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Beyond the Battle Line

US Air Attack Theory and Doctrine 1919–1941

GARY C. COX, MAJOR, USAF

School of Advanced Airpower Studies

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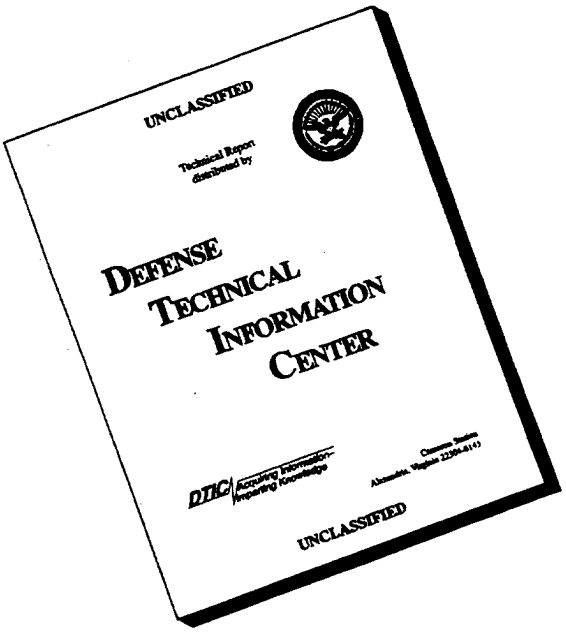

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Abstract

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 20 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 World War II. 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.

About the Author

Maj Gary C. Cox was commissioned in 1979 through the Reserve Officer Training Corps, Texas Tech University. Graduating from undergraduate pilot training in 1981, he went on to fly KC-135s as a copilot at Dyess Air Force Base (AFB), Texas. In 1983 he transitioned to the E-3 as a first pilot and aircraft commander in the newly established NATO Airborne Early Warning program. He then served as an E-3 instructor and evaluator pilot at Tinker AFB, Oklahoma. His follow-on assignment was in the command and control requirements division at Headquarters Air Combat Command, Langley AFB, Virginia. Major Cox is a senior pilot with more than 4,200 flying hours. He has a bachelor's degree in business administration from Texas Tech University and a master's degree in systems management from the University of Southern California. Major Cox is a distinguished graduate of the Air Command and Staff College. In July 1995 he was assigned to Eighth Air Force, air campaign strategy division.

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Chapter 1

Introduction

Principal Research Question

This study examines the evolution of US air attack theory and doctrine in the interwar period, 1919–1941, and provides 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 World War II. This study also 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 is on theory and doctrine and whether they were tested and properly examined in training, maneuvers, and the lessons of war. Additionally, this study examines how doctrine was formalized and disseminated during the interwar years.

Background and Significance of the Problem

The interwar period represents more than 20 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 B. 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 (AI). 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 fundamental attack theoretical and doctrinal views of the interwar period can be found today in the debates on CAS and AI (or battlefield air interdiction [BAI]), or direct versus indirect air support.

Limitations of the Study

The focus 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 examines the underlying theoretical frameworks and principles at work during three interwar periods.

This study is organized in terms of three historical interwar periods, generally based on Thomas H. 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 this 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.

Definitions and Assumptions

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 a 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 war fighting 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 strafing, light bombing, and chemical attacks. Today, direct and indirect ground support is known as CAS and AI.

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 World War II.

Notes

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

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

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

Chapter 2

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

Attack Aviation's World War I Legacy

By the end of WWI, attack aviation came to be recognized as a needed and separate branch of aviation. Brig Gen Mason M. Patrick, chief of the Air Service, American Expeditionary Forces (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 . . ."[1] As a result, one of the Air Services' first significant acts was to establish an attack aviation group in 1921—the 3d Attack Group.[2] 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, AEF, failed to achieve status as a separate aviation department. Instead, the Army Reorganization Act of 1920 established the Air Service as a combat arm of the Army, and no changes were made in its existing relations with the War Department General Staff.[3] 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.[4] While this was a transition from wartime to peacetime 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.[5]

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.[6] 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 3d 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.

