researching potential eagles is sharing air power heritage with ACSC, Maxwell AFB, and the local community during the last week of school.

ACSC also has a strong partnership with the international community. Of the 518 officers attending ACSC in 2016, 76 officers

---

[63] Air Command and Staff College, "Talking Paper on ACSC Honorary DO Program," authored by Lt Col Christensen, 2011.
[64] ACSC OI 36-20, *Gathering of Eagles*, 10 Jun 10
[65]Air Command and Staff College, "Bullet Background Paper on Gathering of Eagles," authored by Lt Col Kruggel, 10 Jul 14.
[66] Air Command and Staff College, "AY16 Gathering of Eagles Course Syllabus," 30 Apr 2015

represented 61 other countries.[67] Since 1951, 160 international officers attending ACSC have become chiefs of staff of their military and 35 have become key representatives in government such as heads of state or ambassadors.[68] The international officers attending ACSC greatly contribute to improving the cultural diversity of the student body.

Partnership with senior leaders within the military also improved under the AU transformation initiative. The AU Commander initiated an ACSC staff challenge to replace the traditional exercise at the end of the school year with a practical application in tackling real-world issues.[69] After choosing a topic, students researched innovative solutions to complex problems and pitched their idea to the Undersecretary of Defense. The challenge was meant to mimic the rigorous environment that future officers will face after graduation and improve dissemination of critical thinking at ACSC to the broader DoD community.[70]

The internal connections within the military remain strong at ACSC, but the external connections especially to private space industry, appear weak. For example, during the academic year, guest speakers are routinely scheduled to talk to the students in mass formation at Commander Speakers Series. The ACSC staff and faculty secure most of the flag officers holding major command in the Air Force or senior level civilian positions in the government to speak to the students. Unfortunately, senior leaders of industry outside the military are not brought in to provide diversity of thought regarding space strategy or technology. Given the rise of space exploration from mavericks like Elon

---

[67] Air Command and Staff College, "Mission Brief," AY16.
[68] Air Command and Staff College, "Mission Brief," AY16.
[69] Staff Sgt. Erica Picariello, Maxwell AFB News, "ACSC students tackle AF future in "Staff Challenge," 2 June 2015, http://www.maxwell.af.mil/News/Display/Article/704271/acsc-students-tackle-af-future-in-staff-challenge/.
[70] Staff Sgt. Erica Picariello, Maxwell AFB News, "ACSC students tackle AF future in "Staff Challenge," 2 June 2015, http://www.maxwell.af.mil/News/Display/Article/704271/acsc-students-tackle-af-future-in-staff-challenge/.

Musk and Jeff Bezos, the future of America's launch program might consist of more commercial than military launch providers. While commercial start-ups have additional hurdles to climb over before gaining the same standing as military's chosen launch providers like United Launch Alliance, they have a significant impact on revitalizing discussions on the role in which the commercial sector could play in advancing America's space program. Conversations at ACSC regarding commercialization of space or promoting diversity of space thought by bringing in external voices outside the military are not occurring. ACSC students and faculty could benefit immensely from outside exposure to space industry leaders.

Conclusion

This organizational analysis indicates that ACSC is not organized properly to fulfill its task to produce graduates who are able to successfully understand the operational art of space and integrate space effects. This chapter finds that across the five levels of analysis to include organization, narrative, doctrine, technology and social, ACSC does not impart the same level of importance to space education as did ACTS to the study of air power. A gap exists in ACSC's stated space-related task and how it is organized to accomplish that objective. Based on this research, it appears ACSC is not able to accomplish this vital task in which the CSAF champions because it does not include all the necessary levels of the Arquilla and Ronfeldt's organizational analysis framework.

Specifically, without an organization that consists of a curriculum and faculty steeped in space, the organization simply promotes air power education instead of promoting space education. Although the school's mission and tasks include space, the curriculum does not reflect sufficient space content to fulfill the school's stated mission and task. The space curriculum approach appears insufficient. Consequently, the space content comprises a small portion of the core curriculum and does

not provide students a strong appreciation of total space at the operational level. Secondly, the AU transformation effort in refocusing education towards challenges of tomorrow represents a strong narrative across Maxwell AFB a focus at ACSC. Unfortunately, representative metrics are not in place to accurately assess program outcomes of ACSC. Student survey responses in 2016 generally reveal a fond appreciation of the relationships established through attending ACSC and the skills gained in enhancing critical thinking from a tactical to operational perspective but students' emphasize a greater need in studying the future and more focus on electives. Third, doctrine development no longer occurs at ACSC but is controlled at the LeMay Center at AU. Today, students are required to develop professional papers or theses which generate critical thinking about problems related to the military. ACSC research is overwhelmingly concentrated on topics not related to space. Fourth, the technology at ACSC is not supporting the development of space education. While the Blue Horizons program is a model of excellence in encouraging the integration of technology within PME, only a small number of ACSC students are in the program. Lastly, the internal connections within the military remain strong at ACSC, but the external connections especially to private space industry are weak. Regular social interactions with senior leaders of industry outside the military such as SpaceX or Blue Horizons is lacking. Table 8 summarizes this chapter's organizational analysis of ACSC.

