

AIRPOWER



JOURNAL

Winter 1989

AIR POWER IN THE BATTLE OF THE BULGE

A Theater Campaign Perspective

COL WILLIAM R. CARTER, USAF

The sixteenth of December 1989 is the 45th anniversary of the Battle of the Bulge. This battle placed tough demands upon our soldiers and airmen, and they met the challenge with competence and courage. To date much has been written concerning the ground operations. For it was on the ground that the ultimate outcome was measured. In contrast, the contributions of air power to the success of the battle have been largely presented in either shallow descriptions or individual flying unit tactical analyses. Missing has been an examination of air power as it was applied to achieve the goals of the theater strategy.

POPULAR lore of the Battle of the Bulge evokes images of surprised Allied commanders, Gen George S. Patton's wheeling Third Army, gallantry at Bastogne, and answered prayer for good weather that brought the wrath of Allied air power on German forces.¹ How did air power support theater objectives and contribute effectively to the defeat of Hitler's 1944 Ardennes offensive? To gain an appreciation of the air commander's





Maj Gen Elwood R. "Pete" Quesada (left), commander of IX TAC during the Battle of the Bulge. Above, C-47s resupply Bastogne after the weather improved. The layered air defense of the bulge enabled unarmed C-47s to deliver supplies directly into combat areas with the loss of only 19 cargo aircraft.



General Quesada was instrumental in the success of the air battle for the bulge. Flexible use of air doctrine and a close working relationship with Army ground commanders made a significant contribution to the defeat of the German offensive.

perspective, we must understand the principles of air power as they were understood in 1944. After setting the background for the battle, we can then see how Allied commanders applied air power in support of a theater campaign to first blunt then smash Hitler's last gamble.

The Principles of Air Power

The United States entered World War II as a "third-rate air power" at best.² As far as our knowledge went with regards to supporting ground operations with air power, we entered North Africa in late 1942 with an "abundance of ignorance."³ However, American airmen learned quickly from the British experience in North Africa. Under the wing of Air Marshal Sir Arthur W. Tedder and Air Vice Marshal Sir Arthur "Maori" Coningham, Generals Carl "Tooe" Spaatz, Elwood R. "Pete" Quesada, Laurence Kuter, and others were seasoned.⁴

On 31 January 1943, President Franklin D. Roosevelt met with Prime Minister Win-

ston Churchill at Casablanca, Morocco. At this conference the Anglo-American leaders and their staffs defined the alliance's grand strategy, established the Combined Chiefs of Staff, and agreed on both a strategic bombing and tactical support policy.⁵ It was the successful, battle-honed model of Field Marshal Sir Bernard Law Montgomery and Air Vice Marshal Coningham that defined the principles of air support that became US Army Air Corps doctrine on 21 July 1943 in FM 100-20.⁶ These intellectual tools forged early in North Africa served the Allied air commanders well in the Battle of the Bulge.

The key concepts incorporated in FM 100-20 were

1. Land and air power are coequal and interdependent forces; neither is an auxiliary of the other.
2. Land forces operating without air superiority must take such extensive security measures against hostile air attack that their mobility and ability to defeat the enemy land forces are greatly reduced. Therefore, air forces must be employed against the enemy's air forces until air superiority is obtained.
3. The inherent mobility of modern land and air forces must be exploited to the fullest.

The missions of air power employment as spelled out in FM 100-20 were

1. *First priority.* To gain the necessary degree of air superiority. This will be accomplished by attacks against aircraft in the air and on the ground and against those installations that the enemy requires for the application of air power.
2. *Second priority.* To prevent the movement of hostile troops and supplies into the theater of operations or within the theater (air interdiction).
3. *Third priority.* To participate in a combined effort of the air and ground forces, in the battle area, to gain objectives on the immediate front of the ground forces (close cooperation).

The basic doctrine of employment in FM 100-20 called for the following:

1. Air power operations should almost invariably precede the contact of surface forces. The purpose of this action is to disrupt the orderly mobilization and strategic concentration of the enemy's field forces.

2. Air operations are conducted in a joint Army and Navy operational plan focused on the strategic and tactical objectives.

3. Only total destruction of the enemy's aviation can gain and maintain complete control of the air. Since this is seldom practical, counterair operations and air defenses in the theater must be carried on continuously to provide security from hostile air operations.

4. Centralized command of air forces enables air power to be constituted in mass and enables it to be switched quickly from one objective to another in a theater of operations.

5. Facilities are required for tactical control and planning, administration, maintenance, repair, supply, and rest. Air bases, suitably located and secure, are essential for the sustained operation of military aviation. Aviation engineers are essential.

6. Adequate communications for the control and direction of air operations and for liaison are required.⁷

The Setting

When the disproportion of Power is so great that no limitation of our own object can ensure us safety from catastrophe . . . forces will, or should, be concentrated in one desperate blow. . . .

Carl von Clausewitz
On War

Hitler alone conceived the Battle of the Bulge. His purpose was to knock the Western Allies out of the war with a great victory that would "bring down the artificial coalition with a crash."⁸ With this objective accomplished, he would turn to the east and "effectively" concentrate

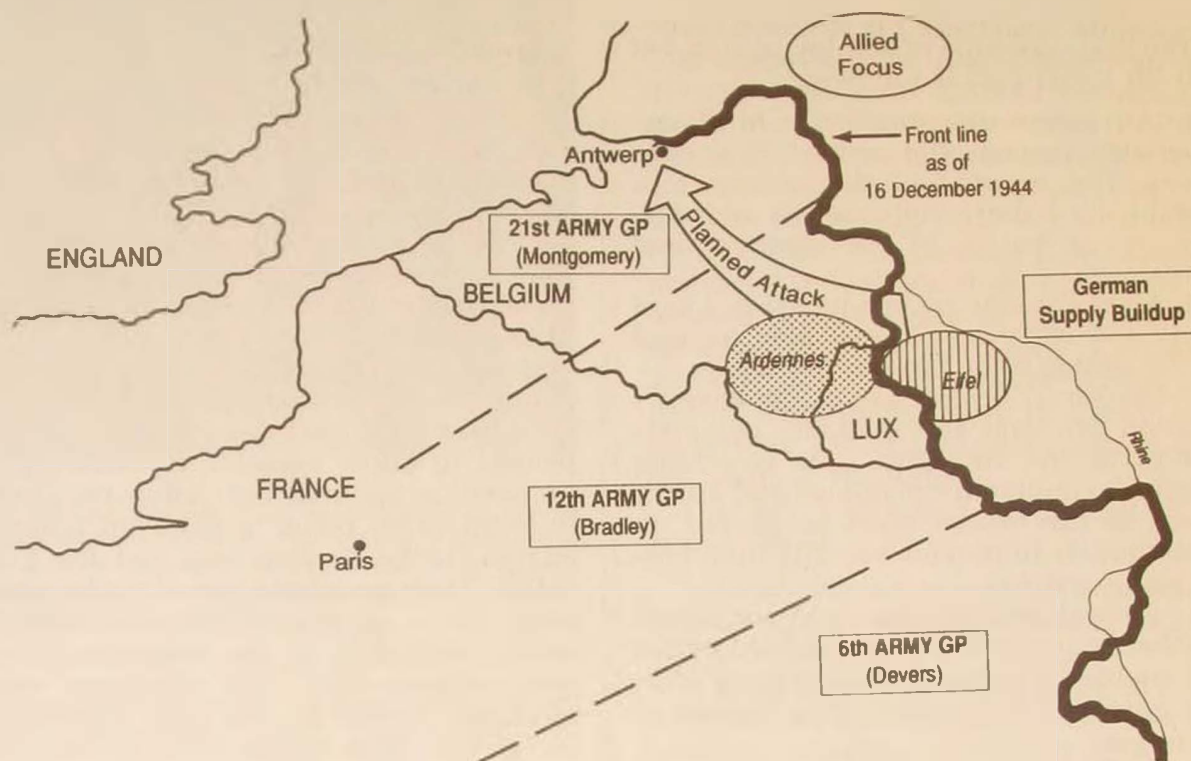
against the Soviets. However, the Germans had not launched an offensive outside the Soviet Union in nearly three years, and it was the first time an offensive had been attempted in the face of an opponent who had achieved air superiority. On the other side, this was the first time American air power had been assigned a large-scale battle mission *not planned in advance* as part of an offensive.⁹

In the fall of 1944, two Allied army groups faced Germany's "West Wall"; a third was in Alsace-Lorraine. The Allies paused to allow logistics to catch up in preparation for their next offensive phase, their attention being focused on planned attacks in the Aachen area and the Ruhr valley. They gave little regard to the possibility of a significant German counter-attack, especially in the Ardennes Forest area, where four US divisions were stretched along an 80-mile front. Gen Dwight D. Eisenhower had thinned his strength in this region to provide the "mass" required to the north (map 1).

On 16 December 1944 Hitler struck this "quiet sector" with 24 divisions and 2,400 tactical aircraft, creating a 60-mile-wide break in the Allied line.¹⁰ The number of aircraft dedicated to this operation was more than the Luftwaffe had used in 1940 to conquer France or successfully defend, though at great cost, the skies over Kursk in 1943.¹¹ Within a week these forces would be engaged by elements of two Allied army groups supported by 6,000 tactical aircraft and heavy bombers. Though the Allies had both numerical and qualitative superiority in the air in 1944, the threat of 2,400 enemy aircraft in one operation could not be dismissed.