The lessons of WWI had a profound impact on the early development of US attack aviation.[7] Attack operations in WWI were operations of opportunity and occurred incidental to pursuit, bombardment, and observation. There wasn't any 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 targets.[8] 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 frontline troops.[9] Moving armies exposed on roads provided better targets. Attack aviation discovered excellent targets beyond the range of friendly artillery where only the airplane could reach them.[10]

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 breech, much as cooks and drivers and military policemen were sent forward as makeshift infantry."[11] 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."[12] The attrition was due primarily to ground fire. In contrast, objectives behind the front lines tended to be less heavily defended.[13] 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, Maj William C. Sherman best articulated the value of attack aviation in effecting the morale of ground troops. In his handwritten 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 in the air.[14] 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."[15] Sherman was also influenced by the German, British, and French experiences in WWI. For example, he quotes Gen Erich 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."[16] 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.[17]

General 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.[18] In effect, attack aviation's impact on troop morale was more beneficial than the destructive power delivered on the troops. Additionally, Mitchell identified the 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."[19] 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."[20] 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."[21] 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 counterattacks during friendly offensive operations.[22] This framework envisioned attack aviation as an auxiliary force best employed in direct support of the ground forces. A second ground scheme was articulated by Sherman. He identified three phases where attack aviation operated—preliminary, conflict proper, and 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."[23] 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.[24]

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 frontline "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. Kennett notes that "in theory and practice, air support 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."[25] 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 in 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 arrival of reinforcements of personnel and material;[26]

3. Ground support was best carried out beyond the crust (indirect support);

4. Direct support was warranted only during times of great friendly or enemy combatant activity;

5. Low-level attacks to achieve surprise "normally" protected by pursuit was the best method of attack;

6. The best targets were moving troops, supply columns, bivouac areas, main lines of communication, reinforcements, reserves, artillery moving forward, etc.;[27] and

7. A fast, maneuverable, selectively armored, forward-armed, two-seat aircraft with rear gunner was the best design for an attack aircraft.[28]

Air Service attack doctrine was greatly influenced by the works of Col Edgar S. Gorrell, General Mitchell, and Major 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.[29] He was largely responsible for General Patrick's "Final Report of the Chief of Air Service, AEF," written in 1919, and two tentative manuals titled "Notes on the Employment of Air Service . . ." (February 1919) and "Tentative Manual for the Employment of Air Service" (April 1919).[30] These early documents called for aviation to support the ground effort and clearly recognized the future of attack aviation. Gorrell professed, as did others, that "the morale effect on ground troops is out of all proportion to the material destruction wrought."[31]

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.[32] Later, TR 440-15 was titled *Fundamental Principles for the Employment of the Air Service* and issued in 1923.[33] 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."[34] 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 enemy vessels."[35] 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 Act 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.[36] 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."[37] 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."[38] 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.[39] 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, 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 studies 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."[40] 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.[41] 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 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."[42] 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.[43] 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.

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."[44] 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.[45] The text also specified the use of attack aviation for attacking hostile airdromes.[46] 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,[47] it did manage to progress in the areas of unit tactical training, gunnery and bombing competitions, and annual maneuvers. In terms of 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.[48]

Tactically, the Air Service maintained competency in all branches of aviation. In 1924, the Air Service held bombing and gunnery matches at Langley Field, Virginia.[49] Competitions included machine-gun firing at ground and towed targets and bombing at low, medium, and high altitudes.[50] There were even inspections by Corps area commanders which were part of the training program of the Air Service. In 1924, for example, the 3d 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.[51] Dive-bombing was generally viewed as an inferior method for attack aircraft primarily due to the dangers from pursuit aircraft. However, when pursuit aircraft were used in attack, the practice was accepted.[52]

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.[53] The first of the annual maneuvers was held at Mitchel Field, New York, and Langley Field in October 1925.[54] 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.[55]

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.[56] ASTS doctrine in the 1925–26, *Attack* text called for delaying enemy operations by harassing and neutralizing the enemy ground forces.[57] 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 yards[58] 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.[59]

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.[60] Second, the rear gunner should be highly trained to enhance the defensive effectiveness of the attack formation. Third, in general more training 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.[61]

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.[62] Perhaps the 1927 maneuvers would provide a better test for attack doctrine.

