THE FUTURE OF FIXED-WING CLOSE AIR SUPPORT: DOES THE ARMY NEED IT TO FIGHT?

A MONOGRAPH
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ABSTRACT

THE FUTURE OF FIXED-WING CLOSE AIR SUPPORT: DOES THE ARMY NEED IT TO FIGHT? by MAJ Edward V. Weber, USAF, 60 pages.

The issue of close air support is one of the most emotional issues between the Army and the Air Force. Both services interpret close air support in terms of the lives of their personnel. The fundamental question previous studies have not addressed is why the Army wants or needs fixed-wing close air support? If it is "the decisive force," why does it need help from another service? A combat effective combined arms forces should not need fixed-wing close air support or needs it only when its organic fire support is unavailable.

Army and Air Force doctrine is compared to determine how the services think about war in general, and close air support specifically. Current Army and Joint doctrine admit that rotary-wing as well as fixed wing aircraft can perform the mission. However, some Army officers see the helicopter as a maneuver element and therefore not

The study examines World War II and the Gulf War to demonstrate the major thesis. During World War II, specifically the Battle for France in 1944-45, the U.S. Army was not as "combat effective" as the German Army opposing it and often required fixed-wing aircraft and artillery to make-up the difference. The Gulf War demonstrates that the Army can dominate the close fight, because its combat effectiveness and better weapons surpassed the Iraqis.

The principal operational requirement for close support is to destroy armored weapons systems; tank, artillery, infantry fighting vehicles. The Army's attack helicopter and artillery systems provide the means to meet this requirement. Because they are organic they are more responsive and can be integrated more readily into the ground commander's scheme of maneuver than Air Force aircraft. Improvements to artillery systems will increase close support capabilities as well. The conclusion is the Army can perform all the close support tasks it requires.

TABLE OF CONTENTS

Chapter 1: Introduction

> Air action by fixed- and rotary-wing aircraft against hostile targets which are in close proximity to friendly forces and which require detailed integration of each air mission with the fire and movement of those forces. Also called CAS.[1]

The issue of fixed-wing close air support is by far the most emotional one between the Army and Air Force. From the Army's view it may mean the life or death of many soldiers. Likewise, the Air Force is concerned with the lives of its pilots. The argument also concerns the efficacy of using precious aircraft sorties on dispersed targets close to, or intermingled with, friendly troops where the risk of fratricide is great and success not as great if those same sorties were used deeper on the battlefield.

Previous studies have looked at improving the employment of fixed-wing close air support. These have focused on one or more aspects of employment: the platform (e.g., A-10 aircraft versus A-16 aircraft, slow versus fast, etc.), organizational (e.g., attaching fixed-wing aircraft units to divisions or corps), and procedural (e.g., multi-service and joint tactics, techniques, and procedures). The Air Force even considered transferring fixed-wing aircraft, specifically the A-10 Thunderbolt II, to the Army.

What previous studies glossed over or ignored was the fundamental question of why the Army "needs" fixed-wing close air support. Here "need" is defined as a capability required to meet mission essential tasks. Specifically, does the Army need fixed-wing close air support to fight its battles successfully?

Far from a parochial attempt to deny the Army a critical capability that means victory or defeat, this paper will attempt to argue that as a highly-trained combined arms team the U.S. Army has the organic capability to fight and win the close battle in a mid to high intensity conflict. As FM 100-5 says:

> [The commander] fights with what he has against whatever force he is committed [and] seeks to attain overwhelming combat power as best he can at the decisive point and time. When tactics are successful, commanders gain a combat power

> advantage over the enemy and are able to defeat him quickly with minimal losses to their own troops.[2]

Of course, there will be exceptions to the rule, specifically units that lack the necessary fire support will need close air support. For example, an airborne brigade during the initial phase of a forced entry operation or an amphibious landing like Normandy in 1944 will need close air support.

This paper will not advocate that the Army can do without air support totally nor that air can do it all. It will hopefully show that air interdiction has been more beneficial to ground forces; out of sight and out of mind does not mean without support. In war "winning" is everything and the only thing success can be judged by. The American way of war caveats that winning should come quickly and with minimum casualties. The U.S. Air Force and its personnel are dedicated to winning and supporting its sister services in the best way it knows how.

This paper will first review Army and Air Force close air support doctrine. Before looking specifically at close air support doctrine, the paper will define what doctrine is, how both services understand doctrine, how each service views war, and their respective roles in it.

The paper's third chapter will look at the history of application of fixed-wing close air support during World War II and the Gulf War. Reviewing battles in France of 1944-45 will show fixed-wing close air support made up a deficiency in combat effectiveness, or "fighting power".[3] The Gulf War will show that a well-trained combat arms team can win with minimal fixed-wing close air support and rely on its organic artillery and aviation. Both cases will show air interdiction is more beneficial.

The fourth chapter will compare and contrast Army and Air Force capabilities for close support. Operational requirements will be used as a standard of success. Too

often comparisons are made between "ways" and "means" as opposed to "ends". The effects needed for victory are of primary importance.

The paper will then summarize what it covered and then draw some conclusions. The reader is asked to indulge any "parochial" statements that are supported by facts. Parochialism is not evil in and of itself, all services have views of war based on their experience as an institution. It is often the difference in views and the possible implication of what is said that stokes the emotions.

The history of airpower is not even a century old and cannot draw on the same body of history that land and sea warfare can. The reader, especially the soldier, must also keep in mind that airpower is more than "air-to-air" engagements. Once freedom of action is achieved in the air, all other operations become less costly in lives and quicker in execution. This includes air-to-ground actions, as well as land and sea force actions. Airpower can dominate air, land, and sea for brief periods of time given sufficient resources, but does not replace other service capabilities. This paper will hopefully demonstrate that fixed-wing close air support should be the exception to the rule and educate without closing minds.

This topic is relevant because in dealing with the current issues surrounding fixed-wing close air support we may be fixing the wrong problem. In relatively flat budgets for the next decade or so it becomes more important to spend resources and time wisely. Instead of looking at fixed-wing close air support as something the land component commander is losing, it should be seen as what he will gain in air interdiction.

As the services get smaller it is incumbent on those left to maximize use of those resources that remain. This leads to focusing on how the Joint Force Commander (JFC) and his staff define the military objectives that will achieve strategic objectives.[4] The

Joint Force Commander, with his staffs assistance, should be the master of the operational environment. They link the war's political objectives with discrete military tasks by analyzing the enemy from national command to fielded military forces to find exploitable weaknesses. Service based analysis principally focuses on the opposing military force. However, only the JFC and his staff can determine the best "way" to defeat the enemy and then assign tasks to components based on their capabilities.

A good analogy is to compare a corps and its divisions to a joint force and its components. The corps commander gives his divisions tasks in line with his intent and vision. He typically assigns one division the main effort and other divisions as supporting efforts. The main effort division is given extra assets to achieve his tasks as they will decide the battle in the corps commander's favor.

Most soldiers will understand the previous discussion and agree that this is how a joint force should work. However, there are two distinctions that should be made. The first is that the Joint Force Commander has no "organic" resources because forces come to him through his components, whether functional or service. The second is the main effort division commander does not control his supporting divisions tasks or resources. Yet some ground commanders seek control of Air Force attack aircraft to achieve its tasks. There seems to be an inconsistency in logic: one standard for ground forces and another for air forces. This inconsistency may arise from the different doctrinal perspectives the Army and Air Force come from.

Chapter 2: Current Doctrine

This chapter will look at how each service views doctrine, and how each conducts military operations. Because service doctrine colors a military service's view it can be a source of friction between services. It is important to determine how the Army

and Air Force view doctrine before discussing their views on close air support. Disagreement and friction over close air support may be the result of each service's view of the best way to win a war.

What is doctrine? The dictionary defines "doctrine" as "something that is taught" and " a principle or position or the body of principles in a branch of knowledge or system of belief." It is derived from the word "doctor" and it can mean to teach or instruct.[5] The DOD Dictionary, Joint Pub 1.02 defines doctrine as:

> Fundamental principles by which the military forces or elements thereof guide their actions in support of national objectives. It is authoritative but requires judgment in application.[6]

In essence doctrine is the glue that binds the people and their weapons into an effective fighting unit. The quantity and quality of weapons or people does not guarantee victory in war; flawed doctrine can be a source of defeat. France's doctrine in 1940 undoubtedly contributed to her defeat even though she and her allies had more than enough personnel and equipment to defend successfully.

Both services agree that doctrine is a guide on how best to use the capabilities each has developed. Army and Air Force doctrine acknowledge that military power is subservient to the National Security Strategy and National Military Strategy. Both base their doctrine on experience and analysis, and use doctrine to create a common language among its members. Their doctrines are open to technological change and resist becoming dogma.[7]

The important point is that only a service can determine how best to employ its systems. Even joint doctrine should not detract from service doctrine. It should guide how the Joint Force Commander orchestrates service forces synergistically to obtain outcomes impossible by one service alone.[8]

The paper will now look at Army and Air Force close air support doctrine. To reiterate, close air support is: "Air action by fixed- and rotary-wing aircraft against hostile targets which are in close proximity to friendly forces and which require detailed integration of each air mission with the fire and movement of those forces."[9] Furthermore, joint doctrine describes certain preconditions for effective application. The most important include air superiority, suppression of enemy air defense, target marking, favorable weather, prompt response, communications, and command and control.[10]

Although "close proximity" is not quantified, it is typically understood to mean close enough to where the risk of fratricide is increased. This single factor explains both services concern over fixed-wing close air support and why "detailed integration" is required. Experiences of Air Force and Army officers quantify it as 3 to 5 kilometers from friendly forces, but as close as 500 meters if the situation is critical.[11]

The matter is further confused because the close air support can be delivered between the forward line of own troops (FLOT) and the fire support coordination line (FSCL).[12] The distance between these depends on the range of Army artillery and aviation; anywhere from 30 to 150 kilometers. It is somewhat ludicrous to call air support delivered 30 to 150 kilometers from friendly troops "close."

While the above identifies "where" close air support occurs it does not identify "when" it occurs. One view is that it is "in extremis" support used in "desperate" or "peculiar" situations.[13] Another view is that close air support could be done by ground forces if given enough "troops" or organic firepower.[14]

According to Army doctrine, close air support can enhance ground force operations because of the variety of munitions and is best massed at decisive points that can create subsequent opportunities for maneuver and advances. It can protect

flanks as it did in 1944 for 3rd Army's race across France. A significant amount will be required during entry stage of force projection.[15]

Army doctrine recommends that an army corps distribute most close air sorties to its divisions, but the corps retains some sorties for its own use. Likewise, the division will distribute sorties to the brigade making the main attack. These sorties should be focused where and when they create the greatest potential to unhinge the enemy commander's plan or operational tempo.

