

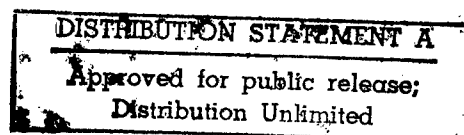
BEYOND THE BATTLE LINE:
US AIR ATTACK THEORY AND DOCTRINE, 1919-1941

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ABSTRACT

This study examines the development and usefulness of US air attack theory and doctrine during the interwar period, 1919-1941. This period represents more than twenty years of development in US Air Corps attack theory and doctrine. It was the first peacetime period of such development. Attack aviation during this time was a branch of aviation used to provide direct and indirect combat support to ground forces in the form of machine gun strafing, light bombing, and chemical attacks.

From the earliest origins, attack theory and doctrine evolved primarily along two paths -- direct and indirect support of ground and air force objectives. The direct support approach was based on fundamental beliefs by the Army that attack aviation was an auxiliary combat arm, to be used directly on the battlefield against ground forces and to further the ground campaign plan.

The indirect support approach, or air interdiction, was derived from the fundamental beliefs by the Air Corps that attack aviation was best used beyond the battle line and artillery range, against targets more vulnerable and less heavily defended, to further both the Air Force mission and the ground support mission.

The Air Corps Tactical School advocated the indirect support approach and the subsequent evolution and logic in attack doctrine flowed from this approach. Air Corps theory and doctrine called for attack aviation to be used beyond the battle line. Aircraft were less vulnerable to ground fire and could be used to delay and disrupt enemy ground forces. Less cooperation was required with the ground forces while more cooperation was needed with other aviation branches, especially pursuit aviation. As attack doctrine evolved, range and hardened targets became problematic for the single-engine attack plane. The indirect support approach, supporting both the Air Force and Army missions, required an aircraft with increased range and payload. Subsequently, the attack-bomber, or light bomber was introduced to meet the attack requirement. What appeared to be neglect, and the overly strong influence of strategic bombing doctrine, was more accurately, an evolution in the development of attack aviation doctrine.

Thus, attack theory and doctrine in terms of the indirect support approach, was adequately developed to be useful at the start of WWII. The use of light and medium bombers in North Africa showed the effectiveness of air interdiction and the indirect approach. Attack aviation had, indeed, established itself before WWII. Attack aviation, in the form of close air support, would have to wait for the lessons of WWII.

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Chapter 1

Introduction

Principal Research Question

The purpose of this study is to examine the evolution of US air attack theory and doctrine in the interwar period, 1919-1941, and to provide insight to future military planners. This period is particularly important since early thinking about attack aviation, and aviation in general, set the stage for development during WWII. This study examines the relationship between attack theory and doctrine, and the practical application of doctrine by the Air Corps in preparing for war. Therefore, the central research question is: Was US Air Corps attack theory and doctrine adequately developed during the interwar years to be useful at the start of WWII? The focus of the study is on theory and doctrine and whether they were tested and properly examined in training, maneuvers, and the lessons of war. Additionally, the study examines how doctrine was formalized and disseminated during the interwar years.

Background and Significance of the Problem

The interwar period represents more than twenty years of development work in US Air Corps attack theory and doctrine. It was the first peacetime period of such development. The body of work perhaps evolved slowly, but nevertheless there were marked changes in air attack thinking. However, the problems in solidifying the thinking into an Army-Air Corps wide doctrine appear to be significant. Lee Kennett and others have suggested that US attack theory and doctrine were largely neglected and little that was learned during the

interwar years found its way into manuals or official journals.¹ The focus of previous works as to the reasons for attack aviation's slow progress has generally centered on service politics, the Air Corps drive to be an independent air force, and the Air Corps' preoccupation with strategic bombing theory and doctrine. Yet, there was considerable thinking, maneuvers, testing, and writing by the Air Corps -- albeit by a smaller circle of individuals -- during the interwar period. Part of the problem was the way the Army (War Department) and Air Corps viewed attack aviation. To both, attack aviation was the tactical application of airpower. However, the Army viewed attack in terms of direct battlefield support, or what we call close air support (CAS) today. The Air Corps attack concept evolved from direct support to indirect support beyond the battle line (direct support was to be used only during times of emergency, or as the exception), or what we know today as air interdiction. Additionally, the Air Corps doctrine called for attack aviation to support the larger Air Force mission with air superiority and bombardment support roles. The problem, of course, is determining which approach would be more successful, or appropriate. Short of war, perhaps a measure of the success of a given theory and doctrine is its persistence and repeated evaluation in maneuvers, and how well the doctrine is formalized and disseminated.

Since the interwar period, the US has continued to suffer many of the same problems in developing and formalizing its air doctrine. Many of the

¹ Benjamin F. Cooling, ed., *Case Studies in the Development of Close Air Support*, Special Studies (Washington, D.C.: Office of Air Force History, 1990), 59.

fundamental attack theoretical and doctrinal views of the interwar period can be found today in the debates on close air support (CAS) and air interdiction (or battlefield air interdiction, BAI), or direct versus indirect air support.

Limitations of the Study

The focus of this study is on the relationship between theory and doctrine, and the processes by which they were tested and formalized. This study does not attempt to order theory and doctrine, or argue which came first. Rather, it attempts to examine the underlying theoretical frameworks and principles at work during three interwar periods.

The study is organized in terms of three historical interwar periods, generally based on Thomas Greer's historical organization in *The Development Of Air Doctrine in the Army Air Arm, 1917-1941*.² This historical organization is useful for maintaining a proper historical context, however the study is not an all-encompassing contextual work. Additionally, the three interwar periods, while reflective of organizational changes within the Air Corps, do not necessarily represent milestones in the development of attack theory and doctrine. Rather, attack theory and doctrine development should be viewed as an evolution, overlapping the three interwar periods in the study.

Definitions and Assumptions

²² Thomas H. Greer, *The Development of Air Doctrine in the Army Air Arm, 1917-1941*, USAF Historical Study 89 (1955; reprint, Washington, D.C.: Government Printing Office, 1985), v-vi.

For the purposes of this study, theory is defined as a set of principles designed to explain a phenomenon or class of phenomena. Its functions include: definition, categorization, explanation, connections or relations to things beyond the phenomenon, and prediction or anticipation. Its primary purpose is to educate judgment by establishing a theoretical framework as a method of understanding. The theory presented in this study is not comprehensive, or necessarily universal in application. Rather it is partial theory attempting to explain phenomena associated with attack aviation--a subset of the human intercourse we call war.

Doctrine is defined as fundamental principles by which military forces guide their actions in support of national objectives. It is authoritative, but requires judgment in application.³ This study views the term "authoritative" to mean officially sanctioned, or codified principles. Doctrine represents the lessons of war, or conclusions about warfighting based on experience. However, for the purposes of this study the concepts of formal and informal doctrine are used for the purposes of analysis. Formal doctrine is essentially sanctioned and approved by the service authority. Informal doctrine is that which is commonly taught and practiced, but not necessarily formally approved by the service authority.

Finally, attack aviation was that branch of aviation used to provide direct and indirect combat support to the ground forces in the form of machine gun

³ AFSC Pub 1, *The Joint Staff Officer's Guide 1993* (Washington, D.C.: Government Printing Office, 1993), I-13.

strafing, light bombing, and chemical attacks. Today, direct and indirect ground support is known as close air support (CAS) and air interdiction.

Preview of the Argument

It is often said that with aviation development, historically technology drives doctrine. Furthermore, it is argued that attack aviation was hampered primarily due to the Air Corps single mindedness about strategic bombing and development. Neither case holds true in the development of attack aviation in the interwar years. In the case of attack aviation, the ideal aircraft requirements were established early and based on theory and anticipated doctrine, yet the technology for a single-seat attack aircraft was never adequate. Additionally, what appeared to be neglect of attack aviation was more accurately an evolving dichotomy in ground support theory and doctrine. The Air Corps chose to emphasize and develop the indirect support approach. What limited the development of close support aviation was the growth of light bombardment aircraft and indirect support doctrine. Additionally, cooperation between the Army and Air Corps suffered due to the differing views and beliefs about ground support doctrine. In this light, US attack theory and doctrine was adequately developed to be useful at the start of WWII.

Chapter 2

Attack Theory and Doctrine of the Air Service, 1919-1926

Attack Aviation's WWI Legacy

By the end of WWI, attack aviation came to be recognized as a needed and separate branch of aviation. General Patrick, Chief of Air Service, AEF, stated: "It will be well to specialize in this branch of aviation and to provide squadrons or groups with machine guns and small bombs for just such work against ground objectives..."⁴ As a result, one of the Air Services' first significant acts was to establish an attack aviation group in 1921 -- the 3rd Attack Group.⁵ The US created the new attack group in spite of post-WWI demobilization. However, US attack aviation was the late comer of the aviation branches and continually struggled to gain equal consideration and status with pursuit, bombardment, and observation.

The post-WWI environment presented many challenges for aviation development, attack aviation in particular. Despite the arguments of aviation proponents like Brig Gen William Mitchell, the Air Service, American Expeditionary Forces (AEF) failed to achieve status as a separate aviation department. Instead, the Army Reorganization Act of 1920 established the Air Service as a ⁶combat arm of the Army and no changes were made in its existing

⁴Thomas H. Greer, *The Development of Air Doctrine in the Army Air Arm, 1917-1941*, USAF Historical Study 89 (1955; reprint, Washington, D.C.: Government Printing Office, 1985), 12.

⁵Benjamin F. Cooling, ed., *Case Studies in the Development of Close Air Support*, USAF Special Studies (Washington, D.C.: Office of Air Force History, 1990), 43.

relations with the War Department General Staff.⁷ Attack aviation, like its sister branches, was to suffer from the internal Army bureaucratic struggles for the control and doctrinal direction of airpower. At the same time, post WWI budget constraints and force demobilization presented serious challenges to Air Service leaders inhibiting the development of aviation as a whole. Air Service appropriations dropped from \$460 million in 1918 to \$25 million in 1920.⁸ While this was a transition from war time to peace time appropriations, the Air Service would suffer from reduction in men and material as did the rest of the Army. On the positive side, the Air Service and aviation had become very popular in the US with aerial performances, pioneering cross-country flights, and aerial contests.⁹

Additionally, aircraft development continued to push ahead during the period with the construction of faster and higher flying aircraft like the Curtiss P-1 delivered to the 1st Pursuit Group in 1925.¹⁰ Unfortunately, for attack aviation, a fast maneuverable, and heavily armored aircraft was not forthcoming in the Air Service era. There was an inventory of WWI era aircraft that were modified to meet attack aviation needs. The 3rd Attack Group had to rely on the slow GA-1 (armored, 37 mm cannon) and modified DH-4B aircraft. However, there was a significant body of knowledge and lessons from WWI which allowed attack aviation to establish a firm foothold in the Air Service.

⁷Robert F. Futrell, *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force, 1907-1964*, vol. 1 (Maxwell AFB, Ala.: Air University Press, 1989), 35.

⁸Maurer Maurer, *Aviation in the US Army, 1919-1939* (Washington, D.C.: Office of Air Force History, 1987), 44.

The lessons of WWI had a profound impact on the early development of US attack aviation.¹¹ Attack operations in WWI were operations of opportunity and occurred incidental to pursuit, bombardment, and observation. There was no specialized attack aircraft. Bombardment and pursuit aircraft were normally used for attack operations. For example, "Battlefield Bombing" with bombardment aircraft included airfields, railway stations, cantonments and artillery parks as targets¹². Pursuit aircraft used in low-level attacks on ground troops initially proved quite successful. At first, the effects were psychological in nature. Attack aviation succeeded in shaking the morale of troops in battle. Later, however, attack aviation exploited enemy reinforcements moving up in column. Troops in the rear were much more visible and vulnerable than entrenched front-line troops.¹³ Moving armies exposed on roads provided better targets. Additionally, attack aviation discovered excellent targets beyond the range of friendly artillery where only the airplane could reach them.¹⁴

Concurrently, there were hard lessons about the chaos of flying over the battlefield and aircraft vulnerability in support of ground forces. Kennett states: "Among all belligerents there was a tendency for the high command to regard airplanes as multipurpose weapons, a view that increasingly lost its validity as specialization proceeded. Particularly at moments of crisis, generals had a tendency to throw every available airplane into the breach, much as cooks and

⁹Ibid., 17.