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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.[1] With some observation, bombardment aviation would be held in a general headquarters (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.[2]

The Air Corps Act attempted to strengthen Army aviation by expanding the Air Corps over a five-year period starting in 1926.[3] 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 as an attack wing consisting of an attack group (the 3d Attack Group) and a pursuit group, each with three squadrons, and designated as army aviation.[4] 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.[5]

The Air Corps and War Department were expanding during a period when isolationism, pacifism, and budget constraints were determinant in America.[6] Additionally, the Kellogg-Briand Pact (1928) attempted to outlaw war. Further, the stock market crash in 1929 set off the Great Depression.[7] Thus, the Congress never fully funded the Air Corps expansion.[8] That the Air Corps was able to expand at all was a tribute to the leadership of General Patrick, chief of the Air Corps, and his successor Maj Gen James E. Fechet.

The new Air Corps expansion occurred at the same time as the 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.

The Air Corps was extremely slow to develop a successful attack aircraft.[9] The Air Corps used modified O-1B observation planes for attack—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."[10] Although an improvement over the DH-4Bs, the A-3s lacked the desired speed, maneuverability, armament, and armor required for attack operations. Thomas H. 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."[11] For attack aviation, the development emphasis on the single-engine monoplane type seemed to carry the day for the 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.[12] Then came the Curtiss A-12, "Shrike," an all-metal, two-seat monoplane available in 1934, while the Northrop A-17A was in development.[13] 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.

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 frontline troops became less important as some questioned the risks to aviation in doing either. The argument was divided between those in the Army favoring, frontline, morale-boosting action and those in the Air Corps who believed such attacks to be wasteful and inefficient.[14] The morale effect of frontline strafing was recognized, but the risk to plane and personnel from ground fire was not warranted.[15] 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."[16] Arguments were made to increase attack's role in the attainment of air superiority and better use of its destructive effects, especially with bombs. Morale as an objective was left to long-range bombardment and attacks on the enemy's interior.

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 ACTS 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.[17] 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 of attack aviation in warfare. In the ACTS *Attack Aviation* text of March 1930, 16 principles of employment were discussed. In brief summary, they were as follows:

1. Distinct Mission of Attack. A fundamental principle of the employment of attack aviation is that its firepower does not replace the firepower 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. Firepower. The successful employment of attack aviation requires a thorough understanding of its tremendous firepower. (Text makes comparison with infantry firepower.)

5. The Importance of Personnel Training. To carry out 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 antiaircraft 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 antiaircraft 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.[18]

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."[19] 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 "firepower," especially when compared with the firepower of an infantry company, seemed to suggest that attack aviation was flying 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.

6. An air force had two major limitations: its inability to conquer and hold terrain long; and its dependency, to a greater degree than other arms on atmospheric conditions.[20]

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 airman'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.[21] The underlying theoretical argument was not that attack aircraft could not do the job, but rather they were best suited elsewhere. The 1934–35 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."[22] Additionally, the airman on the whole believed aviation could best help the ground forces by achieving air superiority, interdicting supplies, destroying production facilities, and striking troops.[23]

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 battlefield 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 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 antiaircraft 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.[24]

Additionally, the doctrine stated that attack aviation should order the specific missions according to the priority objective; be used in counterair 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.[25]

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.[26] 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 of antiaircraft 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 antiaircraft establishments rather than the airdromes themselves. Essential ground establishments could best be attacked by bombardment.[27]

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 1,100 pound demolition bombs were required to drop concrete bridges.[28] Additionally, the Air Corps and ACTS began vigorously exploring and developing light bombardment aircraft.[29] 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.[30] Second, the ACTS text, *Attack*, 1925–26, 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."[31] 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.[32] This thinking was to establish a mind-set that attack aviation's defensive capabilities would allow them to successfully conduct missions without pursuit protection.

