Art of War Papers

Perceptions of Airpower and Implications for the Leavenworth Schools: Interwar Student Papers

David R. Jones, Major, US Army

US Army Command and General Staff College Press
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Fort Leavenworth, Kansas

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Abstract

This thesis evaluates interwar period US Army officer perceptions of aviation as expressed in student papers written as part of the Command and General Staff School during the 1930s. The evaluation compares student perceptions to period airpower theory and doctrine and applies that study to weigh-in on the broader debate over the effectiveness of Fort Leavenworth during the interwar period.

America's School for War and *Command Culture* by Dr. Peter Schifferle and Dr. Jörg Muth, respectively, highlight the competing sides of that debate. Schifferle argues Leavenworth was a key component to the US victory in World War II while Muth argues the US victory occurred in spite of Leavenworth teaching faulty doctrine and stifling critical thinking.

This study concludes that the students generally agreed with period doctrine while also rejecting many of the ideas of airpower theorists. However, application of the study to the question of Leavenworth effectiveness yields mixed results. The papers indicate the doctrine, which formed the basis of Leavenworth instruction, was appropriate for the time. Nonetheless, they also suggest Leavenworth's willingness to part with critical thinking development (in the form of writing) in favor of more classroom instruction - instruction of debatable effectiveness.

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Acronyms

AC	Air Corps
ACTS	Air Corps Tactical School
AEF	American Expeditionary Forces
CAC	Coast Artillery Corps
CGSS	Command and General Staff School
FSR	Field Service Regulations
TR	Training Regulation

Chapter 1
Introduction

As the United States Army slowly ramps down from more than a decade of continuous combat operations in Iraq, Afghanistan, and elsewhere, there are significant ongoing debates over the future of the Army. In an environment characterized by increasingly constrained resources, topics such as the size of the Army, the balance of capabilities between the active and reserve components, equipment procurement, and personnel costs predictably appear to dominate the discussion. That the Army must reduce in size because of these as other factors is, at this point, a foregone conclusion. However, the challenge is ensuring that those Army activities that remain through a post-war drawdown provide the best return on investment possible. In light of this challenge, it should not be a surprise that the topic of the best way to conduct Professional Military Education (PME) is a point of debate within the broader subject of the future of the US Army.

Given that the education and training of its personnel heavily influence the Army's ability to perform in future conflicts, the effectiveness of a portion of that system, the Command and General Staff School (CGSS) at Fort Leavenworth, has recently been the subject of increasing debate. In a blog at *Foreign Policy* online, Dr. Nicholas Murray leveled significant criticism against the conduct of the resident course at the CGSS.[1] He noted that an emphasis on time spent in class, rather than quality of instruction and time for reflection, has become a focus of the CGSS curriculum. An earlier article by the same author stated the problem more bluntly, that "the current focus of PME does not adequately prepare our officers to think critically."[2] Along similar lines, Jörg Muth argued that the current PME structure, including Leavenworth, fails to adequately educate Army officers to be effective staff officers.[3] A recent article written by the former commander of the US Army Training and Doctrine Command, GEN Cone, who stated Leavenworth is not what it should be - an intellectual "Harvard on the Missouri," supports these assessments.[4] However, what is particularly interesting in the debate over the effectiveness of Leavenworth in the Army's officer education system is not that it is happening, but that such debate is not new. Indeed, a number of works exist which explore the effectiveness of the instruction at Fort Leavenworth during the interwar period, points of which may be applicable to the current debate.

Evolution of the Command and General Staff School

Prior to a review of the available works covering effectiveness of the CGSS during the interwar period, it is first necessary to provide a degree of background on the school. Formal military instruction at the former frontier post began with the establishment of the School of Application for Cavalry and Infantry in 1881.[5] However, it was not until after the conclusion of the Spanish-American War that Leavenworth began its evolution from a basic branch school to a form of intermediate level education for mid-grade officers with emphasis on command and staff functions.[6]

As the school evolved, its importance grew within the Army. Even prior to the US entry into World War I, the Leavenworth school (renamed the School of the Line in 1907) was increasingly viewed as the "intellectual center of the Army."[7] While manpower requirements forced the school to close in May of 1916, General Pershing placed such importance on the Leavenworth instruction that he opened a school for officers of the American Expeditionary Forces (AEF) in Langres, France built around the model of instruction used at Leavenworth.[8] Additionally, Pershing gave great praise to the role Leavenworth graduates played in solving many of the significant challenges faced by the AEF.[9] By the time the Army schools at Fort Leavenworth reopened in 1919, Leavenworth attendance was unquestionably a key milestone in the career of a professional officer.

When the school reopened for the 1919-1920 academic year, it did so with a two-year course format. During the first year, students attended the School of the Line with a general focus on division operations. Upon completion of the first year of instruction, the Army selected the best students to attend a second year of instruction at the General Staff School with emphasis on corps and army operations.[10] Commenting on both the 1919-1923 courses and the perceived importance of the school, in 1929 the Commandant of the CGSS wrote, "those who were not fortunate enough to stay for the second year felt that they were ruined professionally."[11] This issue, the need to maximize the number of graduates, and a large "hump" of officers requiring education prompted consolidation of the two schools into a one-year course titled the Command and General Staff School, a name that remains to the present.[12]

However, the shift to a one-year course was short-lived. Beginning in 1928, the CGSS returned to a two-year model, this time with all students attending both years. This format was believed to address

possible shortcomings in the curriculum caused by the shortened course while, at the same time, eliminating the morale problems present in the 1919-1923 two-year format associated with non-selection for a second year of instruction.[13] These two-year courses began in 1928 and graduated from 1930 through 1936. In 1935, as the last students of the two-year course completed their second year of instruction, the Army again instituted a one-year CGSS course for new students. This change occurred to provide the Army as many Leavenworth trained officers as possible.[14]

Throughout these shifts in course structure, Leavenworth retained its important position as a key developmental institution for mid-grade officers of the US Army during the interwar period. Indeed, for many officers of the period, Leavenworth was likely the only formal schooling they received on the operations of divisions, corps, and armies. Due to both the fact that many of the leaders of the US Army in World War II attended Leavenworth during the interwar period and the ultimate success of the Army in the war, significant debate exists over the effectiveness of the interwar CGSS and its role in the American victory.

Effectiveness of the Command and General Staff School in the Interwar Period

The debate over the effectiveness of the instruction at the CGSS during the interwar period falls largely into one of two camps. On one side, scholars argued favorably for Leavenworth in that the school's interwar instruction of division, corps, and army operations was an essential component in the later success of the US Army. On the other side of the debate, the argument is that despite the Army's desire to use Leavenworth to develop skilled commanders and staff officers, the method of instruction and other factors worked against the intent. Thus, any successes of the US Army in World War II occurred not because of the instruction at Leavenworth, but in spite of Leavenworth. What follows in this section is a brief examination of each side of the debate as well as the introduction of another possible method to examine Leavenworth effectiveness beyond the methods used in the current literature.

Beginning with the proponents of the interwar CGSS, two historians stand out - Dr. Timothy Nenninger and Dr. Peter Schifferle. Although the first of these historians, Dr. Nenninger, focused much of his work on Leavenworth prior to the First World War, he wrote two articles directly addressing Leavenworth during the period of 1920-1940.[15] In the earliest of these articles, "Creating Officers, The Leavenworth

Experience: 1920-1940," he wrote that Leavenworth was essential to the preparation of US Army officers for their duties during World War II.[16] From his perspective, not only did the school adequately groom students in the basics of division and larger unit operations, it also successfully served as "an opportunity to practice the mental, intellectual, judgmental and decision-making aspects of higher levels of the military art."[17] As evidence, he pointed out the largely positive perceptions of the school by its students, the method and content of instruction, and the fact that the overwhelming majority of the US Army's corps, army, and army group commanders or principal staff officers of World War II attended Leavenworth during the interwar period.[18] Since Leavenworth was likely the only formal education many of these officers received on large-unit operations, the success of those leaders managing such units, in his opinion, stands as validation of the value of Leavenworth.

Only a few years after the publication of "Creating Officers," Nenninger wrote another article to address criticisms of the interwar CGSS.[19] In "Leavenworth and its Critics," Nenninger acknowledged a number of arguments that the interwar Leavenworth did not perform as well as it could or should have, the main criticism being the school's reliance upon school solutions (doctrinally correct solutions to tactical problems). Nenninger stated that critics of the school viewed these school solutions as having "inculcated narrow, uniform thinking among its graduates."[20] Additional criticism of the school, he points out, existed over the limited instruction on emerging technologies such as aviation and mechanization as well as a belief that the German *Kriegsakademie* conducted better instruction during the same period.[21] To counter the primary criticism of the school solution, Nenninger wrote that school solutions were not the only solution, rather a starting point from which instructors could evaluate student works. Those students who produced well-reasoned solutions to tactical problems were to receive full credit for their solutions.[22] To counter other criticisms of the school Nenninger noted that instruction changed as technology advanced.[23] Additionally, regardless of the instruction at the *Kriegsakademie*, he stated that Leavenworth ensured a common understanding of the capabilities and limitations of the separate arms as part of large-scale combat operations.[24] This, in his opinion, was sufficient for the school as it increased the general abilities and knowledge of the interwar officer corps and trained them to solve problems.[25] Yet Nenninger readily acknowledged that his own short article was not sufficient coverage of the performance of the CGSS in the interwar period.

To address his acknowledged insufficient coverage of the topic, Nenninger called for a comprehensive examination of Leavenworth during the 1920s and 1930s with a focus on student and faculty selection, the curriculum, and post-schooling graduate utilization.[26] Dr. Peter Schifferle's *America's School for War* (as well as his earlier dissertation on the same topic) largely answered that call.[27] Although Schifferle's work mirrors Nenninger's argument that the instruction at Leavenworth during the interwar period "was essential to the success of the United States Army in World War II," Schifferle provided significant detail to support the conclusion and attempt to address critics of the school.[28] To those who proposed American manufacturing rather than military leadership was the basis of US victory, Schifferle noted that victory still required leaders with the ability to coordinate the activities of a massive army.[29] He stated that Leavenworth was the only place officers could train for command and staff roles in operations of large units due to the limited size and budget of the interwar US Army.[30] Regarding criticisms of Leavenworth teaching faulty doctrinal principals, Schifferle countered that there were few notable changes to US Army doctrine from 1923 through 1940 and that the school was not wrong to teach the existing (and accepted) doctrine as the fundamentals.[31]

Perhaps the greatest criticism Schifferle attempted to counter is that of an overreliance on an approved solution and the belief that such reliance stifled critical and creative thinking by the students. To this, he wrote that the much criticized school solutions originated from consideration of multiple solutions to tactical problems. Additionally, the approved solutions were not the only accepted solution but rather a starting point to facilitate the grading process. Students could still arrive at unique and acceptable solutions to problems provided those solutions did not place them at odds with the intent of the school to teach the fundamental doctrinal principles.[32] It is that last caveat, acknowledgement that the school may not have been receptive to students who disagreed with the doctrine, which ultimately prevented Schifferle's work from fully addressing the criticism behind the school solutions. After all, if the interwar doctrine failed to account for changing conditions or if students who arrived at innovative but doctrinally incorrect solutions to problems were viewed unfavorably, then there may exist a reasonable argument that Leavenworth focused on conformity at the expense of critical and creative thinking.

It is this idea that Dr. Jörg Muth explored in his recent work, *Command Culture*, as part of a larger examination of what he believed

were failures of officer selection, education, and training in the US Army.[33] On the subject of Leavenworth, Muth argued, "the presence of Leavenworth graduates in positions of command coupled with the US victory does not automatically lead to the conclusion that the Leavenworth experience taught these men superior military expertise."[34] To argue against the linkage he addressed both instruction at Leavenworth as well as the idea of Leavenworth graduate performance in World War II. Regarding the first, he wrote that the instruction at Leavenworth was poor because of both poor faculty selection and doctrine too focused on the last war.[35] Additionally, he pointed out that not only was the doctrine faulty, the instruction and grading at the school focused on students performing exactly in accordance with that doctrine - the basis of the school solutions.[36] To that end, he described Leavenworth students as "factory products" who were to leave the school with an understanding of the common professional language and doctrine rather than depart as creative and innovative thinkers able to address challenging problems.[37] On the very idea of graduate performance during World War II, Muth wrote that although graduates did occupy positions of significance during World War II, the evidence shows widely uneven performance by Leavenworth graduates. As a result, there can be no clear link between Leavenworth education and officer performance.[38] Thus, if Leavenworth taught the wrong information and attendance at the institution did not result in better performance in combat, was it an effective institution? Muth clearly answered in the negative.

Although these works stand very clearly for or against the quality of instruction at Leavenworth during the interwar period, each of these works stands in agreement that the school excelled at teaching students the doctrine. Thus, the debate over effectiveness in the existing literature comes down to whether or not the doctrine was correct and whether or not the coursework at Leavenworth developed and encouraged critical and creative thinking by its students. To arrive at conclusions on these topics the existing works largely explored different perceptions of similar material. Specifically, the authors relied heavily upon institutional processes of the CGSS including curriculum (with an emphasis on tactical map problems), faculty selection, and student selection. Yet, it may be possible to arrive at conclusions regarding the school's effectiveness through examination of some of the work students completed while in attendance rather than through review of institutional processes. It is this approach to analyzing effectiveness that serves as the basis for this paper.

The Interwar Student Papers

Fortunately, for this examination, the Fort Leavenworth Combined Arms Research Library (CARL) maintains a digitized collection of some 930 research papers authored by students at the CGSS during the interwar period. Although an extensive number of papers exist, the collection does not comprise student research papers from every CGSS class during the interwar period. Rather, the collection is only of those student papers written as a portion of the two-year courses, which started from 1928-1934 and graduated from 1930-1936. Although review of Leavenworth academic schedules indicates the second-year class of 1920-1921 completed monographs as part of their coursework, the research staff at the CARL was unable to locate any copies of their work in the library archives. Additionally, the academic schedules do not show and the library archives do not contain monographs from of any of the courses during the interwar period other than those already mentioned.[39]

Of the existing papers, approximately two-thirds are historical research with the remainder written as opinion pieces to derive answers to then contemporary questions about employment of military forces. Although the topics of the opinion papers vary greatly, in general the papers used past battles, results of maneuvers or tests, theory, doctrine, and aspects of emerging technology in an attempt to draw conclusions applicable to the Army of the time. Since a thorough examination of over 300 opinion papers exceeds the time available for this study, this study only examines the 69 student papers written on the topic of airpower. This topic limitation not only serves to maximize the use of available time, it also holds the potential to address whether or not the interwar doctrine was indeed faulty. If comparison of student opinions to period doctrine suggests the students largely held the established doctrine as true and valid based on references and experiences of the time, then the papers stand as an argument that doctrine was appropriate. Likewise, if the comparison shows students largely rejected doctrine, the papers may add weight to Muth's arguments.

Still, whether or not doctrine was faulty is only one aspect of the debate over Leavenworth effectiveness. Perhaps the more important question is if instruction at Leavenworth developed or stifled critical and creative thinking amongst its students. The manner in which students wrote their papers and the very presence or absence of writing requirements as part of the Leavenworth curriculum may provide answers to that question. Assuming the students applied critical thinking to arrive

at the solutions in their papers, the presence of writing requirements may indicate that Leavenworth, by requiring writing, demonstrated at least some focus on developing its students' critical thinking abilities. Conversely, the absence of writing requirements from the curriculum could indicate a school unconcerned with critical thinking development, depending on the reasons for removal of writing requirements and the quality and focus of the coursework replacing the writing requirements.

Thus, using these papers, this thesis seeks answers two primary questions. First, how did student perceptions of the role of airpower expressed within their papers compare to period theory and doctrine? Second, what do the student papers suggest about the effectiveness of the CGSS during the interwar period?

Thesis

Examination of the papers written on airpower topics suggests that the interwar CGSS students held relatively conservative views of the role of aviation in warfare. The papers displayed near universal rejection of the views of Giulio Douhet and William "Billy" Mitchell that airpower, and strategic bombing in particular, was the key to quick and decisive victory in wars. Instead, the students presented a balanced view of aviation by acknowledging its strengths without downplaying its weaknesses. Rather than viewing aviation as the dominant force in war, they perceived it as part of a combined arms effort to defeat an enemy's military forces and will to fight. In this respect, the student papers largely mirrored interwar US Army doctrine with one major exception. Unlike doctrine, the students appeared very open to targeting cities and civilians in future conflicts.

Of potentially greater significance, it is possible to conclude that the student papers serve as an argument that interwar US Army airpower doctrine was appropriate for its time. Despite the wide range of materials the students used to write their papers, their conclusions on the proper employment of airpower differed little from period doctrine. This lack of difference between doctrine and student conclusions suggests that the students believed the doctrine to be appropriate. To arrive at this conclusion, readers must assume as true that the student papers demonstrated application of critical thinking to arrive at conclusions on aviation topics - conclusions supported by a wide-range of research materials. Although it is possible for readers to validate this assumption independently, doing so requires either reading a large number of those

student papers to gain a detailed understanding of their methodology or inclusion of a large sample of student writing in this thesis.

Regarding Leavenworth effectiveness, the student papers provided mixed reviews. Arguing positively for the school, if the period doctrine was appropriate, the school's reliance upon that doctrine is an indicator of effectiveness rather than ineffectiveness. Additionally, operating on the perception that the students demonstrated good critical thinking skills in their papers, assignment of student papers as part of the curriculum is a positive mark for the school. However, the potential reasons why the school eliminated writing requirements - graduate production, faculty shortages, and institutional preference for classroom instruction - may overshadow that positive mark. Even though elimination of writing requirements potentially indicates a lower priority toward critical thinking development at Leavenworth, whether or not that was the case must return to the debate over the quality of classroom instruction and the impact of approved solutions. Ultimately, this is a debate with sharply divided lines between Muth and Schifferle and a debate that examination of the student papers cannot answer.

Research Scope and Methodology

In order to arrive at the conclusions stated above, this paper consists of three additional chapters. Chapter 2 consists of three sections designed to provide a summary of those works of history, theory, and doctrine that the students used as references. The examination of these works provides a basis of comparison between student opinions and period thought explored in chapter 3. It is of note that since student papers are only available from the two-year courses that began in 1928 and graduated from 1930 through 1936, this chapter does not consider works of doctrine or theory produced after 1936.

In the period history section, chapter two explores the role that aviation played in the First World War as described in the historical works available to and used by CGSS students in the 1930s. These works include the "Final Report of the Chief of Air Service, AEF," Sir Alfred Rawlinson's *The Defence of London*, Charles Turner's *The Struggle in the Air*, Liman von Sanders' *Five Years in Turkey*, Ernest von Hoeppner's *Germany's War in the Air*, and William Massey's *Allenby's Final Triumph*.[40] The intent within this section of the chapter is not to focus on the specific content of the works, but rather on the common themes about the role of airpower during the Great War which exist between

the works - themes which can be said to the be the lessons learned about airpower.

In addition to the history of airpower in the Great War, chapter two also examines the theories on airpower that emerged during the interwar period. Again, as with the histories discussed in chapter two, the discussion of interwar period airpower theory focuses on those theorists whose works were available to, and used by the CGSS students. This scope limits the theoretical works discussed in chapter two to that of five different authors - Giulio Douhet, William Mitchell, B.H. Liddell Hart, William Sherman, and the pseudonym "Squadron Leader."[41] The analysis of these works focuses on placing them on a spectrum regarding their take on the decisiveness of airpower in armed conflict.

The final section of chapter two examines US Army doctrine from the mid-1920s to the mid-1930s. As will be discussed in chapter two, despite a clear picture of which doctrinal references the students used, the combination of likely low initial circulation and elapsed time mean that a number of those doctrinal references are not available for analysis in this study. Nevertheless, chapter seeks to characterize the prevailing US Army doctrine regarding airpower with those sources that are still available. Namely, these include the US Army Field Service Regulations of 1923, US Army Training Regulations, and select Air Corps Tactical School (ACTS) Manuals.[42]

Chapter 3 presents descriptions of the role of air power presented by the students in their papers. This chapter consolidates the positions presented by the students into nine different topic areas - bombardment, pursuit, antiaircraft defense, attack, observation, troop movements, coastal defense, air superiority, and aviation in small wars and other outlying ideas. Each of these topic areas describes both the overall student perceptions on the topic and notable disagreements between student papers, if any. The end of each topic area compares the student perceptions to the interwar period theory and doctrine explored in chapter two. Through this comparison, points of agreement (or lack thereof) potentially indicate to what extent those students supported or refuted the ideas contained in theory and doctrine. In doing so, this chapter ultimately arrives at the answer to the first question of this paper, how did student perceptions of the role of airpower expressed within their papers compare to period theory and doctrine?

Chapter 4 applies the examination of student papers to the broader question of Leavenworth effectiveness during the interwar period. To

do so, the two key points of the effectiveness debate - doctrine and critical thinking - are the focus of the chapter. On doctrine, the chapter briefly explores the nature of doctrine. Building on this exploration, the chapter applies the chapter 3 comparison of student opinions, period doctrine, and theory to conclude whether or not the interwar period doctrine was appropriate. On critical thinking, chapter 4 examines the presence or absence of writing requirements at Leavenworth during the interwar period. The chapter then applies the examination to the debate over whether or not Leavenworth valued and developed the critical and creative thinking of its students. Chapter 4 concludes with implications of the interwar study to the modern CGSS as well as recommendations for further study.

Notes

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6. Hunt, 151-153.

7. Timothy K. Nenninger, *The Leavenworth Schools and the Old Army* (Westport, CT: Greenwood Press, 1978), 129.

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12. Annual Report, 1923, 7; Annual Report, 1929, 8.

13. Annual Report, 1929, 8.

14. Annual Report, 1936, 13.

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16. Nenninger, "Creating Officers," 68.

17. Nenninger, "Creating Officers," 67.

18. Nenninger, "Creating Officers," 64-65 and 67.

19. Nenninger, "Leavenworth and its Critics."

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24. Nenninger, "Leavenworth and its Critics," 9.

25. Nenninger, "Leavenworth and its Critics."

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27. Peter J. Schifferle, *America's School for War* (Lawrence, KS: The University of Kansas Press, 2010); Peter J. Schifferle, "Anticipating Armageddon: The Leavenworth Schools and U.S. Army Military Effectiveness 1919 to 1945" (PhD diss., University of Kansas, 2002).

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29. Schifferle, *America's School for War*, 188.

30. Schifferle, *America's School for War,* 7, 19-22, 28, 31, 63-64, and 93.

31. Schifferle, *America's School for War*, 98-99 and 192-193.

32. Schifferle, *America's School for War*, 111 and 142-145.

33. Jörg Muth, *Command Culture* (Denton, TX: University of North Texas Press, 2011).

34. Muth, 7.

35. Muth, 126-127.

36. Muth, 185-186.

37. Muth, 185-186 and 189-190.

38. Muth, 190.

39. Based on review of academic schedules for the schools at Fort Leavenworth (The School of the Line, the General Staff School and the Command and General Staff School) during the interwar period. Digital copies of the schedules are available through the reference desk at the Combined Arms Research Library, Ft. Leavenworth, KS.

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Chapter 2
Airpower in the First World War, Interwar Airpower Theory, and Interwar US Army Doctrine

By the time the CGSS students wrote their papers in the 1930s, a relatively large number of references existed which described employment of aviation in military operations. Because those works represent the available body of knowledge from which the students could develop their own thoughts, this chapter explores those references. Specifically, this chapter focuses on three categories of interwar airpower materials. The first of these categories is available histories of the First World War. Although aviation played a role in a number of small conflicts in the interwar period, the employment of aviation forces in those conflicts paled in comparison to that of the First World War. The scale of that conflict also meant that the history of the Great War contained the greatest amount of information from which to base aviation theory and doctrine during the interwar period. The second category - works of influential airpower theorists - is included as such review not only serves as a point of comparison with student papers, but also has potential to indicate which theories and theorists actually held influence within the Air Corps. Since critics of Leavenworth raised the prospect of school reliance upon faulty doctrine, a review of interwar US Army doctrine serves as the final category of references examined in this chapter. This examination allows for comparison between the positions advocated in the student papers and those positions approved by at least the leadership of the Air Corps, if not that of the Army as a whole.

Within each of the three categories, only certain works are included for summary in this chapter. The primary basis for selection of those works was whether they were available to and used by the interwar students as indicated by the bibliographies of the student papers. The frequency with which multiple students citied a particular work also served to limit the number of interwar references contained in this chapter. These two source limitations ensure proper comparison of the period-specific ideas of the students to period-specific history, theory, and doctrine. A final undesired but ultimately unavoidable source limitation at play is the present-day availability of certain publications from the 1920s and 1930s. A number of student references are simply unavailable or were inaccessible in the course of this study.