¹⁰Ibid., 83.

¹¹Cooling, 27.

¹²Lee B. Kennett, *The First Airwar, 1914-1918* (New York: The Free Press, 1991), 54.

drivers and military policemen were sent forward as makeshift infantry.”¹⁵ As a result, there were increased attrition rates for aircraft operating over the battlefield. As Kennett notes: “For the whole period of the Cambrai fighting, squadrons engaged in ground attack operations suffered about 30 percent casualties daily.”¹⁶ The attrition was due primarily to ground fire. In contrast, objectives behind the front lines tended to be less heavily defended.¹⁷ In this case, enemy fighters became the primary threat to attack aircraft. These pragmatic lessons had a significant impact on the earliest thinking and writing on the true value of attack aviation.

Air Service Attack Theory

Air Service attack theory, although an incomplete framework, was based on the effect of attack on troop “morale,” fundamental attack principles, support of the progressive phases of the ground campaign, and an airman’s vision of the best attack employment scheme.

In the Air Service, William Sherman best articulated the value of attack aviation in effecting the morale of ground troops. In his hand-written draft on “Air Tactics” (1922), Sherman cites Ardant du Picq’s works on battle stress and notes that most physical destruction is done to soldiers on the run, in panic. Sherman states the “chief fear of man is not shell or bullet, but man,” particularly the man

¹³Cooling, 25.

¹⁴Ibid., 25.

¹⁵Kennett, 91.

¹⁶Cooling, 23.

¹⁷Ibid., 25.

in the air.¹⁸ Therefore, one of the primary factors to be considered in the employment of attack airplanes was that "their morale effect is disproportionate to their power of physical destruction, to a greater extent than any other agent."¹⁹ Sherman was also influenced by the German, British, and French experiences in WWI. For example, he quotes Ludendorff in his draft "Air Tactics" paper and notes that the Germans with their "battle flights" were the first to "grasp the full extent of the possibilities of airplanes in this role, and to employ them systematically."²⁰ However, the Germans attempted to employ attack aviation for more than just demoralizing the ground troops. The German High Command developed the "battle plane" (*Schlachtflugzeug*) as a battlefield breakthrough weapon to provide mobile firepower and shock effect.²¹

William Mitchell was also one of the first Americans to recognize the value of attacks on morale along with other underlying principles in the use of attack aviation. In his Provisional Manual of Operations, 23 December 1919, he identified friendly and enemy troop morale as the object of attack squadrons.²² In effect, attack aviation's impact on troop morale was more beneficial than the destructive power delivered on the troops. Additionally, Mitchell identified the

¹⁸William C. Sherman, "Air Tactics," original draft paper, January 1922, Attack Chapter, 3-6; Sherman notes Ardant du Picq's work on draft "Air Tactics," but du Picq is not referenced in the published version of TR 440-15, "Air Tactics;" In *Battle Studies: Ancient and Modern Battle*, du Picq argues that "fear" is the dominant emotion in battle, see John N. Greely and Robert C. Cotton, trans., *Roots of Strategy*, Book 2 (Harrisburg: Stackpole Books, 1987), 13-299.

¹⁹ Ibid., 8.

²⁰ Ibid., 1-2.

²¹James S. Corum, "The Luftwaffe's Army Support Doctrine, 1918-1941," *The Journal of Military History* 59 (January 1995), 55.

²²Maurer Maurer, ed., *The US Air Service in WWI*, vol. 2 (Washington, D.C.: Office of Air Force History, 1978), 290.

principles of concentration of mass, economy of force, and centralized control as essential for successful attack operations.

Mitchell called for attack squadrons to be used in a "concentrated, continuous, uninterrupted engagement at the decisive time and place."²³

Second, attack aviation should be limited "to that particular portion of the battle front upon which the entire operation depends, and prohibits their distribution over relatively unimportant portions of the battle line."²⁴ Furthermore, attack groups normally should be held under the direct command of the Chief of Air Service of an Army so that "the entire forces of the attack units can immediately be thrown into action at the point designated."²⁵ Mitchell's work provided much of the underlying theoretical basis from which attack doctrine would later be founded.

Attack theory was also discussed in terms of the progression of the ground campaign. First, attack aviation's "offensive" and "defensive" cooperation with the ground forces was an important consideration. In the offensive, attack squadron's were best used against the enemy's forward infantry lines and to disrupt his forward artillery. In the defensive, attack units were best used to disrupt the enemy's attacks, and counter-attacks during friendly offensive operations.²⁶ This framework envisioned attack aviation as an auxiliary force best employed in direct support of the ground forces. A second ground scheme

²³Maurer, *The US Air Service in WWI*, 29.

²⁴*Ibid.*, 29.

²⁵*Ibid.*, 291.

²⁶Maurer, *The US Air Service in WWI*, 292.

was articulated by Sherman. He identified three phases where attack aviation operated: (1) the preliminary phase, (2) the conflict proper, and (3) the pursuit. In the preliminary phase there would be little opportunity for the employment of attack aviation because the enemy takes precautions (night marches and hiding actions) against the effective use of aircraft. During the conflict proper, there would be great opportunity to use attack aviation, but must be qualified by best time and place. And finally, the pursuit phase represented an ideal environment for attack aviation in that roads would become jammed, panic occurs, and morale is broken. However, in past wars "true pursuits have been extremely rare."²⁷ Sherman's phases were further expanded into a third ground scheme in 1923 to address attack aviation's employment in: 1) During mobilization and concentration, 2) On the march, 3) In the attack, 4) In the pursuit, and 5) In the retreat.²⁸

Finally, there was an alternative theoretical frame of reference which influenced thinking and doctrine -- an airman's view. The airman's view of attack aviation centered on how attack could be most effective. Oriented on the static battle lines of ground forces during WWI, the idea of the front-line "crust" and an area beyond the crust provided a separate model for early attack thinking. Many of the early aviators believed the best use of attack aviation was beyond the crust due to heavy aircraft attrition and relative ineffectiveness of attack against dug-in troops. Lee Kennett notes this: "In theory and practice, air support

²⁷ Sherman, "Air Tactics," original draft, 1922, 13-30.

²⁸ Chief of Air Service, "Attack Aviation," staff doctrine study, 1923, 3-5.

aircraft had two categories of targets: objectives along the enemy's heavily defended frontal positions, which some generals called the "crust," and a whole range of targets extending twenty miles and more behind that crust. By the end of the war, a considerable body of opinion held that the chief contribution of aircraft should be against those objectives behind the crust."²⁹ As a result of these beliefs, a theoretical schism between those advocating the direct and indirect use of attack aviation would be reflected in later doctrine and writings as the Air Service moved into the Air Corps era. This schism was reflected the Air Services' attempts to become a separate combat arm. Later, the differences in the auxiliary role and the airman's view would add to the division developing between the Army General Staff and Air Corps about the Air Corps' desire to become an independent service.

Attack Doctrine Established

The attack doctrine that evolved during the Air Service period reflected the lessons of WWI and the underlying theoretical beliefs of aviation advocates. By 1926, Air Service attack doctrine could be summarized as follows: (1) Definition: Attack aviation is that class of aviation whose function is to attack military objectives, especially personnel on the ground or water, by means of light bombs and machine guns; (2) Mission: its primary mission is to delay enemy operations by harassing and neutralizing his forces on the ground and by preventing the

²⁹Cooling, 25; for more discussion on attack aviation in the "crust," see John C. Slessor, *Air Power and Armies* (London: Oxford University Press, 1936), 100-101.

arrival of reinforcements of personnel and material;³⁰ (3) Ground support was best carried out beyond the crust (indirect support), (3) Direct support was warranted only during times of great friendly or enemy combatant activity, (4) Low-level attacks to achieve surprise "normally" protected by pursuit, was the best method of attack, (5) The best targets were moving troops, supply columns, bivouac areas, main lines of communication, reinforcements, reserves, artillery moving forward, etc.,³¹ and (6) A fast, maneuverable, selectively armored, forward armed, two-seat aircraft with rear gunner was the best design for an attack aircraft.³²

Air Service attack doctrine was greatly influenced by the works of Colonel Edgar S. Gorrell, General William Mitchell, and Major William C. Sherman. Gorrell recognized attack aviation as an essential mission requiring specially designed aircraft. He identified the need for attack aircraft to operate under conditions of air superiority and an organizational system which allowed unit specialization.³³ He was largely responsible for General Patrick's "Final Report of the Chief of Air Service, AEF," written in 1919, and two tentative manuals entitled "Notes on the Employment of Air Service" (1919) and "Tentative Manual for the Employment of Air Service" (1919).³⁴ These early documents called for aviation to support the ground effort and clearly recognized the future of attack

³⁰Air Service Tactical School, *Attack*, 1925-1926, text, 1.

³¹*Ibid.*, 2-8.

³²Futrell, *Ideas*; called the "flying tank" by William Mitchell, 34.

³³Ronald R. Fogleman, "The Development of Ground Attack Aviation in the US Army Air Arm: Evolution of a Doctrine, 1908-1926" (Masters thesis, Duke University, 1971), 63.

³⁴Futrell, *Ideas*, 29.

aviation. Gorrell professed, as did others, that "the morale effect on ground troops is out of all proportion to the material destruction wrought."³⁵

Mitchell's and Sherman's influence can be seen in the earliest doctrine manuals of the Air Service. Air Service Training Regulations (TR) 440-15 was first issued with the title "Air Tactics," and was the work of Sherman's writings on air warfare.³⁶ Later, TR 440-15 was titled *Fundamental Principles for the Employment of the Air Service*, and issued in 1923.³⁷ By 1926, TR 440-15 came to represent the War Department's view that the primary objective of the Army and its air arm was the destruction of the enemy armed forces. The mission of the Air Service was "to assist the ground forces to gain strategical and tactical successes by destroying enemy aviation, attacking enemy ground forces and other enemy objectives on land or sea, and in conjunction with other agencies, to protect ground forces from hostile aerial observation and attack."³⁸ TR 440-15 was generally in agreement with Air Service Tactical School (ASTS) teachings, but contained some important and somewhat ambiguous differences. For example, TR 440-15 stated that the attack airplane's principal mission was "within the area of the battlefield." And in contrast to the airman's model, the role of attack aviation was the "attack of hostile ground forces...in close cooperation with ground forces in battle, direct attack of personnel and light material on

³⁵Futrell, *Ideas*, 29.

³⁶Air Service Field Officers School, Training Regulations No. 440-15, "Air Tactics," 1922; see also William Sherman's original draft "Air Tactics," 1922.

³⁷Futrell, 41.

³⁸War Department Training Regulation (WDTR) 440-15, *Fundamental Principles for the Employment of the Air Service*, 26 January 1926, 1.

enemy vessels..."³⁹ Although ambiguous, the suggestion was that attack aviation was to be used in direct support of ground forces. Additionally, TR 440-15 confirmed what had been in practice on paper since the National Defense Action of 1920, that divisions, corps, and armies were given their own observation aviation, attack and pursuit units were assigned to armies, and a General Headquarters Reserve was assigned all bombardment, airships, and some observation units.⁴⁰ Clearly, TR 440-15 relegated the Air Service to an auxiliary role. Interestingly, the Army War College course at the time, *Fundamental Principles for the Employment of the Air Service*, 1925-1926, stated that attack aviation's primary mission was "the attack of hostile ground troops."⁴¹ However, in battle "this should not be interpreted so as to prevent the use of attack aviation against hostile airdromes if the aerial situation demands it."⁴² But, for attack aviation what was lost was a clear understanding of the best ground support approach, direct or indirect, for the Air Service's newest branch.

During the Air Service period, the Office of the Chief of the Air Service, lacking an Air Service Board, relied on various schools and units for doctrine development, and test and training related projects.⁴³ In this way, much of the doctrine development was relegated to informal channels. The Air Service Tactical School (later the Air Corps Tactical School) at Langley Field, Virginia,

³⁹WDTR 440-15, 20 January 1926, 4,12.

⁴⁰Maurer, *Aviation in the US Army*, 70.

⁴¹Army War College, *Fundamental Principles for the Employment of the Air Service*, course text, 1925-1926, 4.

⁴²Ibid., 14.

⁴³Futrell, 40.

handled much of the work. Attack texts were written, taught, and exercised at the Tactical School. This "informalization" of attack doctrine further added to the division in thinking between the Air Service and the War Department General Staff on the proper role of attack aviation.