Table 8: Organizational Analysis of ACSC

	ACSC
Organization	• Limited space power focus in curriculum and faculty space representation
Narrative	• Kwast transformation of education void of assessment metrics
Doctrine	• No doctrine development/limited space research
Technology	• Limited technology involvement (Blue Horizons)
Social	• Strong connections within military, community and DoD, but lacking partnership with space industry

Source: Author's original work

In summary, this chapter identified weaknesses across five levels of analysis in how ACSC is promoting and conducting space education. Throughout this analysis, two significant issues surfaced. The first, a functional deficiency dealing with outreach, concerning the stove-piped military relationships of ACSC void of diversity of space thinking. Furthermore, incompatibilities between the proclivity of assessing student outcomes with protracted information renders assessing space education and transformation at ACSC fragmented and ineffective. Without organizational remediation, the current ACSC program will likely not produce graduates who are robust in space power education as ACTS students were regarding air power education. The following chapter provides recommendations in how the ACSC organization could improve space education.

Conclusions

The Third World War will be
different. It will be won by brains.

General "Hap" Arnold

Given that senior military leaders within the Air Force are calling for a renewed focus on space, this thesis sought to determine whether the Air Force, structured around a comparison between ACTS and ACSC, is producing officers who can successfully understand the operational art of space and integrate space effects?[1] This conclusion summarizes each chapter, presents collective findings, recommends implications for consideration and offers future research.

While evaluating the primary research question, chapter 1 examined three defining periods of space application, and identified a problem in defining space doctrine and strategy. Specifically, since the space race, the US has become more dependent on space applications from precision-guided munitions to global commerce, yet according to senior military leaders, the Air Force is found more unprepared to deter and defend assets in space. Adversaries are adapting their strategies in denying the high ground the Air Force once maintained while tensions increase. Moreover, according to scholars, the US still lacks a comprehensive space strategy. The Air Force requires everyone to be versed in understanding space. As the CSAF, General Goldfein stated, "Space can no longer be the responsibility of somebody that just wears space wings."[2] The Air Force counts on officers to address national

---

[1] One of ACSC's stated task is to: "Develop and enhance students' abilities to plan and execute the joint campaign planning process and air, space and cyber operations to support the joint force commander." ACSC webpage, accessed 10 March 2016 at http://www.airuniversity.af.mil/ACSC/Display/Article/922301

[2] General David Goldfein, "An Interview with Gen David L. Goldfein Twenty-First Chief of Staff of the US Air Force," *Strategic Studies Quarterly*, 5 Jan 2017.

security challenges in space and looks to education as the primary means. Based on observations of senior military leaders, this chapter suggested a need to change how the Air Force educates officers at ACSC regarding space.

After problem identification, chapter 2 contained a historical case study of the ACTS, known as the birthplace of airpower doctrine and strategy in World War II. It is during this period in history where the role of education and strategy emerged. The evolution of Air Force PME began during the interwar period. The idea, in modest dimensions, became formative in 1931 when the ACTS relocated to Maxwell Field. From the ACTS, faculty, staff, and student personnel formulated doctrinal, tactical and strategic principles which were applied successfully in the great air battles of the Second World War.

Through the organizational analysis framework developed by RAND authors John Arquilla and David Ronfeldt, chapter 2 examined the Air Force crisis in developing adequate forces, individuals who could fly and think, and how the school emerged as the catalyst in preparing officers to wage war and advise commanders during a time of austerity. By examining a historical example, the important relationship between education and air power emerged. The central question of this chapter was what aspects of ACTS led to its success in producing air power educated officers? The chapter concludes that all five sub-systems were strong across the ACTS, leading to optimization of performance: respected faculty promoted the development of air power ideas; a strong connection between the ACTS and private industry existed; the narrative inspired by senior leaders was represented in the curriculum; and doctrine development remained a significant focus; and technology advances complemented the ACTS approach in education. The analysis suggests what a school and its curriculum might look like to be adequately responsible to its mission. The ACTS was determined to break away from the traditionalism, rigidity of thought and doctrine, and

the formality characteristic of past military schools. It sought to establish a progressive, forward-looking institution that would constantly bring fresh ideas and prophetic thinking into the curriculum. As General Fairchild said, "We must be on guard against building up resistance to change, against taking the easy course of accepting answers from the past instead of digging them out of the future. This is not a post-war school system-it is a pre-war school."[3] The role of air power education at the ACTS was paramount during the interwar period in developing critical thinking and strategies for war. In conclusion, all levels of Arquilla and Ronfeldt's organizational analysis proved strong in preparing ACTS officers to advise commanders in war. The organization developed the Air War Plans Document-1, otherwise known as industrial web theory, instrumental in the US success in World War II.