The German operational objective was to drive quickly through Gen Omar Bradley's 12th Army Group to collapse the right flank of Field Marshal Montgomery's 21st Army Group. The ultimate goal was to capture Antwerp and "trap" 35 Allied divisions and possibly create another Dunkirk.

Hitler believed that a successful offensive through the American sector would trap



Map 1. The position of the Allied lines on 16 December 1944, the day the Battle of the Bulge began. The focus of the Allies was in the north, while the German buildup was in the center. Hitler's plan was to use the German Heeresgruppe B (Army Group B) to drive through Gen Omar Bradley's 12th Army Group to collapse the right flank of Field Marshal Bernard Montgomery's 21st Army Group. The Sixth Panzer Army was to conduct the primary attack.

Montgomery's forces and drive a political wedge between the British and the Americans. He hoped that it would create enough tension between London and Washington to make possible a negotiated armistice on the Western front. Thus, Hitler's blow was aimed at the will of the Allied high command.¹² He reasoned that Churchill and Roosevelt would have to consult to counter his attack, and that this delay would in turn give the Wehrmacht the time needed to seal the fate of the Allied front. Hitler did not believe that Eisenhower had the authority to act on his own.

Hitler began laying the groundwork for an offensive in the Ardennes in late July 1944.¹³ This was at a time when the Allies were breaking out of Normandy at Saint Lô. In August, as the Allies raced toward Paris, Hitler began stockpiling equipment and materiel for the attack in the Eifel region and along the Rhine.¹⁴ Hitler was setting his "trap" well ahead of Allied thinkers, and he was positioning his scarce resources to ensure adequate support. The Germans did not intend to depend on captured Allied supplies for success in this operation.¹⁵

In his all-out attack, Hitler guaranteed his ground commanders that they would have strong fighter support. Since air forces took time to build, he conceived the ruse of a massive defensive air campaign against Allied strategic bombers to build up his air power. An attack on the planes that were blasting German cities daily would most certainly motivate even the most reluctant Luftwaffe officers into full and enthusiastic

support. Only later would Hitler tell them of their true purpose.¹⁶

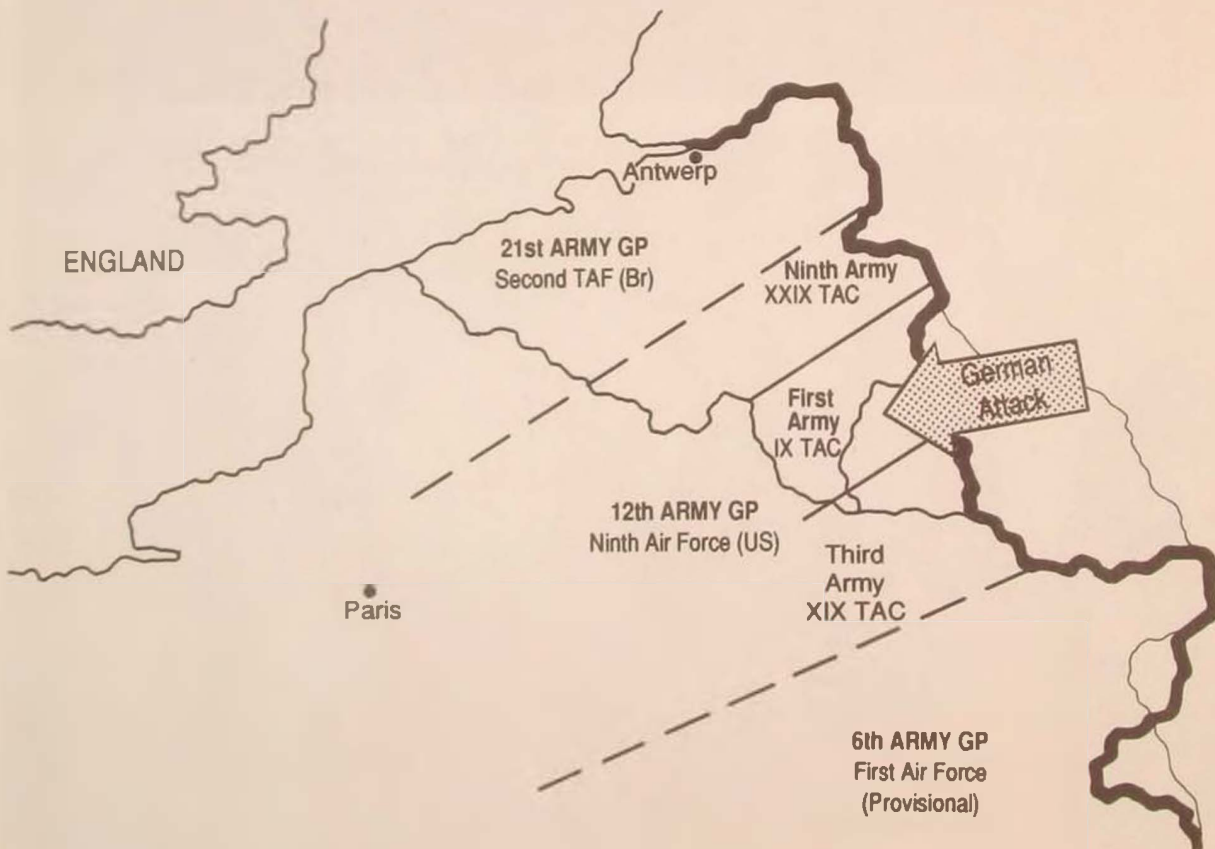
Behind this facade of deception, German air commanders prepared for a large defensive counterair operation, *der Grosse Schlag* (the Great Blow). Their plan was to engage in overwhelming strength the bombers of the Eighth Air Force. These airmen ardently designed a force of 18 fighter wings consisting of 3,700 aircraft, a "fighting force such as the Luftwaffe had never possessed before."¹⁷ Planning, training, equipping, and basing all proceeded with the single focus on air defense. Although Hitler understood, very well, how to elicit his soldiers' devotion, he did not understand air power and distrusted the Luftwaffe leadership.

Hitler did not realize that a fighter force prepared solely for the mission of air-to-air

combat was not very effective when directed to support combat on the ground. With this fault at the base of Hitler's planning, his air commanders built the wrong force structure. Deceived by Hitler, they constructed their air forces in isolation from the ground units that they would be required to support. Precious gasoline was used to train for air-to-air combat, not for air-to-ground attack. Tactics were developed for bomber intercept, not for ground support tasks. Munitions were procured for aerial combat, not for ground attack. Air bases were located east of the Rhine River for security and were consolidated to facilitate centralized control and timely massing. Forward deployed and dispersed fields needed to support ground operations were not prepared. Everything was designed for "the special task of defense of the Reich."¹⁸

On the ground the operational plan was simple though overextended. The Sixth Panzer Army (mostly SS divisions) was to

Map 2. The German attack on 16 December 1944, which split Gen Omar Bradley's 12th Army Group.





Bastogne was resupplied by air from 23 December until 26 December 1944. During that time, IX Troop Carrier Command flew 962 sorties and dropped 850 tons of supplies to the surrounded town.



Fighter aircraft of IX TAC were stationed in Belgium, close to the front. This gave them a significant advantage over the Luftwaffe forces, which had a short combat radius and were stationed some distance from the fighting.

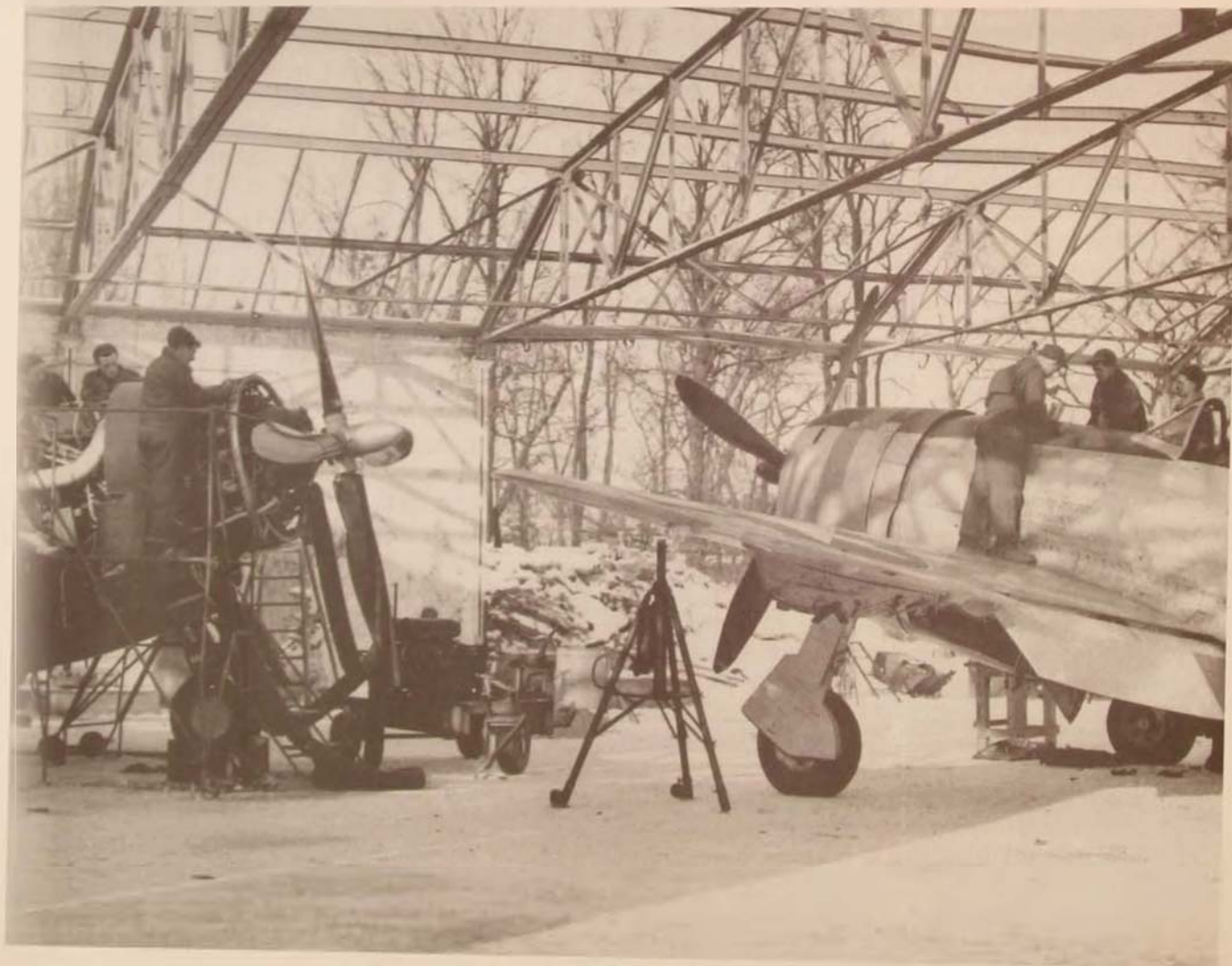
conduct the primary attack with strong support on its left flank by the Fifth Panzer Army, comprised of regular Wehrmacht troops. The Fifteenth Army was to pin Allied troops in the Aachen area on the penetration's northern shoulder, and the Seventh Army was to block Patton on the southern flank.¹⁹