During this period, Capt George Kenney was notable in the development of Air Corps attack theory and doctrine. As an instructor at ACTS from 1927 to 1931,[33] he wrote the attack texts and developed tactics by using the class as a tool.[34] 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."[35] 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 "istrebityelniye" or "destroyers."

The point being made was that the US should be prepared for and expect low-flying attacks by "first class" powers.[36]

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.[37] 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.

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 3d 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 five-year expansion program. As an example, the 3d Attack Group was without adequate housing for its equipment at Fort Crockett, Texas, and only had small allotments of live ammunition.[38] However, by the early thirties training conditions had generally improved.

The 3d 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 A). 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 3d Attack Group flew missions in support of Blue ground forces conducting a general offensive and gained valuable experience. The maneuvers confirmed Air Corps attack doctrine. Attack aircraft flew interdiction and counterair 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.[39]

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 Maj Gen Ernest 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."[40] 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 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."[41]

In staged maneuvers, this viewpoint may not have appeared overly threatening given the air commander's 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.[42] Additionally, one observer calculated the Blue aviation losses to be approximately 50 percent per month—an alarming number that should have drawn the attention of airmen.[43] 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.[44]

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.

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Chapter 4

Attack Theory and Doctrine before World War II, 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."[1] 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 at Langley Field, Virginia. The new GHQ commander, Maj Gen Frank M. Andrews, reported to the chief of staff in time of peace and to the theater commander in time of war.[2] This relegated the chief of the Air Corps to supply, training, and doctrine functions.[3] In addition, three combat wings were established, one each at March Field (1st Wing), California; Langley Field (2d Wing); and Barksdale Field (3d Wing), Louisiana.[4] For attack aviation, this meant the 3d Attack Group with four attack squadrons would be assigned to the 3d Wing at Barksdale. And, the 17th Attack Group with three attack squadrons would be assigned to the 1st Wing at March. For many in the Air Corps, the establishment of the GHQ Air Force was a positive step towards a more unified striking force.[5] For others, the reorganization simply divided the air force into more parts.[6] 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.[7] In December 1934 most tactical squadrons were operating at less than 50 percent of authorized aircraft strength.[8] By mid-1935, the GHQ Air Force had approximately 450 aircraft, of which fewer than 175 were relatively modern.[9] 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 effecting 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.[10] 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.[11] 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.[12]

Thus, overall funding problems would cause the GHQ Air Force to make trade-offs 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 those of the early 1930s. The 1939 *Attack Aviation* text identified only five basic principles of employment: surprise, objective, conservation of force, simplicity, and security.[13] Many of the earlier principles, like firepower and familiarity with terrain, were simply incorporated into newer ones. As an example, "terrain" was discussed as an element of surprise.[14] 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.[15] Attack aviation was now an organic part of the GHQ Air Force. Attack aviation was part of a coordinated team—the 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. Brig Gen Charles E. Kilbourne of the General Staff conceived the GHQ air organization as an all-purpose force.[16] 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.[17] 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.[18] 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.[19] 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.[20]

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 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.[21] 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).[22]

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.[23]

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 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 World War II

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.[24] 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 Strategical Plan.[25] 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.[26]

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 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 antiaircraft 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.[27]

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."[28] 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 multiengine aircraft for attack aviation. Interestingly, this shift was reflected at ACTS when in 1939 the Attack Section was renamed the Light Bombardment Section.[29]