Chapter 3 examined the contemporary relationship between education and space power at ACSC. Thus, the central question of this chapter was, are ACSC graduates be able to successfully understand the operational art of space and integrate space effects? [4] Through the same organizational analysis framework used in chapter 2, this chapter examined the strength of space education at ACSC across five levels of analysis: organization, narrative, doctrine, technology and social. Specifically, this analysis revealed that ACSC's approach in educating Airmen about space power does not resemble the ACTS approach in educating Airmen about air power. Without an organization that consists of a curriculum and faculty steeped in space, the ACSC organization simply promotes traditional thinking instead of promoting space education; a strong narrative of transformation across Maxwell AFB is not measurable at ACSC; doctrine development no longer occurs

---

[3] Welcoming Address by Maj. Gen. Muir S. Fairchild: Commanding General Congratulates Students at Air War College and Air Command & Staff School on Selection," *The Post*, 13 September 1946, 2.
[4] ACSC homepage, accessed 14 April 2017, http://www.airuniversity.af.mil/ACSC/Display/Article/922301/

at ACSC with minimal research devoted to space; the technology at ACSC is not supporting the development of space education; and the internal connections within the military remain strong at ACSC, while the external connections, especially to private space industry, are weak.

Drawing on ACSC's organizational and mission briefings, publications by senior leaders, and the direct experience of the author in attending in-residence ACSC, chapter 3 found that ACSC does not impart the same level of importance to space education as ACTS did for air power, calling into question the achievement in producing graduates who are able to successfully understand the operational art of space and integrate space effects for a Joint Force Commander. Although Air University and ACSC remain rooted in the legacy established by the ACTS, *Proficimus More Irretenti,* a Latin phrase meaning we make progress unhindered by tradition, this research reveals shortfalls in how ACSC prepares officers to think about the future, specifically in the space realm.[5] A gap exists in ACSC's stated space-related task and how it is organized to accomplish that objective. Based on this research, it appears ACSC is not able to accomplish their vital task related to space education in which the CSAF champions because it does not devote enough focus to space issues. The quest for improving space education at ACSC should therefore take into consideration optimizing performance across all five levels of Arquilla and Ronfeldt's organizational framework in comparison to ACTS. Table 9 provides a comparison of ACSC to ACTS across all the five levels of analysis:

[5] Air University, *Education Digest*, 1 January 2015, 10.

Table 9: Comparison of ACTS and ACSC Organizational Analysis

	ACTS	ACSC
Organization	• Air power focus across curriculum and faculty experience • Fluid movement of faculty and staff	• Limited space power focus in curriculum and faculty space representation
Narrative	• Douhet and Mitchell advocates thinking represented in curriculum • Metrics indicate air power focus more than ground	• Kwast transformation of education void of assessment metrics
Doctrine	• Guiding force of ACTS • Challenge assumptions	• No doctrine development/limited space research
Technology	• Bombardment technology incorporated into curriculum	• Limited technology involvement (Blue Horizons)
Social	• Strong connections with private industry	• Strong connections within military, community and DoD, but lacking partnership with space industry

Source: Author's original work

Together with the precedent established in chapter 2, the vital role education played in development of air power during the interwar period, this thesis argues that that greater emphasis should be placed on space power education across all sub-systems of ACSC. Given the strong weaknesses across every ACSC sub-system compared to the ACTS, this thesis finds that preparing officers to successfully understand the operational art of space and integrate space effects is highly unlikely with the current approach. Meanwhile, the need for space power theory, doctrine, and strategy exists. Although senior leadership within the military and AU continue to advocate for transformation in education, and a small sub-set of the ACSC student body do partake in an advanced focused space curriculum, actual findings from this research indicate that the education of space among the whole student body is inadequate. In conclusion, ACSC is not organized to promote adequate thinking

about space in the areas of faculty, curriculum, technology and partnerships.