In the air the operational planning was as flawed as the force structure. The operational order for the attack of *Heeresgruppe B* (German Army Group B) toward Antwerp stated that the first priority of the Luftwaffe was "ground support for Panzer spearheads." Air was "to attack the roads along

the axis of advance and the preparation areas." Only key points were to be supported due to limited air assets. Second priority was to "attack against the airfields of the enemy tactical units close to the front."²⁰ Planning for this second objective began in late November, but because of the extensive "veil of secrecy" surrounding the land attack, command indecision, and poor weather, it was not exercised until 1 January 1945.²¹

No consolidated Luftwaffe-German army command structure, planning staff, or operations staff existed. All integration of air activity went through a liaison headquarters of *Luftwaffen-Kommando West* attached to *Heeresgruppe B*. This liaison group communicated by radio or land line to appropriate Luftwaffe headquarters. All air attack requirements were passed to this

While the bad weather hindered Allied air support in the early days of the battle, it ensured the availability of a rested and ready combat air force once the weather cleared.

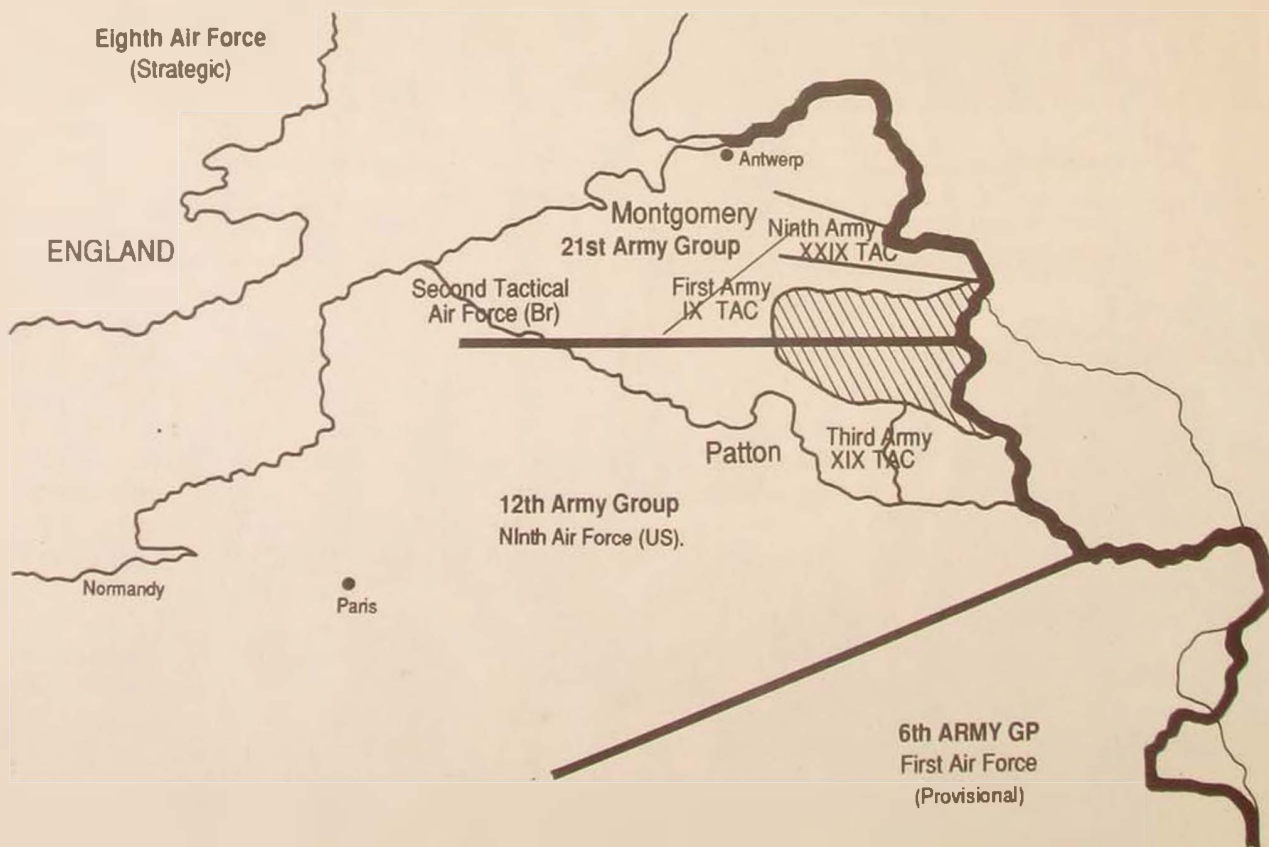


liaison office through army headquarters. Coordination between German air defense flak units and Luftwaffe fighters was extremely poor. Besides the recognition lights on Luftwaffe fighters, the only attempt to reduce fratricide was the use of *Goldregen* rocket signals. Luftwaffe ground liaison personnel fired these signals to alert nearby German ground forces and *Flakkorps* that low-flying Luftwaffe aircraft would be approaching from the rear. Returning flights were on their own.²²

The Ardennes attack obtained its intended surprise. The Germans had produced an effective veil of secrecy and prepared for the offensive in almost total radio silence.²³ Even Ultra revealed no

mention of the buildup.²⁴ In addition, heavy cloud cover and dense foliage in the buildup area as well as German deception activities contributed to the concealment. The plan intentionally took advantage of the poor seasonal weather and the long winter nights. A bogus headquarters, *Gruppe von Manteuffel*, was created to shroud the command structure. Even the code name *Wacht am Rhein* (Watch on the Rhine) was structured to convey a "defensive" nature, while all movements and preparations had to be justified by another code name *Abwehrschlacht im Westen* (Defensive Battle in the West).²⁵ To feed Allied misperceptions about these "defensive" preparations, the first paragraph of every movement order contained the words "in preparation for the anticipated enemy offensive. . . ."²⁶ Moreover, the degree of surprise achieved was compounded by Allied overconfidence, preoccupation with

Map 3. The disposition of the US armies and air commands on 20 December, after Field Marshal Montgomery took command of the north side of the bulge and Patton the south.



their own offensive plans, poor aerial reconnaissance, and the relative lack of combat contact by the US First Army. Allied intelligence failed completely to detect the offensive.²⁷ The Allies "had looked in a mirror for the enemy and seen there only a reflection of their own intentions."²⁸

The Germans had attained surprise, and their *tempo of advance* became the center of gravity for Hitler's offensive. While consuming supplies at a very high rate,²⁹ they had to quickly seize key roads, communications hubs, and bridges. Hitler's forces required hard, frozen ground to support their off-road armor tactics, to support supply movements around obstructions, and to bypass Allied strong points. They also needed low clouds and fog to ground Allied air forces. Unhindered movement was essential.

It was not to be. Constricted and ever-lengthening transportation routes compounded the German logistics problem.³⁰ This was a condition magnified by malpositioned war materiel and gasoline. Nearly half of the German supplies were located east of the Rhine—more than 60 miles from the attack's starting point. Hitler had directed this positioning as a security measure, so as not to draw unnecessary attention to the Eifel buildup area prior to the attack. It became a serious flaw in the face of Allied air interdiction. Additionally, above-freezing temperatures combined with the wet weather to make off-road traffic a muddy impossibility through the first critical week of the offensive. The poor weather channeled the German attack to the already limited number of east-west roads in the Ardennes—a situation that left their army even more vulnerable to disruption by air attack.³¹

During the first three days of the offensive, the Allied air forces and the Luftwaffe met in the skies over the cloud-covered battlefield as the Luftwaffe attempted to get under the low ceilings to support *Wacht am Rhein*. The fighters of the Ninth Air Force engaged them, claiming 136 kills.³² On 23 December the Luftwaffe changed its objec-

tive. Instead of pressing the ground-attack mission "in mass," it divided its effort equally between ground attack and bomber intercept. With this split purpose, the Luftwaffe did neither well.³³ Moreover, hitting the heavy bombers focused Allied attention on the potential problem that such a large number of enemy planes could pose.