Airpower in the First World War

Turning first to works of history, this section explores those official and unofficial histories of the First World War used by the interwar period CGSS students as references in their papers. This exploration is not a summary of those histories, but rather a discussion of the common themes that existed between the works. These common themes ultimately represent lessons learned on the subject of airpower from the experiences of the First World War and, as such, are likely areas of influence on period theory and doctrine. However, prior to presenting the common lessons learned as detailed in the historical references, the following paragraphs provide overviews of the sources by nation of origin.

Of the American histories of the war cited by students, the "Final Report" of the Chief of the Air Service, AEF is the most commonly referenced.[1] Prepared under the direction of Major General Mason M. Patrick, the "Final Report" is a complete historical record of the conduct of the Air Service created for submission to General Pershing.[2] This report was significant enough that those officers were required to complete their own reports on lessons learned in order to redeploy to the United States.[3] As published, the "Final Report" provided significant detail into nearly all aspects of the US Air Service role in the First World War to include not only conduct in battle, but also details on the logistical, training, and mobilization efforts which supported combat operations of the Air Service.[4]

For the German perspective, two works stand out. The first is *Germany's War in the Air* by General Ernest von Hoeppner, the Commanding General of the German Air Force during World War I, who endeavored to describe the development and operations of German aviation from pre-war through demobilization.[5] Also frequently referenced by the GCSS students is General Liman von Sanders' *Five Years in Turkey*.[6] Although not focused solely on airpower, von Sanders' work does provided perspectives on the influence of airpower in broader operations, as will be discussed during the examination of the lessons learned.

From the British side, several works stand out as frequent student references. One such work, *The Defence of London* by Alfred Rawlinson, chronicled the efforts to defend London from air attack.[7] Another common reference is Charles Turner's *The Struggle in the Air, 1914-1918*.[8] Approximately the first third of his book documented the nature of aerial combat using stories and award citations covering the actions of individual airmen.[9] However, it is the remainder of the work that

presented the most lessons learned material in its discussion of topics such as the air defense, bombing, reconnaissance and coordination with the infantry.[10] The final British history considered in this paper based on frequent citations in student papers is *Allenby's Final Triumph* by William Massey.[11] As with *Five Years in Turkey*, the focus of *Allenby's Final Triumph* was not the air war, but the British campaign in Palestine in which aviation played a part. As a final note of British sources, a number of students cited *The War in the Air*, a multivolume official British history.[12] Although the CARL maintains a copy of this work, the sheer size of each of the six volumes of *The War in the Air* precluded review and analysis of the series in this study.

However, what is important is not the content or structure of any one of the above works, but the themes that exist between the works as these represent the lessons of the war. Of these themes, there are five that merit discussion here: generation of aircraft and crews, aircraft reconnaissance, bombardment aviation, attack aviation, and air defense. The remainder of this section details the lessons the various histories provide on these themes.

On the subject of generation of aircraft and crews, there is a general consensus in the histories reviewed that, from the outset of the First World War, considerable time was needed to establish the necessary production and training facilities to create the required aircraft and aircrew members, respectively. The "Final Report" stated one of the major problems facing the Air Service as lack of properly trained personnel, including not just pilots, but also the skilled mechanics necessary to maintain and repair aircraft.[13] Not only did personnel shortages pose a problem for the United States, a lack of combat capable aircraft and an insufficient industry to produce aircraft was a significant issue. Indeed, at the outset of the war, the US Air Service had zero combat capable planes in its inventory and would not produce more than 100 combat ready planes per month until July of 1918.[14] However, these issues were not unique to the United States as a late arrival to the war. From the outset of the conflict, Germany also experienced significant difficulty expanding training and production of aircrews and aircraft. General von Hoeppner noted that Germany suffered a shortage of aircraft, parts, pilots, and workmen at the start of the war due to pre-war failure to anticipate their need.[15] Given these realties, the lesson drawn from the available references is that because of the time required to develop aviation capabilities, significant peacetime investment is required to ensure adequacy of a nation's aviation force at the outset of the next war.

A second theme with relative consensus between the interwar reference materials is that of the impact of air reconnaissance. To that end, there is general agreement that the presence of aircraft in a reconnaissance role significantly influences unit movements and operations. Although the value of aircraft at the start of the Great War was, to the Germans, unproven and considered of little value in some circles, the impact of aircraft in the reconnaissance role would prove significant.[16] General von Hoeppner noted that the opening days of the war proved the value of air reconnaissance when the information supplied by French pilots indicated the position and movements of the German First Army as it turned east of Paris. In turn, this information identified to Marshal Joffre the vulnerability of German forces to a counterattack.[17]

By the last year of the war, commanders, having learned the value of information gained by aerial reconnaissance, went to great lengths to avoid aerial observation of their forces. On the Western Front, the British often employed artists to apply paint schemes on key facilities to camouflage them from aerial observation.[18] At Cambrai, the British were able to mask the assembly of their forces prior to the start of the offensive by conducting movements only under cover of darkness.[19] In the east, General Allenby went as far as to set up fake encampments and only conducted daylight movements when under the cover of the British Air Force.[20] Even the Americans did not overlook the importance of air reconnaissance. The "Final Report" stated that, "the work of the observer and observation pilot is the most important and far-reaching which an Air Service operating with an Army is called upon to perform."[21] Based on this information, the consensus opinion reflected in the reference material is that while aviation can provide vital information on the disposition of the enemy, strong control measures could minimize detection of friendly forces by enemy air reconnaissance.

A third point of consensus found in the references used by the interwar CGSS students relates to aircraft in the bombardment role. Specifically, that during large-scale conflicts, cities, as not only centers of population but also centers of industry, would be attacked by opposing forces in an attempt to destroy the will and the ability to continue fighting. Although *Germany's War in the Air* claimed that France was the first to attack cities in a departure from accepted norms regarding protection of civilians, von Hoeppner acknowledged that Germany quickly followed suit.[22] Although the actual material effect of such bombardment aviation attacks against cities is not entirely clear

from the histories, what is clear in the selected works is the perception that such attacks did affect morale.

Von Hoeppner also stated that, to the Germans, the early attacks immediately sparked a desire to provide both defense against attack and some means of early warning to provide civilians a chance to avoid the bombs.[23] On the British side, Rawlinson, adopting the stereotypical British stiff upper lip, stated, "the dropping of these extremely inefficient bombs, however, did infinitely more good than harm to the country at large and vastly increased our chances of emerging victorious from the great struggle in which we had engaged."[24] Of course, reading between the lines of his statement, there can be little doubt that he acknowledged that the German bombing raids affected the morale of the populace. Although the AEF fielded only a handful of bombardment squadrons prior to the Armistice, the potential of bombardment was not lost on the Americans.[25] The "Final Report," referencing bombardment, stated that although actual damage of bombing raids was questionable, "there is absolutely no doubt that the moral effect of these operations is most considerable."[26]

Regarding bombardment aviation, another theme exists within the selected references, although in this case the theme is not one of agreement between sources, but rather a theme of disagreement. This theme of disagreement is over the capability of pursuit aircraft to stop a bomber attack and the associated necessity (or lack thereof) for friendly pursuit to escort bombers. Both *The Struggle in the Air* and the "Final Report" stated that by 1918, presence of defending German pursuit aircraft opposing bombing raids necessitated the use of escorts to defend the bomber formations and increase the likelihood of success.[27] The "Final Report" also stated tight formation flying by the bombardment pilots ensured the safety of the bombardment group.[28] In contrast, in *Germany's War in the Air*, von Hoeppner cited a late-war example of a flight of 17 German bombers that successfully attacked London with no losses despite the presence of not only British antiaircraft defenses, but also approximately 30 British pursuit planes that attempted intercept.[29] The differing views on the effectiveness of pursuit and the necessity for escort demonstrate a lack of a clear lesson learned on the subject. Thus, while there exists consensus in the sources that use of bombardment aviation against cities is likely in future war and that such attacks affect morale; there exists debate on whether or not such attacks can succeed without pursuit escort in the face of defending pursuit aircraft.

The fourth common theme found in the references is the impact of aircraft employed in tactical roles. Summarized, this theme is that air attacks can have significant effects on both the supply and morale of enemy forces; however, establishment of air superiority is necessary to maximize the impact. Although *The Struggle in the Air* stated that during the first two years of the war air attacks on ground troops were largely unplanned and not done in coordination with friendly ground forces, such was not the case by the summer of 1916 and after.[30] General von Hoeppner remarked that, encouraged by a relatively weak presence of the German Air Forces, French and British pilots at the Battle of the Somme in 1916 frequently strafed German positions. These strafing runs imparted little real damage, but served as a significant blow to the morale of the German soldiers.[31] As the war on the western front developed, the British and French took steps to not only develop better means of cooperation between aircraft and infantry, by 1918 they also developed attack aircraft armed and armored specifically to best conduct the mission of attacking ground troops.[32] Although the developments and employment of attack aviation are discussed at length in a number of the histories, the most striking lesson learned of what could be accomplished with attack aviation operating with air superiority are provided from the British campaign in Palestine.

While dispute exists within the sources over when the British in Palestine achieved air superiority, General von Sanders concedes in *Five Years in Turkey* that, by the summer of 1918, the British had air superiority in the region.[33] This air superiority, combined with measures to disguise troop movements, allowed General Allenby to mass his forces for his September 1918 offensive while remaining undetected by German observation aircraft.[34] At the start of the offensive on 19 September, General Allenby employed his aircraft to bomb Turkish communication nodes linking front-line forces to the Turkish General Headquarters.[35] Additionally, Allenby used one British air squadron to attack a German aerodrome at Jenin in order to prevent employment of their few remaining German aircraft against the British ground forces on the offensive.[36] The greatest example of the power of attack aviation in the campaign came on 21 September 1918 when British aircraft maintained a continuous attack for more than four hours against a five to eight mile long column of Turkish troops.[37] This attack resulted in the near-complete destruction of the right wing of the Turkish 8th Army.[38] The lesson thus derived from the experience appears to be that, when operating with air superiority, air attacks against ground troops can

have significant effects. This lesson was included in the "Final Report" in that the leadership of the Air Service felt there was a demonstrated need to organize attack squadrons to provide for direct attacks against enemy tactical formations.[39]

The final theme considered from the references is that of defense against air attack. The common theme of those references is that antiaircraft defenses (artillery, machine guns, and passive means) were able to modify the manner in which pilots employed their aircraft. However, such means were not only largely ineffective at shooting down enemy planes, they also prevented a significant number of men and materiel from employment elsewhere. Speaking to the first portion of the lesson learned, both British and German sources indicated that antiaircraft defense measures did modify aircraft employment. Specifically, British employment of barrage balloons, while ineffective at actually downing German aircraft, are noted to have altered the altitudes and routes used by German pilots during bombing raids.[40] Due to the effectiveness of such passive measures at routing enemy aircraft, the Germans also made extensive use of the balloons to limit the area requiring antiaircraft artillery coverage.[41] Considering active defensive measures, von Hoeppner noted the use of machine guns in an antiaircraft role forced enemy aircraft to higher altitudes and Rawlinson stated that antiaircraft artillery was able to disrupt or disperse German bombing raids on London.[42]

Turning to the actual effectiveness against aircraft, there is a consensus in the histories that antiaircraft artillery and machine guns employed for antiaircraft defense were extremely ineffective. In *The Defense of London*, Rawlinson described a number of German zeppelin and airplane raids that resulted in no enemy aircraft shot down except by defending pursuit aircraft, despite large numbers of antiaircraft artillery pieces positioned around London.[43] The American experience against the Germans also supports the ineffectiveness of antiaircraft artillery. The "Final Report" noted that, despite large concentrations of German antiaircraft artillery in 1918, the defensive measures could not prevent completion of air reconnaissance in the well-defended sectors.[44] Such was the limited effectiveness of antiaircraft artillery that Rawlinson ultimately argued antiaircraft artillery could not properly defend a city, stating, "neither London nor any other district can be successfully defended against air attacks except by means of adequate forces IN THE AIR."[45]

Finally, with regard to men and materiel, there is little question in the histories that establishment of an antiaircraft defensive network represented a significant commitment in both. Von Hoeppner noted multiple times that the German air attacks against England tied-up a large amount of British resources at the home, thus preventing employment of those resources along the front.[46] Rawlinson also discussed the resource cost of maintaining an aircraft defense network. He identified a constant internal struggle over manpower for the antiaircraft guns defending London and the manpower available for the front. This struggle, according to Rawlinson, resulted in too few men available for antiaircraft defense, and a general lack of physical fitness amongst the men assigned.[47]

Although there are other lessons learned which may be able to be derived from the historical references used by the Leavenworth students during the interwar period, those of a generation of aircraft and crews, aircraft reconnaissance, bombardment aviation, attack aviation, and air defense stand out. This is due not only to the frequency with which such discussions appear in multiple works, but as will be explored in chapter 3 of this work, they are the topics which are among the most discussed within the student papers.

Interwar Airpower Theory

Just as the previous section on the role of airpower in the Great War was limited in scope, so too is this section limited in its discussion of interwar airpower theory. The limitation is necessary here as nearly any document from the interwar period arguing for a particular manner of employment of aircraft or antiaircraft defense can fit into a broad definition of theory. Therefore, the summaries that follow are also limited to those that were available to the interwar CGSS students and actually used by those students. This limitation on the inclusion of theorists limits the following discussion to the work presented by five different authors - Giulio Douhet, William Mitchell, B. H. Liddell Hart, William Sherman, and the pseudonym "Squadron Leader." A brief overview of *Air Defence* by Edward Ashmore is also included as it focuses heavily on the means by which a nation might defend against air attack.[48]

While the immediate post-war histories provide a fair amount of consensus on observations from the war and the lessons derived from those observations, the post-war theories available to the interwar CGSS students represent varying degrees along a spectrum of their perception of the ability of airpower to force a quick and decisive end to a conflict.

An attempt was made to arrange the overviews of the works of the selected airpower theorists that follow in sequence from that which advocates for airpower as the most decisive to that which advances airpower as simply another element of modern warfare which, while important, is not alone the decisive factor.

The Command of the Air - Douhet

Before moving into the summary of Douhet's work, it is worth mentioning that the interwar students did not cite a translation of *The Command of the Air*, but rather a publication titled *Air Warfare*.[49] That publication was a translated extract of Douhet's writings distributed within the Air Corps by the early 1930s.[50] As a copy of that publication could not be obtained for this study, the following description of Douhet's positions is from on a translation of *The Command of the Air*.[51]

Of the theoretical works discussed in this section, Giulio Douhet's *The Command of the Air* is both arguably the best known work of the period, and the one which presents the strongest position that aviation alone can result in a rapid and decisive end to a future war.[52] Discussing the nature of modern warfare, Douhet argued that wars had become and would remain a struggle between the entire population and resources of belligerent nations. The way to win such wars, he stated, is to defeat an opponent's means to resist, both physical and moral.[53] Yet, overcoming that resistance during the First World War required "a long, painful process of attrition."[54] Douhet stated that the air arm, with its ability to attack anywhere, changes everything for the future - effectively acting as a means to avoid a repeat of the bloody stalemate of the past war and its high cost in lives and resources.[55]

After discussing how the opening of a third dimension of warfare holds great possibilities for the future, Douhet devoted much of his work to discussing the means to achieve the best results from the air arm. He held that success or failure of a nation in war is dependent upon the speed at which the nation can mobilize and deploy its air arm.[56] Once mobilized, the air arm must deploy in mass to establish command of the air, a condition in which a nation maintains its own ability to fly while preventing enemy air operations (effectively complete air supremacy).[57] Once a nation achieves command of the air, it should relentlessly attack enemy industry, infrastructure, and civilians until it crushes enemy resistance.[58] Douhet stated that, "to conquer command of the air means victory; to be beaten in the air means defeat and acceptance of whatever terms the enemy may be pleased to impose."[59]

Yet, in his argument for massed offensive air action, Douhet also argued defensive actions against enemy air attack are pointless and that the air arm should seek to inflict a "frightful cataclysm" against enemy civilians.[60] To the first point, Douhet pointed out that during the First World War, antiaircraft defensive measures (including antiaircraft artillery and defending pursuit aircraft) were not only ineffective at downing enemy bombers, but that such defensive efforts only weakened the resources available for offensive action.[61] Thus, he felt that at the start of a war, a nation must resign itself to attacks by an enemy air force while attempting to inflict greater damage on the enemy.[62] Regarding attacks against civilian populations, Douhet made it clear that civilians are valid targets and that attacks against civilians should be as violent as possible to force a quick victory. He wrote that nations should use explosive, incendiary, and chemical bombs to inflict the greatest damage and that such use is valid because, despite international conventions, any means that harm the enemy as much as possible are valid in war.[63] He provided further justification for such attacks in his statements that while civilian casualties would be horrible, the duration would be short and thus reduce the overall number of casualties in a war.[64]

Winged Defense - Mitchell

Of the theories discussed in this chapter, William Mitchell's 1925 work, *Winged Defense,* most closely resembles the positions of Douhet.[65] Specifically, Mitchell made a number of arguments that fit into several categories explored in the following paragraphs - the decisive nature of air warfare, the ineffectiveness of defensive measures, the reduced importance of naval forces in an age of flight, and ultimately the necessity of a separate air force.

Early in his work, Mitchell made it clear that he foresaw a future in which airpower could bring about quick decisions in war for far less cost in money and lives that traditional land warfare.[66] To that end, Mitchell considered it feasible for air attacks to cause the complete destruction of the enemy industries and cities required to sustain a war.[67] Not only did he feel that aircraft were capable of achieving such effects, he stated that victory in war would go to that country which, at the outset of conflict, is able to attack its enemy with the greatest concentration of aircraft (oriented first on destruction of an enemy's air force).[68] Once a country loses the initial air battles, he recommended it capitulate rather than continue fighting due to both the inability to achieve air superiority once lost and the ineffectiveness of ground based defenses.[69]

On the topic of defense against air attack, Mitchell clearly viewed ground based defenses as a poor substitute for sufficient air forces capable of defeating an enemy air force. He argued that offensive air action, preferably over the enemy's territory, represents the proper way to defend against air attack as it seizes the initiative and forces the enemy to defend on unfavorable terms.[70] Attempting to further his point, he stated that not only are ground-based defenses incapable of any significant impact on enemy airplanes, but that establishing a defensive posture cedes the initiative and invites defeat.[71]

While arguing for the decisive abilities of airpower and the need for a strong offensive air arm, Mitchell also emphasized that the dominance of airpower over sea power rendered the latter a poor investment for the security of a nation. Citing trials testing the effectiveness of aircraft attacks against warships, Mitchell stated that, by the end of 1921, the Air Service had fully demonstrated that airpower dominates sea power.[72] Given the vulnerability of naval vessels to air attack, Mitchell pointed out that some four thousand airplanes could be built for the cost of only one battleship (and the impact of that many aircraft would be far more than what could be accomplished with one ship).[73]

Given his perception of the decisive nature of the air arm, Mitchell pushed a position that a separate air force was necessary to ensure the security of the nation. He held this position because he felt that if the Army and Navy controlled development of the air arm, development of air capability would always be subordinate to other priorities of those services.[74] If, as discussed previously, the air arm is indeed the decisive arm and land and naval forces are vulnerable to air attack, such subordination could have no outcome other than failure in a future war. In an attempt to point out that the United States was falling behind other nations in the matter, Mitchell cited the establishment of separate air forces in Britain, France, Germany, and Italy.[75] While Mitchell, like Douhet, was relatively extreme in his perceptions of airpower, several works of theory cited by the students took a more moderate approach.

Paris: Or, The Future of War - B. H. Liddell Hart

One of these more moderate works is a relatively short book by B. H. Liddell Hart titled, *Paris: Or, The Future of War*. Although less committed to the absolute dominance of airpower than Douhet or Mitchell, Hart's work acknowledged the possibility of airpower to serve as a means to change how a nation achieves victory in war. Hart stated that, prior to the Great War, European powers structured their doctrine

on an interpretation of Clausewitz that emphasized the destruction of an enemy's army as the way to achieve victory.[76] Yet, to Hart, even though destruction of an enemy army could defeat the enemy's will, it was perhaps of greater importance than destruction of an enemy's will is almost certain to defeat its army.[77] To that end, Hart viewed aircraft, with their ability to "jump over" an enemy army, as a means to attack an opponent's will and force an end to conflict.[78]

However, Hart acknowledged that to truly attack an opponent's will means attacks against enemy cities to which there existed both economic and ethical objections.[79] On the subject of ethics, he noted that attacks against civilians, while inherently brutal, are likely to result in quick cessation of hostilities, thus resulting in far fewer casualties (and therefore being ethically acceptable from a strictly pragmatic view of ethics).[80] To the economic, Hart pointed out that the use of poison gases rather than high explosives could preserve infrastructure and industry while still affecting the will of the enemy.[81] Yet, Hart did point out that effectiveness of a strategy focused on attacking enemy cities and industrial centers is relative to the size of a nation and the dispersion of such targets within the nation's boundaries.[82] As a result, while he felt airpower could be decisive in Europe, such a strategy would not be effective against the United States.[83]

As a final note on Hart's work, while he viewed airpower as eventually becoming the decisive arm, in the immediate future, the air arm had not rendered armies and navies obsolete. [84] Indeed, Hart spent the last third of his work discussing the future of those services in light of the evolution of aviation as well as the submarine, the tank, and motorization.[85] Thus, while Douhet and Mitchell negate the value of other services relative to airpower, Hart did not see those visions as a reality for the immediate future at the time of his writing. Taking an even more limited view of the ability of airpower to achieve decisive results independent of other services was William Sherman.

Air Warfare - Sherman

Prior to discussing William Sherman's positions stated in *Air Warfare,* it is likely of value to readers to provide a limited degree of background on his roles within the Air Service. Following the Armistice, then Lieutenant Colonel Sherman was responsible for the production of the "Tactical History" of the Air Service's role in the Great War (produced along with the "Final Report").[86] Upon return to the United States, Sherman served as an instructor at the Air Service Tactical

School from 1920 to 1923[87] and as an instructor at the CGSS from 1924 until his death in 1927. During his time as an instructor, he contributed to both curriculum development and Army doctrine.[89] For *Air Warfare*, Sherman stated that he wrote the work primarily from his notes collected while serving as an instructor.[90]

As with the other theorists discussed to this point, Sherman expressed a belief that the most important thing in war is to defeat the enemy's will to fight.[91] To target that will and push toward a political end to conflict, Sherman supported attacks against civilian populations as well as attacks against industrial and transportation targets.[92] However, unlike other theorists Sherman did not support the idea that air superiority, once gained, would become absolute. Rather, on air superiority he stated, "it is generally restricted in scope and fleeting in duration."[93]

In order to address both the desired ability to conduct strategic bombing centered on the enemy's will and an anticipated inability to achieve absolute air supremacy, Sherman focused heavily on pursuit aviation as the key to success. Although Sherman acknowledged the defensive strength of bombers in tight formations, he argued that such formations increase the effectiveness of antiaircraft artillery.[94] Additionally, when attacked by large numbers of enemy pursuit planes bombardment aviation would ultimately suffer "unnecessarily high losses and the consequent deterioration."[95] According to Sherman, the First World War firmly demonstrated that only friendly pursuit could effectively protect friendly bombers from enemy pursuit.[96]

Given his view that strategic bombing, while important, would be limited due to the back and forth nature of the struggle for air superiority, it should be no surprise that Sherman also argued for the air arm to maintain both observation and attack aviation roles to support ground forces.[97] This position is the area in which Sherman is most at odds with the strategic role advocated by the previously discussed theories. Regarding observation, Sherman noted that the services provided by observation aviation during the Great War were of significant value to both intelligence gathering and artillery adjustment.[98] For the future, he viewed the importance of observation only increasing as land war became less static and more mobile in character.[99] On attack aviation, Sherman anticipated that armies in the future would limit their movements to hours of darkness in order to avoid enemy attack aviation.[100] Additionally, Sherman saw incredible value in the moral effect that attack aviation had when employed against enemy troop formations.[101]

Sherman was not the only theorist who displayed a perception of air forces as part of a joint effort with armies and navies.