The Army's "keystone" doctrine and corps doctrine equate close air support with fixed-wing aircraft, but its division level doctrine recognizes that both fixed- and rotary-wing aircraft can perform close air support. In fact, it says helicopters are the best means to defeat armor.[16] Two of Army aviation's essential tasks include supporting the ground battle plan as a maneuver element and supporting forces in contact. In other words, aviation plays a direct role in the battle's outcome as a maneuver element and an indirect role when supporting another unit.[17]

If Army doctrine acknowledges that its organic attack aviation can perform close support missions, why does it not take it over? Part of the problem centers on how Army doctrine makes a distinction between maneuver and fire support: two related but different combat functions. Maneuver is putting an enemy at a position of disadvantage through movement. Fire support is the use of air, land, and sea indirect munitions against ground targets to support land combat. Fire support complements maneuver; it lends it credibility by physically destroying the enemy.[18]

Fixed-wing airpower is considered "fire support" by Army doctrine while rotary-wing air is considered primarily a "maneuver" asset by Army doctrine. Therefore, fixed-wing air becomes synonymous with close air support.[19]

Under Air Force doctrine close air support and interdiction fall within the scope of the "counterland" core competency. Counterland involves attaining superiority over ground operations by destroying or neutralizing enemy ground forces. The main objectives of counterland operations are to dominate the ground environment and prevent the enemy from doing the same. Direct attacks on enemy ground forces during initial phases of an operation can be crucial to stopping their advance.[20]

Close air support "provides direct support to help friendly surface forces carry out their assigned tasks." Its tactical effects can produce operational effects if orchestrated with other ground and air operation. Fluid, high-intensity warfare, the need for tight control, the unpredictability of the tactical situation, and lethal ground-based air defenses make close air support especially challenging. [21]

Air Force doctrine says close air support "produces the most focused but briefest effects of any counterland mission; by itself, it rarely achieves campaign-level objectives. However, at times **it may be the more critical mission** by ensuring the success or survival of ground forces. Close air support should be planned to prepare the conditions for success or reinforce successful attacks; it can halt attacks, help create breakthroughs, cover retreats, and guard flanks. Maximum effect will occur when employed at the "battle's decisive points and massed to apply concentrated combat power and saturate defenses."[22]

Air Force doctrine says interdiction consists of operations to "divert, disrupt, delay, or destroy the enemy's surface military potential before it can be used effectively against friendly surface forces." The results of successful interdiction can achieve tactical, operational, and strategic objectives. Direction by a single commander is

needed to fully exploit interdiction's effects. Interdiction usually provides a relatively larger payoff during a campaign for the associated risk.[23]

Army doctrine says air interdiction can "greatly benefit" combat operations when synchronized with ground maneuver and that it has the potential to delay enemy forces and supplies, and disrupt his command and control.[24] Air interdiction can be effective against enemy follow-on forces, disrupting enemy counterattacks, and reducing enemy logistics.[25]

Both service's concepts of close air support and interdiction seem remarkably consistent. Significantly, while Army doctrine says it "requires" support from Air Force systems for intelligence collection, jamming, and deception it never says that it "requires" fixed-wing close air support to conduct operations.[26] Army doctrine says the Army "must be capable of achieving decisive victory." The Army must have the organic capability to defeat an enemy ground force by generating overwhelming combat power. The means of generating this power is the combined arms concept.

A combined arms force achieves a common goal or objective by "the simultaneous application of combat, combat support, and combat service support." Combined arms produce effects greater than sum of its parts by confusing, demoralizing, and destroying the enemy; he becomes incapable of reacting.[27]

It "requires detailed planning and violent execution by highly trained soldiers and units who have been thoroughly rehearsed."[28] Creating a combined arms force takes time to train properly, and effective leadership. The Army must weld infantry, armor, artillery, and aviation, and ensure these are properly supported to fight and win. Short cuts in either will reduce combat effectiveness.

Current Army doctrine says the ground commander "fights with what he has against whatever force he is committed [and] seeks to attain overwhelming combat power as best he can at the decisive point and time."[29] He defeats his enemy "quickly and with minimal losses" by combining maneuver, firepower, protection, and leadership.[30] Even when the enemy is equal in numbers victory can be provided by moral factors such as, the sense of duty, courage, loyalty, and discipline of soldiers and leaders.[31]

Why does the Army seem to want more close air support rather than interdiction? From the perspective of brigade and division commanders today's "close" battle is "decisive" and therefore they want as many close air support sorties as possible. The airman's perspective is the enemy's Army Artillery Group destroyed today is one that will not kill American soldiers tomorrow. Disrupting the enemy's strategic or operational reserves this week will provide an opportunity for decisive maneuver. These missions fall within air interdiction, not close air support.

While the doctrine is relatively clear on close air support, it does not explain the sensitivity Army officers display when discussing the subject. The source of friction most likely results from how each service view decision in war. The Army understands itself to be the nation's "decisive military force" and "only military force capable of prolonged land combat."[32] The Army believes that in any joint operation "ground force units .... will be the decisive means to the strategic ends."[33]

Army doctrine is focused on ground combat and defeating the enemy's army. From this it is easy to see that when ground operations start the Army component commander should be given free reign and all the firepower that the Air Force brings to the theater. All other service capabilities should support the ground "scheme of

maneuver." Army ground forces believe they are the Joint Force Commander's key to victory and that therefore the air component should be subordinated to them.[34]

In contrast, Air Force doctrine is focused on theater-wide employment because of the characteristics of air and space systems. It follows that this doctrine focuses on the Joint Force Commander's needs, to consternation of ground force echelons. Rare is the Air Component Commander who fights "his" air battle at the expense of the Joint Force Commander; he will not remain a component commander for very long. This perspective on air doctrine is based on an understanding of how best to use airpower; a view born out of a desire to win wars quickly with the least casualties. Thus friction between Army and Air Force results from doctrinal views on what is decisive in war.

Because doctrine is influenced by history the next chapter will review two cases to highlight why the Army seeks to enhance its firepower through fixed-wing air support.

Chapter 3: Historical Cases

This chapter will examine the relationship between the combat effectiveness of U.S. ground forces and the employment of fixed-wing close air support. The first case will look at World War II and focus on the Normandy invasion to the "Battle of the Bulge," a period from June 6, 1944, to January 31, 1945. The second case will look at the Persian Gulf War, 17 January 1991 to 28 February 1991. The impact of air interdiction and organic firepower will also be examined. It will hopefully be demonstrated that in both periods airpower was decisive.

The word "decisive" is a major source of argument between the Army and Air Force and requires definition. The dictionary defines "decisive" as "having the power of deciding." "Deciding" in turn means "to arrive at a solution that ends uncertainty or dispute" or "to bring to a definitive end."[35] Army officers seem to believe that while

ground combat is "decisive," air combat is not. In fact, if one says "airpower is decisive" Army officers react as if one said "airpower can do it alone." Thus it becomes a threat to service existence.

I submit that if an military outcome results from the action of two or more services, then all were "decisive." The combination of capabilities is what achieved the decision. Just because the enemy surrenders after ground combat does not mean only the ground force was decisive. Unless the ground force achieved the victory with no other action the mantle of decision must be shared.[36]

Furthermore, because the American military qualifies that victory must come with low casualties and in the shortest possible time, "decisive" must include these factors. If a victory has high casualties or takes a long time to achieve, it is not decisive. Therefore, I would argue, airpower was decisive during the Battle for France because without it the actual outcome would not have been achieved. The Allies would have lost or victory would have taken more lives and time.

Were German ground forces more combat effective than U.S. ground forces in World War II? Russell Weigley said the U.S. Army traded mobility for combat power and that the trade was not a good one in a confrontation with German troops. The Army "suffered long from a relative absence of the finely honed professional skill of the Germans, officers and men, in every aspect of tactics and operations." According to Weigley, the "German Army remained qualitatively superior to the American army, formation for formation, throughout far too many months of the American army's greatest campaign [and] in the end, it was its preponderance of material resources that carried its army through to victory."[37] During World War II the American Army reflected a faith that technology can solve military problems. The ultimate outcome occurred

because an "unequaled mantle of air power" supported the ground forces throughout the war. This gave it a decisive edge over the Germans.[38]

Combat effectiveness comprises leadership, training, experience, morale, and logistics. A study of soldier capability identified leadership, unit cohesion and loyalty, realistic combat training, and discipline and drill as "crucial" or "extremely important" to troop behavior.[39] Combat effectiveness or "fighting power" is the "sum total of mental qualities that make armies fixture" and "the mixture .... of discipline and cohesion, morale and initiative, courage and toughness, the willingness to fight and readiness, if necessary, to die."[40] An army's "military worth" is a product of its "fighting power" and the quality and quantity of weapons.[41] It follows that a deficiency in fighting power can be made-up by a superiority in the quantity or the quality of weapons. The U.S. Army made a conscious decision to maximize its firepower to make up for manpower deficiencies in World War II.[42]

Colonel Trevor N. Dupuy estimated that on average the combat effectiveness of 1 German soldier was equal to 1.2 American soldiers during World War II. When he ran numbers for battles in France in 1944 he found the Germans were superior by 20-30 percent.[43] A panel of three military historians also rated combat the Germans higher than the Americans.[44]

Many shortcomings of U.S. ground forces were the result of its rapid expansion and inexperience.[45] The U.S. implemented its Protective Mobilization Plan after Germany attacked Poland in September 1939. In that year the Army ground forces had 170,000 men and National Guard had 200,000 men. There were three half strength infantry divisions and six cadre divisions, one cavalry division and one partially

organized, and one understrength experimental mechanized brigade. The Army had no full-time corps or army commands.[46]

The Army's Protective Mobilization Program was designed to create a fully trained army of 1.4 million men.[47] By December 1941 this was achieved and capped by army-level maneuvers in Louisiana and North Carolina in the fall of 1941. However, after the maneuvers there were still deficiencies recognized in individual and small unit training.[48] Training divisions, corps, and armies did nothing for small unit competence; small units learned better in "smaller, closely controlled field exercises."[49]

Remedial training for existing units was dropped and the basic training of new units cut from thirteen to eight weeks. The 1941 Army would grow from 1.4 million men, in 33 divisions, to 8 million men, in 89 divisions, in three years.[50] The infantry alone expanded by 600 percent in that time.[51]

The U.S. Army Ground Forces' combat effectiveness was further diluted by competition with the Army Air Forces and the Navy for high quality manpower, the demands of a two-front war, and the limit of raising only 90 divisions. The Army would never have the time fix the deficiencies in small unit leadership that set it apart from the Germans.