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 multiengine, 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.[30] Clearly ACTS was asking all the right questions: Can the light bomber penetrate successfully? Can the attack group navigate at low altitude? Can the targets be hit accurately? Another study, of which Capt George C. Kenney of the Air Corps 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.[31]

At the same time, there were questions about the efficacy of current ground support doctrine and methods. Some air officers, like Maj Clayton Bissell, were convinced that the existing attack techniques were ineffective.[32] 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-12s he observed carried no precision bombsights and hit only large area targets.[33] 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 primary tactic of attack aviation.[34] Additionally, the war in Spain showed the effectiveness of German antiaircraft artillery and the need for armor protection for attack aircraft or higher altitudes as a measure of protection.[35]

In 1937, studies at the Air Corps Tactical School were recommending a second aircraft in the attack role. Maj Omer Niergarth of the Air Corps recommended that a study be initiated immediately to determine whether a special type of airplane was required to penetrate antiaircraft gun defense at ranges equal to that of bombardment. Niergarth states, "If so, development of this type of airplane should be started at once."[36] Capt Donald R. Goodrich of the Air Corps stated, "That because it appears necessary to develop two distinct types of airplanes for future attack missions, a study [will] 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 counterair force operations.[37]

Additionally, an Air Corps Board study in 1939 recommended standardizing the air fleet with a 5,000-mile-radius heavy bomber, a 2,500-mile-radius medium bomber, a 1,500-mile-radius short-range bomber, and an attack bomber with 500- to 700-mile radius.[38] 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 Crete.[39] It would not be until the fall of 1941 before the traditional type attack plane was viewed in more favorable terms.[40]

Attack aircraft development during the pre-WWII period reflected the doctrine trends in the need for increased firepower, 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.[41] 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 1,200 miles and a load of over 2,000 pounds of bombs.[42] Additionally, the Curtiss A-18, Douglas B-18, and Martin A-22 were twin-engine tactical bombers developed prior to WWII.[43] Hallion notes that "twins blurred the distinction between the low-altitude attack airplane and the medium-to-high altitude medium bomber."[44] 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.[45] The first success was the North American A-36 (a converted P-51) which replaced the Brewster A-32 during WWII.[46] Thus, the attack aircraft development trend was toward an attack bomber or light bomber in the period prior to WWII.

Prewar 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 buildup to 24 groups—two were to be light bombardment (formerly attack).[47] Accordingly, doctrine was updated. The results can be seen in the Field Manual (FM) 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.[48] 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).[49] 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.[50]

The mission of attack aviation in FM 1-5 was essentially the same as that developed at the Air Corps Tactical School.[51] As Thomas H. 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."[52] Perhaps more important, FM 1-5 established light bombardment as the striking element of support forces. The primary armament was the bomb with chemical spray and machine guns of secondary importance.[53]

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."[54] 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 3d 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.[55] 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."[56] 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 3d Attack Group conducted tests in night attacks using flares to illuminate ground targets[57] and experimented with parachute bombs against ground targets.[58]

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.[59] These maneuvers again highlighted that control of air support would remain problematic until WWI (see appendix B).

The use of historical lessons was another approach to validate doctrine. An example is the ACTS study titled "The Attack Airplane in Support of Ground Force" that analyzed the use of aircraft in Ethiopia, Spain, and China and concluded the following:

- In all future wars, ground troops are going to demand much more of this close-in cooperation from air forces.
- The airplane is not an effective weapon against troops except in so far as it does cause delay, confusion, and some casualties.
- 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.
- The morale effect was unbelievably severe and even though many casualties resulted, the worst effect was the lowering of the will to resist.[60]

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.[61]

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."[62] The Germans had validated priority number one by attacking the enemy air force. The British strategy in the air war in North Africa, 1941–42, was also insightful. The British used American lend-lease light bombers in attacking German supply lines with great success.[63] 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.