Recommendations

Faced with security dilemmas in space, the Air Force needs to optimize ACSC to realize the maximum benefits of space education. Using the organizational analysis framework developed by Arquilla and Ronfeldt, this research highlighted a gap: ACSC lacks a long-term, viable structure in preparing officers to successfully understand the operational art of space and integrate space effects for a Joint Force Commander, as reflected in the program's weaknesses across all five sub-systems. However, with the advocacy of senior leadership and significant change, the space education of mid-grade Air Force officers could improve, ensuring that officers at ACSC are prepared to support the Joint Forces Commander in times of peace and war.

Eerily similar to air power during the interwar period prior to World War II, space power lacks a strategy and officers capable of advising commanders about space. Senior military leaders in the Air Force, akin to Billy Mitchell, are aware of the potential advantages and disadvantages the space domain provides but do not have capable mid-grade officers ready to advise Joint Force Commanders. Just as ACTS gave impetus to unhindered thinking about the new air weapon, a school that provides adequate space content where officers can critically think about the highest frontier can help meet the future needs of the Air Force. A possible solution includes developing a Space Corps Tactical School (SCTS). The focus of this thesis is not to provide a course of action approach given the significant implications of a school however, considering such a possibility there are many ways in which this school could exist as a starting point to:

1) Recruit more space officers and faculty
2) Encourage additional space-related research and strategy
3) Maximize technology in promoting space discussions

4) Leverage outside experts' ideas about space

Table 10 briefly describes three options regarding the concept of a SCTS and presents advantages and disadvantages for each consideration.

Table 10: SCTS Recommendations

	Option 1: Separate SCTS	**Option 2: Follow on SCTS**	**Option 3: Expand ACSC curriculum**
Concept	• Directly model ACSC • Separate space school providing IDE credit • Technology enhanced with SCIF and lab • Dedicated space credentialed faculty billets and adjunct faculty consisting of experts from space industry NASA, and Redstone. • Educating broad spectrum of officers	• Follow on program after completion of ACSC • Requires stand up of new school at AU-similar to the School of Advanced Air and Space Studies advanced study program • Educating smaller spectrum of officers	• Utilize existing ACSC construct • Broaden space electives • Mandatory core space curriculum during the ACSC academic year • Educating broad spectrum of officers
Advantages	• Curriculum would entirely focus on space content driving doctrine and strategy development • 5 sub-systems of org. analysis optimized • More officers provided opportunity for in-residence IDE	• Benefit from ACSC curriculum but also enriched by an additional year of space study • 5 sub-systems of org. analysis optimized	• Entire ACSC class exposed to more mandatory space curriculum • Model Space Horizons elective as a model of excellence • Short lead time
Disadvantages	• Long lead time	• Only a highly competitive sub-set of ACSC students would attend school • Lead time	• Removing portions of existing ACSC curriculum • 5 sub-systems of org. analysis not fully optimized

Source: Author's original work

Each approach has many facets for consideration and will be left to senior military leaders and planners to decide on the appropriate course of action. However, the creation of a separate Space Corps Tactical School will optimize all sub-systems of organizational analysis creating the most similar approach as the ACTS. Future implementation should consider a more thorough understanding of advantages and disadvantages not accounted for in this study such as cost and schedule implications. A diverse team of planners should red team these considerations and provide additional options considered for senior level approval. Regardless of approach, staying on the current trajectory in how space education is promoted within ACSC will likely be detrimental in preparing the Air Force's most influential mid-grade officers to successfully understand the operational art of space and integrate space effects. A new approach, could significantly improve each sub-system of the ACSC organization.

Implications for Further Research

During the research of this study, many analogies were referenced by senior military leaders between ACTS, AU and ACSC. ACTS, AU and ACSC share similar stated missions, but there are stark contrasts. ACTS was a single institution which offered instruction primarily in honing critical thinking and application of air power. AU and ACSC, continue to educate future military leaders about air power, but the overall mission of AU and ACSC has changed significantly. AU now educates the total force from commissioning through senior development education as opposed to just mid-career officers. ACSC also educates officers more broadly regarding joint forces, international relations and cyber warfighting. This research revealed that drawing comparisons between AU, ACSC and ACTS lacks fidelity with space power. Future researchers may benefit from analyzing the strength of the analogy for air power.

Next, this research reveals that when and that the span and depth of PME is multi-faceted. PME impacts every Airman in the USAF, not

just mid-grade officers at ACSC. Current PME programs impact enlisted members, civilians, international partners, total force, and sister services outside of the Air Force. Given the time allotted to the researcher in investigating space education, certain boundaries were chosen to provide greater fidelity of the argument. Since the Air Force is the executive agent for space, logically, analyzing Air Force PME proved important. In addition, choosing to examine in-residence ACSC since the top mid-grade officers with greater probability in impacting future decisions of the Air Force proved valuable as well. Future research should take into consideration a more encompassing examination of space education across all PME delivery systems such as correspondence courses, enlisted education, and sister service PME schools.