Basic Principles of Air Warfare - "Squadron Leader"[102]

It the opening of pages of *Basic Principles of Air Warfare*, the author stated that he "does not accept the belief that the forces of the air will supplant those of the sea and the land."[103] He argued that those theorists who conclude otherwise did so by emphasizing the offensive capabilities of aircraft while simultaneously shortchanging aircraft limitations and the potential strength of defense.[104] As a result, he perceived that although bombardment might break an enemy's will, such an argument loses value when it overstates the ability to achieve air superiority.[105] Like William Sherman, "Squadron Leader" emphasized that air superiority is a prerequisite to other air action, but that air superiority, in practice, could never be absolute.[106] If air superiority can never be absolute, then there is not an ability to conduct the continuous air offensives necessary to subvert an enemy's will.[107]

Given the position that airpower cannot achieve decisive results independently, the author presented an overall argument that the proper role of the air arm is to serve in combined and complementary action with the army and the navy.[108] In order to provide the best support to the army and navy, aviation assets required organization into an independent air force for failure to do so would weaken the air arm and violate the principle of concentration.[109] The role of this independent air force is then first toward defeat of the enemy air force (both offensively and defensively), second toward targets of value to the army and navy, and finally against vital (strategic) enemy targets.[110]

Air Defence - E.B. Ashmore

Published in 1929, Ashmore's *Air Defence* is primarily a history of the efforts to establish air defense measures around London during the First World War. [111] Although the history represents a valuable source given Ashmore's role as Commander of the London Air Defense Area, the importance to this section is the last chapter of his book in which argued extensively against theories advocating strategic bombing.[112]

To that end, Ashmore argued that one of the key factors overlooked by bombing advocates is the idea of room - physical space between a bomber origin and target. Specifically, Ashmore stated that room provides time for air patrols to launch and reach the altitude to intercept bombers and for intelligence of approaching enemy aircraft to circu-

late.[113] His writing clearly favored the thought that fighters, when operated in coordination with antiaircraft artillery, are more than capable of bringing down large numbers of enemy aircraft.[114] At the same time, he anticipated that the mere presence of such defensive measures would force enemy bombers to operate at higher and higher altitudes, at which the difficulties of navigation, hypoxia, and cold operate in unison to make bombing less effective.[115] In a clear counter to strategic bombing advocates, Ashmore stated that were Britain to accept their theories, "London would suffer terribly, perhaps intolerably, long before any counter-bombing could save her."[116]

Summary of Interwar Airpower Theory

Although the preceding paragraphs are by no means a complete review of all interwar airpower theory, they cover those works of theory most frequently cited as sources for student papers.[117] From the information provided it should be evident that the interwar theorists' works reviewed here exist on a spectrum regarding their take on the decisiveness of airpower in future wars. Both Douhet and Mitchell advocated so strongly for the power of offensive aviation that they felt expenditures on land or naval forces (or aviation types designed specifically to support those forces) was foolish. The writings of Hart, Sherman, and "Squadron Leader" presented a far more balanced approach. Each author indicated limitations on the ability of an air force to achieve decisive results independent of other services. Speaking from the ground perspective, Ashmore openly questioned the idea that ground-based antiaircraft defenses were ineffective against attacking enemy aircraft.

Despite the differences between the theorists' opinions, there are apparent linkages to the lessons of the Great War presented in the previous section. Mitchell and Douhet seem to have interpreted the time required to generate aircraft and aircrews as justification for developing a strong, strategic bombardment focused, air force in peacetime. With such a force available at the onset of war, and assuming the lessons of the Great War about the relative inability of pursuit or attack to stop bombardment of city vital targets remained true, then they saw no reason why a strong air force would fail to achieve quick and decisive victory. However, the other theorists clearly interpreted the lessons of the war somewhat differently. They appear to have considered that development of an air force takes time and that pursuit, antiaircraft artillery, or a combination thereof, could be effective at preventing a decisive blow early in war. Thus, their writings indicated a back and forth struggle for air superiority as merely another aspect of modern warfare rather than

offering aviation as the sole deciding factor in war. Of course, these theories on the employment of airpower were merely ideas they were not policy. Yet, examination of policy, in this case airpower doctrine, can indicate which ideas were most regarded in official circles.

Interwar US Army Doctrine

While histories attempt to capture what happened (or a least what authors want to argue happened) and theories propose what should happen, doctrine represents what an organization believes is the right way to do things. To quote period material, "doctrine of war is the theory of use of the Nation's force under particular conditions and is based upon national characteristics and resources."[118] Thus, to complete a full picture of the environment in which the interwar CGSS students wrote their papers, a discussion of the official beliefs and policies of the interwar Army - the interwar US Army doctrine - follows. To do so, this section discusses the types of doctrine used by the students, the present-day availability of those materials, and finally the content of the available documents.

Based on the resources referenced within the student papers, it is possible to break down the interwar US Army doctrine into two broad categories - official regulations and ACTS publications.[119] Regarding official regulations, the interwar students referenced both the US Army *Field Service Regulations* of 1923 and a number of US Army Training Regulations. [120] What sets these regulations apart from documents in the other categories is that they exist by order of the Secretary of War.[121] Thus, if any documents from the period state the official position of the army of the time, these regulations are those documents.

The second category of doctrinal publications are works produced by the Air Corps Tactical School for use as textbooks and course material during instruction at the school.[122] These works include publications on each aircraft type (pursuit, attack, bombardment, and observation) as well as Air Corps history and logistics.[123] Although lacking official War Department approval, the works outline the Air Corps position of how to employ aviation assets in combat operations. Also important to note is that since every Air Corps officer who attended a two-year CGSS course between 1928 and 1936 first attended the ASTC/ACTS, they would have trained at the ACTS using these texts (excepting a small number who attended courses in the early 1920s).[124]

Although the preceding discussion should make it clear that there were a number of doctrinal publications referenced by the CGSS

students, understanding the students' positions relative to that doctrine requires access to the material. Unfortunately, of the 18 ASTS/ACTS publications cited in more than one student paper, the author was unable to locate 12. For the six which are known to still exist, one was obtained digitally, two were requested (with one rejection), and three have only one copy available at the Smithsonian.[125] The problem is similar with the other categories of doctrinal materials from the interwar period. As a result, the discussion of interwar US Army doctrine will be limited to less than desired. Specifically, review of official doctrine is limited to the 1923 *Field Service Regulations* and Training Regulation 440-15, *Fundamental Principles for the Employment of the Air Service*.[126] Review of the ASTS/ACTS publications used by students is limited to *Bombardment* for 1926 and 1933, *Pursuit* for 1926, *Attack* for 1930, and *Antiaircraft Defense* for 1927.[127] Unavailability of references means that no summary is possible of the other publications referenced by the students in their papers.

US Army *Field Service Regulations*, 1923

The earliest of the doctrinal works considered in this section is the 1923 *Field Service Regulations* (hereafter FSR). The Army published the FSR to serve as a basis for the principles of combined arms operations of the United States Army when engaged in war with a comparable modern power.[128] As such, the FSR covered a significant number of topics to include roles of the command and staff, each of the combined arms, reconnaissance, security, movement, logistics, and administration.[129] For the purpose of this paper, the following paragraphs discuss only those portions of the FSR that directly related to the role and impact of aviation upon the battlefield.

In a brief section describing the role of the Air Service, the FSR identified three missions for the Air Service - combat, observation, and information transmission.[130] The FSR noted that, to carry out these missions, the Air Service divided itself into units of pursuit, attack, bombardment, and observation.[131] Of these classes of units, the FSR stated that pursuit, with its mission of air supremacy, "constitutes the most vital element of the air service" in that "its success creates the conditions which enable the other elements to operate with the greatest degree of effectiveness."[132] The role of attack aviation, per the FSR, was to conduct aerial attack against enemy ground troops and columns, preferably against those objectives that were decisive.[133] Bombardment existed for attacking those ground objectives that were vital to the enemy supply or lines of communication but were beyond the range of

friendly artillery.[134] The final category, observation, operated to provide information to commanders and the air service, coordinate artillery, and relay messages.[135]

While these unit types and responsibilities very much conform to the types and responsibilities contained in the previously described histories and theories, two items are of note regarding the FSR position on the four classes of aviation. First, the FSR omitted mention of employment of bombardment against strategic targets or enemy will. Instead, the types of targets described as suitable for bombardment were operational level of war targets - supply depots, bridges, railroad stations, and airdromes.[136] Second, the FSR also stated to what level of command to assign the various aircraft types. To that end, the FSR indicated allocation of observation to division and larger units, pursuit and attack to armies and the general headquarters (GHQ), and bombardment and airships to the GHQ.[137]

Regarding the impact of aviation on the battlefield, the FSR clearly acknowledged the potential damage that enemy aircraft could inflict on friendly forces through instructions to avoid and mitigate such damage. Specifically, the FSR advocated that commands defend themselves against air attack using friendly pursuit aircraft and antiaircraft artillery.[138] The expectation presented in the FSR was that use of antiaircraft artillery would force enemy aircraft to higher altitudes that, in turn, reduced the effectiveness of bombardment and observation.[139] To reduce detection and mitigate damage if attacked, the FSR argued for distribution of forces, night marches, cross country movement, concealment, and camouflage.[140]

Ultimately, the FSR outlined a number of general concepts regarding the role of aviation as part of US Army combined arms operations. However, the level of detail in the FSR on actual conduct of aviation operations was relatively light. For detailed information, the FSR stated that the Training Regulations detailed the true tactical principles of each of the combined arms.[141]

Training Regulation 440-15

Published in 1926 under the direction of the Chief of the Air Service, Training Regulation (TR) 440-15, *Fundamental Principles for the Employment of the Air Service*, detailed the mission, employment, administration, and training of the Air Service.[142] Although this regulation in many ways mirrored the information presented in the FSR it did so in detail and included some notable differences.

Beginning with the similarities, TR 440-15 acknowledged that the Air Service was a component part of the Army whose role was to conduct attacks, observation, and communication missions in cooperation with and in support of ground units.[143] The TR also stated the same four classes of aircraft - bombardment, observation, pursuit, and attack - that comprised the combat units of the Air Service.[144] The assignment of these classes, per the TR, mirrored the information in the FSR - that observation existed at division and above, attack and pursuit under control of armies, and bombardment reserved to the GHQ.[145] Additionally, as with the FSR, the TR stated that unit marches and other movements should be under cover of darkness in order to avoid detection and attack by aircraft.[146]

As to the missions of the various classes of aircraft, most of the TR was in agreement with the FSR. Specifically, there existed no notable difference in the missions described for observation, pursuit, or attack with two exceptions.[147] The first is that the TR stated that attack aviation might have a role in suppressing local disturbances in colonial possessions where the deployment of troops was either impossible or impractical.[148] The second is that the TR advocated the use of aircraft for observation and attack of enemy shipping in conjunction with efforts by the Coast Artillery Corps.[149] The absence of these positions from the FSR is unsurprising given that the FSR, unlike the TR, focused solely on land combat with a comparable developed nation.[150]

Despite the similarities, on the subject of bombardment aviation, the TR presented a more expanded role than did the FSR. Whereas the FSR focused bombardment on operational targets outside the range of friendly artillery, the TR stated that bombardment filled either a tactical or a strategic role.[151] To the former, the TR stated an expanded tactical role for bombardment. According to the TR, bombardment was not only for those targets beyond artillery range, but available in place of artillery or to supplement artillery.[152] To the latter, the TR argued for employment of bombardment in a strategic role against vital targets in the enemy interior (including industry, transportation, power plants, etc) to "weaken him by causing discontent and alarm."[153]

Bombardment, ACTS, 1926 and 1933

Given the year of publication, it is reasonable to assume existence of a great deal of similarity between TR 440-15 and the 1926 *Bombardment* manual with the latter simply greatly expanding on the positions

expressed in the former. Indeed, largely this holds true; however, some of the detail was particularly important.

As with TR 440-15, the 1926 *Bombardment* manual described bombardment as having a tactical and strategic role, but elaborated that there is an inherent trade-off between the two and the decision over manner of employment should be up to the high command's assessment of which would have the greatest impact.[154] However, the manual ultimately concluded that employment in the strategic role "must not take precedence over the support of ground operations by proper tactical employment."[155]

Also important to note is the manual's emphasis on will of the bombardment crew. Page 20 stated, "most important of all in the training of the bombing crew is the inculcation of the will to reach and destroy the objective."[156] This statement served to both acknowledge the potential strength of enemy defenses and supported the idea that, when manned with proper crews, bombers would always get through to the objective.[157]

While all of the points of the 1926 manual are too numerous to cover, a final subject from the manual deserving mention is that of attacks on cities. The manual made it clear that such action was restricted under the laws of warfare; however, targeting of "political centers" could be important should the enemy attack such targets first.[158]

What then of the changes in the manual from the 1926 printing to the 1933 printing? The greatest difference between the manuals exists primarily over two subjects. The first is the shift completely away from tactical bombardment. The 1933 manual stated that the entire purpose of bombardment was to strike those enemy targets "which will contribute most to the overcoming of his will to resist."[159] The specific mention of targeting economic and industrial centers makes it clear that the authors of the later manual envisioned attacks on enemy cities and populations, even if it was not clearly stated as such.[160] The manual even stated that if attack aviation could reach a target, that target was not suitable for bombardment aviation.[161]

Another notable difference from the 1926 to 1933 manuals was the strong push for independent air force operations in the 1933 manual. The manual argued that bombardment aviation had the greatest effect when it was concentrated and employed only against vital enemy targets.[162] According to the manual, this concentration existed only by having all bombardment fall under the command of an air force that

reports directly to the theater commander-in-chief designated by the president.[163]

Despite the difference, much of the subject matter argues the same points, just in an expanded fashion. The 1933 manual pushed heavily on the need for "offensive spirit" amongst bomber crews to ensure they reached their objectives and could "carry-on in spite of opposition."[164] The manual also said there was universal acceptance that once launched, an air attack would almost certainly reach its target.[165]

Pursuit, ASTS, 1926

Just as great similarity existed between TR 440-15 and the 1926 *Bombardment* manual, a great deal of similarity existed between TR 440-15 and the 1926 *Pursuit* manual. The *Pursuit* manual stressed that the true mission of pursuit as a class of aviation was to establish and maintain air supremacy through offensive actions designed to defeat enemy aircraft in flight.[166] This closely matched the position stated in the pursuit section of the TR.[167]

However, where the *Pursuit* manual differed from the TR is not in the overall concept of employment of pursuit, but in its arguments against use of pursuit in defensive roles (an idea alluded to, but not clearly stated in the TR). Referencing defense of political centers (taken to imply cities), *Pursuit* stated that the only reason pursuit aircraft would be assigned to such a role is for the sake of political expediency. It is this expediency, the manual argued, which violated sound principles of combat and would not accomplish decisive results.[168] Considering aerial defense of friendly aircraft, the manual made it clear that to tie pursuit aircraft to "close protection" of other aircraft was an unsound practice which "sacrifices both initiative and aggressiveness in combat."[169] The correct defense of friendly air units would be either through completely independent action of pursuit units or through rendezvous with friendly aircraft over key points along the defended unit's route of flight.[170]

Attack, ACTS, 1930

While the 1926 *Pursuit* manual contained little change from the FSR or the TR, the 1930 *Attack* manual included a number of notable shifts from the doctrinal publications of the 1920s. The first such change was a shift in the type of targets the doctrine assigned to attack aviation. Whereas the 1923 FSR and TR 440-15 described proper attack targets as troop concentrations and movements, the 1930 *Attack*

manual focused attack aviation on those targets previously considered bombardment targets. These targets included enemy airfields, enemy reserves and reinforcements, key transportation nodes, and vulnerable points of enemy lines of communication.[171] This change was likely due to the need to ensure that the shift in mission of bombardment from operational to strategic targets did not leave the operational targets uncovered. The second change listed in the 1930 *Attack* manual, and perhaps the most significant change, dealt with which class of aviation was most important in the Air Corps. The 1923 FSR unequivocally placed the greatest significance on pursuit due to the importance of pursuit to air superiority.[172] The *Attack* manual stated, "In air force operations the interests of bombardment aviation are paramount."[173] Also of note, the *Attack* manual did not include any discussion of the possible role of attack aviation in suppression of local disturbances, as did TR 440-15.

The 1930 *Attack* manual also included a number of details that, while not indicative of a shift from earlier doctrinal publications, clarified the development of attack aviation and highlighted risks posed by ground-based antiaircraft fires. Regarding attack aviation development, the manual described the rise of attack aviation as a unique class out of necessity during the First World War. The manual detailed how the initial use of pursuit, observation, or bombardment for ground attack proved unsuitable either due to vulnerability to ground fire or design characteristics of those types limiting their effectiveness when employed against ground targets.[174] With respect to the impact of antiaircraft fires, the manual discussed two important points. First, that it was desirable for attack aircraft to have armor to protect the crew and vital aircraft systems from ground fire.[175] Second, that attack aviation had an important role in support of friendly bombardment - suppression or destruction of enemy antiaircraft artillery.[176] Both of these points indicate official acknowledgement of the potentially significant impact of ground-based antiaircraft defenses on the ability of aviation to accomplish its mission.

Antiaircraft Defense, ACTS, 1927

While the ACTS manuals covered to this point of the study focused on offensive capabilities of different aircraft mission types, *Antiaircraft Defense* focused on defensive measures. According to this manual, because pursuit could only guarantee adequate local defense against enemy aircraft through gaining air superiority, antiaircraft artillery was required to provide local defense until the Air Corps secured command of the air.[177] However, given that *Antiaircraft Defense* was an Air Corps

manual, it is perhaps unsurprising that it largely downplayed the effectiveness of those ground-based local defensive measures.

In terms of the general effectiveness of antiaircraft defenses, the manual was quick to point out that machine guns and antiaircraft guns were unlikely to have significant impact on individual, maneuverable aircraft.[178] Against formations, the manual stated that effectiveness would decline significantly during poor visibility due to either cloud cover or hours of darkness.[179] During such periods of limited visibility, the text made it clear that locating devices were too rudimentary to ensure effective fires.[180] Overall, the manual suggested that the presence of coordinated and accurate antiaircraft fires would force aircraft to maneuver or seek protection at very high or very low altitudes. It did not indicate that such fires were likely to bring down observation or bombardment aircraft.[181] However, with respect to attack aviation, *Antiaircraft Defense* argued that the antiaircraft defenses organic to a division were more than capable of providing adequate defense against attack aviation.[182] Interestingly, there was no data provided to back up this statement, making it appear as though the statement had more to do with a trend toward bombardment taking a position of greater importance than other classes of aviation.

Anticipated effectiveness of antiaircraft defenses represented only a portion of the manual. The majority of *Antiaircraft Defense* detailed the various unit types and overall organization of ground-based defensive systems. Although many of these details focused on the organization of batteries, battalions, and regiments, a more important portion discussed establishment of a system of antiaircraft guns around key locations. On that topic, *Antiaircraft Defense* directed analysis of likely flight routes of enemy bombers and placement of guns in a position to best engage along those routes of flight.[183] As part of this defensive network, the manual also discussed the importance of intelligence gathering and reporting services to coordinate defensive measures.[184]

Summary of Interwar US Army Doctrine

As with the section on interwar theory, the intent of this section on interwar doctrine was to provide a review of doctrinal manuals cited by the CGSS students. Although limitations on availability of publications and desired chapter length meant some manuals did not receive a review, those evaluated presented a picture of the official positions of the Army or Army Air Corps on employment of aviation. Both the *Field Service Regulations* and Training Regulation 440-15 described the roles

of the four aviation mission types as part of combined arms operations. Within those regulations, there was a clear emphasis on the offensive nature of the air arm. The 1926 *Pursuit* and *Bombardment* manuals did not alter the roles described in FSR or the TR but did expand upon those roles. *Pursuit* argued extensively against the use of pursuit aviation in defensive roles while *Bombardment* discussed the idea of will as a key determining factor on whether or not bombers would reach their targets.

However, post-1926, the Air Corps publications began to shift in favor of bombardment, but that shift was only incremental. The 1930 *Attack* and 1933 *Bombardment* manuals represented a shift in targets for each aircraft mission type. The focus for bombardment shifted to strategic targets while the focus for attack moved to targets formerly described as best suited for bombardment. The 1927 *Antiaircraft Defense* manual also emphasized bombardment rather than pursuit as the most important aircraft type in the Air Corps. That manual also downplayed effectiveness of antiaircraft defenses against bombers while suggesting attack was vulnerable to ground fire. Even with these shifts, the publications did not fundamentally alter the idea that all aircraft types must work together to meet the objectives dictated by the theater commander.

Chapter Conclusion

The preceding discussions of the lessons of the Great War, interwar period airpower theory, and US Army doctrine frame the intellectual environment during which the CGSS students completed their papers. Although the students relied on a number of histories of the Great War, common themes on the role of airpower during the war existed within those works. As evidenced by the various theories on airpower employment that emerged in the 1920s and 1930s, the CGSS students wrote in a time of significant debate over the role of aviation in war and the relationship between air, land, and naval forces. Doctrine of the period also experienced incremental changes as technologies advanced and reflected much of the theoretical debate over the proper role of the air arm. Given this discussion on history, theory, and doctrine, this paper now turns to the views of some of those who served in the US military during the interwar period - the CGSS students.

Notes

1. Air Service, A.E.F., "Final Report of Chief of Air Service," in *The U.S. Air Service in World War 1,* ed. Maurer Maurer, vol. 1 (Washington, DC: U.S. Government Printing Office, 1978). For detail see Appendix C. The Final Report was cited in a total of six of the student papers. Hereafter cited as "Final Report."

2. *The U.S. Air Service in World War 1,* ed. Maurer Maurer, vol. 1 (Washington, DC: U.S. Government Printing Office, 1978), 6.

3. *The U.S. Air Service in World War 1*.

4. *The U.S. Air Service in World War 1*, ix.

5. Ernest von Hoeppner, *Germany's War in the Air*, trans. J. Hawley Larned (1921; repr., Nashville, TN: The Battery Press, 1994). This work was referenced in seven student papers (See Appendix C)

6. Liman von Sanders, *Five Years in Turkey*, trans. Carl Reichman (Annapolis, MD: The United States Naval Institute, 1927). Referenced in five of the student papers (See Appendix C).

7. Alfred Rawlinson, *The Defence of London 1915-1918* (London: Andrew Melrose, 1924), xi-x.

8. Charles C. Turner, *The Struggle in the Air, 1914-1918* (London: Edward Arnold, 1919). Referenced in five student papers (See Appendix C).

9. Turner, 34-124.

10. Turner, vii.

11. William T. Massey, *Allenby's Final Triumph* (London: Constable and Company, 1920), https://archive.org/details/allenbysfinaltri00massrich (accessed 15 November 2013). Cited in seven student papers (See Appendix C).

12. Walter A. Raleigh and H. A. Jones, *The War in the Air*, 6 vols. (Oxford: Clarendon Press, 1922-1937).

13. "Final Report," 82 and 99.

14. "Final Report," 51 and 66.

15. Von Hoeppner, 17.

16. Von Hoeppner, 8.

17. Von Hoeppner, 14-15.

18. Turner, 206.

19. Von Hoeppner, 117.

20. Massey, 97-98.

21. "Final Report," 104.

22. Von Hoeppner, 21 and 54. Hoeppner cites the French attack against Freiburg on 4 December 1914 as the first example of an air attack oriented against a civilian population. While decrying the French action, he argues that Germany's attacks against the cities was only oriented against legitimate military targets contained within.

23. Von Hoeppner, 31-32.

24. Rawlinson, 4.

25. "Final Report," 18. The Final Report indicates that the Air Service fielded only 7 total bombing squadrons of all types, day and night, by the end of the war.

26. "Final Report," 48-49.

27. Turner, 185; "Final Report," 44.

28. "Final Report," 43.

29. Von Hoeppner, 105-106.

30. Turner, 224-225.

31. Von Hoeppner, 67-69.

32. Turner, 226.

33. Von Sanders, 250. On page 321 of *Allenby's Final Triumph*, the author states that the British air supremacy was unchallenged following the Battle of Beersheba in 1917, however this assertion is not clearly supported by General von Sanders in *Five Years in Turkey*.

34. Massey, 97-98.

35. Massey, 142.

36. Massey, 142-143.

37. Massey, 183-185.

38. Von Sanders, 280.

39. "Final Report," 49.

40. Turner, 156-157.

41. Von Hoeppner, 129.

42. Von Hoeppner, 129; Rawlinson, 207-208.

43. Rawlinson, 98-102, 178-179, and 232-234. A 2-3 September 1916 zeppelin raid is described on pages 98-102. Pages 178-179 describe a daylight German bombing raid on 7 July 1917. Pages 232-234 discuss a massive multiple wave German bomber attack on 18 December 1917 which lasted more than 2 hours yet did not result in downing of aircraft by antiaircraft artillery.

44. "Final Report," 41

45. Rawlinson, 244.

46. Von Hoeppner, 57 and 107.

47. Rawlinson, 205.

48. Edward Ashmore, *Air Defence* (London: Longmans, Green and Co., 1929), 144-155.

49. See Appendix C.

50. Giulio Douhet, *The Command of The Air*, trans. Dino Ferrari (1942; repr., Washington, DC: Air Force History and Museums Program, 1998), vi.

51. The translation used as source material for this paper is that contained in the 1998 imprint of a 1983 reprint of the 1942 edition of *The Command of the Air*.

52. Thomas H. Greer, *The Development of Air Doctrine in the Army Air Arm 1917-1941* (1955; repr., Washington, DC: U.S. Government Printing Office, 1985), 48-49.