The limit to 90 U.S. divisions hampered the training and rotation of units out of combat. Infantry regiments in committed infantry divisions were losing up to 100 percent strength in three months of heavy combat. The distance between U.S. and theater of operations slowed the arrival of replacements.[52] To meet the need seventeen divisions training in the U.S. gave up many NCOs and infantry privates.[53]

Doctrine also played in the combat effectiveness differential. Although the Americans copied much of the German's doctrine there were key differences. The

Germans emphasized the art of war, its uncertainty, the individual as decisive, fighting power comes from quality commanders and men, and the total commitment of all ranks. In contrast, the Americans emphasized scientific management, planning, and control. Americans rendered the German "simplicity and consistency" in action as "simple and direct plans." The Germans emphasized "friction in war" the Americans instead focused on the decisive battle.[54]

In officer leadership, essential to success in war, the Germans emphasized "character"; the Americans "intelligence." The Germans chose candidates more selectively and spent some effort testing for leadership abilities. German officer candidates received more training and were assigned to units they had served with. American officer candidates were assigned to a pool and filled vacancies as they opened.[55] In 1941 Gen. Marshall believed junior leaders failed to "assume or discharge their duties" because they lacked experience and confidence. Even in 1944 Gen. Patton complained the "chief trouble in this war is the lack of efficiency and lack of sense of responsibility on the part of company officers."[56]

S.L.A. Marshall concluded the disciplinary problems were due to poor discipline among a "considerable percentage" of officers. The result of the officer's poor tactical skills as perceived by those he lead. Although they may have respected his rank, they did not respect the man until he earned it in combat.[57]

Marshall also found that at most only 25 percent of soldiers in a unit fired their weapons in a given engagement. He attributed this to a lack of cohesion within the squad. The squad and platoon leader must get control when their men lose contact with each other in combat.[58]

Marshall felt the U.S. Army training system tried to make him an automaton instead of the master of combat. The properly trained soldier would "think and act correctly" instead of waiting for orders.[59] He said there is "no battle strength within in the company or regiment except as it derives from this basic element within the smallest component."[60] In contrast, the Germans believed the section or squad was the heart of the army; lower level leadership became the key to battle. Emphasis was placed on quality not quantity and small unit integrity was prized above all. The Junior Officer or NCO had to build true cohesion within his unit.[61]

The other part of the combat power equation is the quantity and quality of weapons. U.S. forces for the most part went to war with ample supplies and modern weapons, and was completely motorized by the time it entered combat. Rommel on facing Americans in North Africa said they were "fantastically well equipped and we had a lot to learn from them organizationally."[62] He believed the Americans "better" and more "plentiful" equipment compensated for their inexperience.[63] Rommel believed the Americans had weapons that were "far and away superior to that of our divisions."[64]

However there were some notable deficiencies. U.S. tanks and anti-tank weapons were not as good as the German's. The best tank the U.S. fielded in 1944 used a short-barrel 75 millimeter main gun that was not as effective as German tanks.[65] This was due, in part to the prevailing anti-tank doctrine in which tanks were not considered "tank killers". Only through experience in France did the Army come to realize that tanks had to be able of killing other tanks.[66] U.S. soldiers also preferred the German anti-tank rocket instead of the 2.36" rocket launcher or "bazooka.[67]

Although professing a combined arms doctrine, practice often did not match the rhetoric. Armor-infantry cooperation was deficient, armored units tended to fight "pure".

Cross attachments between armor and infantry were not effective because habitual relationships were not maintained. There was probably more friction between these arms then with air.[68]

U.S. infantry divisions did not have the same combat power as their German equivalents. American infantry divisions had only 50 percent of its personnel in combat arms, the Germans had nearly 60 percent.[69] The U.S. infantry needed a 4:1 superiority to attack successfully, and still needed massive artillery and air attacks.[70] Infantry divisions also lacked organic tank units depriving it of valuable firepower.[71]

U.S. artillery fire control was considered better then the Germans, but the Army lacked the number it considered ideal. In 1943, the Army had estimated 90 divisions would need 354 heavy and medium field artillery battalions; only 257 battalions had been approved by July 1944.[72] Although both Americans and Germans divisions were "roughly equivalent" in artillery, more heavy and medium artillery would have reduced the need for close air support. The 12th Army Group reported that it was the "availability and location" of artillery that determined close air support requests, not the range; more guns kills more enemy.[73]

The conclusion is that U.S. ground forces were slightly inferior in combat effectiveness or "fighting power", lacked enough organic firepower, and were not adept at combined arms warfare; although they had some better equipment. The American deficiencies were mainly due to mobilization, but doctrine, training, and the 90 division limit also impacted combat effectiveness.

The paper will now look at specific examples where air support helped make the difference during the "Battle for France." The Germans were not in the best of situations before the Normandy invasion. Their older divisions had lost much of their best

personnel and equipment. Some of the newer divisions suffered from equipment shortages and lack of training. There were 58 divisions available to the Germans on D-day. Thirty-three were suitable for only a limited defense, but twenty-four divisions had quality personnel and good mobility.[74] The Germans were also having problems maintaining their strength in tank and tank parts.[75] The U.S. Army of course would not be facing all of these divisions. However, it only had 11 divisions in England and only four were experienced.[76] One critical deficiency was that the German Luftwaffe had been defeated and would make only limited appearances in the skies of France.

In preparation for Normandy the Army Air Force's mission was to destroy and disrupt German transportation that supported movement towards the beaches. Attacks began in March 1944 and by D-day 5000 tons of bombs had hit the rail centers in Germany and along the border with France. The campaign destroyed valuable supplies, locomotives, and railcars, and delayed construction of the Atlantic wall. Air attacks on bridges in May worsened the situation for the Germans. All the Seine bridges from Rouen to Mantes-Gassicourt were down before D-day. Rail traffic on all routes over the Seine north of Paris were closed from 26 May to 26 June. By D-day air interdiction reduced trafficability in the planned invasion area by 30 percent.[77]

According to Gen. Omar Bradley "the fighter-bomber operations against road traffic played a major part in the success of the invasion." Air attacks consistently delayed and destroyed German reinforcements.[78] Air power had exceeded expectations in its ability to prevent German counterattacks. It was critical to the invasion's success and prevented the Germans from pushing the Allies back into the English Channel.[79]

Attesting to the impact air attacks were having on German forces, Gen. Rommel reported the following on 10 June 1944:

> Our operations in Normandy are tremendously hampered, and in some places rendered impossible, by the .... immensely powerful, at times overwhelming,

> superiority of the enemy air force. As I and officers of my staff have repeatedly experienced ....the enemy has total command of the air over the battle area up to a point some 60 miles behind the front. During the day, practically our entire traffic—on roads, tracks and in open country—is pinned down by powerful fighter-bomber and bomber formations, with the result that the movement of our troops on the battlefield is almost completely paralyzed, while the enemy can maneuver freely. Every traffic defile in the rear areas is under continual attack and it is very difficult to get essential supplies of ammunition and petrol up to the troops. Even movement of minor formations on the battlefield— artillery going into position, tanks forming up, etc.—is instantly attacked from the air with devastating effect. During the day, fighting troops and headquarters alike are forced to seek cover in wooded and close country in order to escape the continual pounding from the air. Neither our anti-aircraft nor the Luftwaffe seems capable of imposing any check on the paralyzing and destructive effect of the enemy air force (27,000 sorties in one day). The troops ....are putting up as good a defense as they can with the means available to them, but ammunition is short and can only be replaced under the most difficult conditions.[80]

The senior German commander in France, Field Marshal von Runstedt, believed the Allied success was "all a question of air force, air force, and again air force." The Germans referred to highways to Normandy beaches as "the fighter-bomber race course." The majority of German reinforcements were held up to some extent. Some reinforcements were held up by as much as two weeks.[81]

Air attacks during the Normandy landings made-up for paratroopers and landing forces lack of artillery.[82] This is a key point that is relevant today: close air support is needed when a ground force lacks a major portion of firepower as in amphibious landings or airborne operations.

German hopes for a successful defense faded within a couple of days of D-day; air attacks had paralyzed movement by day and even night movement was difficult. Reserves were taking three to four times longer to enter action.[83] However, stiff defenses held up attempts to breakout of the Normandy beach-head. Thirteen U.S. divisions were opposed by seven veteran German divisions; three German divisions were fresh, but the rest were under strength.[84] From late June to early July 1944 U.S.

forces made little headway against the Germans; bad weather prevented needed air support and reinforcement; at times cutting potential air support by half.[85]

Deficiencies in combined arms integration also showed-up. Fighting through the hedge-row country of France became long, slow, and costly because teams of armor, infantry, engineer, and artillery lacked training.[86] Gen. Eisenhower said the reasons for this tough fighting were the "quality of the German soldier, the terrain, and the weather."[87] When air support was available it was able to prevent German attempts at pinching off local U.S. offensives.[88]

These battles demonstrate the vicious cycle that poor combat effectiveness leads to. Because of the low combat effectiveness in infantry, casualty rates were high.[89] This generated a need for replacements who arrive as individuals with minimal training. This of course lowers the unit's combat effectiveness and restarting the cycle of ineffectiveness. The situation became so bad that 25,000 replacements were requested from the U.S. as fast as possible.[90] The manpower shortage also prevented the creation of large tactical reserves; limiting the ability to exploit success.[91]

When the weather improved the Allies implemented Operation COBRA, a massive bombing of German front-lines near the French town of Saint L♈ that occurred on 25 July. This attack decimated the German divisions beneath it and created a hole in the German defenses. Air attacks also prevented the German Seventh Army's reserve from sealing the gap.[92] One hundred thousand U.S. ground troops poured through it, effectively collapsing the German defenses.[93]

During the rest of July 50 percent of all air sorties were air interdiction or close support. The armored "column-cover" method of close support became the most effective air-ground cooperation yet.[94] It provided significant support as "flying artillery"

during Third Army's drive across France from September-December 1944. The Third's long supply lines reduced ability to maintain artillery ammunition levels; its batteries only had 33 percent of a unit per fire per day.[95] Again the availability of artillery was a factor influencing the need for air support. To get more artillery into action would have taken up to two hours; a limitation aircraft did not have.[96] The U.S. Army even created a Field Artillery brigade that used captured German artillery to get around the problem.[97]

In December 1944 the Germans began their Ardennes offensive; 200,000 German troops attacked 83,000 surprised Americans. Taking account of the previous months' battles, they attacked during bad weather to minimize Allied airpower. Bad weather hampered air support and only after four days was it able to fly against Germans in the salient. However, its major contribution was to deal the Luftwaffe a "deathblow."

The Battle of the Bulge demonstrated that Americans were effective at defending and becoming adept at combined arms warfare. An example of this occurred on the northern shoulder of the Bulge.[98] Here the stiff defense from three U.S. divisions stopped the 6th SS Panzer Army's attack around the towns of Rocherath and Krinkelt.[99] Because of the weather air support was minimal and did not factor into the battle. German main attacks met U.S. teams of infantry, armor, artillery, and tank destroyers. In fact, artillery was the main anti-tank defense and "immobilized many panzers." Delay of the 6th SS Panzer Army's advance was fatal to the German plan.[100]

The "Battle of the Bulge" effectively eliminated the Germans strategic reserve and long-term power to resist the advancing Allies. Only Hitler's fanatical desire to resist to until his suicide continued the war for four more months.