In addition, space education not only involves PME, but also career field specific training conducted at the National Space Security Space Institute and the Space Warfare Center. While training and education each accomplish different outcomes, during this research it became clear that the two are not necessarily void of each other. Just as the ACTS during the interwar period provided focused study in tactics and techniques of air power, the NSSI and SWC provide focused study in tactics and techniques of space power specifically for space professionals. As the military continues to put greater emphasis on space readiness, it might prove beneficial for future researchers to examine the effectiveness of space training at NSSI and SWC and identify areas of potential cooperation with ACSC or a possible SCTS.

Lastly, during the analysis of the strength of the narrative at ACSC, it became clear that processes are not in place to adequately assess student outcomes or program performance. The AY16 ACSC student exit survey received less than half of student responses, indicating a low response rate and calling into question the fidelity of responses. Moreover, investigation of the survey revealed that the questions asked did not align to ACSC's stated mission or tasks, and

students were not asked to evaluate AU transformation. AU and ACSC leadership should leverage the potential rigor involved in student assessments, specifically student surveys, to ensure more accurate assessment of program goals and continuous improvement. More importantly, program outcomes from gaining units, in which ACSC students report to upon graduation, should be queried to assess the effectiveness of the program. Assessments from joint forces commanders with respect to students' ability to understand and request space effects could help future planners better shape educational programs to meet needs of the Air Force.

In light of this research, today is an exciting time for change within the Air Force. As final touches were coming together for this thesis, General John Raymond, commander of AFSPC, formally announced during the 33rd Space Symposium the creation of a deputy chief of staff for space who will focus on organizing, training and equipping space forces. Senior military leaders in the Air Force, akin to Billy Mitchell, are aware of the potential advantages and disadvantages the space domain provides but do not have capable mid-grade officers ready to advise Joint Force Commanders. Just as ACTS gave impetus to unhindered thinking about the new air weapon, a space school not tied to the past can help foster critical thinking about the highest frontier for every Airman. The Air Force is starting to understand the importance of articulating space capabilities across the service, this author can only hope the reader understands the role of education in incubating a space strategy.

Bibliography

Articles

Gehri, Suanne B, Lt Col. "The Air Force Mission," Airpower Journal, Winter 1992.

Weaver, Walter, R. "Functions of The Air Corps Tactical School," *Aero Digest.* (August 1939.

Books

Biddle, Tami Davis. *Rhetoric and Reality in Air Warfare: The Evolution of British and American Ideas about Strategic Bombing, 1914-1945.* Princeton: Princeton University Press, 2002.

Catledge, Burton, Major and Powell, Jeremy, LCDR. *Space Power Theory*, *Space Primer*. Maxwell AFB, AL: Air University Press, 2009.

Clausewitz, Carl von. *On War*. Edited and translated by Michael Howard and Peter Paret. Princeton, NJ.: Princeton University Press, 1976.

Davis, Richard, Lt Col and Donnini, Frank P, Lt Col. *Professional Military Education for Air Force Officers: Comments and Criticisms*. Maxwell AFB, Ala.: Air University Press, June 1991.

Douhet, Giulio. *Command of the Air*. Tuscaloosa, AL: University Alabama Press, 2009.

Faber, Peter, R. "Interwar US Army Aviation and the Air Corps Tactical School: Incubators of American Airpower," in *The Paths of Heaven: The Evolution of Airpower Theory*, ed. Phillip S. Melinger. Maxwell Air Force Base, AL: Air University Press, 1997.

Finney, Robert T. *History of the Air Corps Tactical School: 1920-1940*. Bolling AFB, DC: Air Force History and Museums Program, 1998.

Flugel, Raymond R. *United States Air Power Doctrine: A Study of the Influence of William Mitchell and Giulio Douhet at the Air Corps Tactical School, 1921 – 1935*. Norman: University of Oklahoma, 1965.

Futrell, Robert F. *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force 1907-1960*. Maxwell Air Force Base, AL: Air University Press, 1989.

Greer, Thomas H. *The Development of Air Doctrine in the Army Air Arm, 1917-1941*. Maxwell Air Force Base, AL: USAF Historical Division, 1955.

Gray, Colin S. "The Influence of Space Power upon History," *Comparative Strategy 15*, 1996

Klein, John J. *Space Warfare: Strategy, Principles and Policy*, New York, NY: Digital Printing., 2006.