Allied Counterstrategy

By 20 December General Eisenhower had formed a counterstrategy and modified his command structure to meet the threat. Eisenhower had focused his responding battle strategy on the German vulnerabilities of *tempo* and *logistics*—to restrict German resupply by confining the penetration to as narrow a one as possible.³⁴ To accomplish this, he built strong defensive shoulders at the base of the salient, established "impenetrable" flanks to contain the penetration's width, and defended key communications centers along the axis of the German advance (fig. 1). Holding the crossroads at Saint Vith and Bastogne was the key element of the strategy designed to increase German logistics requirements and slow the German advance. Next, Eisenhower established a blocking position to limit the depth of the penetration, relying primarily on Montgomery's 21st Army Group. Once the Germans were contained, he would counterattack.³⁵

General Eisenhower's air commanders placed first priority on air supremacy to prevent the Luftwaffe from giving direct support to the advancing German ground troops. Allied ground forces required complete freedom of maneuver to withdraw, reinforce, and counterattack. Due to the immediate threat of enemy armored spearheads, the second priority became close cooperation with ground forces to "destroy the weapons committed by the enemy to the attack."³⁶ Targets to be attacked were "German tanks, aircraft, motor transport, and guns." The third priority was an in-



terdiction effort designed to "knock out the facilities necessary to replenish the enemy's supplies—the rail roads, bridges, marshaling yards, and communications centers, as well as the supplies themselves."³⁷

The Allies quickly adjusted their command structure to execute General Eisenhower's strategy. General Quesada, then commander of the IX Tactical Air Command (TAC),³⁸ described these adjustments:

The Germans in their Bulge effort had definitely put a dividing line within Bradley's army group area. Bradley would have had one part of his army group north of the Bulge and another part of his army group south of the Bulge. And Eisenhower felt that it would be better to have the north side of the Bulge be under one army group, which in this case would be Montgomery. Because Montgomery was contributing British units to this force, Eisenhower thought it would be better for Montgomery to have command of the U.S. Ninth and First Armies.³⁹ (See maps 2 and 3.)

Innovative uses of radar and other command and control systems (at left, a "Pundit Light") enabled the Allies to gain and maintain air superiority. Despite heavy snow (below), runways were kept clear to keep aircraft flying.

The Air Operation

Along with the Ninth and First US Armies went their respective tactical air commands—XXIX TAC with the Ninth Army, and IX TAC under General Quesada supporting the First Army. These commands were changed from the operational control of the Ninth Air Force to the control of the Second Tactical Air Force of the Royal Air Force (RAF). At that time, Air Marshal Coningham appointed General Quesada responsible for controlling all Allied air efforts on the north side of the bulge.⁴⁰

Throughout the entire continental campaign from the Normandy beachhead to the fall of the Reich, there was neither a theater air component nor ground component commander (an exception to the specific letter of FM 100-20). General Eisenhower, with Air Chief Marshal Tedder as his deputy, assumed the positions of both, as well as that of exercising overall theater command. The tasks of determining the amount of resources that should be placed against which individual target group and allocating resources among the operational com-



mands were accomplished by a balance of Allied air force components working closely together. The need was apparent, and the mission was clear. Organizational structure did not stand in the way of centralized direction and unity of the air campaign.⁴¹

The Ninth Air Force coordinated all support activities and assigned fighter and bomber groups to appropriate tasking and controlling authorities—in most cases either the IX or XIX Tactical Air Commands.⁴² The TACs then executed the air battle and coordinated closely with their respective armies to maintain cohesion with the land battle. The Eighth Air Force coordinated its ground support attacks through the Ninth Air Force, and the TACs coordinated their operations along army boundary lines with each other.

"Inoperable" flying weather closed in on the entire battle area from 19 until 23 December.⁴³ During this period, the German penetration expanded to a 50-mile bulge—its maximum depth. Saint Vith was evacuated; but Bastogne, although surrounded, still held. On 23 December the skies cleared. Allied air and ground power were ready to strike.⁴⁴ Allied ground movements had secured the flanks of the penetration and blunted its expansion westward. Rested and ready, Allied air forces attacked.⁴⁵ In the next five days, they flew more than 16,000 sorties.⁴⁶

The Allied effort maintained air supremacy to the point that the Luftwaffe did not significantly hinder a single Allied ground movement or operation during the battle. The Allied air forces constructed a layered defense that Luftwaffe pilots had to negotiate just to get into the "battle area." First, in response to heavy Luftwaffe attacks on bombers on 23 December, Eighth Air Force heavy bombers carpet-bombed the German forward bases around Frankfurt on 24 December.⁴⁷ The Eighth's fighters engaged the Luftwaffe's airborne fighters and strafed their airfields daily.⁴⁸

The next barrier was the RAF's Second Tactical Air Force and the XXIX TAC roam-

ing over the Eifel region. Finally, to the west, the German fighters faced the IX and XIX TACs directly over the bulge itself. To get home the German pilots had to negotiate these same barriers while contemplating the prospect that Allied aircraft might be waiting to jump them when they returned to their airfields. Aided by ground-based radar and "Y-Service"⁴⁹ radio intercepts, Allied fighter groups timed their airfield attacks to coincide with returning Luftwaffe aircraft that were low on fuel and ammunition. This tactic worked especially well against jet aircraft, which were also restricted to concrete runway operations. Forced to engage Allied fighters while attempting to land, many Luftwaffe pilots ran out of fuel and crashed.⁵⁰

Despite losses, the Luftwaffe managed to fly as many as 1,200 sorties on some days. However, the effort was one of "despair."⁵¹ Shifting operational priorities, the lack of coordinated air and ground planning, no clear doctrine of air power employment, and poor leadership at the top crippled the Luftwaffe's effective use. Other major contributing factors to the ineffectiveness of the Luftwaffe were (1) the inexperience of most of the German pilots compared to their American and British opponents, (2) fuel shortages, (3) the short operational range of their aircraft, and (4) the distance of their air bases from the area of the offensive.⁵²

The clear weather of 23 December unleashed the full power of the Allied air forces, and the Luftwaffe faced another dilemma. Allied interdiction was having a serious impact on German logistics.⁵³ Yet, Luftwaffe orders were to support the German army with ground attack sorties. They had to choose whether to comply with the air operations plan issued by Army Group B at the beginning of the offensive or to engage Allied air power. Once again the decision was split and reactionary. Pilot prisoners captured between 23 and 31 December stated that they had been ordered to attack ground targets but that these attacks had "not been pressed with skill or deter-

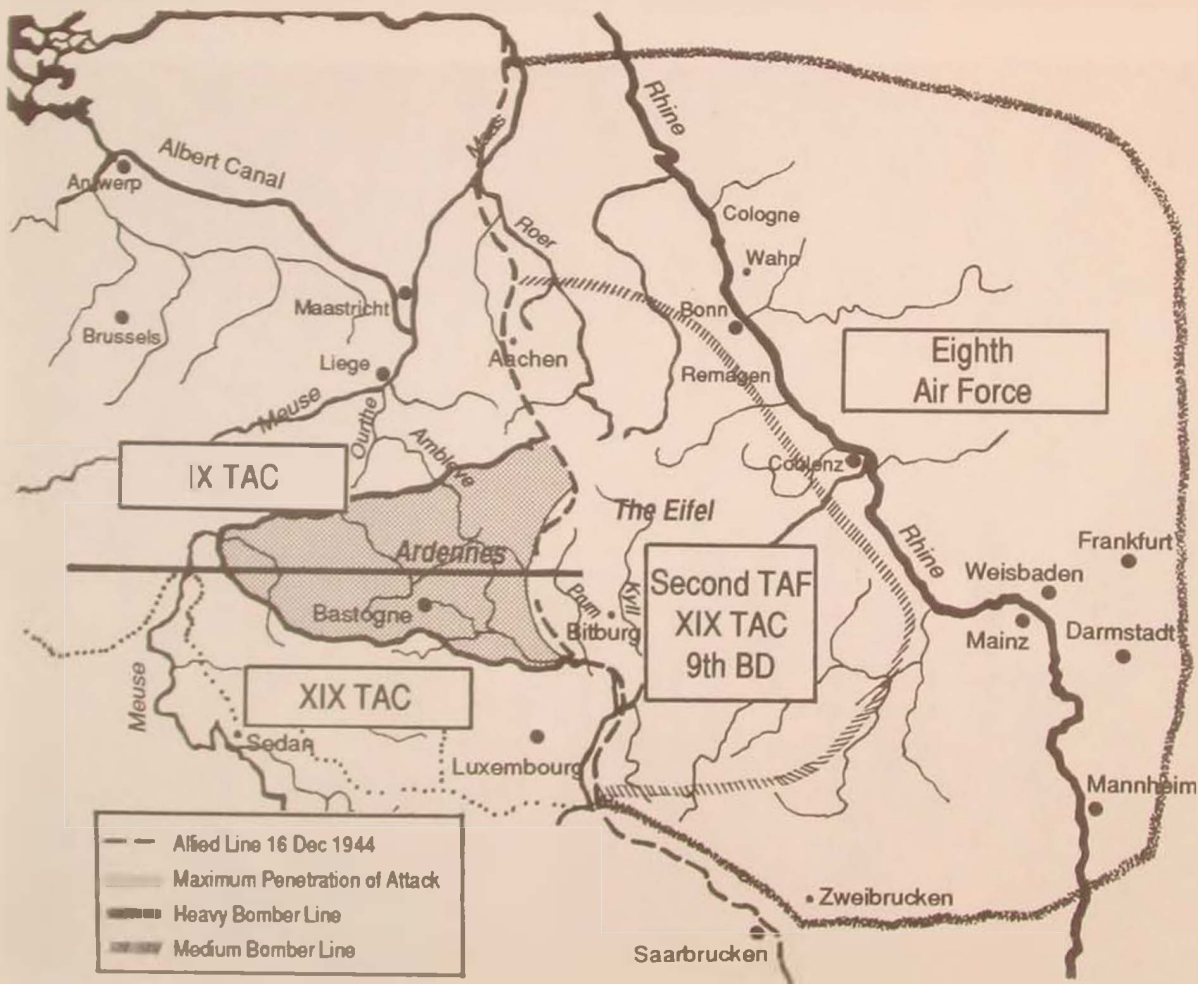
mination."⁵⁴ It had become too deadly to challenge the Allied air forces' layered defense protecting the bulge. Meanwhile, other aircraft were sent to attack the heavily escorted medium and heavy bombers. The Luftwaffe achieved mass on neither objective.