What is the final assessment on airpower's impact on these battles? In 1945 J. Lawton Collins, the commander of the U.S. VII Corps said "we could not possible [sic] have gotten as far as we did, as fast as we did and with as few casualties, without the wonderful air support that we have consistently had."[101] After the war Field Marshal Albert Kesselring said that air strikes "proved our undoing...allied air power was the greatest single reason for the German defeat." Reichsmarschall Hermann Goering echoed this by saying:

> [The] Allies must thank the American Air Force for winning the war. If it were not for the American Air Force the invasion would not have succeeded. Even if it had succeeded it could not have advanced without the American Air Force. Further, without the American Air Force von Runstedt would not have been stopped in the Ardennes. And who knows but that the war would still be going on.[102]

Clearly airpower was decisive in these battles, but was air interdiction more decisive than close air support? Air operations over France from June to December 1944 had a way of blending into each other. Depending on communications and availability of aircraft sorties intended for close support became interdiction and vice versa. Armed reconnaissance missions could show up and attack enemy units close to friendly ground troops without a request. This type of support was closer to the concept of battlefield air interdiction (BAI).[103]

Aerospace historian Richard Hallion argues that BAI has been more effective than either close air support or "classic" air interdiction.[104] Analysis of 31 engagements in Italy found that air interdiction was decisive in at least 25 percent of the engagements and possibly more.[105] The analysis found that "a sustained air [interdiction] campaign yielded six times as much result as a close support effort."[106] It can be assumed this remained the case in France as well.

Another lesson is these results were achieved by a command structure that did not observe the principle of unity of command. For instance, Gen. Patton, Third Army commander, did not command XIX Tactical Air Command supporting him. At best it could be described as "unity of effort" where the ground and air force commands focused their efforts on a common enemy.[107] In fact, the XIX's commander said a "joint operations center" was used to coordinate the actions. In one sense these units had created a joint force, but did not have a common commander.

The conclusion is that air support generally was decisive and gave the ground forces the edge for victory. They needed that edge because it made up for a deficiency in combat effectiveness as compared to the Germans. The paper will now examine the Gulf War to determine if a trained combined arms force with organic aviation needs fixed-wing close air support.

On 2 August 1990 Saddam Hussein sent his Republican Guard into Kuwait and occupied it. U.S. leadership deemed this a threat to vital national interests and moved swiftly to gain international condemnation of Iraq's action. The U.S. and allied nations set up a coalition to oppose further aggression and force Iraq to leave Kuwait. The U.S. military mobilized and sent air, ground, and sea forces to the theater. On 17 January 1991 the Coalition began a 42-day campaign that resulted in Iraq's withdrawal from Kuwait. The Coalition achieved this feat after a 30-day air operation that struck targets in Iraq and Kuwait. On 23 February 1991 Coalition ground forces launched their attack to push the Iraqi Army out of Kuwait and destroy the Republican Guard. They accomplished this in six days with about 300 Coalition deaths; pre-war estimates predicted 1000 to 10,000 deaths.

Before the Gulf War the Iraqi Army was rated the fourth largest army in the world. It had seven corps, and 32 divisions; nine being armored or mechanized.[108] The Republican Guard Forces Command contained two mechanized infantry, two armored, and six infantry divisions. They had better and more troops and equipment than the Iraqi Army. [109] Together the Iraqi Army and Republican Guard had four years of experience in offensive and defensive operations during the war with Iran.

The Iraqis had set up a defense in depth in southern Kuwait and southern Iraq along the border with Saudi Arabia. The first line contained obstacles such as ditches and land mines, and defended by 17 Iraqi infantry divisions. The second line contained four Iraqi armored divisions to counterattack Coalition ground forces that penetrated the first line; two Iraqi corps backed up these divisions. The final line was the Republican Guard Forces positioned along the Iraq-Kuwait border.[110]

There were 336,000 Iraqi troops estimated to be in the Kuwaiti Theater of Operations as of 17 January 1991. Iraqi divisions were at an average strength of 34 percent by the time the air offensive started with some as low as 50 percent.[111]

Was the Army prepared for the Gulf War? The U.S. Army had not been in combat at the level of the Gulf War since the Vietnam War. Its preparation to fight in Europe against the Warsaw Pact provided the focus to remain ready. On the eve of the Gulf War the U.S. Army was probably the most prepared as it has ever been in its existence. Commenting on the Army's preparedness a young Army officer said "we were experienced" and "had fought such engagements six times before in complete battle simulations at the National Training Center and in Germany."[112] In the 1980s the U.S. Army had instituted Combat Training Centers to provide realistic combat training against an opposing force (OPFOR) using Soviet tactics. Through sophisticated

technology the maneuvers were realistic and tested the skills of soldiers, units, and staffs.[113] In 1990, Col. Dupuy calculated the U.S. Army's combat effectiveness was two times the Iraqi's.[114]

If the Army had fought a war after Vietnam it would have probably lost. The Vietnam War had nearly destroyed the U.S. Army. It had depleted the ranks of experienced NCOs and made service in the military something to avoid. Drugs, racial incidents, and other disciplinary problems plagued those who stayed. The move draftee to volunteer military would not make their job any easier.[115]

The Vietnam War had also delayed modernization of the Army's key weapons systems. Their tanks, built in the early sixties, were made obsolete by modern anti-tank missiles. The Soviets were also fielding new equipment in Europe of much better quality and quantity, threatening the Army's ability to meet NATO commitments. The 1973 Arab-Israeli War showed Soviet equipment to be very effective. Israel almost lost to the Soviet-equipped Egyptian Army.

Army leadership in the '70s realized that only quality in personnel, as well as weapons, could make up an inferiority in numbers. Quality people meant the Army had to attract high school graduates, and by the Gulf War 98 percent of its soldiers were high school graduates. The Army made education a priority and encouraged commissioned officers and NCOs to obtain advanced degrees.[116]

General William DePuy was one of those concerned senior officers and the first chief of the Army's Training and Doctrine Command (TRADOC). As a junior officer in World War II France he had experience with the unprepared soldiers and their weak leadership. His division, the 90th, lost 100 percent of its infantry soldiers and 150

percent of its infantry officers in six weeks. The poor practice of combined arms combat and weak division leadership colored his outlook.[117]

Quality in weapons was also emphasized in the late '70s and early '80s. During this period the Army began the process to equip itself with the weapons system used in the Gulf War. The Abrams tank, Bradley fighting vehicle, Apache attack helicopter, and improved tube and missile artillery would begin development at this time. The number one enemy continued to be Soviets and their Warsaw Pact allies. The Gulf War would become a miniature test of the two sides since the Iraqis used Soviet equipment and doctrine.[118]

This modernization would remake the Army by improving its weapons in quality and quantity, and most especially in firepower. A Gulf War U.S. infantry or armor division would have more tanks, infantry fighting vehicles, and artillery, all of higher quality than World War II equivalents.[119]

Army training at places like the National Training Center Ft. Irwin, California emphasized realism so soldiers and leaders could make mistakes without losing lives. All units had mission essential task lists that they were required to master and that were based on experience in war.[120]

The Army created a robust school system to provide basic and advanced training to its junior officers and soldiers also enhanced the quality and thus combat effectiveness. The Battle Command and Training Program (BCTP) was set-up to train division and corps commanders and their staffs.[121]

In the late '70s and early '80s the Army developed its doctrine known as AirLand Battle to defeat a Soviet echeloned attack and deal with the increasing lethality of the modern battlefield. The Army realized that it could not defeat the attack without

engaging the secondary echelons; it would rely on tactical air and its own long range artillery and aviation to fight "deep".

This key aspect of AirLand Battle was to embrace the concepts of maneuver warfare. Discussed in the writings of Soviet military theorists and others like Sir Basil H. Liddell Hart and Major General J.F.C. Fuller, maneuver warfare emphasized deep penetrations and the psychological destruction of the enemy instead of his physical destruction. The potential of maneuver warfare was that an equal or inferior force could defeat a superior one. AirLand battle linked maneuver and firepower as the means to victory; firepower gave maneuver credibility. The new equipment being acquired would provide the necessary firepower.[122]

Another aspect of Army doctrine was its embrace of a third level of war. Traditionally war had been divided into the strategic and tactical levels. The strategic level deals with the national leadership and preparation for war. The tactical deals with the conduct of battles and engagements. The operational level plays a key role by linking strategic endstates with tactical outcomes. It is the operational level that determines when, where, and how the subsequent battles will be fought. Linking these battles and engagements in space and time is "operational art". Thus AirLand Battle doctrine had returned to a truer rendering of World War II German doctrine with its emphasis on military art and creativity.[123]

On the same day that the Coalition air offensive began, two U.S. Army Corps' redeployed to outflank the defending Iraqi forces. One of the most important results of the air offensive was blinding the Iraqi's to this move.[124] The ground campaign began on 23 February 1991 and almost immediately it became apparent that the Iraqi front-line troops were not up to the fight.

Two battles between the U.S. VII Corps and Republican Guard demonstrate the combat effectiveness of U.S. ground forces. The "Battle of 73 Easting" took place between 26 and 28 February 1991 between elements of the U.S. VII Corps and the Republican Guard. Lead elements of the corps fixed the positions of two Republican Guard divisions and one regular army armored division on the 26th. The 1st and 3d Armored division's attack preceded by massive artillery and aviation strikes, and eventually overran one Republican Guard division and a main supply depot captured. VII Corps forces ultimately destroyed two Iraqi armored divisions, one infantry division, and most of a Republican Guard division.[125] A second battle occurred on a ridge further east and became known as the Battle of Medina Ridge. A Republican Guard brigade reinforced with a mechanized battalion failed to stop a brigade from 1st Armored division. U.S. ground forces destroyed sixty top-of-the-line Soviet T-72s in 40 minutes.[126] Only after the ground action did attack helicopters and fixed-wing aircraft show up to "clean out" remaining enemy forces.[127]

Overall the conduct of the ground battles demonstrates that the U.S. Army was more combat effective than the Iraqi Army. The war also demonstrated the superiority of the U.S. Army's new weapons.[128]

What role to airpower play in the Kuwaiti theater of operations (KTO)? The following quote from Gen. Charles Horner, CENTCOM's Air Component Commander, shows the how the theater's senior airmen felt about support to ground forces.