Kretchik, Walter E. *U.S. Army Doctrine: From the American Revolution to the War on Terror.* Lawrence: University Press of Kansas, 2011.

Meilinger, Phillip S. *Bomber: The Formation and Early Years of Strategic Air Command*. Maxwell Air Force Base, AL: Air University Press: 2012.

Mitchell, William. *Winged Defense*. Tuscaloosa, AL: University of Alabama Press, 2009.

Schafer, Ronald. *Wings of Judgment.* New York: Oxford University Press, 1985.

Sherry, Michael S. *The Rise of American Air Power: the Creation of Armageddon*. New Haven, CT: Yale University Press, 1987.

Stares, PB. *Space Weapons and US Strategy – Origins and Development.* London: UK: Croom Helm,1985.

William Mitchell. *Our Air Force: The Keystone of National Defense.* New York: E. P. Dutton & Co., 1921.

Yenne, Bill. *Hap Arnold The General Who Invented the Air Force*. Washington, DC: Regnery History., 2013.

Government Documents

Air Command and Staff College, "Talking Paper on ACSC Honorary DO Program," authored by Lt Col Christensen, 2011.

Air Command and Staff College Operating Instructions 36-20, *Gathering of Eagles*, 10 Jun 10.

Air Command and Staff College, "Bullet Background Paper on Gathering of Eagles," authored by Lt Col Kruggel, 10 Jul 14.

Air Command and Staff College, "AY16 Gathering of Eagles Course Syllabus," 30 Apr 2015

Air Command and Staff College, "Mission Brief," AY16

Air Force Space Command History, *Employment of Space Forces in Operations Desert Shield and Desert Storm*, 1991.

Air University, *Education Digest*, 1 January 2015.

Air University, *Strategic Plan,* 2015.

Blue Ribbon Panel of the Air Force in *Space in the 21st Century Executive Summary*, prepared by Lieutenant General Thomas S. Moorman, Jr., Washington, D.C. HQ USAF, 1992.

Curtis E. LeMay Center for Doctrine Development and Education, Air Force Doctrine Document (AFDD) 1-1, Leadership and Force Development, 2004.

Griffin, Dwight, H, Major. *The Untold Story of the ACTS*. Maxwell AFB, AL: Air University Library, 1995.

Independent Study of Joint Officer Management and Joint Professional Military Education (McLean, VA: Booz Allen Hamilton, 2003

Joint Officer Development Has Improved, but a Strategic Approach Is Needed, GAO-03-238, Washington, DC: General Accounting Office, 2002.

Kamarsk, Kristy N. Goldwater-Nichols and the Evolution of Joint Professional Military Education (JPME), R44340, Washington, DC: Congressional Research Service, January 13, 2016.

Kruse, Keith, et al., *United States Space Management and Organization: Evaluating Organizational Options*, Prepared for the Commission to Assess United States National Security Space Management and Organization 2001, Chapter V.

Ltr, Lt Col John F. Curry to TAG. Maxwell AFB, AL: Air Force Historical and Research Agency, 1934.

Memo, "ACSC Program Review,"; eSSS, Lt Gen Seven L. Kwast, AU/CC, "Request to Implement the Limited Extended Active Duty Program at Air Command and Staff College (ACSC)," 19 May 2015; Memo, Brig Gen Brian T. Kelly, HQ AF/A1P, to AFPC/CC, "Air Reserve Component (ARC) Air Command Staff College (ACSC) Voluntary Limited Period of Active Duty (VLPAD) Program Implementation Guidance and Eligibility Criteria," 25 Sep 2015.

National Security Council. "US National Security Space Strategy." Online at http://archive.defense.gov/home/features/2011/0111_nsss/docs/NationalSecuritySpaceStrategyUnclassifiedSummary_Jan2011.pdf.

National Security Council. "US National Security Strategy." Online at http://nssarchive.us/national-security-strategy-2010/

Report of the Commission to Assess United States National Security Space Management and Organization: Executive Summary, Washington, DC: The Commission, 11 January 2001, http://www.fas.org/spp military/commission/executive_summary.pdf.

Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, 27 January 1967, 18 U.S.T. 2410, T.I.A.S. No. 6347, 610 U.N.T.S. 205 entry into force, 10 October 1967.

United States Department of Defense, *Report of the Secretary of Defense to the President and the Congress*, Washington GPO, 1992.

U.S. Congress, House Committee on Armed Services, Subcommittee on Oversight and Investigations, Another Crossroads? Professional Military Education Two Decades after the Goldwater-Nichols Act and the Skelton Panel, committee print, 111th Cong., April 2010.