In 1923, one of the earliest papers on attack aviation doctrine, prepared for the Office of the Chief of the Air Service, clearly stated attack aviation's definition and mission: "Attack aviation is that branch of the air force which is organized, equipped and trained to attack enemy force and military objectives on the ground or water; Its mission is to attack those ground or water targets which are vulnerable to air attack, usually those moving along roads and lines of communication such as troop columns, trains and transports, etc. Airdromes, cantonments, centers of communication, concentration and debarkation are also proper objectives for attack."⁴⁴ Additionally, during the early phases of the ground campaign, attack aviation would disrupt and immobilize enemy operations. Only "under special situations, in extreme necessity" would attack aviation operate directly against enemy troops on the battlefield."⁴⁵ The doctrine clearly identified attack's supporting role to the ground effort, yet recognized that attack aviation was not a true battlefield weapon, and its best use was beyond the battle line. However, this early doctrine statement failed to clearly identify attack aviation's role in supporting the air superiority effort, in spite of WWI experiences. Instead, attack of airdromes was relegated to secondary importance along with

⁴⁴Chief of Air Service, "Attack Aviation," staff study, 1923, 2.

cantonments and centers of communication. For attack aviation, air superiority as a priority role would be confirmed in later doctrine updates.

By 1926, Air Service attack doctrine was modified to emphasize its value in delaying and disrupting the enemy ground force rather than its destruction. The primary attack mission was now to "delay enemy operations by harassing and neutralizing his forces on the ground and preventing the arrival of reinforcements of personnel and material."⁴⁶ Additionally, the fundamental principles of attack aviation were identified as: (1) Firepower of attack, (2) Distinct role of attack, (3) The principle of delay, (4) Tactical rather than strategical, (5) Not a weapon of opportunity, (6) Pursuit support, and (7) A weapon of the air force.⁴⁷ These early principles reflected fundamental ideas about the employment of attack aviation. First, although attack aviation brought significant firepower to the battle, it was best suited for a distinct role beyond the range of artillery. Second, attack aviation was a tactical weapon optimally used to delay, disrupt, and immobilize rear echelon forces. Third, attack aviation was not a weapon of opportunity (in the sense of being used casually, always on call), rather its missions should be planned and focused on vital objectives. And finally, attack aviation needed pursuit to complete its mission, not necessarily to defend the attack formation.

⁴⁵Ibid., 3-5.

⁴⁶ Air Service Tactical School, *Attack*, 1925-1926, text, 1.

⁴⁷ Ibid., 2.

In 1926, another publication greatly influenced the direction of Air Service thinking -- *Employment of Combined Air Force*. This Air Service Tactical School text challenged the Army's view that the Air Service was primarily an auxiliary force. It suggested that the air force could directly and independently undermine the enemy's morale and will to resist. With regard to attack aviation it delineated the differences between direct and indirect cooperation. In the army air force, under direct cooperation attack aviation "harasses and delays the movement of the enemy's ground forces at the decisive point."⁴⁸ Indirect cooperation included using the air force "at irregular intervals and on targets which are diversified as to type and location" not in the immediate vicinity of ground operations.⁴⁹ The text also specified the use of attack aviation for attacking hostile airdromes.⁵⁰ Thus, attack aviation's primary and secondary missions were appropriately addressed. However, the text continued to address attack aviation in terms of a ground scheme of advance rather than that of independent air force operations.

Early Training and Maneuvers

Although the Air Service did not formalize training for all aviation branches until 1923,⁵¹ it did manage to progress in the areas of unit tactical training, gunnery and bombing competitions, and annual maneuvers. In terms of

⁴⁸Air Service Tactical School, *Employment of Combined Air Force*, 1925-1926, text, 14.

⁴⁹*Ibid.*, 14.

⁵⁰*Ibid.*, 28.

⁵¹Maurer, *Aviation in the US Army*, 75.

improving the capabilities of attack aviation, the Air Service established a pattern of evolution rather than rapid change.

The Office of the Chief of Air Service established an annual training program with four periods: (1) study and ground instruction on the theory and practice of aviation subjects; (2) unit training; attack units trained for aerial gunnery, low altitude bombing, cross country flights, and attack raids against ground targets; (3) regular units trained reserve and national guard units; and 4) field training: work with other branches of the Army and Air Service in maneuvers.⁵²

Tactically, the Air Service maintained competency in all branches of aviation. In 1924, the Air Service held bombing and gunnery matches, at Langley Field.⁵³ Competitions included machine gun firing at ground and towed targets, and bombing at low, medium, and high attitudes.⁵⁴ There were even inspections by Corps Area Commanders which were part of the training program of the Air Service. In 1924, for example, the 3rd Attack Group was inspected at Kelly Field, Texas. In one exercise, the Group made diving attacks with machine guns and 25-pound practice bombs on targets on the airdrome.⁵⁵ Dive-bombing was generally viewed as an inferior method for attack aircraft primarily due to the

⁵²Air Service, *Annual Report of the Chief of the Air Service*, 1925, 49, 61.

⁵³*Ibid.*, 77.

⁵⁴*Ibid.*, 78.

⁵⁵*Ibid.*, 80.

dangers from pursuit aircraft. However, when pursuit aircraft were used in attack, the practice was accepted.⁵⁶

The true test of attack theory and doctrine was to be found in the training period where maneuvers and joint service cooperation were conducted. General Patrick considered tactical training incomplete unless air force units trained annually as an air force.⁵⁷ The first of the annual maneuvers was held at Mitchel and Langley Fields in October 1925.⁵⁸ The focus of attack aviation was on attacking landing craft and vulnerable concentrations of troops. Although these maneuvers were an air force defense against a theoretical attack by aircraft carriers, valuable training occurred, and subsequently, the maneuvers were repeated in the following years.⁵⁹

The next Air Service maneuvers were held in Ohio, in 1926. The theoretical framework was based on that phase of operations during concentration of ground forces and up to a point just before the actual meeting of the ground forces. Air Service doctrine, as written in *Employment of Combined Air Force*, called for attack aviation to "harass and delay hostile troops" -- delaying them from moving forward to advance guard positions. This text, however, set the priority as air superiority and attack aviation was to be used to attack airdromes.⁶⁰ ASTS doctrine in the 1925-1926, *Attack* text called for delaying enemy operations by harassing and neutralizing the enemy ground

⁵⁶Greer, 80.

⁵⁷Maurer, *Aviation in the US Army*, 78.

⁵⁸Ibid., 78.

⁵⁹Ibid., 79.

forces.⁶¹ In terms of the types of targets and the art of employment of attack aviation, the 1926 maneuvers were consistent with written doctrine and practice. The 3d Attack Group with their O-2s and DH-4Bs attacked bridges, railroads, and rail yards⁶² in an attempt to slow the concentration and forward movement of enemy forces in the concentration phase of the war. It must be noted, however, that overall the maneuvers focused primarily on the role and tactics of pursuit rather than the other branches. This too was consistent with Air Service doctrine since air superiority was the first priority of the air force as a whole. Additionally, the Ohio maneuver problems tested attack aviation in four general areas: (1) general bombing and machine gunning practice; (2) the concentration of pursuit, attack and bombardment aircraft over an objective in a timed manner, (3) aerial tactics in offense and defense by and against pursuit aircraft; and (4) the ability of pursuit aircraft to locate attack aircraft operating against ground targets.⁶³

For attack aviation, the 1926 maneuvers confirmed low altitude formation attacks with three and nine-ship formations. However, there were problems noted. First, pursuit aircraft spotted penetrating attack aircraft more easily than was expected. Although the attack aircraft were not camouflaged, it was thought best that except for shallow penetrations attack operations should be covered by Pursuit.⁶⁴ Second, the rear-gunner should be highly trained to enhance the defensive effectiveness of the attack formation. Third, in general more training

⁶⁰Air Service Tactical School, *Employment of Combined Air Force*, 1925-1926, text, 28-29.

⁶¹Air Service Tactical School, *Attack*, 1925-1926, text, 81.

⁶²Maurer, *Aviation in the US Army*, 79-80.

was needed in the accurate timing of flights (the "rendezvous") from distant points. And fourth, "the O-2 airplanes are adequate for attack operations but not the ideal airplane." It was thought the best aircraft was one of high speed and high maneuverability at the sacrifice of bomb load. If the planes encountered heavy ground fire, the speed and maneuverability would be critical.⁶⁵

The 1926 maneuvers were a good start for the Air Service. However, the recommendations for the 1927 maneuvers called for continuity and that the focus shift to that phase of operations when ground troops have gained contact.⁶⁶ Perhaps the 1927 maneuvers would provide a better test for attack doctrine.

⁶³Report of the Office of the Chief of the Air Service, "Maneuvers of the Army Air Service," 17 May 1926, 3-4.

⁶⁴Ibid., 5.

⁶⁵Ibid., 6-7.

⁶⁶Report of the Office of the Chief of the Air Service, "Maneuvers of the Army Air Service," 17 May 1926, 10.

Chapter 3

Attack Theory and Doctrine in the Air Corps, 1926-1935

Attack Aviation in the New Air Corps

The Air Corps Act of 1926 changed the name of the Air Service to "Air Corps" and solidified the Air Corps' position as a combat arm within the Army but did very little to change the relationship between the War Department and Air Corps. Organizational plans during the mid-1920s assigned attack, pursuit, and observation aviation to armies, and observation units to army corps and divisions for direct support of ground forces.⁶⁷ Bombardment aviation, with some observation would be held in a GHQ Reserve. The independent minded Air Corps was pushing for a GHQ Air force to be the combatant arm with pursuit, attack, and bombardment aviation. The closest the Air Corps would come to a GHQ organization was in 1931 when a temporary air division was created for the annual maneuvers.⁶⁸

The Air Corps Act attempted to strengthen Army aviation by expanding the Air Corps over a five year period starting in 1926.⁶⁹ The Air Corps Act provided new hope and a sense of fulfillment to many in the Air Corps. However, implementation of the planned expansion was delayed in an era of government belt-tightening.

The Air Corps plan fulfilling the Air Corps Act called for an increase in the number of tactical squadrons from 32 to 52. For attack aviation, the number of squadrons would double from two to four. Additionally, the attack squadrons would be organized

⁶⁷Maurer Maurer, *Aviation in the US Army, 1919-1939* (Washington, D.C.: Office of Air Force History, 1987), 283.

⁶⁸*Ibid.*, 284.

⁶⁹*Ibid.*, 191.

as an attack wing consisting of an attack group (the 3rd Attack Group) and a pursuit group, each with three squadrons, and designated as army aviation."⁷⁰ The total costs of the new Air Corps expansion would prove to be prohibitive at between \$68 and \$76 million. The War Department and Bureau of the Budget cut 45 percent from the Air Corps requests. As a result, the Air Corps did not complete the program in five years, and suffered from shortages in personnel, airplanes, and tactical units.⁷¹

The Air Corps and War Department were expanding during a period when isolationism, pacifism, and budget constraints were determinant in America.⁷² Additionally, the Kellogg-Briand Pact (1928) attempted to outlaw war. Further, the stock market crash in 1929 set off the Great Depression.⁷³ Thus, the Congress never fully funded the Air Corps expansion.⁷⁴ That the Air Corps was able to expand at all was a tribute to the Leadership of Major General Mason M. Patrick, Chief of the Air Corps, and his successor Major General James E. Fechet.

At the same time, the new Air Corps expansion occurred when aviation technical development, investment, and commercial transport were rapidly advancing. The new Air Corps benefited by replacing old WWI vintage aircraft with newer, improved attack, observation, bombardment, and pursuit aircraft. Attack aviation would not greatly benefit.

⁷⁰Maurer, *Aviation in the US Army*, 197.

⁷¹*Ibid.*, 201.

⁷²*Ibid.*, 199.

⁷³*Ibid.*, 199.

⁷⁴Maurer, 200.