> There are people's lives depending on our ability to help them, if help is required. So I a want a push put on. I want people feeling compulsion to hit the target. I do not want fratricide...But up over the battlefield, it's time to go to work. Because other people's lives depend on ours.[129]

Of the 67,000 total combat air sorties flown in the Gulf War only 4393 were for close air support. Of the latter number the U.S. Air Force flew 1461 sorties. By most

assessments use of fixed-wing close air support was not decisive. A number of circumstances dictated that this would be so.[130] The rapid advance of Coalition ground forces minimized the opportunity for air attack in "close proximity to friendly troops." Many close air sorties attacked targets 20 to 40 miles in front of friendly troops, more like battlefield air interdiction. Close air sorties still made up for light infantry divisions small amount of organic artillery.[131]

The main reason for lower numbers is due to the combat effectiveness of U.S. soldiers and the modern weapons they used. Among the latter include new missile artillery and organic attack aviation. Attack aviation performed many CAS-type missions during the ground offensive. At times only helicopters could conduct operations because oil fires had lowered ceilings. The Air Force's primary close air support aircraft had 35 percent of its sorties did not use their munitions.[132]

In fact, U.S. Army attack aviation showed it could deliver the "closest" of close air support. Their organic nature and link to a combined arms doctrine made attack aviation the "most suitable" means.[133] Attack aviation destroyed 278 tanks, over 235 armored vehicles, 121 pieces of artillery, 302 wheeled vehicles, and 237 assorted other targets. Division commanders used attack aviation in close and deep missions.[134] During the air war, attack aviation performed both attack and armed reconnaissance missions; the latter provided division commanders with current intelligence. A number of Army pilots reported that the full combat potential of attack aviation had not been used.[135] Army commanders considered the Apache more effective against moving tanks than fixed-wing aircraft.[136]

Was air interdiction more effective than close air support? Approximately 35,000 sorties were devoted interdiction of Iraqi forces in the Kuwait theater of operations

(KTO). Eighty-four percent of these were directed on Iraqi front-line troops across from planned breach sites. The overall goal was to reduce their combat effectiveness by 50 percent; CINCCENT judged the "moral" aspects more important than the "physical". The Republican Guard forces in southern Iraq received the remaining 16 percent.[137]

The minimal need for close air support demonstrates the overall effectiveness of air interdiction. Attacks on front-line Iraqi Army forces reduced their ability to resist when the Coalition ground forces attacked. Many were ready to quit before the ground attack.[138] Before the ground offensive ARCENT staff judged the combat effectiveness of the two front-line Iraqi corps at 42 and 58 percent. Divisions behind the front-line were rated at 50 to 60 percent.[139]

One of the most significant demonstrations of airpower's decisiveness was during the Battle of Al Khafji.[140] The Iraqis launched their 1st and 5th Mechanized Infantry Division and 3rd Armored Division against Coalition forces on 29-31 January. The objective was to defeat the Saudi Arabian ground forces and begin to bleed U.S. forces. Air attack essentially stopped this Iraqi offensive from gaining any momentum. An Iraqi brigade commander said he lost more of his force in 30 minutes than eight years of war with Iran.[141]

Air interdiction reduced the flow of logistics to Iraqi Army, induced 160,000 Iraqi troops to desert and 85,000 to surrender, generated 10 percent casualties, and disrupted command and control.[142] The main reason for the quick ground war was that interdiction made it difficult for Iraqi heavy divisions to maneuver and fight. Iraqi reserves could not counterattack without coming under air attack. Overall the air offensive in the KTO is credited with destroying 53 percent of Iraqi tanks, 41 percent of

its armored personnel carriers, and 61 percent of its artillery.[143] Air operations over the KTO "devastated the Iraqi Army" and "virtually brought Iraq to its knees."[144]

The review of World War II during the Battle for France showed that the U.S. soldier was not as combat effect as the German soldier and that air power in support was decisive to victory. Although the Gulf War lasted 42 days it showed that a combat effective ground force needs minimal fixed-wing close air support. Its own organic attack aviation showed it could perform the same type missions.

Chapter 4: Analysis of Close Support Capabilities

This chapter will examine whether the Army's organic aviation and artillery can perform the majority of close support. The chapter will look at the differences between rotary and fixed-wing aircraft, discuss operational requirements for close air support, and assess the capabilities of rotary and fixed wing aircraft. It will briefly review improvements to artillery systems applicable to close support.

Comparing the capabilities of fixed and rotary-wing attack aircraft requires some background. Fixed-wing aircraft use their "fixed wings" to generate lift by being propelled forward until they become airborne. Control surfaces on the wings provide maneuverability. On rotary-wing aircraft an engine turns the wings that generates the lift required to fly. Forward and lateral motion are controlled by moving the spinning wings in the proper direction. This allows rotary-wing aircraft to takeoff and land vertically and hover. In contrast, the fixed-wing aircraft must keep moving forward to stay aloft. Some fixed-wing aircraft can takeoff and land vertically, and hover, but these carry less of a payload. Larger internal fuel and air refueling, greater engine power, and larger wing area combine to give the fixed-wing aircraft greater speed, range, and payload.

Another distinction between the two aircraft types is their relationship to terrain. Rotary-wing aircraft can take greater advantage of terrain. For example, a helicopter can hover behind a ridge and then "pop-up" quickly, engage a target and then duck back behind the ridge; providing minimum opportunity for enemy air defenses to shoot. Fixed-wing aircraft can use terrain-following systems to great advantage, but not as effectively.[145]

Both aircraft types are essentially munitions platforms that maneuver through the air to gain an advantage over surface targets. At the optimum moment they launch those munitions to destroy, neutralize, or suppress a target. Potential munitions include guided missiles or bombs that either fall or "glide" to the target. Using reflected laser light or radar to guide the munitions has improved accuracy significantly. Both types of aircraft can carry a cannon or "gun" to augment its firepower. Fixed-wing aircraft can carry a larger variety of munitions.

The Army and Air Force have aircraft that typically perform close support. The Army has the AH-64 Apache attack helicopter, and the Air Force has the A-10 Thunderbolt II and the A-16 Falcon. The Air Force can use the AC-130 Specter "gunship" in low air defense threats or at night. The AC-130 has an array of guns from 20 millimeter cannon to a 105 millimeter howitzer.

For this analysis the following requirements provide a standard measure for the close air support mission: responsiveness, lethality, and survivability. They are based on a review of history and other documentation.[146]

Responsiveness is the time it takes from a request till the target is attacked. It has been a perennial complaint from Army commanders that fixed-wing aircraft have not been responsive enough. Significantly though, there has been no quantification of

responsiveness by the Army. Responsiveness' basic factors are the platform's speed and the distance to the target. Responsiveness is equal only to lethality in the eyes of most ground commanders.

Fixed-wing aircraft are typically twice as fast as rotary-wing aircraft, given a fixed distance the fixed-wing aircraft will arrive in half the time.[147] However, attack helicopters are typically "based" in its parent unit's area of operations. As a result it will be closer to a potential employment area. One Army general estimated the average combat radius to be 13 miles. The resulting response time for an AH-64 on ground alert would be less than 5 minutes.[148]

The helicopter has the advantage of operating from "rugged" areas while fixed-wing aircraft will normally require prepared basing. The latter can extend its range by air refueling but this adds more planning factors that can delay arrival on target and thus lower response.

Because they are not organic, fixed-wing aircraft must use a number of procedural means to improve responsiveness. The first is pre-planning the use against a particular target. This requires knowing what the target is and where it will be at a certain time. If the target has moved, the sortie or sorties can be lost or rescheduled to another mission. In the second method, fixed-wing aircraft are put on "alert" status waiting on the ground or in the air, armed and ready for tasking. The drawback is the aircraft is not doing a mission waiting on the ground or flying circles in the sky; it too can be lost to a higher priority mission. A modification to this is the "push CAS" system. An aircraft is assigned a mission when it arrives on station; if there is no mission it is retasked to an interdiction mission. This is probably the most efficient means, but typically occurs when there are plenty of aircraft in theater.

The above assumes the ground commander has received a certain amount of fixed-wing sorties. Before this happens, the JFC prioritizes the air component effort between air superiority, air interdiction, close air support, or strategic attack. The Air Component Commander then determines the number of sorties for each mission type. Finally the land component commander is given a number of daily sorties for planning missions.[149] The ground commander may not get any fixed-wing close air support or very little depending on his mission's priority. On the other hand, his organic aviation remains at his beck and call.

One way to increase firepower without using fixed-wing aircraft is for the ground commander to ask for more attack aviation and artillery units; especially from U.S. based units not tapped for operations. A Category 2 or 3 unit probably does not need its aviation or artillery as much as a Category 1 unit does when confronted with potential combat operations.[150]

Another aspect of responsiveness is a command and control system used to synchronize all elements in the ground commander's plan. The best way to achieve unity of effort is by having unity of command. Ground commanders reduce uncertainty by careful planning that relies on the reliability of systems supporting him. "Organic" systems are more responsive to a commander and explains why ground commanders want fixed-wing assets assigned to their unit.

The Army has an existing fire support system that controls the "fires" of a maneuver unit. It is already designed to coordinate and communicate with Army aviation systems.[151] Adequate communications have been a consistent problem with fixed-wing close air support since the beginning of flight. Although "joint" communications standards will improve interservice communications, it will always be

easier to talk with organic systems because doctrine provides a common culture. Also, organic support typically has better situational awareness.

Lethality is the ability to destroy, neutralize, or suppress an enemy's weapons systems. It is directly related to the munitions carried and the type of enemy systems being attacked. A 1989 Defense Department operational test plan concept used tanks, infantry fighting vehicles, artillery/mortar positions, and air defense units as most likely targets for a close air support system.[152]

The most effective munitions are "fire and forget" missiles; they are aimed at an enemy target and quickly reach it after firing. Unguided gravity bombs are not effective because damage to the target is uncertain and increases the risk of killing friendly troops. Newer combined effects munitions although lethal to armor, artillery, and personnel, lack the ability to differentiate friend from foe.

Both Army and Air Force have highly effective and combat proven anti-armor missiles. The Army's Hellfire missile can destroy the typical enemy targets with a probability of kill between 70 and 90 percent.[153] The newer versions have a range of 9 kilometers and can fly below cloud cover to track the target. Fratricide is minimized because the target is identified and "marked" by a laser.[154] The missile can be fired from cover if the target is designated by another air or ground-based laser designator.

The Air Force Maverick missile can also destroy the same type of targets. The Maverick has a 80 to 90 percent probability of kill and a range of 25 kilometers; versions include TV, laser, and radar-guided. A proposed version of the Maverick will have a range of 75 kilometers.[155] Increased range allows launching the missile from outside the enemy's air defense; it also increases the difficulty in identifying friend from foe.

The best of all situations is a capability for one shot and multiple kills. Here the rotary-wing has the benefit of hovering at the release point and can fire multiple missiles at multiple targets. The AH-64 can carry 16 Hellfire missiles and launch all at individual targets in about one minute.[156] A fixed-wing aircraft using missiles typically can get one, maybe two missiles off per pass; it depends on how the targets are arrayed and density of air defense. Newer versions of the Maverick will allow multiple shots per pass, but the A-16 and A-10 can only carry up to six Mavericks.[157]

Of course the fixed-wing aircraft can carry bigger munitions such as guided bombs and combined effects munitions. The former are typically used against "hard" targets such as command bunkers. The latter can be used against concentrations of artillery, armor, and personnel, but have limited effect against dispersed, dug-in troops and equipment. Combined effects munitions provide area coverage and would only be for close air support in emergencies because they increase the risk of fratricide; especially in a fluid and dynamic battlefield.[158] They are best used against a concentrated enemy formation, far from friendly troops.

Survivability of the platform during its attack is the final requirement for close air support. A prerequisite for successful close air support missions is air superiority, no matter what aircraft flies them. The next threat comes from surface-to-air missiles (SAMs) and anti-aircraft artillery (AAA). Air defense systems target aircraft by radar or by detecting heat emitted by the aircraft, so called infra-red.