Historical Studies

AF Office of History Interview with Ira Eaker, Maxwell AFB: Historical Research Agency #K239.0512-918, 1974.

ACTS Lecture, *An Inquiry into the Subject of War*, Maxwell AFB: Historical Research Agency, #K248.11-9, 1935.

ACTS, “Bombing Probabilities,” Bombardment Aviation course. Maxwell AFB: Historical Research Agency, K#249.222, 2, 1935.

ACTS, “The Primary Objective of Air Forces,” ACTS Lesson Plan. Maxwell AFB: Historical Research Agency, #K248.2017A-10, 1936.

Chennault, Claire, Captain. “Pursuit Aviation,” ACTS lecture, Maxwell AFB: Historical Research Agency, #K248.101-8, 1933.

Compendium of AU Programs, Centers & Schools, AU historian, ACSC/CCE overview of ACSC.

Historical office, Air Technical Service Command, comp., “Case History of the Norden Bombsight and G1 Automatic Pilot,” Maxwell AFB: Historical Research Agency K#202.35, 1945.

Lectures and Addresses

Creedon, Madelyn R, Assistant Secretary of Defense for Global Strategic Affairs. “Shared Challenges, Shared Opportunities.” Speech. USSTRATCOM Cyber and Space Symposium, Omaha, NE, 15 November 2011.

Fairchild, Muir S, Major General. “Welcoming Address Congratulates Students at Air War College and Air Command & Staff School on Selection,” *The Post,* 13 September 1946.

General David Goldfein, “Space Power to the Warfighter,” AFA Mitchell speech. http://www.af.mil/Portals/1/documents/csaf/020307migoldfeinv1.pdf. 3 Feb 17.

McPeak, Merrill, General. "Does the Air Force Have a Mission?" Text of Speech to a dining-in at Air University, Maxwell AFB, Ala., 19 June 1992.

Rogers, Mike, Representative. “Remarks to 33rd Space Symposium,” 4 April 2017, http://breakingdefense.com/2017/04/jicspoc-morphs-to-national-space-defense-center-what-it-means/.

Site Content

Air Command and Staff College. ACSC Webpage. Accessed 10 March 2016. http://www.airuniversity.af.mil/ACSC /Display/Article/922301

Air Force Space Command, "AFSPC Fact Sheet," accessed 19 Feb 2017, http://www.af.mil/AboutUs/FactSheets/Display/ tabid/224/Article/104526/air-force-space-command.aspx.

Air University homepage heritage, accessed 24 March 2017, http://www.airuniversity.af.mil/About/.

Art, Ms. Lisa Warr, 42 ABW/PA, "Lt Gen Kwast assumes command of Air University," Air University News, 14 Nov 2014. http://www.au .af.mil/au/audocs/AU_Strategic_Plan_Sept_2015.pdf.

Blankenship, William J, Senior Airman. "Innovating education: New Commander of Air University challenges Airmen," *U.S. Air Force News*, 23 November 2014, http://www.af.mil/News/Article-Display/Article/554844/innovating-education-new-commander-of-air-university-challenges-airmen/

Chavana, Jarrod. "Airmen deliver GPS to the World." *Air Force Space Command News*, 9 September 2014, http://www.afspc.af.mil /News/Article-Display/Article/731234/airmen-deliver-gps-to-the-world/.

Chiabotti, Stephen D, Dr. "Pensive Sword: Educating Officers in Austere Times*," Strategic Studies Quarterly,* vol 8, no 3 (Fall 2014): http://www.airuniversity.af.mil/Portals/10/SSQ/documents /Volume-08_Issue-3/Chiabotti.pdf?ver=2017-01-23-122109-607.

Cody, Edward. "China Confirms Firing Missile to Destroy Satellite," *Washington Post*, 24 January 2007, http://www.washingtonpost. com/wp-dyn/content/article/2007/01/23/AR20070 12300114.html

Forsyth, James W. Jr, Dr. and Muller, Richard, Dr. "We Were Deans Once…and Young," *Air and Space Power Journal*, (Fall 2011): http://www.dtic.mil/dtic/tr/fulltext/u2/a562362.pdf.

Gertz, Bill. "Russia Flight Tests Anti-satellite Missile," *Washington Free*

Beacon, 27 May 2016, http://freebeacon.com/national-security/russia-flight-tests-anti-satellite-missile/.

Goldfein, David, General. "An Interview with Gen David L. Goldfein Twenty-First Chief of Staff of the US Air Force," *Strategic Studies Quarterly*, (Spring 2017): 7, http://www.airuniversity.af.mil/Portals/10/SSQ/documents/Volume-11_Issue-1/Goldfein.pdf.