The Air Corps was extremely slow to develop a successful attack aircraft.⁷⁵ The Air Corps used modified O-1B observation planes for attack, named the A-3 (A-3A improved version). By 1931, the Air Corps lacked a standard attack plane and designated the A-3s and A-3As as "limited standard" and "substitute standard."⁷⁶ Although an improvement over the DH-4Bs, the A-3s lacked the desired speed, maneuverability, armament, and armor required for attack operations. Thomas Greer attributed the problems to the tension between the size (weight) and the number of engines. Two schools of thought were present. One school argued for a "relatively light, single-engine type, while others wanted a larger, two-engine ship."⁷⁷ For attack aviation, the development emphasis on the single-engine monoplane type seemed to carry the day for school arguing for lighter and more maneuverable aircraft. The Curtiss XA-7 in 1930 was the first attack monoplane designed with built-in machine guns. In 1931, the Curtiss A-8 was introduced as an all-metal plane with an in-line engine.⁷⁸ Then came the Curtiss A-12, "Shrike," an all-metal, two-seat monoplane available in 1934, while the Northrop A-17A was in development.⁷⁹ However, all of these aircraft would also fail to meet attack aviation expectations. Additionally, the evolving Air Corps attack doctrine of indirect support with increased emphasis on the destructiveness of the bomb was driving the requirements for a longer range and heavier bomb capacity aircraft-- the light bombardment aircraft.

⁷⁵Thomas H. Greer, *The Development of Air Doctrine in the Army Air Arm, 1917-1941*, USAF Historical Study 89 (1955; reprint, Washington, D.C.: Government Printing Office, 1985), 67.

⁷⁶Ibid., 216.

⁷⁷Greer, 67.

⁷⁸Ibid., 67.

⁷⁹Richard P. Hallion, *Strike from the Sky: The History of Battlefield Air Attack, 1911-1945* (Washington, D.C.: Smithsonian Institution Press, 1989), 47-48.

Air Corps Attack Theory

On the whole, attack theory remained fairly consistent with the previous period. Morale, fundamental principles, aviation's relationship to the progression of the ground employment, and an airman's view were all underlying concepts either defining, explaining, or relating the elements of attack aviation.

Morale as the primary objective and driving principle for attack aviation, while discussed throughout the interwar period, seemed to fall out of favor with the Air Corps. First, the relationship between morale and destructive power on front-line troops became less important as some questioned the risks to aviation in doing either. The argument was divided between those in the Army favoring, front-line, morale-boosting action and those in the Air Corps who believed such attacks to wasteful and inefficient.⁸⁰ The morale effect of front-line strafing was recognized, but the risk to plane and personnel from ground fire was not warranted.⁸¹ The argument was not new and, more and more, morale as a prime objective was questioned. Additionally, papers presented at the Air Corps Tactical School (ACTS) came to question attack aviation's efficacy in its primary role as a ground support weapon designed to "immobilize hostile troops and material, rather than to destroy them."⁸² Arguments were made to increase attack's role in the attainment of air superiority and better use its destructive effects, especially with bombs. Morale as an objective was left to long range bombardment and attacks on the enemy's interior.

⁸⁰Greer, 39.

⁸¹Greer, 67.

⁸²F. M. Andrews (Major, AC), "1. Is attack aviation necessary or justified?; 2. Single seater pursuit vs. attack.," ACTS paper, 15 May 1928, 1.

Fundamental principles of aviation, on the other hand, were expanded to incorporate many of those principles found in ground warfare theory and doctrine. As early as 1926, the Air Corps Tactical School taught the employment of airpower in terms of nine principles. The principles of the objective, the offensive, mass, economy of forces, movement, surprise, security, simplicity and cooperation were all used in the *Employment of Combined Air Force* text.⁸³ Furthermore, students were given problems in the practical application of these principles while at ACTS.

Attack aviation, however, took a different approach and at times attempted to formulate principles which could best explain the use attack aviation in warfare. In the ACTS *Attack Aviation* text of March 1930, sixteen principles of employment were discussed. In brief summary, they were:

- (1) Distinct mission of attack - A fundamental principle of the employment of attack aviation is that its fire power does not replace the fire power of ground weapons. Attack aviation is a long range weapon and should be used in its own distinct field of operations which is beyond effective artillery range.
- (2) Principle of Delay - In supporting ground operations, attack aviation is frequently used to prevent hostile reserves and reinforcements from arriving on the front in time to influence the action.
- (3) Principle of Destruction - The primary mission of the air force is to gain and maintain freedom of action for itself in the air and to deny the same to the enemy.
- (4) Fire Power - The successful employment of attack aviation requires a thorough understanding of its tremendous firepower. (text makes comparison with infantry fire power)

⁸³Air Service Tactical School, *Employment of Combined Air Force*, 1925-26, text, 3.

(5) The Importance of Personnel Training - To carryout the missions of attack aviation, adequate training is absolutely necessary.

(6) The Importance of Proper Command and Ground Organization- In addition to the inherent qualities which must distinguish a leader, the attack commander must possess certain essential qualifications.

(7) The Importance of Airdrome Location - Main airdromes and auxiliary airdromes must be located properly to enable attack aviation to operate with its maximum efficiency.

(8) The Proper Assignment of Targets - Small bodies of troops, or troops deployed for action, are too scattered to be proper targets for attack aviation. In the same way heavy bridges and permanent concrete and steel structures are proper targets for bombardment. In the assignment of targets, attack aviation should never be called upon to operate against targets beyond its practicable range of operations or power of destruction.

(9) Accurate Information of Targets - Attack missions require accurate information on the nature and location of the target. The use of attack aviation as a weapon of opportunity, sent out with a general mission of attacking troops wherever found, resulted in a waste of airplanes and personnel.

(10) Need for Familiarity with the Terrain - Intensive map and photographic study should be conducted by each team well in advance of the operation.

(11) Need for Familiarity with the Ground and Air Plan of Operations - Although operations of attack aviation may be decisive in nature, in the final analysis these operations are in support of the ground operation no matter how decisive they are, or how indirect the support.

(12) Low Flying - The necessity for flying at extremely low altitudes, preceding, during, and following the attack, was thoroughly demonstrated during the World War. The low flying airplane is relatively safe from hostile rifle fire and machine gun fire, and immune from anti-aircraft gun fire. As a protective measure against hostile air attacks, low flying is of special importance.

(13) Mass Action - The application of the principle of mass to operations of attack aviation is necessary to effect decisive results.

(14) Influence of the Air Situation - As is the case in all air operations, freedom of action in the air is a necessity for efficient attack operations.

(15) Attack Aviation in Air Force Operations - Attack aviation supports bombardment by neutralizing or destroying enemy ground anti-aircraft establishments, and in operations against the hostile air force, sometimes supplements the work of bombardment in destroying enemy aviation establishments on the ground.

(16) Factors Limiting Attack Operations - Plans must account for limited supply, untrained personnel, short life of equipment, time for planning missions capabilities of personnel and hostile air operations.⁸⁴

Although these principles were in essence the informal attack doctrine of the Air Corps during the period, they represented the most comprehensive thinking about attack aviation. They were intended to educate airmen in their judgment with respect to attack employment in terms of an air context. As Sherman would say: "But in deriving the doctrine that must underlie all principles of employment of the Air Force, we must not be guided by conditions surrounding the use of ground troops, but must seek out our doctrine, as with the Navy, in the element in which it operates."⁸⁵ However, the principles also reflected some of the inconsistencies in theory during the period. First, from a ground perspective, the principle of "mass action" was at odds with the principle "distinct mission of attack." Attack aircraft were to mass on objectives beyond artillery range, yet concentration of mass could also be effectively achieved in cooperation with ground fires. Second, the principle of "fire power," especially when compared with the fire power of an infantry company, seemed to suggest that attack aviation was flying

⁸⁴Air Corps Tactical School (ACTS), *Attack Aviation*, March 1930, text, 40-50.

artillery and a true battlefield weapon. And finally, the use of attack aircraft in "air force" operations highlighted the range and payload limitations of the single-engine attack aircraft. To successfully execute air force missions, a different attack aircraft would be required.

The ground employment scheme and attack aviation's relation to it became better defined in the Air Corps, as well. Aviation, and attack operations in particular, came to be viewed in a more complex employment scheme than simply offense and defense. The following principles reflected the War Department's concept for the employment of aviation:

- (1) Before contact between opposing ground troops, aerial reconnaissance extended the reconnaissance area. Receiving objectives in general terms, the air service commander enjoyed great liberty of action.
- (2) As ground forces came into contact, the Army commander exercised closer control over aviation. Mission assignments grew more definite, sometimes specific, but the air service commander retained his freedom of as to means and method.
- (3) The air force (if not dissipated) constituted a highly mobile and powerful reserve that could be rapidly concentrated at threatened points to hamper and delay the enemy, whether he be aggressive or retiring.
- (4) The air force (if not dissipated) was available for special missions against sensitive points in the battle area, the enemy's supply organization and installations, and the rail and road nets. It could also be used to extend artillery action and directly support ground forces.
- (5) The rapidity and power of air action made possible in battle many things previously impossible.

⁸⁵William C. Sherman, *Fundamental Doctrine of the Air Service*, pt. 2 of *Air Tactics*, 1922, 7.

(6) An air force had two major limitations: its inability to conquer and hold terrain along; and its dependency, to a greater degree than other arms on atmospheric conditions.⁸⁶

Of concern to airmen advocating centralized control of the air arm, the central mechanism within this employment framework was the increasing control by the ground commander when ground forces came into contact. Tying airpower exclusively to the ground battle did not agree with the airman's theory of aviation employment.

The airman's view of attack theory, calling for "beyond the crust" interdiction operations, was further refined and generally discussed in terms of direct and indirect support. The airmen's view was essentially well defined by this period. The 1930 ACTS version of *The Air Force* stated that rarely would troops engaged in battle be suitable air force objectives. These targets were hard to hit, and since the outcome of ground combat was always determined by the timely employment of reserves, it would be more beneficial to interdict them instead.⁸⁷ The underlying theoretical argument was not that attack aircraft could not do the job, but rather they were best suited elsewhere. The 1934-1935 ACTS text, *Attack Aviation*, confirmed this in its basic principles of employment: "When attack aviation is acting in direct support of the ground forces, its striking power should be used against those targets which cannot be reached by the weapons of the ground arms. In all ground situations there are vital targets beyond the reach of the weapons of ground arms which can be powerfully dealt with by attack aviation."⁸⁸

Additionally, the airman on the whole believed aviation could best help the ground forces

⁸⁶Maurer, *Aviation in the US Army*, 240-241

⁸⁷John F. Shiner, *Foulois and the US Army Air Corps, 1931-1935*, (Washington, D.C.: Office of Air Force History, 1983), 46.

⁸⁸ACTS, *Attack Aviation*, 1934-1935, text, 3.

by achieving air superiority, interdicting supplies, destroying production facilities, and striking troops.⁸⁹

The theoretical division between the War Department and the Air Corps was now complete. The Army viewed aviation, particularly observation and attack, as an auxiliary arm. Furthermore, aviation was to be brought under closer control and used as a battle field weapon when troops were in contact. The Air Corps expected and anticipated that experienced airmen would control attack aviation in achieving objectives it was best suited. For attack aviation, indirect ground support was far superior to direct ground support. Additionally, aviation as a whole, with attack aviation support, could carry out operations quite independent of ground operations.

Attack Doctrine Matures

Although Air Corps attack doctrine would grow to include new roles, for the most part, it would mature by the mid-1930s and remain consistent until WWII. Attack aviation was no longer a weapon solely of opportunity, rather it had a definite mission, one that should be planned in advance. Additionally, by this period, the underlying principles for the employment of attack aviation had been established based on an airman's vision of the "best" use of attack aviation -- that of indirect support.

Air Corps attack doctrine was the informal doctrine being taught at ACTS and the Air Corps Advanced Flying School. Attack doctrine stated in the 1934 text, *Attack Aviation*, is representative of the period:

1. Definition: Attack aviation is that branch of the air force whose general mission is to further the success of the air force mission by the attack of personnel and light objectives

⁸⁹Shiner, 46.

on land and water by means of machine gun fire, light bombs, and chemicals; 2.

Mission: (a) The destruction of aircraft at rest and air force base facilities vulnerable to attack weapons, (b) The attack of vulnerable seacraft in coast defense operation, (c) the destruction of neutralization of anti-aircraft defenses, normally while supporting bombardment aviation in combined operations, and (d) the destruction, or the interruption of movement of personnel and material through attack of factories, logistical establishments, lines of communication, and concentrated bodies of troops.⁹⁰

Additionally, the doctrine stated that attack aviation should: order the specific missions according to the priority objective; be used in counter-air force operations; be used against those targets which cannot be reached by the weapons of the ground arms; and, not be sent out on search missions to attack troops or other objectives wherever found.⁹¹

Attack tactics remained largely the same. Low level attacks using surprise and pattern bombing and strafing by the attack formation was the preferred method. The attack technique was to fly in as low as possible and just before the target, the initial point, pull up to about 300-400 feet, and then dive on the target, strafe, bomb in pattern, and then dive for the deck again.⁹² Additionally, bombs (for their destructive power) were considered more effective than machine guns.