To enhance survivability of all aircraft operating in a theater, enemy air defense systems are targeted early for destruction. Both Army attack helicopters and Air Force attack aircraft can "jam" air defense targeting systems. They also have some capability to accept damage.[159] The helicopter also has the advantage of using nap of the earth

flying to enhance survivability.[160] The Longbow radar on AH-64s allows target designation with only the radar exposed.[161] Fixed-wing aircraft enhances survivability by flying higher, out of the range of enemy defense. However, this can reduce accuracy and make target identification more difficult.[162]

Finally, from a "green eye shade" point of view the helicopter makes a better close support system because it has a lower "sticker price" then fixed-wing aircraft.

Artillery is the primary means of fire support for the Army. Modern systems are better and more responsive than those used during World War II.[163] Improvements include smart warheads that can hit moving armored forces, target acquisition systems like JSTARS and unmanned aerial vehicles that can see deep into enemy territory, and digital communications links that improve coordination and response.[164] One of the lessons learned from the Gulf War was that most Army divisions did not have enough fire support. As a result six divisions are receiving an extra battery of nine Multiple Launch Rocket System launchers.[165]

So why is close air support still considered a fixed-wing mission? It is principally due to historical inertia. In the beginning there were only fixed-wing aircraft to attack enemy in "close proximity" to friendly troops. Thus, the platform has become synonymous with the mission. The mission is the responsibility of the Air Force by law and it has preferred fixed-wing aircraft that can perform multiple roles. Another factor is that fixed-wing aircraft have a lot more aggregate firepower.[166]

Another reason is AirLand Battle doctrine relies on fixed-wing air support to increase the firepower of corps and divisions. In the early '80s the Army realized it could not defeat a Soviet echeloned attack in Europe by itself. While ground forces defeated the first echelon, air forces would attrit and delay follow-on echelons through close air

support and battlefield air interdiction (BAI). The latter is a form of air interdiction that has near term effects on a current battle and gave ground commanders more input into targeting.[167] The focus on high-intensity combat made sense during the Cold War, but the last seven years suggests the focus should be on low to mid intensity conflict. Conventional wisdom says the U.S. will not have a peer competitor for another 15 years. Thus any conflict will likely be low to mid intensity.

A third reason is service interests; the Air Force did not want to lose its control of fixed-wing assets and the Army views close air as fire support. The mission therefore requires a "fires" platform; helicopters are maneuver elements and not really fire support.[168] Ironically the 1962 Howze Board made a good argument that helicopters could do close air support. Helicopters allowed use in "small-unit fire-fights" and short operations of fast movement. Simultaneous sorties were better in supporting the simultaneous engagements that took place and required crews trained specifically for this mission. Its responsiveness was another reason the helicopter could be a better platform. Ground operations required close synchronization with air support for the best effects. This was best achieved by an organic aircraft that allowed the division to fight as a combined arms team.[169]

In 1990 a senior Army Aviation officer argued that it was not in the Army's interest to take over close air support. One reason was that the Army could not "afford the force structure it desires now" and that taking over Air Force close air support assets the Army would actually lose combat power. He believed the best solution was to get the Air Force to "fulfill its assigned roles and functions and meet the Army's CAS requirement."[170] The author also argued that helicopters could not do close air support because they lacked the "speed, range, or load carrying capability of fixed-wing fighters,"

could not perform "strike, interdiction, or defensive air operations on par with fighters," and they are maneuver elements like tanks. Only "rogue artillerymen" saw them as "flying artillery."[171]

This is a weak argument for the prevailing status quo in a number of respects. It is not inevitable that the Army would need to take over Air Force fixed-wing aircraft. That fixed-wing aircraft have done close air support does not mean they have to do it; capability has to be matched to the requirement. Budgetary issues are secondary to determining what one needs to conduct operations. The Army's "CAS requirement" is capability to destroy enemy armored systems and the helicopter to do this.

The fact helicopters do not have equal capabilities as fixed-wing fighters is irrelevant. The comparison should factor in the stated operational requirement; what the Army needs done "in close proximity to troops." For instance, comparing total payload capability of the different aircraft may not address the real operation requirement. As mentioned above, the typical target is an armored vehicle. The helicopter has been optimized to destroy armored vehicles and one helicopter can carry more than twice as many anti-armor missiles than an Air Force fixed-wing aircraft. Thus the real measure would be numbers of armored vehicles destroyed and not payload capability.

A platform's speed is only one factor in overall responsiveness. Starting from the same point the fixed-wing aircraft can beat the helicopter to a trouble spot. However, these aircraft typically do not start from the same spot and the helicopter's organic nature make it more responsive to the ground commander.

Strike, interdiction, and defensive air operations are not close air support missions and therefore should not be part of the argument. Organic artillery and air defense perform these missions even if in a limited way.

Why is it OK to view fixed-wing aircraft as "flying artillery" and not rotary-wing aircraft? One "rogue artilleryman" argued Army attack aviation could do 87 percent of close support requirements, and that was 10 years ago! Army capabilities have surely improved since then and will most likely go on improving.[172]

The fact that the helicopter is considered a maneuver element should not prevent it use as a close support asset. The Department of Defense has a process for identifying and fulfilling operational requirements. The process begins with a user identifying a deficiency in needed capability. The "mission need" is the "minimum" required capability to fulfill the operational task.[173] The user must first study "non-materiel" changes that will solve the deficiency. This includes changing doctrine, training, or organization to provide the needed capability. If two attack aviation battalion per division are not enough, add another until the need is met. Likewise more artillery can be added or a combination may fix the deficiency. Either way the Army should attempt to fulfill its needs with organic systems. Every division may not get the full amount, but surely every Category 1 division can get what it needs.

Some have argued that fixed and rotary-wing aircraft are complementary; "mutually supplying each other's lack."[174] When both forms of aircraft are used inside the FSCL they are "something that completes or makes an addition," that is supplementary.[175] Fixed-wing air attacks are complementary only when used beyond the effective range of the Army combined arms team. It is not logical to send attack helicopters "deep" into enemy territory yet tie fixed-wing aircraft to the front-lines.

To illustrate this the paper will discuss a 1989 TRADOC concept study on Battlefield Air Support (BAS); a combination of close air support and battlefield air interdiction. The study simulated a Blue force defense of one division against a Red

force attacker of four divisions. Four cases were examined to determine the optimum solution. One case used one battalion of rotary-wing attack aviation to defend; it could not. The question is why more aviation or artillery units were not added until Blue force won? This would have a given a good standard to measure rotary versus fixed-wing close air support means.[176]

The last three cases dealt with using fixed-wing sorties against the enemy's artillery, enemy second echelon moving forward, and second echelon after contact, respectively. In each, the Red force culminated and then was defeated by a Blue force counterattack. A fifth, "excursion" case was run and had an interesting outcome. This time the sorties were applied against the enemy's artillery in much greater number and earlier in the battle; further from the FLOT. The result, the lead echelon division did not achieve its objectives and the Red force commander shifted his main attack. Interestingly, the authors considered this unacceptable because "synchronization of the battle plan was destroyed" and Blue force lost control of the "course of events." Another view is that it was a decisive outcome; a good combined arms team fights the enemy, not the plan.[177] Another point to consider: the enemy's artillery may be out of range of friendly artillery and typically clusters into an Artillery Group, creating a great target for fixed-wing aircraft. If the enemy's artillery is destroyed by air, is not that the best kind of "support?"

Finally, a word about the concept of Battlefield Air Interdiction (BAI). BAI gives the ground commander a greater say in target selection and its has "near term" effects to the close battle. The Air Force has not adopted this as a doctrinal concept because it is essentially meaningless. The following situation will illustrate why. Assume the JFCs objective is to defeat the enemy's ground forces, the FSCL is 30 to 50 kilometers from

the FLOT, and friendly ground forces have a rate of advance of 10 kilometers per hour or more. Any interdiction of the enemy beyond the FSCL will be, by definition, "near term." Even in the defense the enemy's rate of advance will cause interdiction effects to be near term. In this example the JFCs objective will focus air interdiction on the enemy's ground forces and synchronized it with ground action; this is the lesson for the future.

The analysis has shown that Army aviation can do a better job at close air support because it is responsive, lethal, and survivable. The combination of organic aviation and artillery provide U.S. Army forces at least as much capability as fixed-wing close air support provided in World War II. The fight for air superiority should not change since without it any form of close air support becomes very expensive as the '73 Arab-Israeli War demonstrated. Fixed-wing aircraft freed from close air support will be used for interdiction and set the conditions for victory.

Chapter 5: Conclusions

This paper attempted to answer the question on whether the Army needed fixed-wing close air support to fight successfully. Doctrine was examined to identify service perspectives on fighting and close air support in general. Joint, Air Force, and Army doctrine state that fixed and rotary-wing aircraft can do close support.

Two historical cases were examined to see how views on close air support were shaped by experience in war. In World War II during the Battle for France U.S. ground forces were less combat effectiveness than the Germans. The primarily cause was the rapid pre-war expansion; quality manpower and training was not given to many soldiers and they were forced to learn on the job.

The weakness in combat power was made up in firepower, through artillery and fixed-wing attack aviation. Although U.S. ground forces did not have as much artillery that it believed it needed to support the divisions raised. Allied air attacks disrupted German counterattacks and delayed reinforcements. Both senior German and American officers believed airpower played a decisive role in the Normandy invasion and the ultimate defeat of Nazi Germany.

The Gulf War showed an Army that was combat effective and equipped with ample firepower including organic aviation. The low number of fixed-wing close air support sorties and low number of friendly casualties is a testament to this. Air interdiction was clearly more decisive inducing mass desertions and attrition in Iraqi equipment and personnel. Its greatest effect was to blind the enemy to the maneuver of two corps.

Both wars showed that air interdiction will affect the ground fight significantly by robbing the enemy of his freedom of action. This is something the ground component can take advantage of without trying to control the targeting or timing of attacks. This will require trust between the components and that will only happen at the component level.

World War II showed fixed-wing close air support is indispensable during amphibious and airborne operations, where there is a big imbalance in available firepower for friendly ground forces. This paper did not argue that fixed-wing close air support will never be required.

The Army's claim of being "the decisive" element in war is open to question if it needs fixed-wing close air support to fight its battles successfully. An alternate interpretation of World War II and Gulf War is that the ground forces acted in a role subordinate to the air by "flushing out" the enemy. It was the "shield" to airpower's

"sword", when air could not fly because of weather, ground forces defended airpower's bases. A service does not have to win a war by itself to be decisive; ground forces freely admit they need the "support" of the other services and yet still claim the mantle of decisiveness for themselves. If airpower provides the majority of force for victory, why should it be subject to a "ground" scheme of maneuver? If an Army corps commander claims an attached wing of Air Force fighters can give him the decisive edge, why not give a Numbered Air Force commander an Army division for the decision?

If the Army is a combined arms team it should require minimum fixed-wing close air support; performing the majority of it by organic firepower. It should maximize organic resources because they are "good enough" to do what needs to be done. If a division lacks aviation or artillery, give it more. Even if it requires changing doctrine or cannibalizing divisions.

ENDNOTES

[1] Joint Pub 1.02, Department of Defense Dictionary of Military and Associated Terms, (Washington D.C.: Government Printing Office, 1997), 98.