53. Douhet, 5-6 and 22.

54. Douhet, 174.

55. Douhet, 179.

56. Douhet, 136.

57. Douhet, 24 and 128-129.

58. Douhet, 20, 57, and 128-129.

59. Douhet, 28.

60. Douhet, 61.

61. Douhet, 17-18 and 112.

62. Douhet, 55.

63. Douhet, 19-20 and 181.

64. Douhet, 61.

65. Greer, 49-50. Thomas Greer identifies similarities between the two works, even stating that some of Mitchell's later work was more extreme than any position advanced by Douhet. However, those later works are not considered in this study as only *Winged Defense* was cited by interwar students and then only once (see Appendix C).

66. William Mitchell, *Winged Defense* (New York: The Knickerbocker Press, 1925), 14.

67. Mitchell, 5.

68. Mitchell, 10.

69. Mitchell, 122 and 198. On 122, Mitchell says that after the loss of air superiority, capitulation is preferable to being subject to continued attacks from enemy aircraft. On 198 he argues that those continued attacks would prevent industry from producing the aircraft necessary to reestablish air superiority.

70. Mitchell, 199.

71. Mitchell, 199 and 204.

72. Mitchell, 76. For further discussion see Chapter 3, "Aircraft Dominate Seacraft" which provides significant details of the testing which used German warships as targets for air attack.

73. Mitchell, 110.

74. Mitchell, 112-113.

75. Mitchell, 114-116.

76. Basil H. Liddell Hart, *Paris: Or, The Future of War* (London: Kegan Paul, Trench, Trubner and Co., 1925), 14-17.

77. Hart, 17.

78. Hart, 43.

79. Hart, 49-50.

80. Hart

81. Hart, 51.

82. Hart, 60-61.

83. Hart

84. Hart, 59-60.

85. Hart, 62-89. In pages 62-67 Hart details his view of how both the airplane and the submarine have altered the nature of naval warfare; Pages 68-89 discuss the need to increase mobility of land forces due to the impact of airpower and the advent of the tank and the manner in which to do so.

86. *The U.S. Air Service in World War 1*, vii.

87. Robert T. Finney, *History of the Air Corps Tactical School 1920-1940* (1955; repr., Washington, DC: Center for Air Force History, 1992), 99-100. Annual Report, 1925, 7-9. Also reference the annual reports for the years 1925-1926 and 1926-1927.

88. William C. Sherman, *Air Warfare* (2002; repr., Honolulu: University Press of the Pacific, 2004), x-xiii. Background information provided in an introduction written by Wray R. Johnson.

89. William C. Sherman, *Air Warfare* (New York: The Ronald Press Co., 1926), v.

90. Sherman, *Air Warfare*, 7-8.

91. Sherman, *Air Warfare*, 210-211 and 218.

92. Sherman, *Air Warfare*, 129.

93. Sherman, *Air Warfare*, 237-238.

94. Sherman, *Air Warfare*, 227.

95. Sherman, *Air Warfare*, 208.

96. Sherman, *Air Warfare*, See Chapter 4, "The Service of Observation" and Chapter 6, "Attack Aviation"

97. Sherman, *Air Warfare*, 2004, 92-93.

98. Sherman, *Air Warfare*, 93-94.

99. Sherman, *Air Warfare*, 1926, 184.

100. Sherman *Air Warfare*, 2004, 162.

101. Squadron Leader, *Basic Principles of Air Warfare* (London: Gale and Polden, 1927). No sources appear to indicate the actual identity of "Squadron Leader." From the book, it is clear the author is a British aviator almost certainly with combat experience during the First World War. That the work advocates the strength of defense against bombers by pursuit suggests that he was probably a pursuit pilot.

102. Squadron Leader, 2.

103. Squadron Leader, 115.

104. Squadron Leader, 7-8.

105. Squadron Leader, 12-13

106. Squadron Leader, 56-60.

107. Squadron Leader, 2 and 115.

108. Squadron Leader, 41-42.

109. Squadron Leader, 48.

110. Ashmore, vii.

111. Ashmore, vii.

112. Ashmore, 147-148

113. Ashmore, 146.

114. Ashmore, 144.

115. Ashmore, 149.

116. See Appendix C. This is true of all works except Mitchell's which is cited only once; it is included here due to his prominence in the development of aviation in the U.S.

117. War Department, Training Regulation 440-15, *Fundamental Principles for the Employment of the Air Service* (Washington, DC: Government Printing Office, 1926), paragraph 1, http://www.au.af.mil/au/awc/awcgate/documents/ tr440-15.htm (accessed 1 January 2014). Quotation comes from Training Regulation 10-5.

118. See Appendix D for a list of interwar period U.S. Army doctrinal references which were cited by the CGSS students. This list includes the source, the date of publication (if known), and the number of papers that reference the source.

119. War Department, *Field Service Regulations (1923)* (Washington, DC: Government Printing Office, 1924).

120. War Department, *Field Service Regulations*, 3; War Department, TR 440-15.

121. Air Corps Tactical School, *Bombardment* (Washington, DC: Government Printing Office, 1933), Letter from the Assistant Commandant.

122. See Appendix D for a listing of ASTS/ACTS interwar publications.

123. See Appendix A for a list of Air Corps officers who attended the CGSS during a two-year course from 1928 to 1936.

124. See Appendix H.

125. War Department, *Field Service Regulations*; War Department, TR 440-15.

126. Air Service Tactical School, *Bombardment* (Washington, DC: Government Printing Office, 1926); Air Corps Tactical School, *Bombardment*, 1933; Air Service Tactical School, *Pursuit* (Washington, DC: Government Printing Office, 1926); Air Corps Tactical School, *Attack* (Washington, DC: Government Printing Office, 1930); Air Corps Tactical School, *Antiaircraft Defense* (Washington, DC: Government Printing Office, 1927).

127. War Department, *Field Service Regulations*, Acting Army Chief of Staff Introduction Letter.

128. War Department, *Field Service Regulations*, v-vii.

129. War Department, *Field Service Regulations*, 21.

130. War Department, *Field Service Regulations*, 22.

131. War Department, *Field Service Regulations*, 22.

132. War Department, *Field Service Regulations*, 22-23.

133. War Department, *Field Service Regulations*, 23

134. War Department, *Field Service Regulations*, 22.

135. War Department, *Field Service Regulations*, 23.

136. War Department, *Field Service Regulations*, 23.

137. War Department, *Field Service Regulations*, 41.

138. War Department, *Field Service Regulations*, 17 and 35.

139. War Department, *Field Service Regulations*, 36, 41, and 48.

140. War Department, *Field Service Regulations*, Acting Army Chief of Staff Introduction Letter.

141. War Department, TR 440-15, paragraphs 1-5.

142. War Department, TR 440-15, paragraphs 3-4.

143. War Department, TR 440-15, paragraph 8.

144. War Department, TR 440-15, paragraph 11.

145. War Department, TR 440-15, paragraph 17d.

146. War Department, TR 440-15, paragraphs 13c, 15c, 17a, and 18a.

147. War Department, TR 440-15, paragraph 17i.

148. War Department, TR 440-15, paragraph 14d(4).

149. War Department, *Field Service Regulations*, Acting Army Chief of Staff Introduction Letter.

150. War Department, TR 440-15, paragraph 16g.

151. War Department, TR 440-15, paragraph 16e.

152. War Department, TR 440-15, paragraph 16g.

153. Air Service Tactical School, *Bombardment*, 1926, 2 and 5.

154. Air Corps Tactical School, *Bombardment*, 72.

155. Air Corps Tactical School, *Bombardment*, 20.

156. Air Corps Tactical School, *Bombardment*, 20 and 73.

157. Air Corps Tactical School, *Bombardment*, 64. The manual does not say cities, civilians, or people, rather it advocates potential reprisal attacks on enemy "political centers." While the manual even states that such attacks should not target residential districts, that it discusses it reference attacks on

Paris and London as well as possible attacks on New York would clearly indicate civilian casualties would be expected based on historical experience.

158. Air Corps Tactical School, *Bombardment*, 1933, 23-24.

159. Air Corps Tactical School, *Bombardment*, 81.

160. Air Corps Tactical School, *Bombardment*, 82.

161. Air Corps Tactical School, *Bombardment*, 81.

162. Air Corps Tactical School, *Bombardment*, 81.

163. Air Corps Tactical School, *Bombardment*, 21-22.

164. Air Corps Tactical School, *Bombardment*, 118-119.

165. Air Service Tactical School, *Pursuit,* 1, 42 and 45.

166. War Department, TR 440-15, paragraph 15.

167. Air Service Tactical School, *Pursuit*, 43.

168. Air Service Tactical School, *Pursuit*, 19.

169. Air Service Tactical School, *Pursuit*, 43 and 90.

170. Air Corps Tactical School, *Attack*, 47.

171. War Department, *Field Service Regulations*, 22.

172. Air Corps Tactical School, *Attack,* 32.

173. Air Corps Tactical School, *Attack*, 1-10.

174. Air Corps Tactical School, *Attack*, 27-28.

175. Air Corps Tactical School, *Attack*, 32.

176. Air Corps Tactical School, *Antiaircraft Defense*, 4.

177. Air Corps Tactical School, *Antiaircraft Defense*, 6.

178. Air Corps Tactical School, *Antiaircraft Defense*, 6.

179. Air Corps Tactical School, *Antiaircraft Defense*, 6.

180. Air Corps Tactical School, *Antiaircraft Defense*, 8.

181. Air Corps Tactical School, *Antiaircraft Defense*, 13.

182. Air Corps Tactical School, *Antiaircraft Defense*, 41-45.

183. Air Corps Tactical School, *Antiaircraft Defense*, 49-52.

Chapter 3
CGSS Student Opinions on Airpower

Turning to the Leavenworth student papers, the collection represents only a small sampling of opinions of interwar military officers. Of that relatively small sample, only 69 papers by 68 different authors cover air power topics. However, it would be premature to dismiss the opinions presented in the papers on the basis that the authors were only a fraction of the overall interwar US Army officer population. Despite the relatively small number of papers, those written by Air Corps officers still account for more than 60% of the total number of Air Corps graduates of the 1928-1936 two-year courses. In addition, those officers selected to attend the two-year course were, at least in theory, among the best officers for their branch at the time of selection.[1] Therefore, the papers by Air Corps authors represent a relatively large sample of supposedly the best mid-grade Air Corps officers of the time. Even though a far smaller percentage of graduates from other branches wrote papers on airpower topics, their papers still provide a snapshot of how those outside of the Air Corps viewed aviation. As a result, the data and opinions found in the papers hold tremendous potential to provide insight into how US Army officers perceived airpower during the interwar period.

Even though the papers hold great potential, they still represent 69 different papers by different authors who sought answers to different questions under the broad topic of aviation. Drawing out the similarities and differences between the papers required a detailed reading of each paper focusing on key facts, ideas, and conclusions. Once complete, this information served as data points for organization into like topic areas. For this study, those topic areas came from the divisions found within the previously discussed World War I histories as well as the interwar theories and doctrine. In the pages that follow, nine different topic areas serve as organization for the student opinions - bombardment, pursuit, antiaircraft defense, attack, observation, troop movements, coastal defense, air superiority, and aviation in small wars and other outlying ideas. Through consolidation of student opinions from multiple papers into these topic areas, it is then possible to identify both overall student perceptions on the capabilities and limitations of airpower within that topic and the areas in which students displayed notable disagreement, if any. Additionally, these topic areas allow relatively easy comparison of student opinions to those positions expressed in the previously

examined interwar period theory and doctrine. Points of agreement or disagreement, between the students, the theory, and the doctrine, in turn, suggest to what extent those students, taken as a whole, supported or refuted ideas contained in theory and doctrine.

As explored in the chapter that follows, the information contained in the student papers appears to show a student body that perceived an incredibly complicated interrelationship between aviation mission types, defenses against aircraft, and the impact of aviation on the conduct of military operations. When compared to theory, their papers suggest that the students, taken as a whole, perceived greater limitations on the potential of aviation to achieve decisive results in war than did Douhet, Mitchell, or Liddell Hart. This places their viewpoints more in line with those expressed by Sherman, Ashmore, or "Squadron Leader." Relative to doctrine, students displayed general agreement with period Air Corps doctrinal publications as well as the 1923 FSR. However, the student papers showed some disagreement with doctrine on topics including the use of defensive pursuit, the ability to achieve air superiority, and, perhaps most strikingly, targeting of civilians.

Bombardment Aviation

Given the heavy emphasis that several of the interwar theorists placed on the power of strategic bombing to achieve victory in war, bombardment aviation is perhaps the best starting point of this examination into student opinions. Within this category, there was a great deal of agreement between students that the role of bombardment was to strike at the vital targets of a nation. Interestingly, the students viewed not only transportation and industrial centers as vital targets, but also foresaw cities as vital targets (even if not openly supporting such attacks, they agreed that such attacks would be likely). Nonetheless, the students presented a number of arguments questioning the ability of such attacks to bring about the desired results, particularly in the presence of enemy pursuit and antiaircraft defenses.

Although some early papers focused on the impact of bombardment against enemy troop concentrations and lines of communication, most focused on the anticipated use of bombardment aviation against industrial and population centers.[2] In his 1934 paper, Captain St. Clair Streett, Air Corps (AC), stated, "air raids on industrial centers and munitions centers seriously affected production in the past and can be expected to accomplish the same result to an even greater degree in the future."[3] The same paper argued that while nations may initially restrain

themselves from attacks on cities, attacks on cities, along with attacks on industry and government, were merely a means to an end of defeating the enemy's will to resist.[4] A 1935 paper by Captain Sam Ellis, AC, argued that the use of bombardment against cities, capitols, and industry would occur and would be comparable to William Sherman's "March to the Sea" in that the intent is the "destruction of the economic forces and the people themselves."[5]

Within the student papers that discussed employment of bombardment aviation, there was acknowledgement that even though attacks against cities violate the accepted rules of war, such attacks would take place. In his 1932 paper, then Major John Hood, Coast Artillery Corps (CAC), argued that cities, particularly those of political or industrial importance, would be subject to air attack even though such attacks violate the rules governing land warfare.[6] Captain Rolla Ladd, CAC, expanded upon this opinion in 1933, stating, "on account of taking over large industrial plants and putting them to manufacturing of war supplies, certain cities and localities become seats of production for such supplies and will invariably have large populations near."[7] He concluded that under those conditions, cities represented proper military targets. Another student, Major Vincent Dixon, AC, while not openly advocating for attacks on cities, cited available literature to argue that it was reasonable to expect attacks against cities during the next war with the intent of inflicting the maximum number of casualties on civilians.[8] Yet another student, Captain Vernon Hall, CAC, cited period journals to argue that in the next war, the lines between combatants and non-combatants would blur and attacks on cities were a way to impact enemy morale and industrial production.[9] Summarizing, the consensus was that the role of bombardment was attacks on vital targets, which included not only industrial centers, but also cities. Regarding the latter, there is near universal agreement that attacks on cities were contrary to international law, but that such attacks would occur regardless of such law.

Given the relative clarity in the papers on the role of bombardment, there was a rather large amount of disagreement on the perceived effectiveness of such use. These disagreements centered upon three areas: the ability to achieve desired target effects, the impact of defending pursuit aircraft, and the impact of antiaircraft artillery. Regarding target effects, Major Lawrence Stone, AC, pointed out that given the rising threat of air attack, nations would disperse their industries in such a manner as to prevent paralysis following a concentrated air attack.[10] A

counterargument to this point existed in another paper. Captain Streett argued that dispersion does not necessarily prevent destruction. Rather, the number of available bombardment units dictated the degree of destruction.[11] Students also did not overlook the fact that target effects depended upon accuracy of bombs and bombers. To ensure target hits, Captain Francis Brady, AC, pointed out the need to operate bombers in mass to increase the number of bombs dropped and thereby increase the number of hits and the associated target damage.[12] Captain Brady and Major Harrison Richards, AC, also acknowledged the reduction in accuracy imposed by night bombardment.[13] Of course, the ability to hit a target is dependent upon reaching the target - another potential weakness highlighted by students.

While a number of factors including weather, maintenance, and navigation play a role determining whether a mass of bombers could reach their target, those are not the means by which a military can defend against bombing. The available defensive measures of the time were pursuit aircraft and antiaircraft artillery. Bombardment success would require bombers to overcome those defenses - a task which not all students viewed as carrying the same risk. Some students expressed little concern over defensive measures. Of these students, Captain Asa Duncan and Major Delos Emmons, both of the Air Corps, believed that massing bombers would ensure adequate defense against enemy pursuit planes, particularly because a defender would likely disperse pursuit aircraft to defend a large area.[14] However, some students argued that it was possible to stop or at least inflict heavy damage against attacking bomber formations. As noted by Major Willis Hale, AC, the ability to defend against a bombardment attack depended upon early warning to provide sufficient time for friendly pursuit to launch and climb to altitude (suggesting that pursuit could be effective against bombers).[15] Major Charles Finley, CAC, and Major Harrison Richards, AC, made it clear that antiaircraft artillery, while not able to completely stop attacks, would inflict significant damage to bombardment formations.[16] Combining these areas of disagreement with those areas of consensus presents a relatively clear picture of student perceptions of bombardment aviation. Bombardment was a force which existed to strike vital targets (e.g., industry, cities, capitals) in order to attack the enemy's will and ability to fight. However, whether or not bombardment would be able to achieve the desired results in the face of enemy defenses was unclear - a lack of clarity which is expanded upon in the subsequent sections of this chapter covering pursuit aviation and antiaircraft defense.

With the preceding review of student opinions on bombardment aviation, it becomes possible to compare those perceptions to interwar theory and doctrine. Concerning theory, the emphasis the students placed on the use of bombardment aviation to attack an enemy's will and means to resist resembles the viewpoints expressed by both Douhet and Mitchell. However, Douhet and Mitchell left little doubt of their support for strategic bombing as a means to achieve relatively quick and decisive victory; the papers indicate the students were not completely convinced. As such, the consensus opinion of the students on bombardment was more restrained than Douhet, Mitchell, and Hart while also more optimistic about the abilities of bombardment than Sherman, Ashmore, and "Squadron Leader."

On doctrine, the student opinions generally adhered to the period doctrine produced by the Air Corps with the notable exception of their acknowledgement that cities would be targets for strategic bombing - targets that some students argued would be legitimate in spite of the law (in spite of which specific laws they did not state). Although the Air Corps manuals imply such use in their discussion of strategic roles, they did not directly mention of cities or civilians as targets. Of course, it likely would not have been acceptable for the doctrine, as official publications of the War Department or subordinate agencies, to support the use of bombardment in ways contrary to accepted international law and norms. This notable difference from doctrine expressed in the papers might be indicative of a larger acceptance of targeting civilians in war within the Air Corps and the greater Army of the early to middle 1930s.

As mentioned, students expressed considerable differences of opinion regarding the effectiveness of bombardment aviation, with a large part of that debate resting on capabilities of available defensive measures - pursuit aviation and antiaircraft defense. The greater the capabilities of the defensive means, the less effective bombardment aviation becomes; the less capable the defense, the greater the impact expected of bombardment.

Pursuit Aviation

Turning to the first of those defensive means, pursuit aviation, this section will show that the student papers demonstrated significant agreement that pursuit represented the best available means of defense against enemy aircraft even though that effectiveness declined at night. Additionally, most students agreed pursuit would be an effective means of stopping enemy aircraft, provided pursuit units were properly located

and received sufficient early warning. However, disagreement existed over whether or not such positioning and warning was possible given the technology available at the time (students did not mention radar).

To the first point of defense against enemy aircraft, several papers expressed agreement that the best means of stopping enemy aircraft was with pursuit aviation. In his 1930 paper, Major William Foote, stated this idea simply in that, "the first line of antiaircraft defense is the airplane."[17] Major C. R. Finley, Major John Hood, and Captain Benjamin Harmon repeated this idea, stating the best defense against enemy aircraft was friendly pursuit.[18] What is notable about the statements of these officers is that all four were members of the Coast Artillery Corps, and their statements point out their own branch's secondary importance in air defense.[19] Air Corps officers also shared the opinion that pursuit was key to defense against enemy aircraft. In his 1932 paper, Major Benjamin Weir, AC, wrote that pursuit exists to support the operations of the other types of aviation through destruction of enemy aircraft in flight.[20] Although Douhet and Mitchell's works stated that attack or bombardment could achieve defeat of the enemy air force through attacks on enemy airfields, Captain Lawrence Hickey, AC, saw things differently. He pointed out that damage to aircraft on the ground was typically easy to repair whereas damage to aircraft in flight was usually fatal. He viewed pursuit as the best means of causing such fatal damage to enemy aircraft in flight.[21] However, agreement that pursuit was the best available means to destroy enemy aircraft was not the same as saying that pursuit was actually effective at stopping enemy aircraft.

To that end, the students consistently argued that the deciding factor of pursuit effectiveness was the amount of reaction time afforded to friendly pursuit aircraft to get into position to attack approaching flights of enemy aircraft. Several students argued that if friendly pursuit received enough notice, it could inflict significant damage upon enemy aircraft (including bomber formations), particularly given improvements in technology such as large aircraft-mounted cannons with exploding shells.[22] Yet, even within the agreement over the importance of early warning, there was disagreement on whether or not sufficient early warning was possible. Arguing that such notice is unlikely, one student pointed out that initiative in air warfare goes to the attacker. Since an enemy selects when and where to bomb as well as the routes to and from the target, detection of enemy bombardment formations would be difficult, particularly under the cover of darkness.[23] However, those who argued that early warning was possible (and that pursuit would

therefore be successful at interception) based their opinions on in-depth analysis prior to the start of a conflict. To that end, Captain Hickey, AC, believed careful analysis by a defending force could identify those targets that the enemy was likely to attack. Further analysis would determine the routes enemy aircraft could use to reach those targets.[24] Knowing targets and routes, Major Clarence Cotter, CAC, stated a defending force could place defensive pursuit aircraft in a position to allow them to react in force to the approach of enemy bombers.[25] Thus, upon receipt of intelligence of approaching aircraft (which neither of these students anticipated would be lacking), the prior analysis and proper placement of pursuit aircraft would ensure adequate time and space to launch, climb, and attack the inbound bombers.

Additionally, papers displayed agreement on the difficulty of pursuit operations during hours of darkness. One student pointed out that the defense of London during the Great War showed that night pursuit was nearly worthless against German bombers.[26] Another, Major Harrison Richards, AC, focused on accidental risks as a significant problem in night pursuit operations. He stated that the mass of pursuit planes required to have the desired effect on enemy aircraft formations is not possible due to risk of collision. Additionally, he argued that landings and departures of pursuit under low-light conditions greatly increase the risks to the defenders.[27] Richards also recommended use of lateral and vertical patrol sectors as well as radios to improve the performance of night pursuit operations although he did not go so far as to argue such techniques would ensure effects against attacking aircraft.[28]

These opinions demonstrate, once again, that the predominant view of the students did not support the position advocated by Douhet and largely shied away from Mitchell's viewpoints. As previously discussed, both theorists largely viewed defense against air attack as pointless - a position which the students clearly found incorrect. Only in the idea that adopting a defensive approach cedes the initiative to the enemy do the opinions of the student papers resemble some of Mitchell's ideas. It is actually Sherman's ideas that most closely match those expressed by the interwar students; specifically, that pursuit, when properly employed, would inflict significant losses to enemy aircraft.

Considering the differences between student opinions and doctrine on the role of pursuit, the students tended to emphasize the defensive power of pursuit while the doctrine focused on offensive pursuit. As mentioned in the preceding chapter, the 1923 FSR and TR 440-15 did not provide sufficient clarity on employment of pursuit aviation; the

regulations simply emphasized the importance of pursuit to gaining and maintaining air superiority. In the *Pursuit* manual, the doctrinal position designated pursuit aviation for offensive roles. The manual indicated that defense of political centers or cities would be a waste of resources done for purely political reasons.[29] Since the students clearly supported defensive uses of pursuit aviation, their positions rest somewhat at odds with period doctrine.

Antiaircraft Defense

Turning to the second component of defense against aircraft, students wrote extensively on their perceptions on effectiveness of ground-based antiaircraft defensive measures. Such measures included antiaircraft guns, searchlights, intelligence networks, organization, and use of machine guns and small arms against aircraft. The individual student perceptions, when taken as a whole, indicated near universal agreement that demand for protection would exceed supply, thereby requiring tough choices on where and how to employ ground-based defenses. Students also expressed near unanimous agreement that, to be effective, those limited resources must be properly organized and deployed. Surprisingly, a majority of the students covering the subject also agreed, though not unanimously, that properly prepared and organized ground-based antiaircraft defenses could stop or significantly impact enemy bombardment attacks against strategic targets. However, students presented mixed reviews of the ability of antiaircraft defenses to stop attacks against tactical and operational targets.