With air superiority achieved, Allied air forces executed their air-to-ground operations to obtain four specific objectives. First, fighter-bombers were assigned to attack armored spearheads.⁵⁵ The IX TAC directed air action against the Germans' primary attack axis, which was the north

side of the bulge. The XIX TAC ran operations in relief of Bastogne and along the southern side.⁵⁶ The second objective was to "isolate the Ardennes-Eifel area from rail traffic." Responsibility for this "classic interdiction" went to the light and medium bombers of the Ninth Air Force's 9th Bombardment Division, the XXIX TAC, and the RAF's Second Tactical Air Force.⁵⁷ (See map 4.) In addition to ground attack, the Ninth's fighters supported the 9th Bombardment Division in the Eifel region with air escort, flak suppression, and follow-up attacks after bomber raids.

The third objective of the ground attack plan called for delaying, harassing, and obstructing road traffic. The medium and

Map 4. The maximum extension of the bulge. Also shown are the mission assignments of the air assets.



heavy bombers of the Ninth and Eighth Air Forces accomplished this objective both in the Eifel region and within the bulge itself.⁵⁸ To streamline the responsiveness of strategic bombardment assets, the Eighth Air Force passed direct tasking authority of its 2d Air Division to the Ninth Air Force.⁵⁹ The final objective was to isolate the battle area by the "destruction of storage, rail heads, and supplies around the perimeter of the isolated area." This was the primary task of the Eighth Air Force, which attacked river bridges, rail yards, and marshaling areas along the Rhine. Eighth Air Force fighters, after completing bomber-escort duties, strafed rail and road traffic east of the Rhine.⁶⁰

Also with the clear skies came the opportunity to resupply Bastogne, which by 23 December had run critically low on ammu-

nition and supplies.⁶¹ Between 0930 hours on 23 December and the afternoon of 26 December, the day the US 4th Armored Division broke the siege, the IX Troop Carrier Command flew 962 sorties and dropped 850 tons of supplies to the defenders. Heavily protected from air attack and ground fire by the fighter-bombers of the XIX TAC, the entire operation resulted in the loss of only 19 C-47s.⁶²

The Luftwaffe's attempted aerial resupply to the overextended *Kampfgruppe* Peiper of the Sixth Panzer Army's 1st SS Panzer Division and the paradrop of Col

A German half-track (below) and a Mark IV tank (opposite page) destroyed in Houffalize, Belgium. This area was repeatedly struck by Ninth Air Force bombers.



Friedrich von der Heydte's commandos were complete failures.⁶³ However, the Luftwaffe's night bombings of Bastogne on Christmas Eve and again in January had their effect. Conducted under flare illumination from Luftwaffe pathfinder aircraft, the attacks exposed a weak point in the Allied air defense—night fighters. General Bradley said, "Enemy air was able again and again to get through to attack the defended city with serious results. [Allied] night fighter activity was inadequate."⁶⁴

As the bulge was compressed, the Luftwaffe attempted one last effort to reduce the effectiveness of Allied fighter-bombers. In a dawn raid on 1 January 1945, 900 Luftwaffe aircraft attacked Allied airfields in Belgium, Holland, and France—operation *Bodenplatte* (Base Plate).⁶⁵ The Luftwaffe and the German command had once again

achieved surprise. However, poor tactical execution and planning cost the Luftwaffe more than 300 of their attacking aircraft.⁶⁶ More important, they lost 232 pilots—of which 18 were unit commanders and 59 were leaders; this was the life's blood of the Luftwaffe. As a pitiful epitaph, German flak gunners shot down as many as 100 of their own returning Luftwaffe aircraft.⁶⁷ In contrast, the Allies replaced the 127 aircraft lost on the ground in less than a day, and the skies of 1 January 1945 saw the second largest Allied sortie rate of the battle.⁶⁸ The Luftwaffe was rarely seen again in any appreciable strength.⁶⁹ *Bodenplatte* was more than a total defeat. "The Luftwaffe [had] received its death blow."⁷⁰

During the Battle of the Bulge, Allied air power doctrine and its conceptual underpinnings had reached full maturity in the



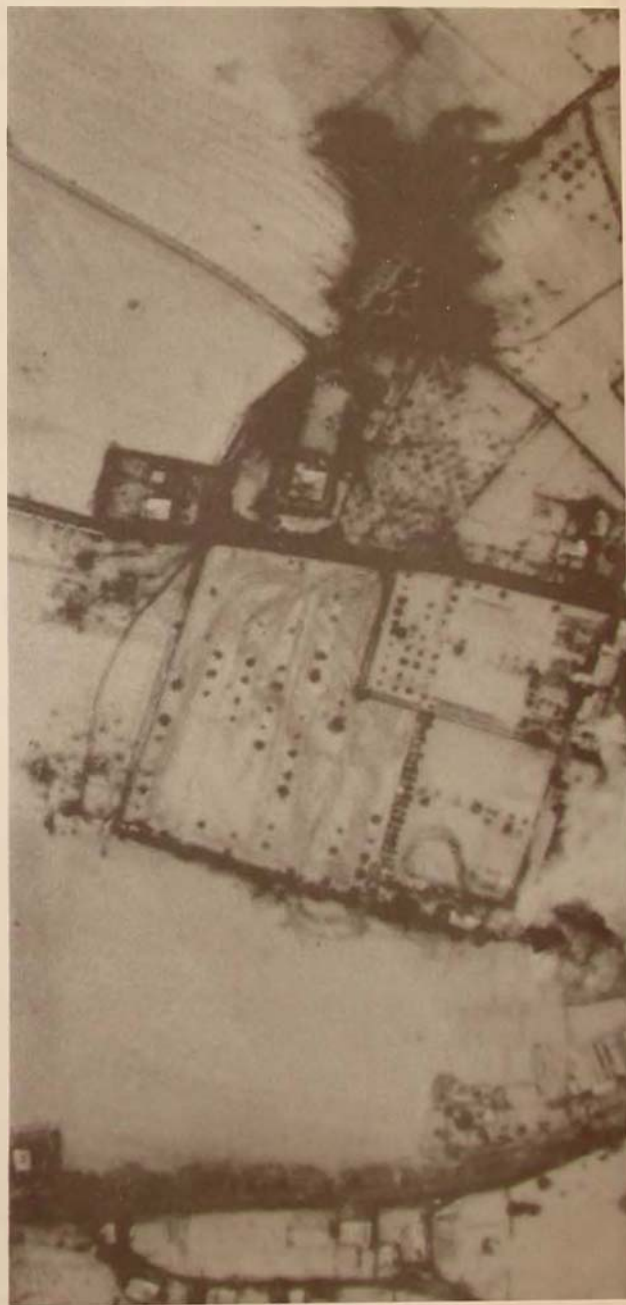
European theater of operations. Commanders of ground and air forces worked alongside each other every day, participating together in the planning process from concept to execution.⁷¹ Forward air controllers worked with army maneuver elements to ensure effective tactical coordination. The Army used distinctive panels to mark its vehicles and fired artillery routinely to suppress enemy antiaircraft fire. It also fired smoke rounds to help fighter pilots identify targets. Even Army balloon companies helped by identifying friendly positions and assisting in fighter target area navigation.⁷²

A key element of Allied air control was ground-based radar—a capability that the Luftwaffe ignored. Luftwaffe leaders realized neither its importance nor its vulnerabilities. Although they understood the technical capabilities of radar, they never put it to use in the manner employed by the Allies. They saw its use only through the “lens” of their own application—as a facilitating tool for *air defense* operations.⁷³