There were trends and some changes in attack doctrine during the Air Corps period which were significant. The first was the influence of strategic bombardment doctrine and thinking of ACTS. Attack doctrine now reflected a role in the suppression

⁹⁰ACTS, *Attack Aviation*, 2 January 1934, text, 1.

⁹¹Ibid., 2-3.

⁹²Oral History Interview, *General Earle E. Partridge*, (Washington, D.C.: Office of Air Force History, 1974), 61.

of anti-aircraft defenses in support of bombardment operations. Additionally, attack aviation would, when required, augment bombardment missions (for light objectives) during independent Air Force operations. Although some have argued that Air Corps emphasis on strategic bombing doctrine hindered attack aviation, the main problem can be seen elsewhere.

During the Air Corps period, the growth of attack theory and doctrine led some to question attack aviation's ground support role, rather than its role in the general air force mission -- air superiority, as well as its ability to deliver the necessary destructive power on the kinds of targets a doctrine of indirect support required. Some ACTS papers argued that attack aviation's best use in support of air forces was that of attacking anti-aircraft establishments rather than the airdromes themselves. Essential ground establishments could best be attacked by bombardment.⁹³

Thus, a greater interest in destructive power led to increased development of light bombardment aircraft, the second trend effecting attack aviation. Since attack aviation's best use was beyond the battle line and the varying interdiction targets required more than 25 pound fragmentation bombs, light bombardment was seen by many as a better approach to providing indirect support to the ground forces. Bridge bombing tests during the late 1920s were an illustrative example where 1100 pound demolition bombs were required to drop concrete bridges.⁹⁴ Additionally, the Air Corps and ACTS began

⁹³F. M. Andrews (Major, AC) "1. Attack Aviation Necessary or Justified?; 2. Single seater pursuit vs. attack." ACTS paper, 1-2.

⁹⁴ACTS, Pee Dee River Bridge Bombing Test Photos, December 1927.

vigorously exploring and developing light bombardment aircraft.⁹⁵ The logic behind light bombardment aviation was clear. The best approach to ground force support was indirect, beyond the battle line, and the most destructive power was delivered with big demolition bombs (fragmentation bombs for troops), not machine guns. Additionally, as indirect support objectives were beyond the range of artillery, less cooperation was needed with the ground forces; more cooperation was needed with pursuit and bombardment forces.

The final trend was that attack aviation could operate, at short distances, independent of pursuit protection. First, the Air Corps Training Manual No. 2, *Attack Aviation*, stated that the absence of pursuit support would not prevent the efficient performance of the missions assigned given the defensive power of attack aircraft.⁹⁶ Second, the ACTS text, *Attack*, 1925-1926, stated: "This pursuit cooperation is required not so much to ensure against losses of attack planes, as to ensure successful accomplishment of attack's offensive mission."⁹⁷ And, third, the 1930 version of *Attack Aviation*, revised the earlier thinking somewhat by stating that attack aviation could successfully make daylight penetrations into hostile territory up to 40 miles without the need for pursuit protection.⁹⁸ This thinking was to establish a mind set that attack aviation's defensive capabilities would allow them to successfully conduct missions without pursuit protection.

⁹⁵ACTS, "Outline of Study Desired in Connection with the Low Altitude Light Bombardment Airplane," 1929-1930, 4-5.

⁹⁶The Air Corps Advanced Flying School, Training Manual No. 2, Part III, *Attack Aviation*, 1926, 10.

⁹⁷ACTS, *Attack*, 1925-1926, text, 6.

⁹⁸ACTS, *Attack Aviation*, March 1930, text, 22-23.

During this period, Captain George Kenney was notable in the development of Air Corps attack theory and doctrine. As an instructor at ACTS from 1927 to 1931,⁹⁹ he wrote the attack texts and developed tactics by using the class as a tool.¹⁰⁰ It was during this period that the 1930 *Attack Aviation* text identified 16 principles of employment. Additionally, Kenney recognized and acknowledged the early and continuing influences of the Europeans in attack aviation development. In his first 1927 conference (lecture), he states that the Germans in 1917 were the first to organize massed, coordinated, low attacks against personnel targets--called "Sturm Staffeln" or "assault flights."¹⁰¹ Additionally, Kenney stated the British, French, Italians, and Russians all had attack aviation units in 1927, but were called different names. The Russians, for example, called attack aircraft "istrebitelniye," or "destroyers." The point being made was that the US should be prepared for and expect low flying attacks by "first class" powers.¹⁰²

Officially sanctioned doctrine, in the form of TR 440-15, *Fundamental Principles for the Employment of the Air Service*, 1926 version, remained unchanged until its revision in October, 1935. The 1935 revision gave the Army Air arm an updated doctrine to match the GHQ Air Force organization.¹⁰³ In terms of the development of attack doctrine, the Air Corps during this period relied on the innovative thinking, and informal doctrine developed at ACTS.

⁹⁹ Robert T. Finney, *History of the Air Corps Tactical School, 1920-1940*, USAF Historical Study 100 (1955; reprint, Washington D.C.: Center for Air Force History, 1985), 18.

¹⁰⁰ Oral History Interview, *General George C. Kenney* (Washington, D.C.: Office of Air Force History, 1967), 6.

¹⁰¹ George C. Kenney (Captain, AC) "History and Development of Attack Aviation: First Conference," 1927-1928, 1-5.

¹⁰² *Ibid.*, 1-5.

¹⁰³ Shiner, *Foulois and the US Army Air Corps*, 229.

Annual Training and Maneuvers

For Air Corps attack aviation, annual training and maneuvers confirmed the doctrine being taught at the Air Corps Tactical School. Thus, the tactics and employment of attack aviation in maneuvers was internally consistent with doctrine. However, the maneuvers would highlight some problems external to the Air Corps -- the Army vision of attack aviation.

The training road was a rocky one for most attack squadrons, although the 3rd Attack Group managed to participate in all of the annual maneuvers. The training of tactical units on the whole suffered by a lack of money, equipment, supplies and facilities. This was primarily due to budget constraints and the slow progress of the 5-year expansion program. As an example, the 3rd Attack Group was without adequate housing for its equipment at Fort Crockett, Texas and only had small allotments of live ammunition.¹⁰⁴ However, by the early thirties training conditions had generally improved.

The 3rd Attack Group participated in all the annual maneuvers from 1925 to 1931, as well as other field exercises. The annual maneuvers were the most significant because they were intended to exercise large air forces in an environment of joint cooperation. The two most important maneuvers during the Air Corps period were the San Antonio, Texas, maneuvers in May, 1927, and the Dayton, Ohio, maneuvers in July, 1929. (see Appendix 1) It was during these maneuvers that attack theory and doctrine were best tested, as well as, the most indicative of some of the problems in doctrine and joint cooperation.

During the San Antonio maneuvers the 3rd Attack Group flew missions in support of Blue ground forces conducting a general offensive and gained valuable experience. First, the maneuvers confirmed Air Corps attack doctrine. Attack aircraft flew interdiction and counter-air missions beyond the range of artillery. Pursuit, for the most part, covered attack operations. Additionally, the majority of attack aviation targets included troop concentrations, railroad and highway bridges, Red reserves and reserve areas, airdromes, lead points of the enemy's retreat, and the dispersion of enemy attacks.¹⁰⁵

There were however, glaring problems with the ultimate control of aviation, especially given the apparent difference in vision between ground commanders and air commanders. Although the air force was allowed great freedom in deep operations, attempting to secure air superiority, and the selection of targets for support of the ground forces, army commanders still believed the air force as an auxiliary reserve force to be used as the ground battle dictated. Typical of this view is General Hind's (Blue First Army Commander) end-of-exercise critique: "It is a comparatively new and powerful auxiliary arm of the service whose most effective use is in conjunction with ground forces and not in independent action. These are the principles on which maneuver was based."¹⁰⁶ Also, his other comments are noteworthy: "Such action by Army headquarters was based upon the principle that, during the attack, the main function of the combatant Army Air Corps, was to act as a general reserve for use in meeting emergencies, and for desired concentrations. ...In planning for air operations during the attack I decided to use

¹⁰⁴Maurer, *Aviation in the US Army*, 224.

¹⁰⁵Report, "Critique of Air and Ground Maneuvers," San Antonio, Texas, 15-19 May 1927, 4-22.

the Army Air Corps exactly as I would any other auxiliary combatant arm and determined to employ it on targets of opportunity to the full extent of its combat power. Keeping in mind always its main function as a general reserve and its probable and possible use in later states of the action and even beyond that time.¹⁰⁷

In staged maneuvers, this viewpoint may not have appeared overly threatening given the air commanders' apparent freedom of action. In battle, however, ground troops often remained in contact and thus closer control of attack aviation could be expected by ground commanders.

In the Ohio maneuvers, the Air Corps' attack doctrine again held true to form. Significantly, these were two-sided maneuvers with opposing air forces as well as ground forces. The Blue air forces conducted deep operations, used attack aviation to help gain air superiority and supported the ground forces with indirect operations. The typical targets included ground troops on the march, auto columns, red airdromes, the Red Capital City, supply bases, bridges, and a railway station. Again, attack aviation used low level attack tactics. Interestingly, there were important problems with attack doctrine that would foreshadow future flaws in the doctrine.

First, air superiority was pursued but never gained. Exercise umpires and attack pilots themselves would often consider their attacks successful when unescorted and jumped by pursuit.¹⁰⁸ Additionally, one observer calculated the Blue aviation losses to be approximately 50 percent per month -- an alarming number that should have drawn the

¹⁰⁶Report, "Critique of Air and Ground Maneuvers, San Antonio, Texas," 14.

¹⁰⁷Ibid., 14-15.

¹⁰⁸"The May Maneuvers, 1929, of the Air Corps of the US Army," *Messenger of the Air Arm*, (Translated article from Russian magazine), 20-21.

attention of airmen.¹⁰⁹ The second problem area was with air force cooperation between the different air branches. Coordinating and executing combined packages was a problem. And finally, radio communication presented the third significant problem area. There were problems with air-to-ground, as well as, air-to-air communications. A recommendation was made to develop air-to-air radio communications so that commanders could gain better control in-flight.¹¹⁰

In spite of the noted problem areas, the maneuvers were invaluable training for attack aviation during a period where the test of combat was not to be obtained. The question remained, however, whether attack aviation could profit from its training experiences before the start of the next war.

¹⁰⁹Ibid., 24.

¹¹⁰W. H. Frank (Major, AC), "Critique, Air-Ground Maneuvers Fifth Corps Area, May 1929," address to maneuver participants at Wright Field, Ohio, 1,4.

Chapter 4

Attack Theory and Doctrine Before WWII, 1935-1941

Attack Aviation in the GHQ Air Force

After years of debate and struggle, the Air Corps' fight to become an independent air organization was again answered by reorganization without independence. On 1 March 1935, the War Department established the GHQ Air Force, primarily "as a new tactical unit of the Army."¹¹¹ The organization of the GHQ Air Force followed the recommendations of the Secretary of War's special committee examining Air Corps operations, the Baker Board, and established the GHQ headquarters at Langley Field, Virginia. The new GHQ Commander, Major General Frank M. Andrews, reported to the Chief of Staff in time of peace and to the theater commander in time of war.¹¹² This relegated the Chief of the Air Corps to supply, training, and doctrine functions.¹¹³ In addition, three combat wings were established, one each at March Field (1st Wing), Langley Field (2nd Wing), and Barksdale Field (3rd Wing).¹¹⁴ For attack aviation, this meant the 3rd Attack Group with four attack squadrons would be assigned to the 3rd Wing at Barksdale Field. And, the 17th Attack Group with three attack squadrons would be assigned to the 1st Wing at March Field. For many in the Air Corps, the establishment of the GHQ Air Force was a positive step towards a more unified striking force.¹¹⁵ For

¹¹¹Thomas H. Greer, *The Development of Air Doctrine in the Army Air Arm, 1917-1941*, USAF Historical Study 89 (1955; reprint, Washington, D.C.: Office of Air Force History, 1985), 73.