The first point of universal consensus amongst the student papers on the topic related to the limited availability of antiaircraft defensive measures and the trade-offs necessary to either increase availability or manage the limited resources. Succinctly stated by Captain Vernon Hall, CAC, in 1932, "the only thing certain is that the demand [for defenses against hostile aviation] will always far exceed the supply."[30] Students identified the cause of this problem as a combination of limited national resources (men and materiel) as well as an incredibly large number of targets vulnerable to air attack if left unguarded. Referencing manpower and resources, Major Clarence Cotter, CAC, wrote that the challenge in antiaircraft defense is determining the correct balance of forces. Where defenses were too strong, men and materiel were lost from the decisive points on the battlefield; where defenses were too weak an enemy could exploit bombing to cause vital damage to the friendly ability to wage war.[31] Regarding vulnerabilities, Captain Francis Brady, AC, argued that the scale of anticipated future conflicts combined with the

range of modern aircraft meant that a vast number of targets present themselves to an enemy air force.[32] Given this problem of targets to defend exceeding means of defense, several students wrote that trade-offs would have to be made.

Regarding trade-offs, Major Alva Englehart, CAC, wrote that because it is not possible to protect every vulnerable point commanders must determine the most important points requiring protection and concentrate available defenses around those points.[33] Expressing a similar viewpoint, Captain Clarence Cotter, CAC, stated that the first priority of antiaircraft defense must be to those "points which are vital to the program of industrial mobilization and to mobilization of manpower."[34] Yet as part of these priorities for antiaircraft defense, Captain St. Clair Street, AC, cautioned that political pressure would not simply play a significant part determining what was vital and worthy of defense. Political pressure would also demand greater resources allocated toward antiaircraft defense, thereby limiting those resources available in theaters of operation.[35]

The second point of universal consensus amongst the students on the topic of antiaircraft defense was that to succeed, a nation had to organize its limited resources into a closely coordinated system linking intelligence to both antiaircraft units and defensive pursuit units. To establish such a system, students argued that there should be an overall commander with authority over the means of antiaircraft defense.[36] Subordinate to this overall force or antiaircraft defense command, the antiaircraft artillery commander and air force commander should have authority over their own forces.[37] In such an arrangement, the overall command served as the central node of the system, receiving intelligence reports and distributing those reports to pursuit units or ground-based defense units as required to mass friendly effects against approaching enemy aircraft.[38] To support this idea of a coordinated antiaircraft defensive network, students largely referenced the defense of London during World War I as described in Ashmore's *Air Defence*. Of course, as described, such systems would consist of several components - intelligence, command structure, pursuit, and antiaircraft artillery.

Of the components of an integrated air defense system, students agreed that proper organization and command structure made the best use of limited resources, but the key to making the system function was a large and responsive intelligence section. The pursuit aviation section of this chapter discussed the students' perceived need for such an early warning system as the determining factor on pursuit effectiveness.

Students viewed such early warning as no less important for the antiaircraft artillery units. Just as pursuit required time to launch and establish altitude in order to engage enemy aircraft, so too was time required to man and prepare guns to fire upon aircraft from the ground.[39] Major Ward Duval, CAC, wrote in 1932 that, in rear areas, the responsibility for the intelligence gathering was not merely a military function, but a responsibility of all citizens and businesses. He argued that the organization of civilian observers and the civilian telephone system under the air defense command(s) would prove a key part of early warning of enemy air attack.[40] In forward areas, the responsibility for intelligence of approaching enemy aircraft would fall to forward observers equipped with radios.[41]

However, just because the students identified the need to decide how to organize and deploy those limited resources to maximize the chance of success, this does not necessarily mean the students thought ground-based defenses could successfully defend against enemy aircraft. Yet, the majority opinion in the student papers show that ground-based antiaircraft defensive measures were viewed as very capable of inflicting significant damage to bombardment aircraft attacking strategic targets. However, the ability of antiaircraft defenses to protect troops and targets at the tactical and operational level was a point of contention.

Those students who maintained a positive view of the ability of antiaircraft defenses to protect strategic targets based their opinions on a number of references. These references included World War I statistics, World War I history, and a report of a board of officers convened by the Hawaiian Department to examine the capabilities and limitations of the Coast Artillery and Air Corps.[42] From history and statistics, Captain Vernon Hall, CAC, noted fewer than 10% of the German aircraft sent against Paris in 1918 reached the objective, a fact that he attributed to the strength of the antiaircraft gun defenses in and around the city.[43] Another student, Major Christian Foltz, CAC, attempted to argue positively for antiaircraft gun effectiveness by comparing the average number of antiaircraft rounds expended per plane shot down to the average number of rounds (small arms, artillery, grenades, and small mortars) expended by the Allies per Central Powers soldier killed on the ground in the war. He estimated that every 1,100 rounds expended resulted in one casualty whereas the AEF averaged one plane shot down for every 604 antiaircraft rounds fired.[44] Also using this idea of measuring effectiveness in rounds per shoot-down, Captain Edward Rehman, Infantry (IN), explained that in the years following the world war, there was

a continuous improvement in antiaircraft accuracy. He also anticipated that improved technologies, including better fire control directors, would only serve to further increase accuracy.[45] On the same topic, Major C. R. Finley, CAC, frequently referred to findings of the McNair Board. Those findings determined that properly positioned antiaircraft artillery was to bombers what properly positioned coast artillery was to warships.[46] Although neither defensive measure was likely to stop all bombers or warships, respectively, from attacking their target, attacks against those defenses would prove costly. Finley's own conclusions mirrored the board's findings: that antiaircraft artillery "can make an air attack on a city sufficiently hazardous to deter an enemy lacking great air superiority and ample replacements."[47] Another student expressed a similar belief that the presence of antiaircraft defenses, while not sufficient to prevent a large number of bombers from reaching their target, could inflict significant damage on the bomber flight and force enemy aircraft to operate at higher altitudes where they would be far less accurate.[48]

Turning to ground-based antiaircraft defenses used to protect tactical and operational targets, students held mixed views on the capabilities of defensive measures. Students were quick to point out that the problem of greater demand for defense than available resources was even more dramatic at the tactical level than the strategic level. Students argued that just as antiaircraft defenses of strategic targets required prioritization, so too did the distribution of antiaircraft defenses of friendly forces.[49] This prioritization, to the students, likely meant that infantry units would have to conduct active defensive measures against enemy aircraft through employment of rifle, automatic rifle, and machine gun fire.[50] However, the students debated whether such measures were effective. Major Paul Baker, IN, citing the French experience against Rif forces, noted that the Rifs were able to inflict a relatively high rate of hits and casualties against French aircraft and pilots, respectively.[51] Nevertheless, Major John Hood, CAC, clearly felt that the stopping power of organic infantry weapons was unreliable for antiaircraft defense of ground units.[52] The subsequent chapter of this section on attack aviation explores the other side of this argument, the perceived effectiveness of attack aviation against those targets - a perception likely influenced by debate over whether or not defensive measures were effective countermeasures.

Comparison of the student perceptions of antiaircraft defense to the theorists once again indicates that students largely rejected the opinions

of Douhet and Mitchell. Those two theorists found antiaircraft defenses not simply ineffective, but also counterproductive in that the manpower and resources expended to create an antiaircraft defense network would shortchange efforts to create a strong air force. As a result, the student opinions on antiaircraft defense closely resembled the more moderate positions presented by both Sherman and Ashmore.

While a full comparison of the student perceptions on antiaircraft defense to period doctrine is possible through analysis of the antiaircraft manuals produced by the Coast Artillery Corps in the 1920s and 1930s, such analysis exceeds the intended scope of this study. As a result, for this study, the student perceptions on antiaircraft defense are best considered in respect to how they influenced students' views on the ability of the different aviation mission types to accomplish their missions - a factor discussed with each of those topics in this chapter. That said, when compared to the doctrine analyzed in chapter two, the students provided significantly greater fidelity on the role of antiaircraft defense. The FSR gave little guidance on the effectiveness or employment of antiaircraft defenses except to state that commanders must defend themselves from air attack and those guns would to force enemy aircraft to higher altitudes where they would be less effective. Compared to the Air Corps doctrinal manuals, specifically the positions stated in *Antiaircraft Defense*, it should be clear that the students held a far more favorable view of antiaircraft effectiveness than the ACTS publication presented. Of course, this is not surprising since the ACTS publication was a product of the Air Corps that had a stake in arguing that ground-based defenses were ineffective. The student opinions, on the other hand, included a number of CAC officers whose branch was responsible for those ground-based defenses.

Attack Aviation

Closely related to the abilities of antiaircraft defenses to protect tactical and operational targets were the student perceptions regarding the role and effectiveness of attack aviation. Among the students who wrote on the topic of attack aviation, there was little disagreement that the proper role of attack aviation was for attacks against enemy ground targets beyond the range of friendly artillery, except in cases of emergency.[53] Major Charles Banfill and Captain Asa Duncan, both of the Air Corps, argued these attacks should focus first on enemy aircraft on the ground and air force ground facilities as part of greater Air Corps efforts to establish and maintain air superiority.[54] Secondary to attacks on enemy air force targets were attacks on sensitive logistical points,

antiaircraft defenses, or concentrations of troops in rear areas.[55] Their omission of the use of attack aviation against troops in forward positions except as an emergency measure likely owed to debate over the actual effectiveness of attack aviation in such a role - a debate captured in the student papers.

Those students who argued positively for the impact of attack aviation against troops deployed at the front did so on the basis of both World War I events and interwar period Air Corps testing on the subject. Captain Frederick Eglin, AC, pointed out that as part of the German spring offensive in March 1918, the Germans organized over 300 attack aircraft into flights and squadrons. He argued that these aircraft, operating in coordination with German ground forces, played a significant role in the collapse of the British Fifth Army and caused great disruption to inbound British reserves.[56] He also described the French Army's use of aircraft employed in the attack role to destroy the bridges and bridging equipment of the German Seventh Army along the Marne in July of 1918, thereby playing a major part in stopping the German advance.[57]

Regarding interwar period Air Corps testing, student descriptions of the tests conducted make it clear that the Air Corps sought to determine the true impact of attack aviation against troops. In one such test during 1931, described in a 1935 paper by Major Howard Davidson, AC, an infantry battalion marching on a road had four seconds to disperse to simulate their reaction to approaching aircraft. The positions of the soldiers at the end of the four seconds were marked and the soldiers replaced with man-sized targets. When subsequently engaged by attack aircraft, the targets showed 72% hits from guns and 83% hits by guns and bombs.[58] If accurate, such tests, combined with the historical vignettes, make a clear argument for the value of attack aircraft against troops in forward areas.

However, many students rejected these arguments as overly optimistic. One student, Major Paul Baker, IN, based on his own analysis of various tests, pointed out that the manner of execution of different tests of attack aviation against simulated infantry battalions resulted in a range of hits by machine guns between 0% to 70%.[59] He also noted that when a test made use of fragmentation bombs, pilots often dropped more bombs over a smaller area than prescribed by service manuals.[60] One test cited in a paper by Captain Edward Rehman, IN, supports this belief of overestimation of the power of attack aviation, noting that testing conducted at the Infantry School suggested properly deployed

infantry columns would only suffer 10-15% casualties.[61] Of course, it may not be a surprise that a pair of infantry officers would downplay the effectiveness of attack aviation. However, criticism of attack effectiveness did not only come from infantry officers. In further criticism of the interwar period testing, Captain Dayton Watson, AC, identified that many of the tests occurred during daylight hours.[62] Since there was near universal agreement that threat of air attack would force units to move under cover of darkness (student perceptions on aviation and troop movements discussed later in this chapter), daylight testing did not fit perceived reality of the time. Another student, Captain Carl Russell, IN, argued against the effectiveness of attack aviation on the basis that without local air superiority, the best attack aviation could hope to achieve was confusion among or limited delay to ground troops.[63] Two students presented less specific arguments opposed to employment of attack aviation against forward-deployed troops. Captain Francis Brady, AC, wrote that aviation showed only marginal effectiveness against troops which were deployed for battle, and those marginal results were not worth the effort expended to carry out such attacks.[64] Major Benjamin Weir, AC, argued that direct employment of attack aviation against troop formations was likely of limited value owing to both dispersion of troops and that attack aviation could get better results against other targets.[65] From these statements, it is apparent that many students were unconvinced of the benefit of attacking troops at the front, even if they supported the other missions of attack aviation.

Another area of student dissension on attack aviation, and a subset of the debate on attack effectiveness against troops, was a debate on the employment of poison gas. Three students writing on the topic noted that the use of gas delivered by attack aircraft, or even the potential thereof, could cause considerable negative impact on troop movements. For units operating under the threat of gas attack, the characteristics of period protective equipment were such to significantly slow or stop movement.[66] For units actually hit with mustard or similar gases, Majors Howard Davidson, AC, Paul Baker, IN, and Leonard Boyd, IN, anticipated the same slowed or stopped movement as well as significant casualties that would reduce combat effectiveness.[67] Even though there was agreement between student papers on the impact of gas if employed against troops, two authors debated whether troops on the move could or would be suitable targets for gas deployed from attack aircraft. In 1931, Captain Carl Russell, IN, stated that the use of poison gas was not contemplated except when used for retaliatory measures in

defense.[68] Even if this position was overly optimistic (as suggested by students spending significant time debating the impact of gas attacks), a student pointed out that the flight profile required to release gas spray or drop gas bombs would subject attack aviation to significant ground fire and correspondingly high casualties.[69]

This concern over the ability of ground fire to prevent or limit the effectiveness of attack aviation was a point of debate. In addition to the comment on ground fire influencing release of gas, one student speculated that concentrated .50 caliber machine guns or light antiaircraft guns in coordination with small arms could prevent attack aviation from achieving the desired results in most circumstances. [70] However, the majority felt otherwise provided attack aviation existed as distinctly different from other types of aviation. For attack aviation, a student pointed out that aircraft could defend themselves against ground fire through placement of armor designed to absorb small arms and machine gun rounds.[71] Naturally, for other aircraft types operating at altitudes or speeds beyond the range or capability of small arms, machine guns, and light antiaircraft guns, such armor would serve little purpose. Therefore, the threat and the armor needed to counter the threat lead to the idea that attack must be distinct from other types of aviation. In 1932, Captain Frederick Eglin, AC, wrote that the difficulty and complexity of the attack mission necessitates specialized training for pilots.[72] He also pointed out that the physics of flight meant aircraft optimized to perform the attack mission would perform marginally in other missions.[73] Conversely, his argument also meant that those aircraft designed for pursuit, bombardment, or observation were less effective at the attack role. Eglin supported his argument by noting that use of pursuit aircraft in the attack role rather than employing specialized attack aircraft resulted in significant French aircraft losses during ground attack missions.[74] In the same year, Captain Lloyd Harvey, AC, took an identical position with respect to aircraft design and employment. He noted that even though any aircraft mission type was capable of attack against tactical ground targets, the best results occurred when aircraft were employed on the mission for which they were designed.[75]

Given the trend thus far, it should come as no surprise that the student perceptions again did not support the theories of Mitchell, Douhet, or Hart. Those theorists argued in favor of quick decisions through massive strikes of bombardment aircraft against strategic targets to destroy an enemy's will and means to resist. From their perspective, since an enemy could be defeated through bombardment, there was little value

in a mission type designed specifically to attack lines of communication and troop concentrations. In fact, of the theorists discussed in chapter two, only Sherman placed value on the mission of attack aviation - a mission he viewed largely along the same lines as the students.

With respect to period doctrine, the student opinions of attack aviation somewhat blurred the doctrinal lines between attack aviation and bombardment aviation. Stated in the previous chapter, the FSR and the TR both described the mission of attack aviation as conduct of attacks against ground troops and columns while the mission of bombardment was against enemy lines of communication, preferably beyond the range of friendly artillery. The student perception then pushed attack aviation up one level. To the students, attack aviation was ideal for use against enemy lines of communication and use against ground troops was less suitable for the mission type because of factor such as dispersion and self-defense abilities of front-line units. Of note, this student perception, while different from the FSR and the TR, lined up with the information in the later ACTS *Bombardment* and *Attack* manuals. As bomber range improved, those aircraft became more capable of reaching strategic targets well inside an enemy's borders. A shift of bombardment targets from lines of communication to strategic targets would have left the former uncovered. Thus, while the student perceptions of suitable attack targets differed notably from some of the earlier doctrinal publications, they were in line with later publications.

Observation Aviation

Another component of the debate over the effectiveness of aviation evident in the student papers was the ability of aviation assets to detect the movements of an opposing army. No students argued against the usefulness of observation aviation for detection of enemy movements - on either land or sea. This section is limited to the student perceptions over observation aviation's role over land, as a later section discusses student perceptions of aviation in coastal defense. On the topic of observation aviation and land forces, the student opinions of observation were unanimously positive about its place on a modern battlefield. Students gave only limited consideration to potential vulnerabilities of observation to both pursuit aviation and ground-based antiaircraft defenses.

On the value of observation aviation, seven of the students unequivocally emphasized the importance it played on a modern battlefield. In his 1931 paper, Captain Francis Brady, AC, argued that by the end of

the World War, "aerial observation proved to be indispensible to a commander if he were to keep informed of the location and actions of his own and enemy units, and consequently, be enabled to make correct decisions."[76] The same year, Major Lawrence Stone, AC, stated that field commanders must not fail to use adequate observation aviation to remain advised of the enemy situation.[77] Major Robert Bathurst, Field Artillery (FA), expressed his opinion that observation aviation represented the fastest, most capable means available to commanders to lift the fog of war.[78] These perceptions repeated in several other student papers.[79] One such paper, written by First Lieutenant Kenneth Walker, AC, went as far as to state that not only did observation play a significant role, the service schools also overstated the limitations and understated the benefits of reliance upon the information provided by observation aviation.[80]

Related to the perceived role of observation aviation's influence upon the ground commander's understanding of the situation was the interaction students expected between observation and cavalry, the traditional "eyes" of the commander. Although only a small number of students focused significant effort on that relationship, those who did saw the two, operating in unison, as essential to reconnaissance efforts. Two students, Captain George Barnes, Quartermaster (QM), and Captain Charles Robinson, AC, wrote nearly identical statements that observation aviation would provide the cavalry the information necessary to operate with greater precision.[81] Another student, Captain William Irvin, Cavalry, summarized the relationship by simply stating, "close continuous liaison between the cavalry and aviation engaged in combined reconnaissance operations is essential to success."[82]

Although the students placed significant value on observation aviation, they devoted little in their papers to the risks posed to observation by enemy pursuit or ground-based antiaircraft defenses. One paper suggested the conduct of observation missions at night to minimize the risk of interception by enemy pursuit aircraft.[83] That author acknowledged that night observation crews were limited in what they could see; however, the anticipated increase in night movements (discussed in the next section of this chapter) meant that those crews required training to identify key items of interest during periods of darkness; proper training would thereby limit the disadvantages posed by darkness.[84] For protection of observation against ground-based antiaircraft defenses, the papers offered little. One student merely took the approach that while those defenses could cause the loss of some observation aircraft, they would be unable to stop air reconnaissance from taking place.[85] While

this approach was not dissimilar to the student perspective on effectiveness of ground-based antiaircraft defenses, it did leave open the question of whether or not those defenses could inflict enough losses to make aerial observation prohibitive (as was the student viewpoint on bombardment versus antiaircraft defenses).

Although the previous topics showed significant disagreement between student opinion and the beliefs of Douhet, Mitchell, and Hart, such is not as clearly the case regarding observation. Students' faith in observation to determine enemy dispositions was not necessarily contradictory to Douhet, Mitchell, and Hart, provided use of observation focused on identification or assessment of targets of strategic value. It was the use of observation as a reconnaissance arm of the army that was contradictory to the theoretical views. Since Douhet, Mitchell, and Hart viewed bomber attacks on strategic targets as the way to win wars, employing limited observation assets to other targets was, to them, a waste of the resource.

Turning to doctrine, the emphasis that the students placed on the value of observation aviation to ground commanders closely mirrored the emphasis contained within the 1923 FSR and TR 440-15. The FSR stated that observation existed to provide information to ground commanders. To support this role, the FSR clearly indicated that observation assets required assignment to division or higher-level units. Therefore, on this topic there is little difference between the opinion of the students, taken as a whole, and the position of doctrine.

Impact on Troop Movements

Closely related to student perceptions of observation and attack aviation were their views over the impact of those aviation types on troop movements. A number of students used their papers to discuss how ground forces should adjust their movements to avoid detection or, if detected, what measures could minimize soldier casualties and equipment damage in the event of engagement by enemy aircraft. Summarized, due to the presence of aircraft on the battlefield, the students felt ground forces must conduct the majority of their movements under cover of darkness, during poor weather, or when operating under the protection of friendly local air superiority. Students also justified the need to motorize ground forces based on the impact of aircraft on the battlefield. To that end, students stated that motorization of ground forces both maximized rates of movement during periods of

decreased aircraft performance (night, weather, etc.) and eliminated the vulnerability of animal-drawn transport.

On the first point, student papers on the topic showed unanimous agreement over the need to conduct troop movements while protected from enemy aircraft by darkness, weather, or friendly aircraft. Captain Francis Brady, AC, stated in his 1931 paper that the World War conclusively showed that to have any chance of secrecy of major troop movements, those movements must occur during periods when observation is "hindered or prohibited by weather conditions as at night or during foggy weather."[86] To confirm that this lesson from the war remained applicable, Major Lawrence Stone, AC, reached out to Major Courtney Hodges, IN, (then an instructor at the Infantry School) for information on how that school addressed aviation's impact on troop movements. Hodges stated that the school placed "an added emphasis on the importance of using darkness to cover all movements when the situation permits."[87] Two students, Captain Carl Russell, IN, in 1931 and Captain Idwal Edwards, AC, in 1935 further argued that night movements alone, while necessary to conceal strength and composition of forces and essential for protection of those forces were insufficient to ensure complete secrecy of troop movements.[88] Students, based on World War I experience, also argued that this necessary emphasis on night movements significantly complicated troop deployment. They pointed out that this added complexity would likely strain command and control of ground forces and result in reduced movement speeds, even if an air attack never occurred.[89]

According to several students, motorization of ground forces represented a possible solution to the complexity and slow speed of night movements caused by the threat of hostile aviation. Since the duration of darkness, poor weather, or friendly air cover was limited, students felt that success of ground movements required maximizing the rate of movement during those limited hours. To do so, students recommended the replacement of slow and vulnerable animal-drawn transports with motor transports.[90] Not only did students feel that increases in speed would maximize limited time for movement, they also argued that the speed and cross-country mobility of motorized transport would make detection by enemy aircraft more difficult.[91]

Moving to the theory and doctrine comparison, the student opinions once again showed similarity with William Sherman's work. Just as Sherman was the only theorist who placed value on attack aviation, he was also the only theorist discussed who described the impact of

aviation upon troop movements. His belief that the presence of aviation would force armies to limit their movements to hours of darkness is exactly in line with the students' position. The only difference between the two is on the student focus on elimination of animal-drawn transport. Regarding doctrine, as both the FSR and the TR placed emphasis on the need to conduct movements under cover of darkness to avoid detection and attack by enemy aircraft, the doctrine and the student perceptions were also nearly identical.

Coast Defense

Just as some of the students discussed the impact of aviation on military movements on land, so too did some discuss the role they felt Army aviation would play in movements at sea, specifically in vicinity of the coastlines. Although only a few students addressed coast defense, those who did were quick to identify both the risks posed by hostile aviation actions against the United States or its overseas possessions and the key role of friendly aviation in opposing any attempted invasion of the same. Regarding the risks, Major Ira Hill, CAC, and Captain Robert Olds, AC, stated that in any future operation undertaken by a foreign power against the United States, carrier-based aviation represented a significant risk to established defenses.[92] To counter these risks, the students stressed the necessity of aerial reconnaissance to locate approaching enemy vessels. Captain Olds and Captain Edmund Hill, AC, wrote that airships, particularly due to their range and station time, were ideal for the conduct of such reconnaissance.[93] Students anticipated that heavier-than-air observation aviation might become suitable for the role given increased range through technological developments.[94] Students also wrote that once observation detected an enemy naval force, it became the role of bombardment to destroy the enemy ships, pursuit to defeat enemy aircraft in flight, and attack to destroy enemy landing forces either ashore or in their transports.[95] Additionally, Majors Richard Gibson and Ira Hill, both of CAC, argued for a sufficient number of land-based antiaircraft defenses organized under the Coast Artillery to defend against enemy aircraft.[96] Of course, it is not surprising that two CAC officers argued that Air Corps assets fall subordinate to their branch rather than CAC assets subordinate to the Air Corps. Ultimately, the effectiveness of such antiaircraft defenses employed for coast defense was subject to the same student debates on pursuit and antiaircraft artillery effectiveness.

While most of the student positions on aviation and coastal defense are relatively generic, some of the students made very specific

observations and conclusions over the link between aviation and coastal defense. The last topic of this chapter explores some of those observations and conclusions due to the degree to which they foreshadowed the events to come at Pearl Harbor on 7 December 1941. However, the broad opinion of the students of the risks from and defensive power of aviation in coastal defense remained fixed.