In contrast, General Quesada innovated. He used the microwave early warning (MEW) radar and the SCR-584 antiaircraft radar in several new and unplanned ways, building an entire command and control network centered around this new technology. He put radio intercept operators (Y-Service) with MEW and radio controllers to help win the air battle.⁷⁴ To assist ground-attack missions, MEW operators coordinated with SCR-584 operators to provide navigation and precise control to fighter-bombers.⁷⁵ The wide-band MEW was used for long-range and area control, while the SCR-584, with its narrow beam, was used for close-range, precision work.⁷⁶

Throughout the battle, the thick, low clouds, the snow-covered land, and the fluid ground situation made navigation

and ground target identification difficult to impossible.⁷⁷ General Quesada's operation solved the problem.⁷⁸ Radar operators helped fighters get under and through the weather both in the target areas and at recovery bases and validated targets by correlating ground locations with tracked fighter positions. Furthermore, IX TAC used the SCR-584 to “blind bomb” through overcast skies such area targets as Saint Vith and to direct night aerial reconnaissance flights.⁷⁹ As a result, the fighter-



St. Vith, the vital communications center and choke point captured by the Germans after fierce fighting, is seen under aerial attack on Christmas Day, 1944. This operation was part of the systematic effort to isolate the Germans from their much-needed supplies.

bombers controlled by the IX TAC effectively supported Allied ground forces, even in times of poor weather and confusing ground tactical situations.⁸⁰

Had it not been for radar, the coordination of effective air-to-ground operations would have been "incredibly difficult and impossible under the weather conditions" that prevailed.⁸¹ The effective use of radar in attacking ground targets was devastating on the enemy, while Allied fratricide was minimal.⁸² The use of radar, though in its

infancy, "permeated every phase of air warfare." It provided for the control and direction of "virtually every day or night sortie flown by the TACs."⁸³ The IX TAC's radar-centered command and control system became a decisive factor in the battle outcome.⁸⁴

Analysis

Allied air power's success and Hitler's defeat during the Battle of the Bulge vindi-



cated the principles of FM 100-20.⁸⁵ The Allies kept the Luftwaffe out of the ground battle and by January had knocked it out of the war. German ground forces suffered severe delays and heavy losses to their armored spearheads, which were denied the tactical mobility of daylight maneuver. And Allied air interdiction crushed the German logistics effort. In contrast, force structure, doctrine, and leadership problems doomed the Luftwaffe.

The Allied command had withstood the test, and the Allied air commanders had met the challenge. Exceptions were made to the "letter" of the doctrine to fit the need of the battle. Command lines were tailored to fit General Eisenhower's organization. *Centralized control* was accomplished by relying on the battle-honed, close-working relationships of the air force commanders. *Mission priorities* were adjusted to address the threat. *The mission of close cooperation with ground forces*, as prioritized by FM 100-20, was moved ahead of *interdiction* as a necessity of battle. In addition, the close working relationships of the air and land commanders developed by their *collocated headquarters* proved to be an essential element of the combat synergism of combined air and land power. The doctrine of FM 100-20 proved to be as flexible and responsive as air power itself.

Allied air forces maintained *air supremacy* over the battle area, which in turn facilitated unhindered Allied ground movement. They had constructed a layered fighter defense supported by ground controllers and radio intercept operators. Meanwhile, they attacked Luftwaffe airfields with both fighters and bombers, and the Allies timed their attacks to hit when the Luftwaffe was most vulnerable—during landing operations.⁸⁶

With air supremacy achieved, the Allies successfully executed both the *close cooperation* and *interdiction* phases of their plan. Innovations in radar used became a key factor in successful air-to-ground attack as well as combat in the air. With the MEW and the SCR-584, General Quesada's IX

TAC directed *close cooperation* through poor weather and confusing ground battle situations—achieving a degree of effectiveness that would have been impossible otherwise. The TACs' command and control system adjusted to and met the challenge of a massive, unplanned operation. Field Marshal Gerd von Rundstedt, the nominal commander of the Ardennes offensive, said that Allied air power "made impossible the reshuffling of troops and robbed us of all mobility."⁸⁷ In the words of another German general, it was like playing chess where your opponent took three moves to your one.⁸⁸

Though third in priority, *air interdiction* crushed the German army's logistical effort. The German army had not been underprovisioned; rather, the Ardennes attack had provided ideal circumstances for interdiction. The *tempo* of the German Ardennes offensive required supplies in large quantities, which in turn had to be transported over restricted and ever-lengthening routes to meet critical timetables. Furthermore, the "malpositioning" of large stockpiles behind a major river barrier, the Rhine, created a significant vulnerability and a lucrative target. When executed against the direct Allied ground and air counterstrategies, *Wacht am Rhein* failed.

The Allies had prepared *complementary* air and ground strategies against the German logistics vulnerability. On the ground, obstacles like Bastogne frustrated German supply and created targets vulnerable to air attack. In the air, the firepower and mobility of Allied air forces slowed resupply to a nighttime-only trickle. The Allied attack on the German logistics system from the Rhine, across the Eifel region, and throughout the bulge crippled the tempo, timing, and sustainability of the offensive.

German supplies were disrupted during the critical high-usage-rate periods of the offensive. The German 2d Panzer Division of the Fifth Panzer Army ran out of gas just as the US 2d Armored Division attacked it on 24 and 25 December at the westernmost tip of the bulge salient.⁸⁹ In other German

divisions, tank and motorized crews abandoned hundreds of vehicles with empty gas tanks.⁹⁰ Finally, German morale was deflated—and Allied morale boosted—by the constant swarming of Allied aircraft over the battlefield. German ground forces had felt the full impact of successful air interdiction.⁹¹

Despite Hitler's success in maintaining secrecy and executing deception, his air operations were flawed from the start by his naive view of air warfare and his distrust of the Luftwaffe leadership. He had deceived his own airmen into posturing the wrong force for the task. The Luftwaffe, knowing it had prepared its force structure and basing to fight a totally different conflict, began the Battle of the Bulge demoralized and disillusioned. The domination of the Luftwaffe's air support system by senior ground commanders further fragmented its efforts and diluted any concentration that could have been achieved with its scarce resources. Thus, with poor leadership at the very top, the wrong force structure, and the lack of unity in the command structure, the Luftwaffe misapplied the basic principles of air power.

When examining the Luftwaffe operations in detail, one finds poor execution as well as planning. The senior Luftwaffe commanders diluted the potential effectiveness of their air assets by shifting operational priorities on an almost daily basis. This "flexibility," which allowed the Luftwaffe to move from one mission to another, contributed to the lack of adequate air power on any one objective. Furthermore, the Luftwaffe lost the potential to mass its forces and brought destruction on its own airfields when half of its forces were shifted away from *Wacht am Rhein* to attack the strategic bombers early in the battle. Later, when the Luftwaffe tried to execute the *Bodenplatte* portion of its prepared air operation, tactical errors and fratricide cost them the heart of their air force.⁹²

Moreover, the Luftwaffe leadership and the German high command did not com-

prehend the changes that had taken place in air power during the five years of war. Technology, doctrine, and leadership had flourished in air forces other than in the Third Reich. The Luftwaffe command had so segregated itself that it became crippled by the lack of creative thought. Thus, it failed to realize either the potential weaknesses of the enemy (i.e., the Allies' limited number of radar sets) or the strengths of the Allied doctrine, organization, or command and control system. Hitler's commanders had relied solely on their own perceptions and understood neither their enemy nor air power.

Epilogue

In mid-January 1945, the Soviets launched their final offensive against the Reich—an attack that by May took them to Berlin. To counter it, Hitler ordered all available forces to the east. On 22 January near Dasburg, Allied aircraft caught German divisions moving in broad daylight to the Eastern Front. Troops and equipment were spread along columns 10 miles long. Allied air exploited the situation. The IX TAC alone destroyed more than 2,800 vehicles, tanks, and wagons and killed large numbers of troops.⁹³

The Allied air campaign—air superiority, close cooperation, and interdiction—had succeeded in full. In a document captured after the war, German Field Marshal Walther Model, commander of Army Group B during the Battle of the Bulge, wrote the following statement concerning the effectiveness of air power during the battle: "Enemy number one is the hostile air force, which because of its absolute superiority tries to destroy our spearheads of attack and our artillery through fighter-bomber attacks and bomb carpets and to render movements in the rear areas impossible."⁹⁴ Shortly thereafter, he put a pistol to his head and committed suicide.

Conclusion

History is the only laboratory that we have in peacetime to develop and try theories of war. . . .

John A. Warden III
The Air Campaign

The air operations during the Battle of the Bulge reveal the effect of air power's missions in the context of a theater-level conflict. The contrasting strategies, doctrine, and organizations of the Allies and the Luftwaffe continue to give us insight into the force structure and decision process of air power employment—both right and

wrong. General Quesada's skillful leadership provides a rich case study of the vision, flexibility, and innovation required of a great air commander. Furthermore, the battle demonstrated the effect of technology, with increased capabilities, which could not only improve the tactical effectiveness of forces but directly influence the war-fighting concepts and overall force employment. The cohesion of the Allied air and land forces, working in concert with each other, continues to relate how air power is synthesized "jointly" in a theater campaign. The "Air Battle of the Bulge" validates the foundation of current air power doctrine. □

Notes

1. Patton summoned Army Chaplain James H. O'Neill to "get God on our side for a change" and to pray for good weather. The chaplain complied. On 23 December the skies cleared; Chaplain O'Neill earned a medal. Danny S. Parker, "Battle for the Ardennes, May 1940 and December 1944," *Strategy and Tactics* 71 (November–December 1978): 38.