Hitchens, Teresa and Johnson-Freese, Joan. "Toward a New National Security Space Strategy Time for a Strategic Rebalancing," *The Atlantic Council*, 17 June 2016, http://www.atlanticcouncil.org/publications/reports/toward-a-new-national-security-space-strategy-time-for-a-strategic-rebalancing.

Hyten, John, Colonel. "Sea of Peace or a Theater of War: Dealing with the Inevitable Conflict in Space." *Air and Space Power Journal*, (Fall 2002): http://www.au.af.mil/au/afri/aspj/airchronicles/apj/apj02/fal02/hyten.html.

Hyten, John, General. "An Airman's Story," Air and Space Power Journal, (Winter 2015): http://www.au.af.mil/au/afri/aspj/archivepage.asp?id=41

Kelley, Kevin P and Johnson-Freese, Joan. "Rethinking Professional Military Education," *FPRI.org,* 25 October 2013, http://www.fpri.Org/article/201310/rethinking-professional-military-education/

Kehler, Robert, General. "Implementing the National Security Space Strategy." *Strategic Studies Quarterly Journal*, volume 6, number 1 (Spring 2012): 20, Spring 2012, 20, http://www.airuniversity.afmil/Portals/10/SSQ/documents/Volume-06_Issue1/Spring12.pdf.

Loicano, Sara, Tech. Sgt. 42 ABW/PA, "Colonel Hastings to carry on ACSC transformation," 5 August 2015, http://www.maxwell.af.mil/News/Display/tabid/10067/Article

Johnson-Freese, Joan. "Stopping the Slide Towards A War in Space: The Sky's Not Falling," *Breaking Defense*, 28 December 2016, http://breakingdefense.com/2016/12/stopping-the-slide-towards-a-war-in-space-the-skys-not-falling-part-2/

Garamone, Jim. "Work: Space Domain Presents Challenges, Threats." DoD News, 16 April 2016.https://www.defense.gov/News/Article/Article/604475/work-space-domain-presents-challenges-threats.

Moorman, Thomas, Lieutenant General. “Space: A New Strategic Frontier,” *Airpower Journal*, (Spring 1992): http://www.au.af.mil /auafri/aspj/airchronicles/apj/apj92/spr92/moor.htm.

Newton, Wesley Phillips and Ennels, Jerome A, “Air University Recovers from Vietnam and Regains Respect,” http://www.au .af. mil/au/afri/aspj/airchronicles/apj/apj97/win97/ newt.html, accessed 21 March 2017.

Pawlikowski, Ellen, Lieutenant General, Loverro, Doug and Cristler, Tom, Colonel. “Disruptive Challenges, New Opportunities and New Strategies,” *Strategic Studies Quarterly Journal*, volume 6, number 1 (Spring 2012): 29, http://www.airuniversity.af. mil/Portals/10/SSQ/documents/Volume-06_Issue-1/Spring12.pdf.

Picariello, Erica, Staff Sgt. “ACSC students tackle AF future in “Staff Challenge,” *Maxwell AFB News,* 2 June 2015, http://www. maxwell.af.mil/News/Display/Article/704271/acsc-students-tackle-af-future-in-staff-challenge/.

Report of the Commission to Assess United States National Security Space Management and Organization: Executive Summary, Accessed 5 January 2017. http://www.fas.org/spp/military /commission/executive_summary.pdf.

Ricks, Tom. “Need a Budget Cut, We can start by Shutting the Air War College*,” Foreign Policy,* 11 April 2011, http://foreignpolicy.com/ 2011/04/11/need-budget-cuts-we-probably-can-start-by -shutting-the-air-war-college/.

RoAnn Bishop. “Lindbergh's Influence on Aviation,” NCpedia.com. Fall 2003. Accessed 17 April 2017.http://www.ncpedia.org/ aviation/Lindbergh.

Sciutto, Jim. “US Military preparing for the next frontier: Space War.” *CNN report*, 29 November 2016, https://www.youtube.com /watch?v=j-ZBLFhb_lg.

Spires, Bradley. *An Air Force Vision for Military Space Mission: A Road Map for the 21st Century*, Maxwell AFB, AL: Air University Press, 2006, http://space.au.af.mil/books/spires/ch08.pdf.

Welsh, Marc, General. Comments to National Press Club. 23 April 2014. https://www.youtube.com/watch?v=NqWvqaNdThg.

Yasmin Tadjdeh, “New Chinese Threats to U.S. Space Systems Worry Officials,” *National Defense*, 5 July 2014,http://www.nationaldefensemagazine.org/archive/2014/July/pages/NewChineseThreatstoUSSpaceSystemsWorryOfficials.aspx.