With respect to coastal defense, only Mitchell and TR 440-15 made any significant mention of the part which aviation plays. Citing the tests of aircraft against ships he led in the early 1920s, Mitchell concluded in his work that airpower dominates sea power. Based on Mitchell's statements on the topic in *Winged Defense*, it is clear that student perceptions on the integration of aviation - at least attack and bombardment - into coastal defense largely matched Mitchell's with the probable exception of the role of antiaircraft defenses. As to the doctrine, the TR also emphasized the value of aviation to detect and engage enemy shipping in conjunction with the Coast Artillery Corps.

Air Superiority

One of the significant areas discussed in both theory and doctrine of the period was that of air superiority - the ability to operate friendly aircraft free of effective enemy interference. On the subject, although a few students pressed the necessity to establish complete air superiority, most argued that complete air superiority was not possible in war between like powers. Rather, the predominant view expressed by the students was that only local air superiority is possible and even that only for a limited duration.

Arguing that complete air superiority was possible, Major Vincent Dixon, AC, wrote, "all air force operations should be conducted against the hostile air force, in the air and on the ground, its bases and sources of supply; until 'air superiority' has been attained and its retention assured."[97] Only once this was complete, he argued, should the air force shift to attacks against other targets.[98] Captain Asa Duncan, AC, and Major Charles Oldfield, AC, expressed a similar viewpoint. Each argued that the first mission for an air force at the start of a conflict had to be the enemy's air force.[99] Yet, both Duncan and Oldfield, despite advocating that air superiority was the most important mission, acknowledged that actually achieving such superiority would prove difficult.[100]

The majority of students argued that the difficulty of establishing air superiority restricted air superiority to limited areas and for limited periods within those areas. On this point, Captain St. Clair Streett, AC,

wrote that, "no matter how overwhelming the air force of a belligerent may be, it cannot wholly prevent hostile air mobility, unless the enemy's air force is completely destroyed."[101] Yet, students largely did not believe that the complete destruction of an enemy's air force was likely, at least not until a significant amount of time after the start of hostilities. Because students expected air forces to target each other early in hostilities, they argued in favor of dispersion of air force assets well to the rear of the front lines to prevent significant losses from any one enemy attack.[102] The dispersion of the air forces of both sides in positions well behind the front, while necessary for protection, also limited the depth those air forces could reach over enemy territory.[103] This, the students argued, forced the fight for air supremacy to the skies between those bases, a fight in which control of the skies would frequently change hands since neither side could force a decisive commitment from the other.[104]

Even though students expressed beliefs that absolute air supremacy was not realistic, they firmly believed that local supremacy was possible. Major Henry Miller, AC, argued that establishing local air supremacy merely required application of the age-old principles of mass and economy of force.[105] From his perspective, a friendly air force could establish air supremacy over a certain area by massing its pursuit aircraft there, while ceding supremacy in other areas through economy of force operations.[106] According to another student, massing of air power to establish local air superiority was comparable to how a navy temporarily controls a portion of the seas without first destroying the entire enemy fleet.[107] Ultimately, the back and forth struggle for air supremacy was, according to Streett, determined by the nation which could produce more aircraft and conduct better pilot training - a process which would not come into play until the late stages of a war.[108]

On the subject of air superiority, the theorists appear to fit into one of two categories - those who felt total air superiority was possible and those who believed superiority was limited in both time and space. Douhet, Mitchell, and Hart clearly believed in the former, while Sherman, "Squadron Leader," and, to a limited extent, Ashmore agreed with the latter. Based on this, the majority of the interwar students aligned themselves with the theorists advocating limitations on the ability to air superiority. On doctrine, the FSR and the TR both stated that air superiority was an essential role of the Air Corps, in that it affected the ability of other arms to perform effectively. While the value of air superiority written in doctrine is similar to the students' position, the absence of a

statement in doctrine on the ability to achieve and maintain that superiority was a notable difference when compared to the student papers.

Aviation in Small Wars and Outlying Ideas

Up to this point, each of the topics discussed in this chapter closely match topics that existed within the period doctrine and theory. These common links between the papers, the doctrine, and the theories allow for comparison between student ideas and the intellectual environment of the period in which they wrote. Yet some of the ideas expressed in the student papers do not lend themselves to such comparison. Several papers, either in whole or in part, included either new ideas or discussed post-World War I application of airpower in ways that do not fit with the employment of airpower described in theory or doctrine. These ideas are included in this chapter not because they provide a means to compare student opinions to theory and doctrine, but rather because those ideas are demonstrations of a student population that considered and analyzed a wide range of ideas. What follows is a brief exploration of these ideas, focusing on student perceptions of aviation in small wars as well as outlying ideas that were forward thinking, fanciful, or foreshadowing.

Starting with the subject of small wars, even though there was not major conflict between world powers in the years between the world wars, there were a number of small wars in places such as Iraq, Nicaragua, and North Africa. While most of the interwar CGSS students did not consider the role of aviation in those wars, three students devoted either all of their paper or a large portion of their paper to the topic. The papers by Captain William Evans, USMC, and Captain Earl DeFord, AC, focused solely on aviation in small wars while a third by Major William Lynd, AC, referenced events of the small wars in a broader discussion of air transportation.[109] Between these papers, the consensus was that aviation played an indispensible role in successful conduct of counter-guerilla operations particularly through supply, evacuation, observation, and attack.

Regarding supply and evacuation in small wars, Evans pointed out that transportation aviation proved particularly useful, as it often was the only reliable link between geographically separated units. When friendly forces dispersed over large areas as was common during counter-guerrilla operations, he argued that aviation not only allowed resupply of those forces, but it also allowed reinforcement or evacuation of personnel as required.[110] To support this viewpoint, he highlighted the

significant role which aviation played in the supply of Marine forces deployed to Nicaragua. In that operation several Marine detachments in the northern portions of the country were entirely or primarily supplied by aviation, and the Marines used aircraft to evacuate troops from those outposts.[111] DeFord supported this viewpoint through acknowledgement that during their campaign in Morocco, the French made extensive (and successful) use of transport aircraft to deliver supplies and evacuate their wounded. By doing so, the French increased their capabilities and decreased the number of soldier deaths.[112] Lynd wrote extensively of British experiences with aviation in small wars. He noted that in response to a crisis in the summer of 1932, the British flew an entire battalion from Egypt to Baghdad and returned the battalion to Egypt by air once the crisis abated.[113] Regarding the value of aviation to support troops on the move, Lynd also described the British use of transports and parachute loads to resupply a column of 1000 British Soldiers on a march of some 150 miles in vicinity of Peshawar.[114]

On observation and attack, both DeFord and Evans made it clear that both aviation mission types had incredible value in the conduct of small wars. To make the argument, DeFord focused on the actions of those mission types in Morocco, Libya, and Nicaragua. Regarding Morocco, he pointed out that the French were able to use attack aircraft to locate concentrations of Rif forces and subsequently inflicted significant casualties. These casualties ultimately forced the Rifs to switch to night movements and disperse during the day, thereby reducing their effectiveness.[115] DeFord presented a similar take on Italian actions in Libya in that Italian observation aircraft scouted for enemy concentrations and, when located, radioed for attack or bombardment aircraft to execute an attack on the enemy.[116] Additionally, he noted the Italian use of aircraft in what was, essentially, a screen for ground movements. Italian pilots observed the route of march of friendly ground forces through the desert and informed those forces of impending hazards.[117] Evans mirrored this emphasis on the value of observation. He noted that the difficult terrain in Nicaragua significantly limited ground observation, making aerial observation the best means of detecting enemy forces.[118] Such was the effectiveness and value of aviation that, according to Evans, Marine patrols frequently requested aerial escort during movements.[119] Both Evans and DeFord also advocated for aviation's ability to conduct independent missions during counter-guerilla operations when the risks of employing ground forces were simply too high. Each student cited a situation where approximately 1,000 Sandino forces concentrated in a

fortified position on Chipote Mountain in Nicaragua - a position ground forces could not successfully attack. The Marines attacked the fortified position with four aircraft and caused the defenses to collapse.[120]

Taken as a whole, the opinions of Evans, DeFord, and Lynd presented a view that aviation could significantly alter the course of counter-guerilla operations. The value of aviation in such campaigns was well-summarized by DeFord who concluded the speed and economy of aviation forces relative to ground forces combined with the ability of aviation to allow a smaller ground force to defeat a larger ground force meant that, "there is no substitute for aviation in guerilla warfare."[121]

Turning now to those ideas that were forward thinking in nature, the papers contained a number of indications that students paid attention to technological developments and were interested not merely in what was, but also what could be. One such student, Captain George Johnson, AC, wrote his entire 1935 paper on the military uses of radio aided navigation - at the time a technology still in its infancy. He pointed out that the Air Corps was experimenting with the use of radio signals to provide aircraft with approach and departure procedures during periods of poor weather.[122] He subsequently concluded that the demands of the Air Corps to operate under adverse weather meant that radio aided navigation would be essential to the Air Corps in the future, and all military aircraft should be equipped with radio navigation equipment.[123] Another paper authored by Major Louis Bourne, USMC, in 1932 emphasized the potential value of radio-controlled airplanes as flying torpedos able to strike enemy fleets using radio direction finders.[124] This idea rests somewhere as a precursor to modern precision anti-ship munitions and resembles ideas attempted in World War II to strike targets with explosive-laden remote controlled planes. A final, rather forward-looking paper from 1936 focused on the role of modern communications in cavalry raids. In his paper, Captain George Palmer, AC, contemplated the potential value of television in reconnaissance. He cited General Harbord's statement that, "There still will be nothing new in the principle of using every possible means of communication if the day comes when the perfected television flashes to our armies the exact appearance of enemy territory or 'no mans land' as seen by an 'electric eye' from an unmanned airplane guided by remote control."[125]

On the fanciful front, only one paper really stands out. Writing in 1931, Captain Edmund Hill, an Air Corps airship pilot, focused extensively on his perceptions of the important place airships should play in the future of the Air Corps.[126] Were such perceptions limited to the use

of airships for coastal observation or of balloons for battlefield observation, his writing would not stand out. However, he went notably further, arguing that technological advances would allow for airships capable of lifting over 400 tons of cargo, making them extremely valuable as both transports and as flying aircraft carriers.[127] While the idea of using airships to launch and recover aircraft or transport supplies was not new (he discussed experiments from the 1920s), Hill's take on airship aircraft carriers was fanciful in its scale.[128] The visions of massive airships were based on his assumptions of what technology would allow rather than source materials indicating feasibility to engineer airships with significantly greater lifting capacity than those in service at the time. Hill also stated that the increased range of artillery was limiting the effectiveness of ground observation and necessitated significant roles for observation balloons on the battlefield.[129] Overall, his paper represents one blatantly focused on self-interest given his background as an airship pilot and largely disconnected from the realities of his time.

The final outlying ideas are those that foreshadowed events to come - in this case, foreshadowing the attack on Pearl Harbor in 1941. Writing in 1933, Captain Fenton Epling, CAC, predicted that a relatively small force from a "sufficiently centralized, autocratic, and Machiavellian government" or an "Asiatic Power" could cause significant damage to Manila, Oahu, and other Pacific bases through surprise attack.[130] Again foreshadowing the events of 1941, Captain Robert Olds, AC, argued extensively for aircraft or airship reconnaissance of those areas some 500-600 miles from shore.[131] He calculated that it was essential to detect enemy aircraft carriers by dusk 500 miles out. Failure to do so would mean a carrier force could transit undetected some 300-400 miles under cover of darkness and be in position to launch a surprise attack at dawn with minimum risk to the carrier force.[132] However, Olds was not the only one concerned with surprise attack. Captain Charles Banfill, AC, discussed joint maneuvers in which a carrier aviation force launched a surprise attack against Hawaii on the morning of Sunday, 7 February 1932 resulting in the (notional) destruction of the entire defending Army Air Corps force as well as significant (notional) damage to ammunition depots, hangars, barracks, and rail centers.[133] While the actual events prior to and on 7 December 1941 are well studied, these papers demonstrate that at least some of the interwar Leavenworth students were aware of and concerned about the risks of a surprise attack against the United States.

Summary of Student Perceptions and Conclusions

To summarize the positions of the interwar CGSS students, their works, taken as a whole, stated the following:

1. Bombardment was the best striking arm to achieve results against the enemy's means and will to resist; however, bombers often lacked accuracy and enemy pursuit and antiaircraft defenses posed risks to bomber formations.

2. Pursuit, when properly deployed and with sufficient warning, was a capable means of defense against bombers and other aircraft although to a more limited degree at night. Students disagreed on whether or not such warning could in fact occur.

3. Ground-based antiaircraft defenses, while less effective at downing aircraft than pursuit, still posed a significant risk to enemy aircraft. This risk was present, but reduced when defending tactical and operational level targets. In addition, demand for antiaircraft protection would always exceed available means, requiring tough choices on what to protect. In order to maximize the effectiveness of limited resources, students argued the military should establish a centralized command with authority over the guns, in control of intelligence, and closely tied in with pursuit aviation.

4. The proper use of attack aviation was to target enemy air force ground facilities, lines of communication, and other areas of concentration. Use of attack aviation against troops in forward areas was of debatable effectiveness.

5. There was universal acceptance that observation aviation represented an indispensible tool for commanders to determine the strength and disposition of enemy forces.

6. Ground forces should conduct the majority of movement under cover of darkness, during poor weather, or when operating with friendly local air superiority. Additionally, the army should replace animal-drawn transport with motorized transport to maximize rate of march during the limited periods of reduced enemy air capability.

7. Enemy aviation posed the greatest threat to coastal defense and friendly aviation played an essential role in countering that threat.

8. Air superiority, while an important function of an air force, was unlikely to be total in conflicts between like powers. Rather, belligerent parties in war would exchange control of the air in a back and forth

struggle, with each side able to establish local air supremacy over limited areas for limited periods.

9. In small wars, aviation was vital for supply and evacuation of troops while observation and attack aircraft could locate and engage enemy concentrations more effectively, faster, and with less risk than ground engagements.

From this chapter, it should be clear that the students were keenly aware that strengths in one area represented weaknesses in another, and conversely that weaknesses in one were strengths of another. Although they made it clear that aviation had changed aspects of the conduct of warfare, their views suggest that the balance between aviation forces would make the much-desired objective of air supremacy elusive. Given a perceived inability to achieve complete air superiority combined with limitations on the capabilities of bombardment and attack in the face of air and ground defenses, the student opinions, taken together, point to aviation as simply another element of modern warfare. This element was incapable of decisive results on its own in a conflict between like powers. This position, the uncertainty whether or not airpower could be decisive, largely stands in contradiction to the expressed views of Douhet, Mitchell, and Hart while mostly adhering to the ideas of Sherman, Ashmore, and "Squadron Leader."

Compared to doctrine, the students, in most cases, did not depart far from the accepted positions of the Army. One such departure from doctrine was student perceptions that pursuit was not just an offensive arm, but also could play a key role in defense. Regarding air superiority, the difference between doctrine and the students centered on the ability to achieve that superiority. The FSR and the TR emphasized the importance of air superiority but did not describe how to reach it; the ACTS manuals viewed air superiority as gained through successful offensive action. The students perceived superiority as difficult to obtain and generally fleeting in duration. The final difference, and almost certainly the most important, was that students were far more open about the use of bombardment against cities and civilians.

Notes

1. Annual Report, 1929, 8; Annual Report, 1930, 6; Annual Report, 1936, 13.

2. Francis M. Brady, "Study of the effect of aviation on the strategical and tactical movement of troops" (1931): 9. CGSS Student Papers, 1930-1936, Combined Arms Research Library Digital Library, Fort Leavenworth, KS. Hereafter collection and library information omitted from citations of student papers; Harrison H.C. Richards, " Effect on aerial operation of the greater use of night movements by ground troops as a result of development of aircraft," (1930): 27. In his paper, Brady focuses on the impact of bombardment against enemy lines of communication, specifically bridges and railroads. Richards discusses the use of bombardment against areas of troop concentrations.

3. St. Clair Streett, "What Principles Should Govern the Strategical Employment of the Air Force, With Particular Consideration to the Most Suitable Objectives?" (23 March 1934): 70.

4. Streett, 70-72.

5. Sam L. Ellis, "The Air Force as the Maneuvering Force in War" (1935): 8-9.

6. John H. Hood, "To what extent should antiaircraft artillery be relied upon for the defense of ground troops, cities and fortifications against aircraft" (31 May 1932): 6.

7. Rolla V. Ladd, "Organization of Antiaircraft Artillery in All Echelons" (12 May 1933): 14.

8. Vincent B. Dixon, "Principles governing the selection of the proper air force objectives" (1932): 8-9.

9. Vernon W. Hall, "Antiaircraft defense of cities and measures that should be taken in time of peace in preparation therefor" (1932): 10.

10. Lawrence F. Stone, "A study of the effect of aircraft on the present system of the development and approach march of ground units and the effect of aircraft on the present system of supply and transportation" (1931): 3.

11. Streett, 61.

12. Brady, 8.

13. Richards, 22; Brady, 10.

14. Asa N. Duncan, "Operations of the British Aviation, 25 October to 15 November, 1917" (1931): 5; Delos C. Emmons, "Location of Airdromes with Respect to the Front Lines" (23 March 1934): 12. Duncan focuses on using masses of bombers to overcome the weakness of limited speed and maneuverability and Emmons expresses his belief that concentration of bombers is likely to overcome dispersed pursuit.

15. Willis H. Hale, "The Role of Air Force in Frontier Defense" (1934): 8.

16. C.R. Finley, "To What Extent Should Anti-aircraft Artillery be Relied Upon for Defense Against Aircraft of: (a) Cities, (b) Fortifications, (c) Ground Troops" (1931): 15; Richards, 33.

17. William C. Foote, "Antiaircraft Defense of Infantry and Cavalry Divisions" (1 June 1930): 2.

18. Finley, 5 and 10; Hood, 3; Benjamin F. Harmon, "A Comparison of Current American Doctrines as to Antiaircraft Defense with those of the British Army" (1934): 34.

19. See Appendix B.

20. Benjamin G. Weir, "The Effect of Aerial Operations on the Development and Approach March of Ground Units, and on the location of Supply Installations" (31 May 1932): 2.

21. Lawrence P. Hickey, "A Study of the Effect of Increased Speed and Armament Developments on the Tactical Employment of Pursuit Aviation" (23 March 1934): 19.

22. Emmons, 10-11; Hickey, 1-2 and 17-18.

23. Emmons, 12-13.

24. Hickey, 11.

25. Clarence E. Cotter, "Antiaircraft Defense of the Zone of the Interior" (17 June 1930): 11-12.

26. Finley, 2.

27. Richards, 23 and 28. Darkness alone was not a major risk factor. Rather the risk came from the combination of limited visibility and poor low-speed flight handling characteristics of pursuit aircraft (designed for high-speed maneuver).

28. Richards, 29.

29. Air Service Tactical School, *Pursuit* (Washington, DC: Government Printing Office, 1926), 43.

30. Hall, 15.

31. Cotter, 6.

32. Brady, 10-11.

33. Alva F. Englehart, "To what extent should antiaircraft artillery be relied upon for the defense of ground troops, cities and fortifications against aircraft" (3 April 1933): 30-31.

34. Cotter, 8.

35. Streett, 70.

36. Ladd, Rolla, 20; Harmon, 65.

37. Alexander H. Campbell, "The Coordination of Anti-Aircraft Defense in the Combat Zone" (1936): 36.

38. Campbell, 37; Hall, 14-15; Foote, 23; Hood, 7.

39. Paul T. Baker, "Infantry Defense Against Aircraft, with Particular Attention to the Receipt and Transmittal to Troops of Warnings of the Approach of Hostile Aviation and Including a Comparison of United States and Foreign Developments" (1936): 51. Baker argues for the need of ground forces to receive as much notice as possible of inbound enemy aircraft in order to prepare defense.

40. Ward E. Duvall, "Antiaircraft defense of cities and measures that should be taken in time of peace in preparation therefor" (1932): 8.

41. Baker, 51.

42. Finley, bibliography.

43. Hall, 7-8.

44. Christian G. Foltz, "The Positions and Dispositions of Anti-aircraft Artillery in Defense of Front-line Troops in the Attack and Defense" (1935): 5-6.

45. Edward J. Rehmann, "A Study of the Effect of the Development of Aircraft on Troop movements and operations, with particular reference to night movements" (2 June 1930): 14-15.

46. Finley, 1 and 14.

47. Finley, 21.

48. Cotter,10-11.

49. Foltz, 24.

50. Baker, 49-51.

51. Baker, 18.

52. Hood, 5-6.

53. Henry J.F. Miller, "The Effect of the Development of Aircraft upon Troop Movements" (31 May 1932): 5; Stone, 15.

54. Charles Y. Banfill, "The Use of Attack Aviation in Support of Decisive Ground Attack" (March 1936): 10 and 19; Asa N. Duncan, "Defensive Power of Unsupported Attack Aviation (Against Pursuit Aviation)" (1931): 1.

55. Banfill, 19; Duncan, "Unsupported Attack Aviation," 1.

56. Frederick I. Eglin, "A Study: Is attack aviation necessary as a distinct type of aviation?" (1932): 4.

57. Eglin, 6-7.

58. Howard C. Davidson, "How Much Delay and Loss can an Attack Squadron Inflict on an Infantry Division under varying Conditions" (1935): 6.

59. Baker, 3-5.

60. Baker, 3-5.

61. Rehmann, 15.

62. Dayton D. Watson, "The Active Antiaircraft Defense of Troop Movements at Night" (1936): 2.

63. Carl A. Russell, "A study of the effect of the development of aircraft upon troop movements, with particular reference to night movements and operations" (1931): 10.

64. Brady, 5.

65. Weir, 8.

66. Baker, 49.

67. Davidson, 20; Baker, 49; Leonard R. Boyd, "Infantry defense against aircraft with particular attention to the effect of low-flying attack-aviation on foot and motor columns" (1935): 38.

68. Russell, 7.

69. Boyd, 37.

70. Finley, 21.

71. Boyd, 38.

72. Eglin, 12.

73. Eglin, 11.

74. Eglin, 7.

75. Lloyd L. Harvey, "Attack Aviation" (1932): 8.

76. Brady, 4.

77. Stone, 15.

78. Robert M. Bathurst, "Study of the methods of training Air Observers" (1932): 1-2.

79. Weir, 6; Miller, 7; Idwal H. Edwards, "Is the Wide Envelopment Practicable with Present Day Aviation and Communication Facilities Available

for Intelligence Agencies?" (1935): 11-12; Kenneth H. Walker, "What the Ground Forces may Expect of Observation Aviation" (1935): 2-3.

80. Walker, 2-3.

81. George T. Barnes, "The Necessity for Coordination of Reconnaissance Activities of a Cavalry Division--Aviation--Armored Car" (1936): 15; Charles M. Robinson, "The Supply of Airplane Bombs in the Theater of Operations" (March 1936): 30.

82. William R. Irvin, "Combined Reconnaissance Operations by Cavalry and Aviation" (1934): 23.

83. Richards, 25.

84. Richards, 36.

85. Edwards, 9-10.

86. Brady, 4.

87. Stone, 14.

88. Russell, 11; Edwards, 15-16.

89. Stone, 9; Miller, 5-6.

90. Stone, 14-15; Boyd, 41; Baker, 52.

91. Baker, 50-51; Edwards, 13.

92. Robert Olds, "A Critical Analysis of Air Force Action in Coastal Defense, By Phases" (1935): 3; Ira B. Hill, "The Best Method of Cooperation Between the Navy, the Air Corps, and the Coast Artillery in Harbor Defense" (1931): 4.

93. Olds, 11-12; Edmund W. Hill, "The Use of Lighter-Than-Air in Future Wars and its Recommended Peace Time Organization" (1931):8.

94. Olds, 34.

95. Olds, 16-17; Richmond T. Gibson, "A study of the best method of cooperation between the Navy, the Air Corps, and the Coast Artillery in harbor defense" (1930): 5.

96. Hill, Ira, 7; Gibson, 3.

97. Dixon, 13.

98. Dixon, 13-14.

99. Duncan, "Operations of the British Aviation," 5; Charles B. Oldfield, "A Study of the Effect of Increased Radius of Action on Air Force Operations" (1933): 10.

100. Duncan, "Operations of the British Aviation," 5; Oldfield, 4.

101. Streett, 70-71.

102. Ellis, 12; Howard A. Craig, "The Supply of Airplane Bombs in the Theater of Operations," (1936): 15.

103. Craig, 11; Streett, 16.

104. Streett, 16.

105. Miller, 8.

106. Miller, 9.

107. Ellis, 11.

108. Streett, 25.

109. William T. Evans, "Task Force and Use of Aviation in Minor Wars" (1934); Earl H. DeFord, "A Critical Analysis of Air Operations Since the World War" (25 March 1935); William E. Lynd, "Military Air Transport," (12 May 1933).