2. Lt Gen Lewis H. Brereton, USA, *The Brereton Diaries: The War in the Air in the Pacific, Middle East and Europe*, 3 October 1941–8 May 1945 (New York: William Morrow and Company, 1946), 7.

3. Michael L. Wolfert, "From Acts to Cobra: Evolution of Close Air Support Doctrine in World War Two," Report 88-2800 (Maxwell AFB, Ala.: Air Command and Staff College, 1988), 21.

4. General Spaatz commanded the Northwest African Air Forces, one of the three major subordinate commands under the Mediterranean Air Command headed by Air Marshal Tedder. Air Vice Marshal Coningham ran the Northwestern African Tactical Air Force under which both Generals Quesada and Kuter served. Frank Craven and James L. Cate, eds., *The Army Air Forces in World War II*, vol. 2, *Europe: Torch to Point Blank, August 1942 to December 1943* (Chicago: University of Chicago Press, 1948), 162–64.

5. Richard H. Kohn and Joseph P. Harahan, eds., *Air Superiority in World War II and Korea* (Washington, D.C.: Office of Air Force History, 1983), 30.

6. "U.S. Tactical Air Power in Europe," *Impact* 3, no. 5 (May 1945): 4; see also Wolfert, 49.

7. War Department Field Manual (FM) 100-20, *Command and Employment of Air Power*, 21 July 1943, 1–11.

8. Charles B. MacDonald, *A Time for Trumpets* (New York: William Morrow and Company, Inc., 1985), 47.

9. "U.S. Tactical Air Power in Europe," 45.

10. The German air order of battle on 16 December 1944 consisted of the following:

Jet Aircraft	40
Level Bombers	55
Ground Attack Aircraft	390
Single-engine Fighters	1,770
Twin-engine Fighters	140
Reconnaissance Aircraft	65
TOTAL	2,460

See Parker, 35. Postwar records show that of this number only 1,376 were ever operational at any one time, and the Luftwaffe averaged less than 50 percent operationally ready on any given day. Craven and Cate, vol. 3, *Europe: Argument to V-E Day, January 1944 to May 1945*, 673.

11. MacDonald, 45. At Kursk the Luftwaffe possessed approximately 1,850 aircraft against more than 3,000 Soviet planes. John F. Kreis, *Air Warfare and Air Base Defense* (Washington, D.C.: Office of Air Force History, 1988), 199.

12. General of the Army Dwight D. Eisenhower, *Report by the Supreme Commander to the Combined Chiefs of Staff on the Operations in Europe of the Allied Expeditionary Force, 6 June 1944 to 8 May 1945* (Washington, D.C.: US Government Printing Office, 1946), 75.

13. "The intention to go over to the offensive in the west already existed at the end of July," Adolf Galland, *The First and the Last: The Rise and Fall of the German Fighter Forces, 1938–1945* (New York: Holt, 1954), 242.

14. "Strategic Air Wins in Europe," *Impact* 3, no. 7 (July 1945): 67. The bulk of the gasoline was stored east of the Rhine. *Operational History of the Ninth Air Force*, bk. I, *Battle of the Ardennes: 1 December 1944–31 January 1945*, sec. II, 4.

15. Joseph A. Wyant, "Material in Response to Telephone Request of 28 September 1945 Concerning Allied Air Effort during the Battle of the Bulge," an undated reply to Brig Gen R. C. Candee by the Office of Ninth Air Force History on file at the Air Force Historical Research Center, Maxwell AFB, Ala. Stringent rationing, drawing from existing stockpiles, and importing oil from Hungary had resulted in a 5-million-gallon petrol stockpile for the attack in the Ardennes. Any captured Allied gas would be a bonus. MacDonald, 46.

16. Galland, 241–42.

17. *Ibid.*, 241.

18. *Ibid.*

19. Vincent J. Esposito, ed., *West Point Atlas of American Wars* (New York: Praeger, 1959), 60.

20. Jean Pallud, *Battle of the Bulge: Then and Now* (London: Battle of Britain Prints International, Limited, 1986), 33.

21. Michael J. F. Bowyer, 2 Group R.A.F.: *A Complete History, 1936–1945* (London: Faber, 1974), 403–4; see also Galland, 241.

22. Pallud, *Battle of the Bulge*, 33.

23. MacDonald, 61.

24. "Ultra" refers to the German high command encoded messages that had been intercepted and decoded by the Allies. This information only went to the commanders of Allied field armies, tactical air commands, and above. The lack of any Ultra information about the impending German attack contributed to a dismissal of what little tactical information was becoming available. Lt Gen Elwood R. Quesada, USAF, Retired, interview with author, 9–11 April 1988 [hereafter referred to as Quesada, 1988 interview]; see also MacDonald, 60–61.

25. MacDonald, 40.

26. Ibid.

27. Parker, 38. On 15 December some 18 hours before the Germans launched their attack, Eisenhower's G-3, in briefing the air commanders on the ground situation, dismissed the Ardennes with a simple "nothing to report." See also Craven and Cate 3:682; and MacDonald, 56–57.

28. MacDonald, 79.

29. An estimation of the tons of supplies per day for a division in contact can be made by examining the logistics requirements for sustaining an equivalent Allied division, adjusted for size and motorized composition. Using this "yardstick," German logistics requirements in the Ardennes should have been between 400 and 550 tons per day per division in contact and about two-thirds that number while in movement. To meet this need, a minimum of 2,000 truckloads of materiel had to reach the front each day just to sustain the German army group.

30. Wyant, 23.

31. Ibid., 23–26.

32. Ibid., 16–18.

33. *Operational History of the Ninth Air Force*, bk. I, sec. III, 58.

34. Craven and Cate 3:685.

35. "Another Tactical Air Triumph," *Impact* 3, no. 2 (February 1945): 8.

36. Note that "close cooperation with ground forces" moved to the second priority task from its stated priority in FM 100-20. This action at the command level demonstrated that pragmatic Allied decisionmakers had learned to take advantage of the flexibility of air power.

37. *Operational History of the Ninth Air Force*, bk. I, sec. II, 5.

38. The IX, XIX, and XXIX Tactical Air Commands (TACs), along with the 9th Bombardment Division were the major subordinate combat commands under the Ninth Air Force. Each TAC was assigned to work with a US field army, while the Ninth Air Force worked with the Allied 12th Army Group. The 9th Bombardment Division, comprised of heavy and light bombers, worked directly for the Ninth Air Force.

39. Quesada, 1988 interview; see also MacDonald, 419–24; and *Operational History of the Ninth Air Force*, bk. I, sec. II, 26, 29–30.

40. Eisenhower, 76.

41. Quesada, 1988 interview.

42. *Operational History of the Ninth Air Force*, bk. I, sec. I, 2.

43. Ibid., 26–27.

44. Of the 800 German fighter sorties flown that day, over half were defensive and directed against strategic bombers. This activity reflected the confusion that existed within the Luftwaffe as to what its real mission was supposed to be—to support the Ardennes offensive or to attack bombers. Craven and Cate 3: 689.

45. Quesada, 1988 interview.

46. Approximately 8,500 sorties were flown by the Ninth Air Force between 23 and 27 December 1944. *Operational History of the Ninth Air Force*, bk. I, sec. III, 62. The British Second Tactical Air Force, the Eighth Air Force, and RAF

Bomber Command accounted for the remainder of the 16,000 sorties. For Allied sortie totals correlated against weather conditions, see "Another Tactical Air Triumph," 5.

47. Because of the poor weather over the bulge area in the early days of the offensive (16–23 December 1944), the Luftwaffe leadership decided that aircraft dedicated to the Ardennes offensive would be "retooled" to attack Allied bombers that were striking targets deep in Germany. These attacks were unrelated to the Ardennes campaign. Though this use of aircraft could have been interpreted as using flexibility of air power—or a use-it-or-lose-it philosophy—it resulted in an undesirable Eighth Air Force reaction for the Germans. The Eighth "carpet bombed" their airfields. This activity reduced the Luftwaffe's support of their primary objective, the Ardennes attack. The German air commanders had violated the first principle of war, *objective*. In addition, the Luftwaffe had tipped its hand by "telegraphing" to the Allies the increased numbers of aircraft that were brought into the theater before they could be decisively used. This action squandered scarce resources. The decision to go against the strategic bombers was probably influenced by the Luftwaffe's intensive planning, positioning, and training for the "cover story" of the "Great Blow." Galland, 242.

48. Eisenhower, 77.

49. The Y-Service was a radio intercept operation, first devised by the British, to monitor and intrude on Luftwaffe ground-to-air communications. General Quesada refined the system by collocating this capability with his MEW radar units. By doing so, the IX TAC gained the information it needed to time its airfield attacks to the most vulnerable periods of air operations—landings and takeoffs. Quesada, 1988 interview.

50. Ibid.

51. *Operational History of the Ninth Air Force*, bk. I, sec. IV, 39.

52. General Quesada said that of all the Luftwaffe's shortcomings, "stupid leadership" was its primary deficiency. Generalleutnant Josef Schmid, Kommando West, ran all Luftwaffe support for the Ardennes offensive. The German commander of Jagdkorps II, the Luftwaffe's fighter forces supporting the offensive, was Generalmajor Dietrich Peltz. Quesada, 1988 interview. See also Pallud, *Battle of the Bulge*, 655.

53. *Operational History of the Ninth Air Force*, bk. I, sec. III, 59.