[2] Field Manual 100-5, Operations, (Washington D.C.: Government Printing Office), 2-9-10.

[3] Martin van Creveld, Fighting Power, (Westport: Greenwood Press, 1982), 166-68.

[4] A Joint Force Commander has combatant command of a "joint force." This is an organization consisting of two or more military services. The joint force is typically responsible for military operations in a specific theater of war.

[5] Merriam-Webster's Collegiate Dictionary, Tenth ed., (Springfield, MA: Merriam-Webster, Incorporated, , USA, 1995), 342.

[6] JP 1.02, 174.

[7] FM 100-5, v, 1-1, 1-2, The Army says doctrine "is the authoritative guide to how its forces fight wars and conduct operations other than war." It "facilitates communications between Army personnel and establishes a shared professional culture and approach to operations" and describes how the Army thinks about applying the basic principles of war in a given situation. Doctrine should be able to exploit new technology and not be regressive or narrowly focused; Air Force Doctrine Document (AFDD) 1, "Basic Aerospace Doctrine," (Washington D.C.: GPO, 1997),1, According to Air Force doctrine "officially sanctioned beliefs and warfighting principles that describe and guide the proper use of air and space forces in military operations." Air and space doctrine is based on experience, provides "a common frame of reference." It shapes how the Air Force organizes, trains, equips, and sustains its forces. Doctrine provides a framework for planning and conducting operations."

[8] JP 1.02, vi, "joint doctrine deals with the fundamental issue of how best to employ the national military power to achieve strategic ends;" AFDD 1, 3, "Joint doctrine.....describes the best way to integrate and employ air and space forces with land and naval forces in military action."

[9] JP 1.02, 98.

[10] JP 3.09.3, Joint Tactics, Techniques, and Procedures for Close Air Support, (Washington D.C.: The Joint Staff, 1995), I-4-5.

[11] Stephen E. Bell, "Close Air Support for the Future" (Master of Military Art and Science Thesis, U.S. Army Command and General Staff College, 1992), 28,31.

[12] The FLOT is typically where the majority of friendly troops are arrayed. There will probably be a covering force in front of this during the initial stages of a battle. So it is possible that air attack could be delivered "close" to these troops. The FSCL is a

"permissive" measure in that ground forces can fire across it if they have to, but coordination before the fact is desirable. The Air Force sees this line as "restrictive" to its forces; attacks can not take place within the FSCL.

[13] Richard P. Hallion, Strike from the Sky: the history of battlefield air attack, 1911-1945, (Washington D.C.: Smithsonian Institution, 1989), 263; Bell, 29, 32.

[14] John A. Warden, III, The Air Campaign: Planning for Combat, (Washington D.C.: Brassey's, 1989), 87.

[15] FM 100-5, 2-19.

[16] FM 100-5, 2-19; FM 100-15, 2-17; FM 71-100, Division Operations, (Washington D.C.: Government Printing Office, 1996), 1-17, 2-15.

[17] FM 1-100, Army Aviation in Combat Operations, (Washington D.C.: Government Printing Office, 1989), 1-7 - 1-8.

[18] FM 100-5, 2-13, For example, a ground unit that flanks an enemy and seizes his main supply route in this rear has put the enemy in a bad position. The enemy is being denied supplies and can only use what he has; his ability to defend successfully is diminished. The enemy may not have reoriented to the friendly attack and may have his rear exposed; making the friendly attack less risky. The combination of surprise and the enemy in his rear destroys morale.

[19] FM 100-5, 2-13, 2-19; FM 1-100, Army Aviation in Combat Operations, (Washington D.C.: Government Printing Office, 1989),1-8.

[20] AFDD 1, Air Force Basic Doctrine, (Washington D.C.: HQ. U.S. Air Force, 1997), 48.

[21] AFDD 1, 49-50.

[22] AFDD 1, 50.

[23] AFDD 1, 49-50

[24] FM 100-5, 2-19.

[25] FM 100-15, 2-17.

[26] FM 100-15, Corps Operations, (Washington D.C.: Government Printing Office, 1996), 2-17.

[27] FM 100-5, 2-3.

[28] FM 100-5, 2-3.

[29] FM 100-5, 2-9-2-10.

[30] FM 100-5, 2-9-2-10.

[31] FM 100-5, 2-10.

[32] FM 100-5, 1-4.

[33] FM 100-5, 2-0.

[34] Richard M. Swain, Lucky War: Third Army in Desert Storm, (Fort Leavenworth: U.S. Army Command and General Staff College Press, 1995), 181-83.

[35] Merriam-Webster's Collegiate Dictionary, Tenth ed., (Springfield, MA: Merriam-Webster, Incorporated, , USA, 1995), 298-99.

[36] This of course assumes that the political objectives were achieved. There was no decision without achieving the national policy, even if every battle was won.

[37] Russell F. Weigley, Eisenhower's Lieutenants The Campaign of France and Germany 1944-1945, (Bloomington: Indiana University Press, 1981), 730.

[38] John A. English, On Infantry, (New York: Praeger, 1981), 121; van Creveld, 166-68.

[39] Trevor N. Dupuy, Numbers, Predictions, and War: Using History to Evaluate Combat Factors and Predict the Outcome of Battles, (Indianapolis: Bobbs-Merrill Company, 1979), 38; Soldier Capability - Army Combat Effectiveness (SCACE) Historical Combat Data and Analysis, (Virginia: Historical Evaluation and Research Organization, 1980), 2.

[40] van Creveld, 3, 170

[41] van Creveld, 174

[42] Michael D. Doubler, Closing with the Enemy: How the GIs Fought the War in Europe, 1944-45, (Lawrence, KS: University Press of Kansas, 1994), 289.

[43] Dupuy, Numbers, Predictions, and War, 32, 62, 63.

[44] Trevor N. Dupuy and Gay Hammerman, Soldier Capability - Army Combat Effectiveness (SCACE) Historical Combat Data and Analysis, (Virginia: Historical Evaluation and Research Organization, 1980), B-3-B-7.

[45] van Creveld, 166-168.

[46] Christopher R. Gabel, The U.S. Army GHQ Maneuvers of 1941, (Washington D.C.: Center of Military History, 1991), 8.

[47] Ibid., 8-9.

[48] Ibid., 115.

[49] Ibid., 172, 174.

[50] Ibid., 185.

[51] English, 131.

[52] Robert R. Palmer, "Mobilization of the Ground Army," The Organization of Ground Combat Troops, U.S. Army in World War II, Kent Roberts Greenfield, Robert R. Palmer, and Bell I. Wiley, eds., (Washington D.C.: U.S. Depart of the Army Historical Division, 1947), 193-94.

[53] Palmer, 239, 249, The personnel system also did a poor job accounting for and distributing the existing manpower.

[54] van Creveld, 28-29, 32-40, German command principles focused on the independence of the subordinate and practiced mission-type orders. The subordinate was told "what" to do and was trusted to figure out "how" to do it. American doctrine did not mention the subordinate commander's independent responsibility and did not use mission-type orders. Even Patton admitted most senior officers did not understand the concept.

[55] van Creveld, 131, 137, 140-41

[56] English, 133; Martin Blumenson, ed., The Patton Papers, Vol. 2, (Boston: Houghton Mifflin, 1974), 572 in Greenfield, Palmer, and Wiley.

[57] S.L.A. Marshall, Men Against Fire: The Problem of Battle Command in Future War, (Gloucester, MA: Peter Smith, 1978), 168

[58] Ibid., 68

[59] Ibid., 36-43

[60] Ibid., 126-127

[61] English, 67-69, The German squad was a combined arms team in miniature. It could set up a base of fire and a maneuver to outflank an enemy position.

[62] The Rommel Papers, B.H. Liddell Hart, ed., with the assistance of Lucie-Maria Rommel, Manfred Rommel, and General Fritz Bayerlein, trans. Paul Findlay, (New York: Harcourt, Brace and Company, 1953), 404.

[63] Ibid., 407.

[64] Ibid., 477.

[65] Weigley, 9.

[66] Weigley, 10, 11.

[67] Alan R. Millet, "The United States Armed Forces in the Second World War," "Military Effectiveness, Vol. III, The Second World War, Allan R. Millet and Williamson Murray, eds, Mershon Center Series on Defense and Foreign Policy, (Boston: Unwin Hyman, 1988), 73; Weigley, 11.

[68] Palmer, 412; Gabel, 21; Millet, 69.

[69] Dupuy, Numbers, Predictions, and War, 63.

[70] Millet, 61.

[71] Doubler, 301-02.

[72] Gordon A. Harrison, "Cross-Channel Attack," United States Army in World War II The European Theater of Operations, (Washington D.C.: Office of the Chief of Military History, 1951), 236-37.

[73] Palmer, 232-35; Omar N. Bradley, The Effectiveness of Strategic and Tactical Airpower in the ETO, Vol. V, No. 2, (Washington D.C.: War Department General Staff, 1945), 4.

[74] Harrison, 236, 242, These included ; 13 infantry, 2 airborne, 5 panzer, and 4 SS panzer and panzer grenadier.

[75] Harrison, 241-242, A combination of the Allied Strategic Bombing and the Red Army helped achieve this.

[76] Harrison, 158.

[77] Harrison, 224-30; The French resistance also helped achieve reduced trafficability prior to, during, and after the Normandy invasion.

[78] Bradley cited in Sheffield Edward Papers, USAMHI, quoted in Thomas Alexander Hughes, OVER LORD: General Pete Quesada and the Triumph of Tactical Air Power in World War II, (New York: The Free Press, 1995), 12.

[79] Harrision, 235, 334-35, 448

[80] The Rommel Papers, 476-477 Actually there were only 10,585 sorties on D-day.

[81] Hughes, 12, 150.

[82] Hughes, 148.

[83] Liddel Hart, B.H., German Generals Talk, (New York: Quill, 1979), 244-45.

[84] R. Ernest Dupuy and Trevor N. Dupuy, The Encyclopedia of Military History From 3500 B.C. To The Present, 2d ed. revised, (New York: Harper & Row, Publishers, 1986), 1107; The Rommel Papers, 489, Gen. Bayerlein was in command of the Panzer Lehr division at St. Lo when the operation commenced. The air attack wiped out his front line troops and he barley escaped capture.

[85] Martin Blumenson, "Breakout and Pursuit," United States Army in World War II The European Theater, (Washington D.C.: Center of Military History, 1984), 36-49, 178.

[86] Blumenson, 43.

[87] Ibid., 177.

[88] Ibid., 89.

[89] Doubler, 240-41, 70 percent of all battle casualties were from the infantry, but represented only 14 percent of Army troops overseas. Surprisingly many casualties were the result of cold weather; troops did not change socks regularly and as a result suffered from "trench foot" which could become debilitating. So significant were these casualties that the loss in combat power equaled five-and-a half infantry divisions.

[90] Blumenson, 179.

[91] Doubler, 235.

[92] Weigley, 163.

[93] Blumenson, 238-41.