110. Evans, 15.

111. Evans, 15-16.

112. DeFord, 9.

113. Lynd, 4.

114. Lynd, 6.

115. DeFord, 7.

116. DeFord, 10-11.

117. DeFord, 10.

118. Evans, 11.

119. Evans, 12-13.

120. Evans, 14; DeFord, 13.

121. DeFord, 14-15.

122. George P. Johnson, "Radio Aids to Air Navigation as it applies to Military Operations both Day and Night" (26 March 1935): 14.

123. Johnson, 30-32.

124. Louis M. Bourne, Jr., "Aviation in Coast Defense" (31 May 1932): 1.

125. George M. Palmer, "The Effects of Modern Communications (Radio, Airplane etc.) on a Cavalry Raid" (1936): 11.

126. Hill, Edmund, 11.

127. Hill, 8-9.

128. Hill, 5.

129. Hill, 6.

130. Fenton G. Epling, "A Study of Cooperation between Naval, Air, and Ground Forces in Coast Defense" (12 May 1933): 16-17. Of note, Epling was primarily concerned about raids conducted by actual landing parties, possibly supported by carrier-based aviation rather than an air raid alone.

131. Olds, 19.

132. Olds, 19.

133. Banfill, 15-16.

Chapter 4
Student Papers and Leavenworth Effectiveness

The previous chapter explored student opinions in relation to period theory and doctrine and concluded that the students' work, taken as a whole, suggests a student body which largely agreed with published Army doctrine on the employment of airpower. However, examination of student perceptions of airpower relative to theory and doctrine is only one aspect of this paper. More important than interwar student perceptions is what their papers offer to the ongoing debate over Leavenworth effectiveness during the interwar period.

Regarding effectiveness of the CGSS during the interwar period, chapter 1 reviewed the works of Nenninger, Schifferle, and Muth. Although Nenninger and Schifferle ultimately argued in favor of Leavenworth during the 1920s and 1930s, they acknowledged the existence of two major criticisms of the school - criticisms that Muth used to argue against the school in his work, *Command Culture*. The first of these criticisms is that the CGSS was ineffective due to a reliance on faulty doctrinal principles. This doctrine, the argument goes, was too focused on the last war and failed to adequately account for the rapid pace of technological advance following World War I. Additionally, Muth argued that the faculty's rigid adherence to this faulty doctrine limited students to solutions in line with doctrine and punished those who deviated. It is this supposed rejection of student solutions outside of established doctrine that represents the second major criticism of the CGSS - that the school's focus on approved solutions stifled critical and creative thinking.

This chapter applies the study of the student papers to both of these criticisms - doctrine and critical thinking. The application ultimately determines that the student papers provide mixed evidence regarding Leavenworth effectiveness. On one hand, the papers indicate the doctrine was likely appropriate for the time. Given appropriate doctrine and general agreement that Leavenworth ensured students knew that doctrine, this paper concludes the interwar CGSS was effective at ensuring its graduates entered the Army with a solid basis of doctrinal knowledge. On the other hand, a student departing Leavenworth with solid knowledge of doctrine is not the same as that student departing Leavenworth with improved critical thinking skills.

When viewed in conjunction with annual reports and academic schedules, the papers provide indications that the school was willing to part with critical thinking development, in the form of writing, in favor of increased classroom instruction. Whether or not this institutional preference for classroom instruction reduced the school's effectiveness at developing critical thinking comes down to the quality of that instruction. Unfortunately, examination of the papers does not provide sufficient clarity on critical thinking during classroom instruction to make a clear determination for or against the school's effectiveness at developing critical and creative thinking during the interwar period.

Interwar Doctrine

The first criticism addressed is the notion that a key shortcoming of the instruction at Leavenworth during the 1920s and 1930s was heavy reliance upon faulty doctrine. No evidence from the study of student papers on airpower topics indicates anything to contradict assertions that the school relied heavily upon doctrine. However, the impression from the papers is that the students showed the critical thinking skills necessary to arrive at supportable conclusions on the proper employment of airpower. As a result, the papers suggest that the airpower doctrine was appropriate for the period. Additionally, this section argues that even though the doctrine as taught failed to match "the necessities of modern war at it was to come" [1] (according to Muth), such failure does not make the school's instruction of that doctrine wrong. To support this assertion, this section begins with a review of present understanding of the nature of military doctrine with a focus on those factors that influence doctrine development. Following this review, this paper argues that because the students' conclusions closely matched period airpower doctrine and they based findings on available history, theory, doctrine, technology, and personal experience - the very items that serve as building blocks of doctrine - their conclusions indicate the appropriateness of period airpower doctrine. Further, since no events of sufficient significance occurred until the late 1930s to fundamentally alter beliefs over existing best practices, this conclusion may well apply to period doctrine covering other subjects.

Turning to the nature of doctrine, the current edition of Joint Publication 1-02, *The Department of Defense Dictionary of Military and Associated Terms* 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."[2] Although this definition highlights that doctrine represents

fundamentals and serves as a guide for action, several notable sources argued doctrine is much more than a list of principles or a checklist for action. They perceived doctrine as a tangible representation of a system of beliefs.[3] This system includes what a military force believes about its roles and responsibilities, what lessons it believes history demonstrates, beliefs about fundamentals derived from the experiences of the institution and its members, and beliefs about present or future capabilities. These beliefs all contribute to make doctrine, in the words of Dennis Drew and Donald Snow, "what we believe about the best way to do things."[4]

Because beliefs represent firmly held ideals, the interpretation of doctrine as a system of beliefs suggests that once established doctrine is not likely to change without something significant occurring to alter perceived best practices. To this point, a recent briefing by the US Army Combined Arms Doctrine Directorate stated, "the need to change [doctrine] only occurs when we find a better way to do something based on experience."[5] While this statement begins to suggest how doctrine evolves, the description of doctrine in the British Air and Space Power Doctrine manual does an excellent job describing the basis for doctrine and how doctrine changes. That manual highlights doctrine as a process in which inputs (national interest, military objectives, threats, politics, theory, history, and capabilities) lead to doctrine. This doctrine results in certain outputs (notably force structure and training), which in turn cause feedback (experiences, current combat, and training requirements). As feedback either validates or refutes doctrinal inputs, doctrine adjusts accordingly.[6] With each of these sources, occurrence of an experience of sufficient significance to alter perceptions is a necessary component to cause changes to doctrine.

The emergence of a vast number of doctrinal manuals in the years immediately following the First World War suggest that the war was a driving force behind doctrinal revision within the Army. As reference material for post-World War I doctrine, Army doctrine writers would have undoubtedly had access to all manner of official and unofficial histories from World War I and prior, wartime lessons learned, a wide range of personal experiences, previous doctrine, foreign source material, and theories from a range of writers including Jomini and Clausewitz. Evidence of such inputs are easily found in the 1923 *Field Service Regulations*, TR 440-15, or any of the other interwar doctrinal manuals referenced in chapter 2.[7] Yet, according to Schifferle, the doctrine developed by the US Army in the wake of World War I changed little from

1923 through 1940.[8] This is in spite of the interwar period involving a rapid pace of incremental technological development and the occurrence of a number of small wars, in locations such as Iraq, Nicaragua, and Afghanistan. To Muth, this lack of doctrinal advance in the face of evidence indicating potential shifts in the conduct of war likely represents a failure to prepare for the next war. However, according to the nature of doctrine explored in the preceding paragraphs, the lack of doctrinal change could be simply because the events that occurred were insufficiently compelling to challenge doctrinal beliefs. If a compelling cause for doctrinal change did not occur, then Muth's position that the doctrine was insufficient for the next war may be irrelevant to the debate over CGSS effectiveness. With respect to doctrine used at the CGSS, what mattered is not that the doctrine proved correct at a then unknown point in the future, rather that it was believed to be appropriate at the time it was taught.

The student papers reviewed for the study support the idea that the beliefs contained in interwar Army airpower doctrine were correct based on the information available at the time. In order to arrive at the conclusions presented in their papers, the students relied on a number of sources. Among these was a wide variety of World War I histories by American, British, French, and German authors.[9] However, the students did not confine their research to history. Much of their research relied upon the works of interwar airpower theorists, official reports of military operations and tests, board proceedings, military journals, aspects of emerging technology, and doctrinal publications.[10] This very process leaves the impression that the vast majority of the students were more than capable of arriving at reasonable and well-supported solutions. Based on that perception of their work, had their analysis of these sources resulted in beliefs divergent from period airpower doctrine, their research might indicate fault with the doctrine. However, despite the wide range of materials the students used to write their papers, their conclusions on the proper employment of airpower differed little from period doctrine.[11] This lack of difference between doctrine and student conclusions suggests that they believed the doctrine to be appropriate at the time.

While this study confines the comparison of papers to doctrine and theory to the subject of airpower, there is strong reason to believe that study of student papers on other topic areas would suggest the same conclusion of the appropriateness of period doctrine. The absence of large-scale combat operations or significantly large peacetime maneuvers

by the US Army through the mid-1930s serves to limit the experience base, which could challenge established beliefs over the best way to conduct operations. The lack of major military conflict between large powers in the interwar period meant there was likely little compelling evidence to present a serious challenge to the established beliefs within the US Army. While small-scale exercises, advancing technology, or influential theories may have hinted that period doctrine would prove insufficient in the next war, such events, items, or ideas likely were just not enough to put established US Army doctrine to the test and find it wanting. This apparent combination of belief in established doctrine and absence of convincing evidence contradictory to doctrine suggests Leavenworth was correct to rely upon available doctrine for its courses of instruction. After all, given a mission to provide graduates capable of conducting themselves as key members of division and larger units, it was reasonable for Leavenworth to teach its students the established doctrinal beliefs of how such units and their associated arms operate.

Critical Thinking at the Leavenworth Schools

Although the student papers suggest that the period doctrine was appropriate, criticism of the interwar CGSS also argues that rigid application of that doctrine served to limit the thinking of its students. To that end, Muth stated, "to constantly emphasize uniformity in judgment in a military school - as was done at Leavenworth - sooner or later stifles original and creative thinking."[12] Unfortunately, the content of the interwar student papers alone provided little evidence regarding the degree of doctrinal rigidity applied within the school. As a result, the papers do not directly answer to the broader debate of whether Leavenworth sought "factory products" or students who could find creative solutions to problems. Nevertheless, examination of the student papers in conjunction with Leavenworth's annual reports and academic schedules provide indicators of Leavenworth's priorities regarding critical thinking.

For the purposes of this examination, critical thinking shall be considered the process of questioning with a purpose in mind, gathering information pertinent to the question, applying interpretation and reasoning to that information, and drawing conclusions which have implications and consequences on the subject examined.[13] This examination also presumes that there is little dispute over the value of an officer corps capable of quality critical thinking or the need to develop and practice those skills.

While the student papers indicated varying degrees of proficiency at this reasoning process, the question at hand is not how well the students thought through the questions they asked, but whether or not Leavenworth encouraged the process. To that end, it is possible to state that the CGSS's requirement that students complete independent research during the second year of the two-year courses demonstrates that the school valued time spent practicing and developing critical thinking skills. After all, time blocked off for independent research is time that could have been dedicated to other courses of study. However, this statement may oversimplify the issue. The information gathered for this study actually indicates Leavenworth may have sacrificed writing - and in such, a form of critical thinking development - for the sake of increased graduate production and limited faculty size. To arrive at this conclusion the starting point is not the student papers themselves, but rather the information contained in the CGSS academic schedules and annual reports from the interwar period.

As discussed in Chapter 1, the CGSS annual reports described a number of changes to the Leavenworth curriculum during the interwar period. When the course reopened following the end of the First World War, it resumed the two-year model that was in place prior to the war. This two-year model was really two one-year courses. In the first year, officers attended the School of the Line, which focused on division operations. Selection for subsequent attendance at the General Staff School was, in theory, based on which officers performed best at the School of the Line. To address both the need for education of a large "hump" of Army officers and to allay concerns over non-selection for the General Staff School, the Army consolidated the courses into a one-year Command and General Staff School.[14] As the Army moved past the "hump" and sought to improve the quality of officer education, it returned the course to a two-year program beginning with students who entered the school in 1928. Unlike the previous two-year program, in the new format all students attended both years unless they failed to meet course standards. [15] When students entered the CGSS in fall of 1935, the course once again returned to a one-year format in order to maximize the number of graduates.[16] What is important to the debate on critical thinking at Leavenworth is not that the course format changed, rather two key factors identifiable within that change. The first of these factors, and the one already discussed, is that the need for officer production was the primary driving force behind changes to course duration. The second factor, and the point of consideration

for the remainder of this section, is the aspects of the curriculum that differed as the format changed.

Given that the primary focus of this study is the interwar student papers, the writing requirements of the various iterations of the interwar CGSS are a natural starting point for examination of the changes in curriculum. Other than two-year courses from 1928-1936, a review of available academic schedules and annual reports from 1919 through 1936 indicates that only one additional course mandated individual research and writing of any significance.[17] The academic schedule for the 1920-1921 General Staff School shows that students were required to complete three monographs.[18] The first was to be an independent work of between 3,000 and 10,000 words covering a topic of importance to the student. The second, 6,000 to 15,000 words analyzing a US division or corps action in 1918 or the Battle of Verdun in 1916. The final monograph was a group paper on United States military geography.[19] Interestingly, while the post-World War I General Staff School operated from 1919 through 1923, only those students in attendance for the 1920-1921 were subject to the monograph requirement.[20]

No clear statements describe why the school dropped the monographs for subsequent iterations of the General Staff School, but indications suggest it may have been the result of insufficient faculty. To this point, Leavenworth began the 1920-1921 academic year with 31 instructors for 150 students (94 in the School of the Line and 56 in the General Staff School).[21] The following year's courses hosted a total of 272 students with 197 in the first year course and 75 in the second year course. This near doubling of the student population took place with only a 50 percent increase in instructors.[22] This ratio of students to instructors at Leavenworth remained in excess of 5:1 for the 1922-1923 academic year.[23] By comparison, from 1920 to 1939 the student to instructor ratio at ACTS, which all interwar Army Air Corps officers attended prior to CGSS, never exceeded 2.5:1.[24] Since evaluation of papers covering a wide range of different topics with different conclusions potentially represents a more difficult task than evaluation of works on the same topic for which there is a doctrinal solution, the shifting student to instructor ratio was a possible factor in the decision to eliminate the monograph requirements.[25]

Regarding other changes to curriculum, the academic schedules of the General Staff School show that when the school eliminated student monographs - exercises in critical thinking - it maintained approximately the same number of map problems while also reducing

non-classroom instruction. The 1920-1921 class included a total of 46 map problems and 36 blocks of non-classroom instruction (terrain exercises or tactical rides).[26] For 1921-1922, the schedule had 48 map problems with only 24 terrain exercises or tactical rides.[27] The 1922-1923 General Staff School instruction included 43 map problems and 17 terrain exercises or tactical rides.[28] This shift away from writing and non-classroom instruction without a notable change in the number of map problems provides indications about the priorities for instruction at the school. If map problems and classroom instruction were indeed the creativity stifling experiences Muth argues, prioritization of those problems over other forms of instruction would show an institution less suited to developing and practicing critical thinking in its students. Conversely, if Schifferle is correct that the problems challenged students to arrive at independent, well-reasoned solutions to map problems, then the preference given to classroom instruction may not indicate lack of focus on critical thinking development.

Returning to the overall focus for this section, whether or not the interwar courses at Leavenworth encouraged critical thinking, the available information returns a mixed verdict. Since the school included individual research in the curriculum for eight of its interwar courses, this suggests school leadership placed value on the critical thinking process. However, the fact that school leadership allocated the available time to other methods of instruction during the other 21 courses from 1919 through 1936 might overshadow that positive mark. Also potentially speaking against the school, there is a notable correlation between the Army's desire for increased graduate production and the presence or absence of writing requirements.[29] While these factors point toward the school placing less value on writing requirements than doctrinal instruction, they do not touch on the conduct of the doctrinal instruction (most notably the map problems). As a result, examination of the student papers cannot counter criticisms that the school was more interested in student adherence to doctrine than critical thinking, particularly in graded map problems. Adequately addressing that criticism requires examination of the doctrinal instruction. Of course, such examinations by Nenninger, Schifferle, and Muth have intensified rather than resolved debate.

Conclusions on Interwar CGSS Effectiveness

This chapter focused on two key criticisms of the instruction at Leavenworth during the interwar period. First, that the school was ineffective due to a reliance on faulty doctrinal principles. Second, that

by rejecting student solutions that contradicted established doctrine, Leavenworth stifled rather than developed critical thinking amongst its students. On doctrine, the close match between interwar US Army doctrine and the solutions contained within the student papers suggests the doctrine was not wrong, even if the doctrine proved inappropriate at the outbreak of World War II. If the interwar doctrine was appropriate for the time, then Leavenworth, as a key component of officer education would have been wrong if it did not teach that doctrine. There is, of course, no suggestion in available literature that the school failed to instruct students on period doctrine. Indeed the criticism of the school is the opposite - that it overemphasized doctrine. As a result, this study concludes that Leavenworth was effective at ensuring its graduates understood US Army doctrine - doctrine that was appropriate for the time.

Unfortunately, effectiveness at doctrinal instruction may have come at the expense of critical thinking development. Even though the papers examined in this study displayed critical thinking, the requirement to produce papers during the interwar courses was the exception rather than the norm. Although Leavenworth's apparent preference for doctrinal instruction over writing suggests the school may not have given priority to critical thinking development, it is not reasonable to label Leavenworth as ineffective at critical thinking development on that basis alone. Ultimately, the Leavenworth's effectiveness at critical thinking development comes down to the ongoing debate over classroom instruction and the rigidity of doctrinal application through school solutions.

Application to the Modern CGSS

Even though this study returned mixed results on the effectiveness of the Leavenworth schools during the interwar period, the information still has applicability to the debate over the present-day CGSS. The interwar CGSS existed at a time during which circumstances served to pressure the CGSS to increase graduate production. When pressured for increased production, when faced with limited resources (faculty in particular), or both, the school dropped writing requirements from the curriculum in favor of increased classroom instruction. Although those actions do not mean that the school was unconcerned with critical thinking development, dropping exercises that supported critical thinking development in favor of classroom instruction of questionable value at the same indicates a potential weakness of the interwar institution.

From that, the lesson for the modern CGSS is not that it should focus on writing or that time spent in the classroom does not promote critical thinking development. Rather, the takeaway from the interwar experience is that the school must ensure that whatever the driver of changes to curriculum, those courses which remain should not sacrifice critical thinking. Given the combination of Army downsizing, limitations on resources, and reductions in the number of attendees at the resident CGSS, now may be the ideal time for the school to ensure its curriculum promotes critical and creative thinking rather than graduates who are factory products.

Recommendations for Further Study

This study originated from a recommendation to seek out information residing in the hundreds of research papers authored by Leavenworth students during the 1930s. From that recommendation, research focused on an examination of the differences between student perceptions of airpower and interwar airpower doctrine and theory. As more information was uncovered during the course of that research, the scope of the study expanded to the debate over effectiveness of the Command and General Staff School. Yet, this expansion also brought to light a number of related items worthy of additional research that, unfortunately, did not fit within the constraints of available time and intended scope of this study. What follows are recommended areas for additional research.

1. A number of student research papers cover motorization, mechanization, tanks, and other topics related to technologies emerging during the interwar period. Research into student opinions on those topics could provide valuable information or insights. This includes whether or not those students appeared to agree with period doctrine as this paper speculates they would.

2. Whether or not clear linkages exist between opinions expressed by a student in his paper and later actions held by that student, particularly during World War II.

3. Examination into the historical ratios of students to instructors at Leavenworth and the apparent effect of those ratios on the quality of instruction, if any. Such study could also extend to other Army schools.

Notes

1. Jörg Muth, *Command Culture* (Denton, Texas: University of North Texas Press, 2011), 126.

2. US Department of Defense, Joint Publication 1-02, *Department of Defense Dictionary of Military and Associated Terms*, (15 Mar 2014), 95, http://www.dtic.mil/ doctrine/new_pubs/jp1_02.pdf (accessed 7 April 2014).

3. Aaron P. Jackson, *The Roots of Military Doctrine* (Fort Leavenworth, KS: Combat Studies Institute Press, 2013), 6, http://usacac.army.mil/Cac2/cgsc/carl/ download/csipubs/RootsOfMilitaryDoctrine.pdf (accessed 8 April 2014); U.K. Ministry of Defense, Army Doctrine Primer, AC 71954 (May 2011), iii and Part I Title Page, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/33693/20110519ADP_Army_Doctrine_Primer pdf.pdf (accessed 7 April 2014); U.S. Department of Defense, Joint Publication 1, *Doctrine for the Armed Forces of the United States* (25 Mar 2013), I-1, http://www.dtic.mil/ doctrine/new_pubs/jp1.pdf (accessed 7 April 2014).

4. Dennis M. Drew and Donald M. Snow, *Making Strategy: An Introduction to National Security Processes and Problems* (Maxwell Air Force Base, Alabama: 1988), 163. http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA422016 (accessed 9 April 2014).

5. US Army Combined Arms Doctrine Directorate, "Doctrine Development Philosophy and Practice," August 2008 (Slides used as part of a presentation to the CGSS Class 14-01 Art of War Scholars Program in 2014), Slide 21.

6. UK Ministry of Defense, The Air Staff, British Air and Space Power Doctrine, AP 3000, 4th ed., 3.11.4. http://www.raf.mod.uk/rafcms/mediafiles/9E435312_ 5056_A318_A88F14CF6F4FC6CE.pdf (accessed 07 April 2014).

7. War Department, *Field Service Regulations (1923)* (Washington, DC: Government Printing Office, 1924); War Department, Training Regulation 440-15, *Fundamental Principles for the Employment of the Air Service* (Washington, DC: Government Printing Office, 1926), http://www.au.af.mil/au/awc/awcgate/ documents/tr440-15.htm (accessed 1 January 2014).

8. Peter J. Schifferle, *America's School for War*, (Lawrence, KS: The University of Kansas Press, 2010), 98-99 and 192-193.

9. See Appendix E.

10. See Appendices E, F, G, and H.

11. See Chapter 3.

12. Muth, *Command Culture*, 190.

13. Richard Paul and Linda Elder, *The Miniature Guide to Critical Thinking*, 4th ed. (The Foundation for Critical Thinking, 2006), 4-7.

14. Annual Report, 1923, 7.

15. Annual Report, 1929, 8.

16. Annual Report, 1936, 13. The commandant stated that the Army needed to make clear the true intent of the school. If the point was to produce the largest number of graduates he stated that the one-year format could do so. However his words clearly indicate that he was in favor of more selective instruction of the best officers through a return to a two-year format.

17. Statement based upon a full review of all available Annual Reports, 1920 through 1936, Leavenworth Course Schedules, 1919 through 1937, and available student papers. Refer to the bibliography for complete citations of all Annual Reports and Course Schedules consulted in this study. Complete schedules were not located for the following courses: School of the Line, 1919-1920 and 1920-1921; One-year CGSS, 1926-1927, 1935-1936; Two-year CGSS, 1931-1932 (both courses), 1934-1935 (both courses), and 1935-1936 (second year).

18. The US Army, the General Service Schools, Course for the General Staff School, 1920-1921 (26 June 1920), 16 and 19, Adobe pdf provided by the Combined Arms Research Library. Hereafter, references to Leavenworth academic course schedules cited as abbreviated course title, Schedule, year, and page(s) if applicable. In this format, this citation reads: GSS Schedule, 1920-1921, 16 and 19.

19. Annual Report, 1921, 20. It must be noted that no evidence was located to prove whether or not these monographs required in the academic schedule were actually written. The Combined Arms Research Library did not locate any student monographs on file other than those written from 1930-1936. Additionally, the 1921 Annual Report (written after the 1920-1921 classes ended) suggests some students did not complete all requirements due to the need for extra instructors at the School of the Line. The report does not state which requirements were dropped for those students. On page 20 the report states, "The Staff School course for the year 1920-1921 was brought to a successful

conclusion practically as originally planned, those officers who were not called on for instruction work taking the entire course in all its details, those required to perform instruction work omitting only such portions as were absolutely necessary and as interfered with their instruction duties."

20. GSS Schedule, 1919-20; GSS Schedule 1921-22; GSS Schedule 1922-23.

21. Annual Report, 1921, 3-5.

22. Annual Report, 1922, 19-22.

23. Annual Report, 1923, 3-5.

24. Robert T. Finney, *History of the Air Corps Tactical School 1920-1940* (Washington, DC: Center for Air Force History, 1992), 99-132.

25. On note, when individual research requirements returned to the school for the second-year courses which graduated from 1930-1936, the student to instructor ratios at Leavenworth were 3.8:1 or less. Ratios for the 1920-1921, 1921-1922, and 1922-1923 academic years were 4.8:1, 5.8:1, and 5.4:1, respectively. Refer to Appendix I for additional information.