¹¹²*Ibid.*, 73.

¹¹³John F. Shiner, *Foulois and the US Army Air Corps, 1931-1935*, General Histories (Washington, D.C.: Office of Air Force History, 1983), 261.

¹¹⁴*Ibid.*, 205.

¹¹⁵Greer, 74.

others, the reorganization simply divided the air force into more parts.¹¹⁶ The question remained whether the GHQ Air Force would become a viable organization during a period of change and multiple constraints.

The GHQ Air Force faced continuing funding problems that severely limited aircraft and personnel procurement. From 1933 to 1937, the government failed to fully fund the Air Corps and GHQ Air Force. As a result, the inventory of aircraft shrank from 1,646 planes in 1932 to 855 in 1936.¹¹⁷ In December 1934 most tactical squadrons were operating at less than fifty percent of authorized aircraft strength.¹¹⁸ By mid-1935, the GHQ Air force had approximately 450 aircraft, of which fewer than 175 were relatively modern.¹¹⁹ Although the trend would reverse itself in the years prior to WWII, the effect of declining aircraft resources was a major concern to airmen fighting for the viability of a GHQ Air Force.

The shortage of air personnel was another problem affecting the advance of the GHQ Air Force. Air Corps' officer strength in mid-1934 was about 350 short of the 1,650 specified in the Air Corps Act of 1926.¹²⁰ Additionally, the tables of organization called for 1,245 pilots, but only about 555 pilots, counting Reserves, were available at the start of the GHQ Air Force.¹²¹ Enlisted strength was not as serious a problem and eventually surpassed the levels established in 1926. By 1936, there were nearly 16,000 enlisted troops assigned.¹²²

¹¹⁶Ibid., 75.

¹¹⁷Shiner, 236.

¹¹⁸Ibid., 236.

¹¹⁹Ibid., 239.

¹²⁰Shiner, 241.

¹²¹Ibid., 243.

¹²²Ibid., 241.

Thus, overall funding problems would cause the GHQ Air Force to make tradeoffs on where future investment was to be made. During this period, there can be little doubt that the move toward an independent air organization and the emphasis on bombardment as the primary combat arm left little room for attack aviation procurement. However, as the War Department's primary interest, attack aviation was not entirely ignored.

Attack Theory Refined

Attack theory during the period continued to be refined and structured as principles of employment, the relationship of attack to the ground scheme or campaign, and an airman's view of attack aviation's best use beyond the battle line.

Attack aviation principles of employment were discussed and written in more general terms than the terms of the early 1930's. The 1939 *Attack Aviation* text identified only five basic principles of employment: surprise, objective, conservation of force, simplicity, and security.¹²³ Many of the earlier principles, like fire power and familiarity with terrain, were simply incorporated into newer ones. As an example, "terrain" was discussed as an element of surprise.¹²⁴ The trend appeared to be one away from emphasizing tactics to one emphasizing the application of attack aviation at higher levels of war. The "objective," for example, was to be selected to further the Air Force mission to effectively utilize attack aviation to its fullest extent."¹²⁵ Attack aviation was now an organic part of the GHQ Air Force. Attack aviation was part of a coordinated team -- the

¹²³ Air Corps Tactical School, *Attack Aviation*, 1 June 1939, text, 3-4.

¹²⁴ Ibid., 3.

¹²⁵ Ibid., 3.

air strike force. Its theoretical principles of employment must account for this new operational concept.

The theory of the unfolding ground campaign also underwent refinement. For the War Department, creation of the GHQ Air Force left unanswered questions of the exact role of the GHQ Air Force. General C. E. Kilbourne of the General Staff, conceived of the GHQ air organization as an all-purpose force.¹²⁶ The GHQ Air Force was viewed as having operations in four categories: beyond the sphere of ground forces, immediate support of ground forces, defense of seacoasts, and defense of rear areas.¹²⁷ For the air strike force, and attack aviation in particular, the critical theory of employment was to be found in the second category, the "immediate" support of ground forces. Here, Kilbourne envisioned operations to be subdivided into two phases: the approach to battle and the battle itself. In the first phase, operations would be directed at enemy air action, reconnaissance, enemy communications, and attacks upon troop concentrations, moving columns, and ammunition dumps.¹²⁸ During the battle, the GHQ Air force would be called upon to deliver massed attacks upon key points in the enemy position, upon enemy units preparing for an assault, and upon enemy reserves.¹²⁹ The worry for airmen with this view of warfare was reflected in ACTS attack texts -- that the tendency for ground commanders was to continually call on attack aviation to augment ground fires.¹³⁰

The airman's theory on the best use of attack aviation was also refined in the GHQ Air Force period. The new emphasis was not so much directed at employment

¹²⁶Greer, 74.

¹²⁷Greer, 74.

¹²⁸Ibid., 74.

¹²⁹Ibid., 74.

theory as it was command theory. As early as 1934, a War Plans Division study headed by Kilbourne identified methods of control of the GHQ Air Force.¹³¹ Kilbourne's study suggested three ways for Army GHQ to use the air force: (1) assign the GHQ Air Force Commander a broad general mission; this would be applicable prior to the contact of ground forces and in lulls in ground operations; (2) assign to the GHQ Commander special missions of major objectives upon which the Air Force should be employed; this would be the normal method of control and coordination during the period between contact of the opposing forces and the actual beginning of the battle; and (3) utilize the striking power of the GHQ Air Force for decisive attacks in conjunction with the ground forces; this is accomplished by (a) assignment of specific mission to the GHQ Air Force Commander for execution under direct control, or (b) directing the GHQ Air force Commander to support the specific operations of an army in accordance with the instructions of said army's commander, or (c) use a combination of (a) and (b).¹³²

Airmen recognized that method number one would give the GHQ Commander the greatest freedom of action and the responsibility to select objectives against which the Air Force would be directed. Method number three, on the other hand, ensured the maximum development of airpower in battle.¹³³

On the surface, the theory of GHQ control seemed to be solely one applying to the strategic employment of bombardment. But, the question of control was critical to the airman's view of attack aviation employment. Attack aviation, not unlike bombardment

¹³⁰ Air Corps Tactical School, *Attack Aviation*, 1 June 1939, text, 2.

¹³¹ Shiner, 213.

and pursuit, required control method number one if it was to be translated into effective doctrine during time of war. Here again the theoretical tension can be seen between the Army view of attack aviation being continuously applied in direct support of ground forces as a battlefield weapon and the airman's view of attack aviation's best use beyond the battle line, indirectly supporting the ground forces beyond artillery range. Whoever exercised control over the GHQ Air Force, theoretically, would become the final arbiter.

Attack Doctrine Before WWII

When the GHQ Air Force was established in 1935, one of the first priorities of the War Department was to update TR 440-15 in October 1935.¹³⁴ The basis of the new TR 440-15, *Employment of the Air Forces of the Army*, was the doctrine study accomplished by the War Department's War Plans Division headed by General Kilbourne. The new TR 440-15 reflected an expanded mission for the Air Force and considered for the first time air operations beyond the sphere of influence of the ground forces. Yet, these operations were to be undertaken in furtherance of the Army Strategic Plan.¹³⁵ TR 440-15 was, in effect, a compromise -- in that it attempted to reflect the desires of the Air Force for independent operations and maintain Army control of the air arm. The 1935 regulations remained the formal doctrine until 1940.¹³⁶

Attack doctrine, as taught at the Air Corps Tactical School, remained much the same as previous years with two significant additions. First, the definition of attack now

¹³²ACTS, "A Study of Proposed Air Corps Doctrine Made By The Air Corps Tactical School, Based Upon Information Furnished By The War Plans Division, General Staff, In Memorandum, Dated December 21, 1934," 31 January 1935, 10.

¹³³Ibid., 10.

¹³⁴Shiner, 229.

¹³⁵Shiner, 229.

¹³⁶Ibid., 229.

described attack aviation as a class of aviation within the “striking force” to destroy light materials and objectives. Additionally, the mission of attack aviation included:

(1) the destruction of aircraft on the ground and aircraft base facilities, (2) the attack of light vessels and personnel in coast defense operations, (3) the neutralization of anti-aircraft defenses to support friendly air operations, and (4) the destruction of hostile forces and their system of supply and replacement, by the destruction of neutralization of lines of communication, supply and manufacturing establishments, light bridges, transportation equipment and concentrations of troops.¹³⁷

The second, and most significant, doctrine change was the shift to light bombardment as the primary attack weapon in the support of air force operations. The 1939 *Attack Aviation* text stated: “In early stages of a war, the principal missions of attack aviation involve combined operations of the air force, and therefore, its radius of action should equal that of bombardment aviation, in that it must be able to reach Air Force objectives which are vulnerable to chemicals, machine gun and light bombs.”¹³⁸ Given the increased emphasis on destructive capability and bigger bombs during the Air Corps period, a call for increased range to support bombardment aviation signaled a shift in aircraft requirements to larger multi-engine aircraft for attack aviation. Interestingly, this shift was reflected at ACTS when in 1939 the Attack Section was renamed the Light Bombardment Section.¹³⁹

¹³⁷ ACTS, *Attack Aviation*, 1939, text, 1.

¹³⁸ ACTS, *Attack Aviation*, 1939, text, 2.

¹³⁹ Robert T. Finney, *History of the Air Corps Tactical School, 1920-1940*, USAF Historical Study 100 (1955; reprint, Washington, D.C.: Center for Air Force History, 1992), see footnote, 80.

The trend toward light bombardment as the primary attack weapon was an evolving idea and one that created controversy within the War Department. As early as 1929, studies at ACTS were exploring the use of multi-engine, light bombers in the attack role. One study concluded that fast day bombardment was a necessity and that better safety and more accurate performance was obtained by high flying rather than low flying aircraft.¹⁴⁰ Clearly ACTS was asking all the right questions: Can the light bomber penetrate successfully?; Can the attack group navigate at low altitude?; and, Can the targets be hit accurately? Another study, of which Captain George Kenney was a member, recommended an attack plane with two-motors, geared engines, crew of three (front gunner/bomber, pilot, and rear gunner), and flexible guns.¹⁴¹

At the same, there were questions about the efficacy of current ground support doctrine and methods. Some air officers, like Major Bissell, were convinced that the existing attack techniques were ineffective.¹⁴² As the result of tactical exercises in Hawaii in 1936, Bissell believed that attack airplanes could not accurately place their bombs on small targets. The Curtiss A-12's he observed carried no precision bombsights and hit only large area targets.¹⁴³ Other doubts about attack doctrine were created as a result of the Spanish Civil War. The light bomber proved effective in Spain in support of ground forces while the machine-gun fire from fast-flying aircraft proved inaccurate. Thus, the suggestion from higher authority was that level bombing at medium altitudes become the

¹⁴⁰ACTS, "Outline Of Study Desired In Connection With The Low Altitude Light Bombardment Airplane," 1929-1930, 4-5; see also coordinating letter by John H. Jouett, 2.

¹⁴¹ACTS, "Proceedings of a Board of Officers to determine the general requirements of an attack airplane," 8 April 1929, 2-3.

¹⁴²Greer, 87.

¹⁴³Ibid., 87.

primary tactic of attack aviation.¹⁴⁴ Additionally, the war in Spain showed the effectiveness of German anti-aircraft artillery and the need for armor protection for attack aircraft or higher altitudes as a measure of protection.¹⁴⁵

In 1937, studies at the Air Corps Tactical School were recommending a second aircraft in the attack role. Major Omer Niergarth recommended that a study be initiated immediately to determine whether or not a special type of airplane was required to penetrate anti-aircraft gun defense at ranges equal to that of bombardment. Niergarth states: "If so, development of this type of airplane should be started at once."¹⁴⁶ Captain Donald Goodrich stated: "That because it appears necessary to develop two distinct types of airplanes for future attack missions, a study be initiated to determine the feasibility of transferring all long range attack missions to bombardment aviation, and making the primary mission of attack aviation the direct support of ground operations." Additionally, he recognized the need for a suitable "attack-bomber" airplane for long range counter-air force operations.¹⁴⁷

Additionally, an Air Corps Board study in 1939 recommended standardizing the air fleet with a 5000-mile radius heavy bomber, a 2500-mile radius medium bomber, a 1500-mile radius short-range bomber, and an attack bomber with 500- to 700-mile radius.¹⁴⁸ However, as light bombardment took hold, some in the War Department argued for greater use of dive-bombers, pointing to the success of German tactics in Greece and

¹⁴⁴Ibid., 87.