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Chapter 5

Conclusion

Summary of Findings

Attack aviation development during the Air Service, 1919–26, 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 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 1926–35 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 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 1935–41 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 prewar 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 prewar codification effort. Finally, prewar 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 airpower 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 A
Analysis of Attack Operations in Air Service and Air Corps Maneuvers, 1925–1931

Date	Place	Attack Unit and Aircraft	Scenario	Exercise Objectives	Targets	Tactics	Applied Doctrine
October 1925	Mitchel Field, N.Y., and Langley Field, Va.	3d Attack Group	Air defense against hostile fleet with aircraft carriers	Defend coast against air attack; meet enemy point of attack	Landing craft, aircraft		National defense; coastal defense
April 1926	Wright Field, Ohio	3d Attack Group; O-2s and DH-4s	Red nation secretly mobilized and declared war	Pursuit attacks against attack, bombardment aviation; prevent concentration and forward deployment of enemy ground forces	Bridges, railroads, rail yards	Low-level attacks, supported and unsupported by pursuit	Indirect support; beyond the battle line targets during the concentration phase before ground contact
May 1927	San Antonio, Texas	3d Attack Group	Two opposing forces; Blue general and offensive	Support offensive; deploy and consolidate air forces from large distances; joint cooperation	Red reserves and reserve areas, airdromes, railroad bridges, highway bridges, troop concentrations, artillery, lead points of enemy retreat	Low-level attacks with pursuit cover	Indirect support beyond artillery range before offensive; support of air superiority; close support to II Corps during offensive (dispersion of enemy attacks)
April 1928	Langley Field, Va.	3d Attack Squadron	Demonstration	Tactical training	Troops in column	Low-level attacks	Troop concentration on the move
May 1928	Virginia Beach, Va.	1st Attack Squadron	Two opposing forces	Tactical training	Red Army Headquarters		
July 1929	Wright Field, Ohio		Two-sided maneuvers	Air Force vs. air force simulated warfare	Railroad station, supply depots, red airdromes, capital city, auto columns, troops on the march, troops crossing bridge, bridges	Low-level, high-speed attack, formation attacks, self-defense against pursuit	Indirect support beyond the battle line (interdiction), antiaircraft positions, air superiority mission
April 1930	Mather Field, Calif.			Mobility of air force units; use of radio communications		Defense of formation	Attack in role of pursuit to protect bombardment
May 1931	Dayton, Ohio	Public demonstrations					

Source: Air Service and Air Corps Maneuver Reports; see maneuver folders, HRA 248.2122.

Appendix B

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.[1] 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.[2] 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.[3]

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.[4] 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.

Other influences include the introduction of Navy and Marine Corps flyers to Air Corps attack theory and doctrine in the 1920s and 1930s. Hallion states that Marine Maj Ross E. Rowell had been assigned to the Army Air Service for duty at Kelly Field, Texas, home of the 3d Attack Group.[5] Additionally, starting with three students in 1925, Marine Corps personnel regularly attended the Air Corps Tactical School. The Navy provided some instructors at ACTS starting in 1936 until just before WWII.[6]

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.[7] 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.

Notes

1. Malcolm W. Cagle and Frank A. Manson, *The Sea War in Korea* (1957; reprint, New York: Arno Press, 1980), 48.
2. Richard P. Hallion, *Strike from the Sky: The History of Battlefield Air Attack, 1911–1945* (Washington, D.C.: Smithsonian Institution Press, 1989), 72. Author also notes that the British were the first to pioneer close support operations in 1918.
3. Gary R. Lester, "Mosquitoes to Wolves: The Evolution of the Airborne Forward Air Controller in Asia, 1950–1972" (PhD diss., Florida State University, 1994), 7–8.
4. Cagle and Manson, 48.
5. Hallion, 72.
6. Robert T. Finney, *History of the Air Corps Tactical School, 1920–1940*, Historical Study 100 (1955; reprint, Washington, D.C.: Office of Air Force History, 1992), 117–41.
7. Cagle and Manson, 48–49.

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