26. GSS schedule, 1920-1921, 3-4.

27. GSS Schedule, 1921-1922, 65-79.

28. GSS Schedule, 1922-1923, 70-84.

29. See table in Appendix I.

Appendix A
Air Corps Graduates of the Command and General Staff School Two-Year Courses, 1930-1936

CGSS Attendance	Name	ASTS/ACTS Attendance[1]	Highest WWII Rank[2]	Paper Used in Study
1928-1930[3]	Brett, George H.	1927-1928	LTG	Yes
	Hanley, Thomas J.	1920-1921	COL	No - Paper on unrelated topic
	Richards, Harrison H.C.	1927-1929	COL	Yes
1929-1931[4]	Ballard, Richard H.	1927-1928	COL	Yes
	Brady, Francis M.	1922-1923	BG	Yes
	Connell, Carl W.	1928-1929	BG	Yes
	Duncan, Asa N.	1928-1929	BG	Yes
	Hill, Edmund W.	1922-1923	MG	Yes
	Lackland, Frank D.	1928-1929	BG	No - Paper on unrelated topic
	Peabody, Hume	1928-1929	BG	No - Paper on unrelated topic
	Rudolph, Jacob H.	1928-1929	BG	Yes
	Stone, Laurence F.	1927-1928	Died in 1940	Yes
1930-1932[5]	Dixon, Vincent B.	1928-1929	COL	Yes
	Eglin, Frederick I.	1929-1930	Died in 1937	Yes
	Harvey, Lloyd L.	1925-1926	Died in 1935	Yes
	Ladd, Arthur K.	1929-1930	Died in 1935	Yes
	Miller, Henry J.F.	1929-1930	MG	Yes
	Moore, John I.	1929-1930	COL	No - Paper on unrelated topic
	Phillips, Charles T.	1921-1922	COL	Yes
	Stratemeyer, George E.	1929-1930	LTG	No - Paper not on file
	Weir, Benjamin G.	1929-1930	BG	Yes
1931-1933[6]	Beam, Rosenham	1922-1923	BG	Yes
	Bissell, Clayton L.	1920-1921	MG	No - Paper on unrelated topic
	Cousins, Ralph P.	1930-1931	MG	No - Paper on unrelated topic
	Duncan, Early E.W.	1925-1926	BG	Yes
	Lynd, William E.	1923-1924	MG	Yes
	Oldfield, Charles B.	1930-1931	COL	Yes
1932-1934[7]	Adler, Elmer e.	1931-1932	MG	Yes
	Burwell, Harvey S.	1931-1932	BG	Yes
	Echols, Oliver P.	1931-1932	MG	No - Paper on unrelated topic
	Emmons, Delos C.	1931-1932	LTG	Yes
	Ford, Christopher W.	1922-1923	LTC	No - Paper not on file
	Hale, Willis H.	1927-1928	MG	Yes
	Hickey, Lawrence P.	1931-1932	COL	Yes
	Miller, Lester T.	1930-1931	MG	No - Paper not on file
	Streett, St. Clair	1925-1926	MG	Yes

1933-1935[8]	Butler, William O.	1931-1932	MG	No - Paper not on file
	Davidson, Howard C.	1932-1933	MG	Yes
	DeFord, Earl H.	1928-1929	BG	Yes
	Edwards, Idwal H.	1930-1931	MG	Yes
	Ellis, Sam L.	1932-1933	COL	Yes
	Harmon, Hubert R.	1932-1933	MG	No - Paper not on file
	Hopkins, Hubert V.	1922-1923	COL	No - Paper not on file
	Johnson, George P.	1922-1923	COL	Yes
	McDonnell, John C.	1932-1933	BG	No - Paper not on file
	Morgan, John R.	1932-1933	COL	No - Paper not on file
	Olds, Robert	1927-1928	MG	Yes
	Paul, Frank M.	1923-1933	COL	Yes
	Smith, Lowell H.	1923-1933	COL	Yes
	Walker, Kenneth N.	1928-1929	BG	Yes
	Wooten, Ralph H.	1923-1924	MG	No - Paper not on file
1934-1936[9]	Banfill, Charles Y.	1933-1934	BG	Yes
	Barker, John DeF.	1929-1930	BG	No - Paper not on file
	Birnn, Roland	1933-1934	COL	No - Paper not on file
	Breene, Robert G.	1930-1931	MG	No - Paper not on file
	Burt, Byron T.	1933-1934	COL	No - Paper not on file
	Craig, Howard A.	1931-1932	MG	Yes
	Curry, James T.	1929-1930	LTC	No - Paper on unrelated topic
	Hodges, James P.	1929-1930	MG	No - Paper not on file
	Johnson, Harry A.	1932-1933	BG	No - Paper not on file
	McDaniel, Arthur B.	1933-1934	BG	No - Paper not on file
	Meloy, Vincent J.	1933-1934	BG	Yes
	Palmer, George M.	1933-1934	COL	Yes
	Ramey, Howard K.	1933-1934	BG	No - Paper not on file
	Robinson, Charles McK.	1929-1930	LTC	Yes
	Wash, Carlyle H.	1931-1932	BG	No - Paper not on file
	Watson, Dayton D.	1933-1934	Died in 1939	Yes

1. Robert T. Finney, History of the Air Corps Tactical School 1920-1940 (1955; repr., Air Fo*rce History and Museums Program, 1998), Appendix.*

2. The Adjutant General's Office, Official Army Register (Washington, DC: Government Printing Office, 1946), https://archive.org/ details/ officialarmyregi1946unit (accessed 7 November 2013). Note: The 1946 Register was the primary source for information on the highest rank attained by each officer during World War II. All registers from 1935-1946 were consulted to determine those officers who retired or died prior to the end of the war. Access to the additional army lists consulted is through the same url as shown for the 1946 Register with a different year in place of 1946.

3. Annual Report, 1930, 3-5.

4. Annual Report, 1931, 3-5.

5. Annual Report, 1932, 4-6.

6. Annual Report, 1933, 4-6.

7. Annual Report, 1934, 4-6.

8. Annual Report, 1935, 4-6.

9. Annual Report, 1936, 3-5.

Appendix B
Non-Air Corps Graduates of the Command and General Staff School for Two-Year Courses, 1930-139, With Papers Used in this Study

CGSS Attendance	Name	Army Branch or Military Service	Highest WWII Rank[1]
1928-1930[2]	Cotter, Clarence E.	Coastal Artillery	COL
	Foote, William C.	Coastal Artillery	COL
	Gibson, Richmond T.	Coastal Artillery	COL
	Rehmann, Edward J.	Infantry	COL
	Wallington, Edward C.	Chemical	COL
1929-1931[3]	Burr, William E.	Field Artillery	COL
	Finley, C.R.	Coastal Artillery	COL
	Hill, Ira B.	Coastal Artillery	COL
	Russell, Carl A.	Infantry	BG
1930-1932[4]	Bathurst, Robert M.	Field Artillery	BG
	Bourne, Louis M.	USMC	Unknown
	Duvall, Ward E.	Coastal Artillery	COL
	Hall, Vernon W.	Coastal Artillery	COL
	Hood, John H.	Coastal Artillery	COL
1931-1933[5]	Englehart, Alva F.	Coastal Artillery	COL
	Epling, Fenton G.	Coastal Artillery	COL
	Ladd, Rolla V.	Coastal Artillery	COL
1932-1934[6]	Evans, William T.	USMC	Unknown
	Ford, Elbert L.	Ordinance	BG
	Harmon, Benjamin F.	Coastal Artillery	Died in 1936
	Irvin, William R.	Cavalry	COL
1933-1935[7]	Boyd, Leonard R.	Infantry	BG
	Foltz, Christian	Coastal Artillery	COL
1934-1936[8]	Baker, Paul T.	Infantry	COL
	Barnes, George T.	Quartermaster	COL
	Campbell, Alexander H.	Coastal Artillery	COL
	Shea, George D.	Field Artillery	COL

1. The Adjutant General's Office, Official Army Register (Washington, DC: Government Printing Office, 1946), https://archive.org/details/officialarmyregi1946unit (accessed 7 November 2013). Note: The 1946 Register was the primary source for information on the highest rank attained by each officer during World War II. All registers from 1935-1946 were consulted to determine those officers who retired or died prior to the end of the war.

Access to the additional army lists consulted is through the same url as shown for the 1946 Register with a different year in place of 1946.

2. Annual Report, 1930, 3-5.

3. Annual Report, 1931, 3-5.

4. Annual Report, 1932, 4-6.

5. Annual Report, 1933, 4-6.

6. Annual Report, 1934, 4-6.

7. Annual Report, 1935, 4-6.

8. Annual Report, 1936, 3-5.

Appendix C
Select List of References Used in the Student Papers Consulted for this Study[1]

Theory

Source	Number of Student Papers Citing the Source
Air Defence, E.B. Ashmore	11
Air Power and the Cities, J.M. Spaight	2
Air Power and War Rights, J. M. Spaight	1
Air Warfare, William C. Sherman	7
Air Warfare,[2] Guilio Douhet	3
Basic Principles of Air Warfare, "Squadron Leader"	5
Paris: Or, the Future of War, B.H. Liddell Hart	3
Winged Defense, William Mitchell	1

History

Source	Number of Student Papers Citing the Source
Allenby's Final Triumph, W.T. Massey	7
Allenby of Armageddon, Raymond Savage	5
The Defence of London, A. Rawlinson	9
"Final Report of Chief of Air Service, AEF"	6
Five Years in Turkey, Limon von Sanders	5
The German Air Force in the Great War, Georg P. Neumann	5
German Air Raids on Great Britain, Joseph Morris	5

Germany's War in the Air, Ernest W. von Hoeppner	7
Der Grosse Krieg, Max Schwarte	6
Ludendorff's Own Story, Erick Ludendorff	8
The Struggle in the Air, 1914-1918, Charles C. Turner	5
The War in the Air, W. Raleigh (Vol. 1) and H.A. Jones (II-VI)	9

Doctrine, Reports, Military Journals, and Official Publication[3]

Source	**Number of Student Papers Citing the Source**
The Air Force, ACTS Manual	8
Attack Aviation, ACTS Manual	12
Bombardment Aviation, ACTS Manual	6
Coast Artillery Journal[4]	8
Field Service Regulations, US Army Publication	17
"Marching Organization and Air Effectiveness," German Report	5
Observation Aviation, ACTS Manual	5
Tactics and Techniques of the Air Corps, CGSS Publication	10
Training Regulation 435-50: Tactical Employment of Anti-Aircraft Artillery, US Army Publication	8

1. Data compiled from the bibliographic information listed in each of the 69 student papers consulted for this study. References are included on this list either due to appearance in at least five student papers or on the basis of the prominence of the author from a modern perspective (i.e. Mitchell, Douhet, Spaight).

2. Students reference a publication produced by the Office of the Chief of the Air Corps titled "Air Warfare" by Douhet. This was a translated selection of Douhet's writings most probably from The *Command of the Air*.

3. Student bibliographies are not always clear as to the date of publication when citing various manuals. The total reflects the total number of papers that reference the manuals listed, regardless of publication year.

4. Although no single article from the Coast Artillery Journal is referenced in more than two papers, a total of 23 articles are cited in *eight separate papers*.

Appendix D
Doctrinal References Cited in Multiple Interwar Student Papers[1]

Numbers appearing in parentheses indicate the number of papers that cite the source.

US Army Regulations

Field Service Regulations, 1923	(17)
Training Regulation (TR) 300-5: Anitaircraft Combat, 1928	(4)
TR 420-130: Infantry, Combat Principles, The Machine Gun Platoon	(2)
TR 435-30: Tactical Employment of Anti-aircraft Artillery	(8)
TR 440-15: Fundamental Principles for the Employment of the Air Service	(2)

ASTS/ACTS Publications

The Air Force		Bombardment Aviation	
1930	(2)	1927-1928	(1)
1931	(3)	1929-1930	(1)
1934	(1)	1931	(4)
Unknown Year	(2)	Observation Aviation	
Attack Aviation		1930	(3)
1928	(2)	1934	(2)
1929	(1)	Pursuit Aviation	
1930	(3)	1926	(1)
1933	(1)	1927-1928	(1)
1934	(1)	History of the Air Corps	
1935	(1)	1927	(4)
Unknown Year	(3)	Air Logistics, 1935	(2)

Other Publications

Tactics and Techniques of the Air Corps, CGSS Publication	
1929	(8)
1935	(3)
Army Extension Course, Air Force, Special Text No. 189	(3)
Training Manual Number 1, The Advanced Flying School, 1926	(2)
Training Manual Number 2, The Advanced Flying School, 1927	(2)

1. Data compiled from examination of the bibliographies of the 69 student papers consulted for this thesis.

Appendix E
Historical References Cited in Multiple Interwar Student Papers[1]

Numbers appearing in parentheses indicate the number of papers that cite the source.

Air Defence, E.B. Ashmore[2]	(11)
Allenby's Final Triumph, W.T. Massey	(7)
Allenby of Armageddon, Raymond Savage	(5)
L'aviation militaire et la guerre aérienne, Marcel Jauneaud	(2)
The Defence of London, A. Rawlinson	(9)
"Final Report of Chief of Air Service, AEF"	(6)
Five Years in Turkey, Limon von Sanders	(5)
The German Air Force in the Great War, Georg P. Neumann	(5)
German Air Raids on Great Britain, Joseph Morris	(5)
The German General Staff and its Decisions, Erich von Falkenhayn	(2)
Germany's War in the Air, Ernest W. von Hoeppner	(7)
Der Grosse Krieg, Max Schwarte	(6)
Ludendorff's Own Story, Erich Ludendorff	(8)
The March on Paris, Alexander von Kluck	(3)
Mémoires du Général Gallieni, Joseph-Simon Gallieni	(3)
Military Operations, France and Belgium, 1914, James E. Edmonds	(2)
The Official History of Australia in the War of 1914-1918	(3)
"Organization of the German Air Service," A.E.F. G.H.Q.	(4)
The Palestine Campaigns, Archibald Percival Wavell	(4)
The Real War, 1914-1918, B.H. Liddell Hart	(4)
The Struggle in the Air, 1914-1918, Charles C. Turner	(5)
The War in the Air, W. Raleigh (Vol. 1) and H.A. Jones (II-VI)	(9)

1. Data compiled from examination of the bibliographies of the 69 student papers consulted for this thesis.

2. Based on the organization of the book as both a history of air defense efforts in London during World War I and recommendations for the proper conduct of air defense, this book is included in this appendix and the theory appendix.

Appendix F
Airpower Theory References Cited in Multiple Interwar Student Papers[1]

Numbers appearing in parentheses indicate the number of papers that cite the source.

Aircraft in Warfare, F.W. Lanchester	(2)
Air Defence, E.B. Ashmore	(11)
Air Power and the Cities, J.M. Spaight	(2)
Air Warfare[2], Guilio Douhet	(3)
Air Warfare, William C. Sherman	(7)
Aviation in Peace and War, F.H. Sykes	(3)
Basic Principles of Air Warfare, "Squadron Leader"	(5)
Paris: Or, the Future of War, B.H. Liddell Hart	(3)
The Role of Defensive Pursuit, Claire Chennault	(2)
The Strategy and Tactics of Air Fighting, Oliver Stewart	(2)
Winged Defense, William Mitchell	(1)[3]

1. Data compiled from examination of the bibliographies of the 69 student papers consulted for this thesis.

2. Students reference a publication produced by the Office of the Chief of the Air Corps titled "Air Warfare" by Douhet. This was a translated selection of Douhet's writings most probably from *The Command of the Air*. Of note, no student references to Douhet occur until the 1934 papers.

3. Although not cited in multiple student papers, Mitchell's work is included on this list due to his prominence within American aviation history.

Appendix G
Official Reports and Other Miscellaneous References Cited in Multiple Interwar Student Papers[1]

Numbers appearing in parentheses indicate the number of papers that cite the source.

The Air Annual of the British Empire		(10)
1929	(2)	
1930	(2)	
1931-1932	(2)	
1933-1934	(3)	
1934-1935	(1)	
The Air Corps Newsletter		(3)
Antiaircraft Defense, The Kirtland Board, 1925		(2)
Coast Artillery Journal		(8)
Conference on Antiaircraft Defense, French War Department, 1923		(5)
Foreign Field Service Regulations		(11)
British	(3)	
French	(4)	
German	(4)	
Infantry Defense Against Airplanes (Conference), 1929		(2)
Joint Action of the Army and Navy, The Joint Board, 1927		(4)
Marching Organization and Air Effectiveness, Waldemar Pfeifer		(5)
Preparation of Antiaircraft Defense Plans, War Department, Office of the Chief of Coast Artillery, July 15, 1928		(2)
Report of Air-Ground Maneuvers, San Antonio, 1927		(4)
Report of Antiaircraft Exercises, Aberdeen Proving Ground		(8)
1927	(2)	
1928	(3)	
1929	(2)	
1930	(1)	
Report of the President's Aircraft Board, 1925		(4)

1. Data compiled from examination of the bibliographies of the 69 student papers consulted for this thesis.

Appendix H
Air Corps Tactical School Publications and Availability

Items followed with [a] were cited in interwar student publications.

Items followed with [b] are known to still exist based on various online catalogs.

Items followed with [c] were able to be accessed for this study.

Bombardment Aviation

1925[b] (1 at USAFA)

1926[b, c]

1927-1928[a]

1929-1930[a]

1930[b] (1 at Arkansas State)

1931[a]

1933[b, c]

1935[b, c]

Attack Aviation

1925[b] (1 copy at USAFA)

1928[a]

1929[a]

1930[a, b] (1 at USAFA, 1 at Marshall Lib., 1 at UW)

1933[a]

1934[a]

1935[a, b] (1 copy at the Smithsonian)

Pursuit Aviation

1925[b] (1 copy at USAFA)

1926[a, b, c]

1927-1928[a, b] (1 copy at the Smithsonian)

1933[b] (1 at AHEC, 1 at the Smithsonian)

Observation Aviation

1930[a, b] (1 at Sill, 1 at UW)

1934[a]

Antiaircraft Defense

1927[b, c]

The Air Force

1930[a]

1931[a, b] (1 copy at the Smithsonian)

1934[a]

Balloons and Airships

1932[b] (1 at CARL closed stacks)

A Brief history of the Air Corps

1927[a]

Antiaircraft Artillery

1924[b] (1 at USAFA)

Air Logistics

1935[a]

Appendix I
Interwar Leavenworth Student, Instructor, and Graduate Numbers by Academic Year and Course

	1919-1920	1920-1921	1921-1922	1922-1923	1923-1924	1924-1925	1925-1926	1926-1927	1927-1928
Students Per Class									
School of the Line	99	94	197						
General Staff School	49	56	75	111					
CGSS (1 year)				154	251	263	248	204	212
CGSS (1st Year)									
CGSS (2nd Year)									
Annual Student Total	148	150	272	265	251	263	248	204	212
Number of Instructors[1]	32	31	47	49	72	76	78	59	57
Student:Instructor Ratio	4.6:1	4.8:1	5.8:1	5.4:1	3.5:1	3.5:1	3.2:1	3.5:1	3.7:1
Annual Graduate Production[2]	82	80	154	261	249	259	245	200	200

	1928-1929	1929-1930	1930-1931	1931-1932	1932-1933	1933-1934	1934-1935	1935-1936
Students Per Class								
School of the Line								
General Staff School								
CGSS (1 year)	89							122
CGSS (1st Year)	117	126	118	133	121	120	122	
CGSS (2nd Year)		112	126	118	125	118	118	122
Annual Student Total	206	238	244	251	246	238	240	244
Number of Instructors[1]	60	62	69	69	64	63	64	69
Student:Instructor Ratio	3.4:1	3.8:1	3.5:1	3.6:1	3.8:1	3.8:1	3.8:1	3.5:1
Annual Graduate Production[2]	86	109	124	116	125	118	118	242

1. Instructor total does not include positions such as commandant, assistant commandant, school directors, secretary, librarian, adjutant, publications, or correspondence course leads.

2. Total number of graduates for all courses less those students selected to remain at Leavenworth for another year of instruction; for the two-year courses of 1928-1936 only graduates of the second year are included.

All data for this appendix was taken from the Command and General Staff School Annual Reports from 1920 to 1936. Those reports are accessible through the Combined Arms Research Library website. Links to each year's report are listed in the bibliography.

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Cotter, Clarence E. "Antiaircraft Defense of the Zone of the Interior," 17 June 1930, CGSC Student Papers, 1930-1936, Combined Arms Research Library Digital Library, Fort Leavenworth, KS.

Foote, William C. "Antiaircraft Defense of Infantry and Cavalry Divisions," 1 June 1930, CGSC Student Papers, 1930-1936, Combined Arms Research Library Digital Library, Fort Leavenworth, KS.

Gibson, Richmond T. "A study of the best method of cooperation between the Navy, the Air Corps, and the Coast Artillery in harbor defense," 1930, CGSC Student Papers, 1930-1936, Combined Arms Research Library Digital Library, Fort Leavenworth, KS.

Rehmann, Edward J. "A Study of the Effect of the Development of Aircraft on Troop movements and operations, with particular reference to night movements," 2 June 1930, CGSC Student Papers, 1930-1936, Combined Arms Research Library Digital Library, Fort Leavenworth, KS.

Richards, Harrison H.C. "Effect on aerial operation of the greater use of night movements by ground troops as a result of development of aircraft," 5 June 1930, CGSC Student Papers, 1930-1936, Combined Arms Research Library Digital Library, Fort Leavenworth, KS.

Wallington, Edward C. "A study of the tactical uses of smoke," 1930, CGSC Student Papers, 1930-1936, Combined Arms Research Library Digital Library, Fort Leavenworth, KS.

1931

Ballard, Richard H. "A Study of Commercial Aviation and its Growth," 25 May 1931, CGSC Student Papers, 1930-1936, Combined Arms Research Library Digital Library, Fort Leavenworth, KS.

Brady, Francis M. "Study of the effect of aviation on the strategical and tactical movement of troops," 1931, CGSC Student Papers, 1930-1936, Combined Arms Research Library Digital Library, Fort Leavenworth, KS.

Burr, William E. “A Discussion of the All-Purpose gun from a tactical point of view,” 12 June 1931, CGSC Student Papers, 1930-1936, Combined Arms Research Library Digital Library, Fort Leavenworth, KS.

Connell, Carl W. “ Air operations connected with the action of the French Tenth Army, 18-23 July, 1918,” 1931, CGSC Student Papers, 1930-1936, Combined Arms Research Library Digital Library, Fort Leavenworth, KS.

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Russell, Carl A. “A study of the effect of the development of aircraft upon troop movements, with particular reference to night movements and operations,” 1931, CGSC Student Papers, 1930-1936, Combined Arms Research Library Digital Library, Fort Leavenworth, KS.

Stone, Laurence F. “A study of the effect of aircraft on the present system of the development and approach march of ground units and the effect of aircraft on the present system of supply and transportation,” 1931, CGSC Student Papers, 1930-1936, Combined Arms Research Library

Digital Library, Fort Leavenworth, KS.

1932

Bathurst, Robert M. "Study of the methods of training Air Observers," 1932, CGSC Student Papers, 1930-1936, Combined Arms Research Library Digital Library, Fort Leavenworth, KS.

Bourne, Louis M. Jr. "Aviation in Coast Defense," 31 May 1932, CGSC Student Papers, 1930-1936, Combined Arms Research Library Digital Library, Fort Leavenworth, KS.

Dixon, Vincent B. "Principles governing the selection of the proper air force objectives," 1932, CGSC Student Papers, 1930-1936, Combined Arms Research Library Digital Library, Fort Leavenworth, KS.

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Eglin, Frederick I. "A Study: Is attack aviation necessary as a distinct type of aviation?" 1932, CGSC Student Papers, 1930-1936, Combined Arms Research Library Digital Library, Fort Leavenworth, KS.

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Harvey, Lloyd L. "Attack Aviation," 1932, CGSC Student Papers, 1930-1936, Combined Arms Research Library Digital Library, Fort Leavenworth, KS.

Hood, John H. "To what extent should antiaircraft artillery be relied upon for the defense of ground troops, cities and fortifications against aircraft," 31 May 1932, CGSC Student Papers, 1930-1936, Combined Arms Research Library Digital Library, Fort Leavenworth, KS.

Ladd, Arthur K. "An estimate of the powers and limitations of commercial aviation, in relation to National Defense," 1932, CGSC Student Papers, 1930-1936, Combined Arms Research Library Digital Library, Fort Leavenworth, KS.

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1933

Beam, Rosenham. "Air Operation in the Palestine Campaign Particularly after the 3rd Battle of Gaza," 15 May 1933, CGSC Student Papers, 1930-1936, Combined Arms Research Library Digital Library, Fort Leavenworth, KS.

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