¹⁴⁵G-2 Report, Spain (Combat), "Lessons from the Spanish Civil War," 5 January 1938, 2.

¹⁴⁶Omer O. Niergarth, Major, AC, "The Attack Airplane in Support of Ground Forces," ACTS paper, Maxwell Field, Ala., 1937-1938, 35.

¹⁴⁷Donald R. Goodrich, Captain, AC, "History and Development of Attack Aviation," ACTS paper Maxwell Field, Ala., 1937-1938, 26.

¹⁴⁸Futrell, 93.

Crete.¹⁴⁹ It would not be until the Fall of 1941 before the traditional type attack plane was viewed in more favorable terms.¹⁵⁰

Attack aircraft development during the pre-WWII period reflected the doctrine trends in the need for increased fire power, accuracy, and range. In 1936, the Northrop A-17, a single-engine, two-seat, monoplane became the standard attack plane, replacing the Curtiss A-12.¹⁵¹ However, the twin-engine attack designs introduced in the late 1930s were more in accord with ACTS indirect support doctrine. The Douglas A-20, Havoc, attack-bomber was a two-engine, three-seat, monoplane with a range of 1200 miles and a load of over 2000 pounds of bombs.¹⁵² Additionally, the Curtiss A-18, Douglas B-18, and Martin A-22 were twin-engine tactical bombers developed prior to WWII.¹⁵³ Hallion notes that: "Twins blurred the distinction between the low-altitude attack airplane and the medium-to-high altitude medium bomber."¹⁵⁴ In effect, the light and, later, medium bomber would prove effective in the indirect, beyond the battle line, support role. For the direct support of ground forces, the fighter was modified to be the fighter-bomber by the time of WWII.¹⁵⁵ The first success was the North American A-36 (a converted P-51) which replaced the Brewster A-32 during WWII.¹⁵⁶ Thus, the attack aircraft development trend was toward an attack bomber, or light bomber in the period prior to WWII.

¹⁴⁹Ibid., 122.

¹⁵⁰Ibid., 122.

¹⁵¹Greer, 88.

¹⁵²Richard P. Hallion, *Strike from the Sky: The History of Battlefield Air Attack, 1911-1945* (Washington, D.C.: Smithsonian Institution Press, 1989), 48.

¹⁵³Daniel R. Mortensen, *A Pattern For Joint Operations: World War II Close Air Support, North Africa* (Washington, D.C.: Office of Air Force History and US Army Center of Military History, 1987), 29-32.

¹⁵⁴Hallion, 49.

¹⁵⁵Ibid., 50.

¹⁵⁶Greer, 122-123.

Pre-War Codification of Doctrine

In the years prior to WWII formal codification of aviation doctrine was speedily attempted. The Aviation Expansion Program, started in 1939, set in motion a planned build-up to 24 groups--two were to be light bombardment (formerly attack).¹⁵⁷ Accordingly, doctrine was updated. The results can be seen in the Field Manual series covering the employment of aviation as a whole, and its specific branches. FM 1-5, *Employment of Aviation of the Army*, issued in April 1940, superseded TR 440-15, yet still reflected much of the doctrine at the Air Corps Tactical School.¹⁵⁸ FM 1-5 described the functional groupings of GHQ aviation as: (1) striking forces (long range offensive), (2) defensive forces (strategic air), (3) support forces (for ground operations), and (4) special forces (airlift, reconnaissance, utility).¹⁵⁹ However, FM 1-5 contained no clear cut definition of air superiority, and failed to clearly address the vital importance of air superiority and centralized control in tactical operations.¹⁶⁰

The mission of attack aviation in FM 1-5 was essentially the same as that developed at the Air Corps Tactical School.¹⁶¹ As Greer states: "Proper targets were vulnerable surface installations and forces, principally in rear areas, and included logistical establishments, communications, supplies, fortifications, and vehicles or troops."¹⁶² Perhaps more important, FM 1-5 established light bombardment as the striking

¹⁵⁷Robert F. Futrell, *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force, 1907-1964*, vol. 1 (Maxwell AFB, Ala.: Air University Press, 1989), 94.

¹⁵⁸Greer, 113.

¹⁵⁹Major John P. Owen, "The Evolution of FM 100-20, Command and Employment of Air Power (21 July 1943): The Foundation of Modern Airpower Doctrine," (Masters thesis presented to the US Army Command and General Staff College, 1989), 61.

¹⁶⁰*Ibid.*, 60, 81.

¹⁶¹Greer., 121.

¹⁶²*Ibid.*, 121.

element of support forces. The primary armament was the bomb, with chemical spray and machine guns of secondary importance.¹⁶³

Another manual, FM 1-10, *Tactics and Technique of Air Attack*, November 1940, was a repetition of previous Air Corps doctrine, but stressed the need for local air superiority. It stated "the mission of first priority of combat aviation in support of ground force units is, whenever possible, the destruction or neutralization of effective hostile air resistance from the decisive area of ground operations."¹⁶⁴ What FM 1-10 lacked was clear techniques and procedures for close cooperation with the ground force. Air Corps attack doctrine following the beliefs of indirect support recognized the need for both air and ground cooperation. However, since targets beyond the battle line required less cooperation with the ground forces, cooperation with covering pursuit and bombardment was deemed a greater necessity. These shortfalls, not well addressed during exercises and maneuvers, would be quickly recognized at the start of WWII.

Exercises, Maneuvers, and Lessons of Wars

Attack aviation in the GHQ Air Force period attempted to test and validate doctrine in terms of area exercises, maneuvers, and the historical lessons of small and European wars. Area commanders continued to request attack aviation in tactical exercises during this period in spite of the cancellation of several annual maneuvers. In 1938, for example, the 18th Infantry Brigade worked with attack units from the 3rd Wing, Barksdale Field, to improve cooperation between attack aviation and mechanized forces. This exercise tested attack aviation against enemy tanks and in support of friendly tanks.

¹⁶³Greer, 122.

¹⁶⁴Owen, 92.

¹⁶⁵ The 8th Attack Squadron participated in the exercise and subsequently concluded the following: "Attack Aviation may be used effectively in support of mechanized attacks on bivouac areas and lines of communication in rear zones... Tanks that are deployed or dispersed do not present a good target for Attack Aviation, however mechanized forces in column on roads or massed so as to present an area target can be effectively attacked with light bombs."¹⁶⁶ Clearly, these exercises confirmed attack doctrine, as well as, the trends toward the use of bombs as the munition of first choice. However, attack aviation was also innovative in many ways. The 3rd Attack Group conducted tests in night attacks using flares to illuminate ground targets,¹⁶⁷ and experimented with parachute bombs against ground targets.¹⁶⁸

In preparation for WWII, extensive army-size maneuvers were held in Arkansas, Louisiana, and the Carolinas. The maneuvers were intended to improve air-ground cooperation. In the Louisiana maneuvers, for example, the air and ground commanders exchanged liaison officers, but failed to place command posts near airfields.¹⁶⁹ These maneuvers again highlighted that control of air support would remain problematic until WWII.

The use of historical lessons was another approach used to validate doctrine. An example of this approach is an ACTS study titled: "The Attack Airplane in Support of

¹⁶⁵ HQ 18th Infantry Brigade, "Cooperation Between Attack Aviation and Ground Troops," *Training Memorandum No. 12*, Fort Devens, Mass., 30 August 1938, 1.

¹⁶⁶ Y. A. Pitts (Major, AC), "Report of Training of Attack Aviation with Tank and Mechanized Units at Ft. Devens, Mass.," Barksdale Field, LA, 7 September 1938, 3.

¹⁶⁷ Earle L. Naiden (Lieut. Col., AC), "Report of Tests of Night Attacks Against Ground Targets," HQ 3d Attack Group, Barksdale Field, La, 20 August 1936.

¹⁶⁸ ACTS, "Memorandum for Major Thomas: Notes on Air Demonstration at Fort Benning, GA, by the Attack Section of the A.C.T.S.," 2 May 1939.

¹⁶⁹ Cooling, 55.

Ground Force.” The study analyzed the use of Aircraft in Ethiopia, Spain, and China. It concluded the following:

- (1) In all future wars, ground troops are going to demand much more of this close-in cooperation from air forces.
- (2) The airplane is not an effective weapons against troops except in so far as it does cause delay, confusion and some casualties.
- (3) The continuous attacks with bombs and machine guns against both troops on the march and troop trains caused serious delay and gave the forces sufficient time to strengthen the defenses.
- (4) The morale effect was unbelievably severe and even though, many casualties resulted, the worst effect was the lowering of the will to resist.¹⁷⁰

The study was also used to validate attack tactics. In Spain, it was reported that the method of attack was flights of three aircraft at a low altitude of 100 feet or less. Just before reaching the target, the planes would zoom to 450 to 500 feet and release their bombs. These tactics were used effectively by Russian A-5 observation type aircraft that had been equipped as a ground-attack aircraft.¹⁷¹

In the opening campaigns of WWII, the Germans and British provided valuable lessons with regard to attack aviation in support of the ground forces. The German conquest of Poland was illustrative. Greer states: “Although the theories provided in Poland were related primarily to ground support operations, they involved such concepts as unified control of the air force, achievement of air control, and isolation of the battlefield.”¹⁷² The Germans had validated priority number one by attacking the enemy

¹⁷⁰Niergarth, 18-19.

¹⁷¹¹⁷¹Ibid., 16.

¹⁷²Greer, 109.

air force. The British strategy in the air war in North Africa, 1941-1942, was also insightful. The British used American lend-lease light bombers in attacking German supply lines with great success.¹⁷³ Upon entry into the war in North Africa, the Americans would also discover the value that added range and payload would bring to indirect support of the ground forces.

The instructors and airmen at ACTS were quick to seize upon these lessons as confirmation of ACTS doctrine. However, the question remained as to whether American airmen could execute Army Air Forces doctrine when war presented them the true test.

Chapter 5

Conclusion

Summary of Findings

Attack aviation development during the Air Service, 1919-1926, can best be understood given three important findings. First, attack theory and doctrine was significantly influenced by the lessons of WWI. Airmen believed that aircraft vulnerability over the immediate battlefield caused such high attrition so as not to warrant the risks of close support. On the other hand, objectives in the rear areas, beyond artillery range, were highly susceptible to attack and were generally less heavily defended. Second, Air Service attack theory was in its infancy and represented a fragmented body of knowledge. Early theorists like Mitchell

¹⁷³James S. Corum, "The Air War In North Africa, December 1941-June 1942," paper presented to the Siena College World War II Conference, Albany, New York, 1995, 8-10.

and Sherman believed the best value of attack aviation was in shattering troop morale, rather than the destructive power of attack aircraft. Attack theory was also addressed in terms of fundamental principles, the theoretical progression of the ground campaign, and an airman's model. The airman's model suggested that attack aviation could be most successful beyond the "crust," or battle line.

And third, Air Service attack doctrine stated the mission was to attack military objectives on the ground, or water, especially personnel. Attack doctrine emphasized targets beyond the range of artillery, especially moving troop columns and supplies. Attack tactics called for low-level operations using machine guns and fragmentation bombs. By 1926, TR 400-15 established the Air Service as an auxiliary arm of the Army in the pursuit of ground objectives.