[94] Blumenson, 333-35. Armored column-cover consisted of four fighter-bombers in 30 minute relays that supported the lead column of an armor unit. It included an air liaison officer in the van of the column. Close contact between air-ground made this effective.

[95] Christopher R. Gabel, The Lorraine Campaign: An Overview, September-December 1944, (Fort Leavenworth: Command and General Staff, 1985), 7.

[96] Alan F. Wilt, "Coming of Age: XIX TAC's Roles During The 1944 Dash Across France," Air University Review, March-April 1985, Vol. XXXVI, No. 3, 71-87.

[97] Weigley, 567.

[98] Hugh M. Cole, "The Ardennes: The Battle of the Bulge," The United States Army in World War II, The European Theater of Operations, Stetson Conn, ed., (Washington D.C.: Chief of Military History, 1965), 660-663.

[99] Charles B. MacDonald, A Time for Trumpets, (New York: William Morrow and Company, Inc., 1985), 161, The 6th SS started with five airborne and *Volksgrenadier*

divisions, four SS panzer divisions with 800 tanks and assault guns, and 1000 artillery pieces. The main attack consisted of two SS panzer divisions in the vicinity of Rocherath-Krinkelt. Two more SS divisions constituted the second echelon.

[100] Cole, 124-25.

[101] Answers to Questionnaire for Key Army Commanders on the Effects of Strategic and Tactical Air Power on Military Operations ETO, 533.4501-2, USAFHRC, quoted in Hughes, 295.

[102] Kesselring cited in POW Reports, Edwards Papers, USAMHI; Hermann Goering cited in Goering Interview, box 134, Spaatz Papers, LC, quoted in Hughes, 300.

[103] BAI was a term introduced in the early 1980's to describe air interdiction that had "near term effects" on the current battle. BAI is probably what most Army commanders desire; it provides a lot of firepower synchronized more closely with his scheme of maneuver.

[104] Richard P. Hallion, Strike from the Sky: The History of Battlefield Air Attack 1911-1945, (Washington D.C.: Smithsonian Institution Press, 1989), 263-265.

[105] Dupuy, Numbers, Predictions and War, 76-77, The investigation only looked at the effect on German logistics and did not take into account effects on mobility or command and control.

[106] Ibid., 94.

[107] Wilt, 77.

[108] James Blackwell, Thunder In the Desert: The Strategy and Tactics of the Gulf War, (New York: Bantam Books, 1991), 48-52, A mechanized infantry division contained 13,000 troops, 220 tanks, and 600 armored fighting vehicles, divided into two mechanized brigades and one armored brigade. An armored division had 12,000 troops, 330 tanks, and 460 armored fighting vehicles, divided into two armor brigades and one mechanized brigade.

[109] Blackwell, 52-55; Norman Friedman, Desert Victory, (Annapolis: Naval Institute Press, 1991), 21, Saddam ensured the Guard's loyalty by paying and feeding it better than the Iraqi Army. During the Iran-Iraq War Guard units were rotated from the front after losing 30 percent of their strength; Army units were rotated when they reached 50 percent.

[110] Williamson Murray, Air War in the Persian Gulf, (Baltimore: The Nautical & Aviation Publishing Company of America, 1995) p. 280.

[111] Barry Watts and Thomas A. Keaney, "Effects and Effectiveness," Gulf War Air Power Survey Vol. II, Cohen, Eliot A. director, (Washington D.C.: Government Printing Office, 1993), 167-69.

[112] Kevin Kelly, Out of Control: The New Biology of Machines, Social Systems and the Economic World, (Reading MA: Addison-Wesley Publishing Company, 1994), 246.

[113] Robert H. Scales, Certain Victory: The U.S. Army in the Gulf War, (Washington D.C.: Office of the Chief of Staff United States Army, 1993), 20-23; H. Norman Schwartzkopf, with Peter Petre, It Doesn't Take a Hero, (New York: Bantam Books, 1992), 242-44, 258-59.

[114] Trevor N. Dupuy, and Curt Johnson, David L. Bongard, Arnold C. Dupuy, How to Defeat Saddam Hussein, (New York: Warner Books, 1991), 184-86.

[115] Scales, 6-8; Tom Clancy, Into the Storm: A Study in Command," with General Fred Franks, Jr., (New York: G.P. Putnam's Sons, 1997), 85-86.

[116] Scales, 7; Clancy, 90.

[117] Scales, 11.

[118] Scales, 19-20; Clancy, p. 104-07.

[119] Greenfield, Palmer, and Wiley, 274-75, 321; Student Text 100-3, "Battle Book," (Ft. Leavenworth: United States Army Command and General Staff College, 1996), 2-27.

	World War II	Gulf War
105 mm Towed Artillery Tubes	54	0
155 mm Towed Artillery Tubes	12	0
155 mm Self Propelled Artillery Tubes	0	72
Rocket Artillery	0	9 (108 tubes)
Tanks	0	317
Infantry Fighting Vehicles	0	290
Anti-Tank Guns	57	0
Anti-Tank Rockets	558 (Bazooka)	580 (TOW)

Table 1. Comparison of Infantry Divisions

	World War II	Gulf War
105 mm Self Propelled Artillery Tubes	54	0
155 mm Towed Artillery Tubes	0	0
155 mm Self Propelled Artillery	0	72
Rocket Artillery	0	9 (108 tubes)
Tanks	195	375
Half-track/Infantry Fighting Vehicles	466	232

Anti-Tank Guns	0	0
Anti-Tank Rockets	609 (Bazooka)	436(TOW)

Table 2. Comparison of Armored Divisions

[120] Scales, 20-21.

[121] Scales, 23-24; Clancy, 91-99.

[122] Clancy, 133-34.

[123] Scales, 25-26; Clancy, 139.

[124] Murray, 243.

[125] Blackwell, 201-04; Murray, 287.

[126] Blackwell, 205-06

[127] Clancy, 421-22.

[128] Peter Touras and Elmo C. Wright, Jr., with Bruce George, Tim Lister, James Piriou, and Joe Sanderson, "The Ground War," Military Lessons of the Gulf War, Bruce W. Watson, ed., (California: Presidio Press, 1991), 117-18.

[129] Murray, 276

[130] Watts and Keaney, 248; Murray, 290; James A. Winnefeld, Preston Nibalk and Dana J. Johnson, A League of Airmen: U.S. Air Power in the Gulf War, (RAND, 1994), 148.

[131] Watts and Keaney, 247, 248; Murray, 283, This supports the previous observation that the Army wants Battlefield Air Interdiction versus "close" air support or air interdiction; BAI gives greater control and predictability. However, it begs the question of who has priority. In a two corps fight only one will be the main effort for a given time period; that corps should get all the BAI and the second gets none; this assumes that the main effort is directed at the "decisive point."

[132] Thomas A. Keaney and Eliot A. Cohen, Gulf War Air Power Survey Summary Report, (Washington D.C.: Government Printing Office, 1993), 110-12.

[133] Watts and Keaney, 243.

[134] Government Accounting Office, Report to the Chairman, Subcommittee on Oversight and Investigations, Committee on Energy and Commerce, House of Representatives, "Operation Desert Storm: Apache Helicopter Was Considered Effective in Combat, but Reliability Problems Persist." (Washington D.C.: Government Printing Office, 1992) 3-4, 16

[135] Frank C. Conahan, "Operation Desert Storm: Apache Helicopter Was Considered Effective in Combat, but Reliability Problems Persist," Report to the Chairman,

Subcommittee on Oversight and Investigations, Committee on Energy and Commerce, House of Representatives, (Washington D.C.: General Accounting Office, 1992),18-24.

[136] Scales, 287.

[137] Murray, 262.

[138] Keaney and Cohen, 108, 110.

[139] Scales, 207.

[140] Michael R. Gordon and Bernard E. Trainor, The General's War, (Boston: Little, Brown and Company, 1995), 267-88, The attack took place throughout the KTO with one divisional prong going towards Al Khafji, a second towards Wafra in southern Kuwait and the third towards Umm Hajul.

[141] Keaney and Cohen, 109; Blackwell, 166.

[142] Keaney and Cohen, p.107, 220-21, 264; Murray, 299-303; Stephen T. Hosmer, Psychological Effects of U.S. Air Operations in Four Wars 1941-1991 Lessons for U.S. Commanders, (Santa Monica: RAND, 1996) 152-57.

[143] Watts and Keaney, 261, 263.

[144] Rod Alonso, with Bruce George, Raimondo Luraghi, Tim Lister, James Piriou, and B.L. Cyr, "The Air War," Military Lessons of the Gulf War, Bruce W. Watson, ed., (California: Presidio Press, 1991), 77

[145] Bill Sweetman, "Close air support fighters high, helicopters low," International Defense Review, Vol. 25, 11/1992, 1079

[146] Operational Test Plan Concept for Evaluation of Close Air Support Alternative Aircraft, Office of the Director, Operational Test and Evaluation Office of the Secretary of Defense, 31 March 1989; E.M. Lynch, "Close Air Support: Its Failed Form and Its Failing Function," Armed Forces Journal International, August 1986, 77

[147] High Tech Warfare, (New York: Crescent Books, 1991), 34-35, (A-10), 128-129

[148] Lynch, 77; Estimate was calculated using an average speed of 170 mph.

[149] JFACC Primer, 2d ed., (Washington D.C.: USAF Deputy Chief of Staff, Plans and Operations, 1994), 16-17

[150] Category 1 units are kept at the highest level of readiness for operations. Units are assigned a category based on the likelihood of being used for military operations.

[151] Field Manual 6-20 Fire Support in the AirLand Battle, (Washington D.C.: Government Printing Office, 1989) passim

[152] Operational Test Plan Concept for Evaluation of Close Air Support Alternative Aircraft, Director of Operational Test and Evaluation, Office of the Secretary of Defense, II-15 to -21, Interestingly, this test concept did not plan to use attack helicopters and limited itself to looking at fixed-wing aircraft, to include the AV-8B and propeller driven aircraft.

[153] Conversation with MAJ Wayne Parks, AV. Longbow Apache will raise probability of kill of Hellfire to 90 percent.

[154] Ducan Lennox, "AGM-114 Hellfire," Jane's Air-Launched Weapons, (Alexandria: Jane's Information Group, 1996); Bill Gunston, The Illustrated Encyclopedia of Aircraft Armament: A major directory of guns, rockets, missiles, bombs, torpedoes and mines, (New York: Orion Books, 1988), 136-37

[155] Duncan Lennox, "AGM-65," Jane's Air-Launched Weapons, (Alexandria: Jane's Information Group, 1996); "Conduct of the Persian Gulf War," Final Report to Congress, (Washington D.C.: Government Printing Office, 1991), 778

[156] Conversation with MAJ Wayne Parks, AV.

[157] Paul Jackson, Jane's All the World's Aircraft, (Alexandria: Jane's Information Group, 1996) , 646; High Tech War, 32-33

[158] Duncan Lennox, "CBU-87/B Combined Effects Munitions (CEM) (with BLU-97)," Jane's Air-Launched Weapons," (Alexandria: Jane's Information Group, 1996)

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