Air Corps attack theory and doctrine development during 1926-1935 is best reflected in several key findings. First, the reorganization of the Air Service into the Air Corps, budget constraints, US isolationism and a delayed expansion program all inhibited the growth of attack aviation. Second, although new attack aircraft were acquired, attack aviation on the whole suffered as aviation technology failed to provide an adequate single-engine aircraft to meet the speed, maneuverability, weight, and armor requirements of the attack mission. Third, attack theory continued its advance but remained consistent with the previous period. The effect of attack aviation on troop morale was

taught at the Air Corps Tactical School (ACTS), but was emphasized less as the destructive capabilities of aircraft came to the forefront of thinking. Sixteen principles of employment were identified for attack aviation in 1930. The airman's theory of the best use of attack aviation called for indirect support beyond the immediate battlefield. This model conflicted with Army beliefs that aviation should be brought under closer control and used in direct support when troops were in contact. Fourth, the informal attack doctrine developed at ACTS reflected the theoretical division between the Army and Air Corps. Attack aviation was now that branch of the air force whose general mission was to further the success of the air force mission by attack of personnel and light objectives. Attack aviation's primary mission was to help attain air superiority by attacking enemy airdromes and aircraft on the ground. Attack tactics remained low-level attacks using surprise, pattern bombing, and strafing. However, doctrinal emphasis shifted to the need for greater destructive power and range of aircraft, and subsequently the study and development of light bombardment aircraft. Dive bombing was considered an inferior method for attack aviation since a steady, continuous dive was highly vulnerable to pursuit attack. Fifth, official doctrine was still embodied in TR 400-15, "Fundamental Principles for the Employment of the Air Service," 1926, which relegated attack and pursuit aviation as an integral part of each field army. And finally, Air Corps attack training and maneuvers were consistent with the theory and doctrine developed at ACTS. The 1929,

Ohio maneuvers were the first two-sided air force maneuvers. The maneuvers highlighted both the positive and negative aspects of attack doctrine. While attack aviation exercised its primary mission against hostile airdromes, simultaneously attacks were made against other targets. Air superiority was conveniently not considered a prerequisite for attack aviation. Also, problems were noted with cooperation between the different air branches as well as ground units, especially in the area of communications.

Before WWII, the development of attack aviation in the GHQ Air Force 1935-1941 can be summarized by the following key findings. First, the Air Corps was reorganized in 1935 to include a GHQ Air Force. The Air Corps was relegated to supply, training, and doctrine functions, while the GHQ Air Force became the combatant air arm. As a result, attack groups were established in East and West coast wings. Second, attack theory was further refined and continued to be modeled in terms of principles of employment, the ground scheme or campaign, and the airman's model. Attack principles became more general in nature while the ground campaign model focused on the control and role of the GHQ Air Force. The War Department General Staff viewed the battle proper as the critical phase of employment where the GHQ Air Force would be brought under closer control and called upon to deliver massed attacks upon key points in the enemy position. The airman's model also emphasized command theory. Airmen recognized that the greatest

freedom for the employment of the GHQ Air Force was when the air commander selected the objectives and directed operations based upon the true capabilities of the air force. Third, formal doctrine, in the form of TR 440-15, was updated in 1935 and then again in 1940 as *FM 1-5, Employment of Aviation of the Army*. The new TR 440-15 reflected the expanded mission of the GHQ Air Force -- those missions beyond the sphere of influence of the ground forces. Yet, formal doctrine still relegated air force operations to the furtherance of the Army strategic plan. Fourth, the informal doctrine taught as ACTS remained largely the same, with some exceptions. Attack aviation was defined as the class of aviation within the strike force to destroy light materials and objectives. The primary attack mission was the destruction of aircraft on the ground and aircraft base facilities. The secondary mission became the support of the ground forces. Fifth, given the two separate missions and emphasis on the destructive capabilities of attack aircraft, the push for a new attack aircraft, the light bomber, became apparent. Additionally, light bomber development was influenced by the need for attack aviation to support the air superiority mission of the GHQ Air Force. More range and payload was required of the new light bomber. The twin-engine, Douglas A-20, Havoc, was the first "attack-bomber" to enter the inventory. Sixth, the pre-war effort to codify the GHQ Air Force attack aviation doctrine was rapid and subsequently captured much of the interwar ACTS doctrine. Significantly, FM 1-5 established light bombardment as the striking

element in support of the ground forces. FM 1-10, *Tactics and Technique of Air Attack*, 1940, established attack aviation's, first priority as the destruction or neutralization of hostile enemy air forces. The shortcomings of interwar attack doctrine, poor air-to-ground and air-to-air cooperation for example, failed to be fully addressed in the rapid pre-war codification effort. Finally, pre-war doctrine was validated primarily through attack unit participation in area exercises, maneuvers, and the application of the lessons of small and European wars. Area exercises experimented with the use of attack aviation against tanks and personnel in different stages of operations. Historical lessons were used to validate current doctrine and to further highlight attack principles. Neither method truly addressed the shortcomings identified during earlier maneuvers. Thus, prior to WWII, US attack aviation using indirect support doctrine was well developed, but still lacked resolution in some areas.

Principal Conclusions

From their earliest origins, attack theory and doctrine evolved primarily along two paths -- direct and indirect support of ground force and air force objectives. The direct support approach was based on fundamental beliefs by the Army that attack aviation was an auxiliary combat arm, to be used directly on the battlefield against ground forces and to further the ground campaign plan. This approach recognized the Air Corps need to achieve air superiority, at least temporarily, in order to conduct other aviation missions in support of ground objectives.

The indirect support approach, or air interdiction, was derived from the fundamental beliefs by the Air Force that attack aviation was best used beyond the battle line and artillery range, against targets more vulnerable and less heavily defended, to further both the Air Force mission and the ground support mission. This approach recognized the need to achieve air superiority, at least temporarily, in order to conduct missions in support of Air Force and Army objectives.

The Air Corps Tactical School advocated the indirect support approach and the subsequent evolution and logic in attack doctrine flowed from this approach. Air Corps theory and doctrine called for attack aviation to be used beyond "the crust" or battle line. Aircraft were less vulnerable to ground fire and could be used to delay and disrupt enemy ground forces. Less cooperation was required with the ground forces while more cooperation was needed with other aviation branches, especially Pursuit. As attack doctrine evolved, hardened and varied targets became problematic for the single-engine attack plane. The indirect support approach, supporting both the Air Force and Army missions, required an aircraft with increased range and payload. Subsequently, the "attack-bomber," or light bomber was introduced to meet the attack requirement. What appeared to be neglect, and the overly strong influence of strategic bombing doctrine, was more accurately, an evolution in the development of attack aviation doctrine.

Thus, attack theory and doctrine in terms of the indirect support approach, was adequately developed to be useful at the start of WWII. Once a unified air

commander was identified and air superiority achieved, the use of light and medium bombers in North Africa showed the effectiveness of air interdiction and the indirect approach. This is not to say that there were not significant problems in attack operations given the lack of emphasis by the Air Force in the direct support approach. Air Force-Army cooperation suffered considerably. The Air Force proved inadequately prepared when called upon to provide direct support to the ground forces, even with its doctrine of direct or close support in time of emergency. However, attack aviation, in the form of air interdiction, had established itself before WWII. Attack aviation, in the form of close air support, would have to wait for the lessons of WWII.

Relevance of the Study and Its Conclusions

The theoretical and doctrinal divisions in the direct and indirect support of the ground forces still exist today between the Air Force and Army. As a consequence, many of the same problems in joint cooperation and control of airpower assets still occupy the time and energies of military leaders and planners.

Much of the history behind the development of close air support and air interdiction, like that of attack aviation doctrine, has been forgotten. Additionally, service posturing and bureaucratic politics have tended to distort this history. We must understand that the divisions in ground support thinking and doctrine have deep historical roots. As a result, a common understanding, or common view of the battlefield and theater is absolutely necessary if joint cooperation, effectiveness, and efficiency are to be improved.

Over the years, the Air Force has chosen to emphasize the indirect approach -- that of air interdiction. However, we cannot ignore the validity of Army objectives any more than they can ours. By fully and doctrinally addressing the requirements of both missions, the great flexibility of airpower can be exploited. For both services to continue the current doctrinal path of underemphasizing the legitimate interests of both land- and air-power, is to invite failure.

The Air Force is no longer a service fighting for independence, nor is it a service identified by a single mission. The history of attack aviation has provided a rich legacy from which air interdiction and CAS have evolved. These missions, in turn, are a reflection of the true value of airpower.

Appendix 1					
Analysis of Attack Operations in Air Service and Air Corps Maneuvers,					
Date	Place	Attack Unit & Aircraft	Scenario	Exercise Objectives	Targets
October 1925	Mitchel & Langley Fields, VA	3rd Attack Group	Air defense against hostile fleet with aircraft carriers	Defend coast against air attack; meet enemy point of attack	Landing craft, aircr
April 1926	Wright Field, OH	3rd Attack Group; O-2s & DH-4s	Red nation secretly mobilized and declared war	Pursuit attacks against attack, bombardment aviation; pre-vent concentration & forward deployment of enemy ground forces	Bridges, railroads, railyards
May 1927	San Antonio, TX	3rd Attack Group	Two opposing forces; Blue general offensive	Support offensive; deploy & consolidate air forces from large distances; joint cooperation	Red reserves & rese areas, airdromes, railroad brides, hig bridges, troop concentrations, artil lead points of enem retreat
April 1928	Langley Field, VA	3rd Attack Squadron	Demonstration	Tactical training	Troops in column
May 1928	Virginia Beach, VA	1st Attack Squadron	Two opposing forces	Tactical training	Red Army Hqs
July 1929	Wright Field, OH		Two-sided maneuvers	Air force vs. air force simulated warfare	Railroad station, su depots, red airdrom capital city, auto columns, troops on march, troops cross bridge, bridges
April 1930	Mather Field, CA			Mobility of air force units; use of radio communications	
May 1931	Dayton, OH		Public demonstrations		

Appendix 2

Navy - Marine Corps Close Air Support Prior to WWII

The Navy-Marine Corps approach to support of the ground forces grew from the experiences of small wars and the need for mutual support during amphibious operations.

In the early 1920s, Marine Corps actions in Nicaragua, Haiti, and Santo Domingo established the pattern for close cooperation between the infantry and airplane.¹⁷⁴ The best example of early close air support was the Sandino War in Nicaragua. During this war, Marines used dive-bombing attacks against the Sandinistas with considerable success.¹⁷⁵ The Marines flew a number of air support missions in Nicaragua where aircraft served as artillery -- something the Marines were in short supply. Additionally, aircraft intervened in sieges, flew escort missions for columns, and broke-up enemy ambushes.¹⁷⁶

The need to support amphibious landings and warfare was another early influence on Navy-Marine close air support. There was a critical vulnerability period between the end of naval gunfire and when artillery was not yet ashore that could be met only with airpower.¹⁷⁷ The idea was to let the airplane take the place of Marine artillery during and immediately after the landing. As a result of these experiences, the Marine close air support system would provide a doctrinal basis for further development in WWII.

¹⁷⁴ Malcolm W. Cagle, and Frank A. Manson, *The Sea War in Korea* (1957: reprint; New York: Arno Press, 1980), 48.

¹⁷⁵ Richard P. Hallion, *Strike from the Sky: The History of Battlefield Air Attack, 1911-1945* (Washington, D.C.: Smithsonian Institution Press, 1989), 72; Hallion also notes that the British were the first to pioneer close support operations in 1918.

¹⁷⁶ Gary R. Lester, "Mosquitoes To Wolves: The Evolution Of The Airborne Forward Air Controller in Asia, 1950-1972," unpublished PhD dissertation, Florida State University, 1994, 7-8.

¹⁷⁷ Cagle, 48.

Other influences include the introduction of Navy and Marine Corps flyers to Air Corps attack theory and doctrine in the 1920's and 1930's. Hallion states that Marine Major Ross E. Rowell had been assigned to the Army Air Service for duty at Kelly Field, Texas, home of the 3rd Attack Group.¹⁷⁸ Additionally, starting with three students in 1925, Marine Corps personnel regularly attended the Air Corps Tactical School (ACTS). The Navy provided some instructors at ACTS starting in 1936 until just before WWII.¹⁷⁹

During WWII, the Navy-Marine close air support system was perfected during the Pacific campaign. The airplane was used effectively to help Marines advance against Japanese held islands. Additionally, the close air support system included the use of air liaison parties (with an experienced aviator on the ground controlling aircraft), and improved air-ground radio communications.¹⁸⁰ As a result, the Marines produced a sound system of close air support.

Although the Marines advanced the idea of close air support beyond the beaches, their doctrine evolved from the practical experiences of small wars and the need for fire support during critical phases of operations. The Navy-Marine system that resulted represented a distinct contrast from the Army-Air Corps system developed during the interwar years.

¹⁷⁸ Hallion, 72.

¹⁷⁹ Robert T. Finney, *History of the Air Corps Tactical School, 1920-1940*, USAF Historical Study 100 (1955; reprint: Washington, D.C.: Center for Air Force History, 1992), 117-141.

¹⁸⁰ Cagle, 48-49.

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