54. Ibid.

55. Ibid., sec. IV, 6.

56. Ibid., sec. III, 13.

57. *Ninth Air Force in the European Theater of Operations*, vol. IV, Headquarters Ninth Air Force, 1945, 72.

58. Eisenhower, 77.

59. This change of operational command lines was accomplished in a single day. The use of the Eighth's heavy bombers had not been so easily obtained for General Eisenhower's D-day support. However, the bulge support by the Eighth demonstrated common vision of mission that existed among the air commanders during this phase of the war. It also highlighted the flexibility of bomber aviation in its ability to contribute to the close cooperation and interdiction battles. Craven and Cate 3:686. See also *Operational History of the Ninth Air Force*, bk. I, sec. III, 12.

60. *History of the Eighth Air Force: Invasion and Victory*, Headquarters Eighth Air Force, 1945, 144.

61. MacDonald, 511.

62. Ibid., 522.

63. Pallud, *Battle of the Bulge*, 86–89; and MacDonald, 458.

64. *Operational History of the Ninth Air Force*, bk. I, sec. III, 7.

65. Lt Gen John K. Cannon, "The Contribution of Air Power

to the Defeat of Germany," a report prepared by the assistant chief of staff, A2. Headquarters United States Air Forces in Europe, on file at the Air Force Historical Research Center, Maxwell AFB, Ala., vol. 4, 8 May 1945, 7C(2)(e). See also Werner Girbig, *Six Months to Oblivion: The Eclipse of the Luftwaffe Fighter Force* (New York: Hippocrene Books, Inc., 1975), 112; *Operational History of the Ninth Air Force*, bk. I, sec. IV, 15–16, 39–41; and Pallud, *Battle of the Bulge*, 433–36.

66. Allied antiaircraft artillery (AAA) fire shot down between 80 and 150 aircraft. One of the reasons that Allied antiaircraft fire was so effective and "not one Allied plane was lost" can be attributed to the high state of readiness of the AAA positions during aircraft takeoff and recovery cycles. All sites were manned to alert status, and fighter pilots stood duty as aircraft identification officers with every gun crew during these periods of vulnerability. This was a standing procedure directed by the commander of the IX TAC, General Quesada. After all, these were the very times that Allied air commanders attempted to attack German airfields. It only seemed reasonable that the Luftwaffe might try to imitate the successful tactic. Quesada, 1988 interview. See also John L. Frisbee, ed., *Makers of the United States Air Force* (Washington, D.C.: Office of Air Force History, 1987), 197.

67. Adolf Galland, *The First and the Last: The Rise and Fall of the German Fighter Forces 1938–1945* (New York: Ballantine Books, 1954), 243; see also *Operational History of the Ninth Air Force*, bk. I, sec. IV, 40; and Girbig, 112.

68. *Operational History of the Ninth Air Force*, bk. I, sec. IV, 40, and sec. V, 12.

69. *Ninth Air Force in the European Theater of Operations*, 73; see also "Another Tactical Triumph," 5.

70. Galland, 242.

71. Gen James Ferguson, USAF, Retired, interview, 14 June 1988 at Air University television studio, on file at AUTC, Maxwell AFB, Alabama.

72. Quesada, 1988 interview.

73. Only six radar sets formed the nucleus of the Allied air control system. Had these sets been knocked out of action, Allied air power would have been severely affected. This could have been an "Achilles' heel" to the entire air support battle. *Ibid.*

74. In December 1944, MEW-assisted intercepts were credited with 161 Luftwaffe aircraft destroyed and 72 damaged. Blair E. Garland, "Radar in ETO Air-Ground Operations," *Signals* 3, no. 4 (March–April 1949): 11.

75. Lt Gen Elwood R. Quesada, USAF, Retired, telephone interview with author, 14 January 1989 (hereafter referred to as Quesada, 1989 interview).

76. General Quesada had modified three SCR-584 antiaircraft radars with Norden bombsights, which were placed upside down and backwards. Mounted on the radar's X-Y axis plotting table that projected a light beam of the tracked aircraft through a 1:1,000,000-scale ground map, the bombsight-radar innovation provided navigation accuracy to within 300 yards of a ground target over 30 miles away. Quesada, 1988 interview. See also Garland, 10; and "U.S. Tactical Air Power in Europe," 38.

77. At this time there was no distinct forward edge of the battle area (FEBA) line, and the situation tasked the Allies with fighting a significant rear battle for the first time since D-day. Coordinating air power around the pockets of Allied resistance and in concert with the retreating and reinforcing ground movements stressed the existing command and control elements of the TACs' to their limits. The manpower-intensive nature of command and control was one of the major shortfalls of the pre-D-day force structure planning. To correct this deficiency, General Quesada "broke-up" the fighter wing organizations (roughly equivalent to today's air divisions) and reallocated their manpower to the tactical air control system

under the TACs. Quesada, 1988 interview.

78. Frisbee, 197.

79. Garland, 10.

80. Quesada, 1988 interview.

81. "U.S. Tactical Air Power in Europe," 34.

82. Two Allied air strikes on Malmédy (both by the 9th Bombardment Division), one on the Arlon marshaling yards in Belgium and one on Verviers, were the most significant events of fratricide by Allied aircraft. Maj Gen Blair E. Garland, USAF, Retired, 8 February 1989, telephone interview with the author at Maxwell AFB, Alabama. Although both civilian and military casualties occurred at these locations, none had a significant impact on Allied operations. Quesada, 1989 interview. Fighter group leaders were very reluctant to attack targets on the ground, not knowing whether they were friendly or enemy. The SCR-584 procedures resolved this problem. Fighter group leaders would be tracked and vectored by the SCR-584 in the battle area. As they flew over vehicles on the ground they would notify the radar controller. The controller, knowing the position of the aircraft and the location of friendly positions that were plotted on his X-Y table, could validate whether the target was friendly or enemy. This was a routine, "day in and day out process" throughout the entire Battle of the Bulge. United States Joint Board on Scientific Information Policy, *Radar, A Report on Science at War* (Washington, D.C.: Office of Scientific Research and Development, 1945), 39. See also MacDonald, 464–65; and Quesada, 1988 interview. For more information on Allied fratricide, see Craven and Cate 3:692; Pallud, 388; and Jean Paul Pallud, *Ardennes 1944: Peiper and Skorzeny* (London: Osprey Publishing, 1987), 13.

83. "U.S. Tactical Air Power in Europe," 34.

84. One early example of radar's impact on the battle occurred near Stavelot, Belgium. On 18 December German *Kampfgruppe Peiper* approached the bridge over the Linne at Hamimont, Belgium. This was the last bridge before open ground leading to the Meuse River. General Quesada ordered a spotter plane reconnaissance airborne, despite the dangers of fog and cloud ceilings below 100 feet. Capt Richard H. Cassidy and 2Lt Abram Jaffe volunteered to fly the mission. Using guidance information from a MEW radar, then an SCR-584 radar, the pilots were guided to the vicinity of *Kampfgruppe Peiper's* breakthrough. Breaking a 200-foot ceiling in the target area, they quickly discovered the enemy column and called for fighter-bomber support. The 365th Fighter Group, under the command of Col Ray Stecker, along with a squadron each from the 366th and 404th Fighter Groups were launched through the weather, again under radar control. The fighter group descended through the clouds and to a rendezvous with the spotter plane. The attack on *Kampfgruppe Peiper* destroyed only a few vehicles. More important, though, it resulted in a two-hour delay in the column's movement—just enough time for Army engineers to destroy the bridge, literally in the face of Peiper's troops. The Battle of the Bulge was the only time during the war in which radar was so heavily depended on. Reasons for this were improving weather, less fluid lines of advance, and shortness of the war after the Battle of the Bulge. Quesada, 1988 interview. See also *Operational History of the Ninth Air Force*, bk. I, sec. II, 81; Craven and Cate 3:687; and MacDonald, 241–44.

85. *Ninth Air Force in the European Theater of Operations*, 45–46; see also "U.S. Tactical Air Power in Europe," 48.

86. *Operational History of the Ninth Air Force*, bk. I, sec. III, 44.

87. "Strategic Air Wins in Europe," 63.

88. The "chess" analogy was a popular way of describing the effects of tactical air power on ground maneuver. General Frido von Senger und Etterlin, commander of the XIV Panzer Corps in Italy, is given credit for first use of the phrase. F. M.

Salagar, *Operation "Strangle" (Italy, Spring 1944): A Case Study of Tactical Air Interdiction* (Santa Monica, Calif.: Rand Corporation, 1972), 62; see also Frido von Senger und Etterlin, *Neither Fear Nor Hope* (New York: E. D. Dutton, 1964), 224.

89. *Operational History of the Ninth Air Force*, bk. I, sec. III, 4.

90. *Ibid.*, 53.

91. Ultra intercepts during the Battle of the Bulge described the immensely destructive effect of air interdiction. Reinforcements and supplies were cut from the impetus of the offensive. The destruction of rail lines in the Eifel area made rerouting impossible. Telephone facilities hardly existed. Supplies had to be hand-loaded and unloaded along the Rhine, a condition that seriously delayed them from reaching

the units in need. Ralph F. Bennett, *Ultra in the West: The Normandy Campaign* (New York: Scribner, 1980), 217.

92. As stated in FM 100-20, "Counter air force operations and air defenses in the theater must be carried on continuously to provide security from hostile air operations." As executed on 1 January 1945, Operation *Bodenplatte* was designed as a "single blow" of decisive strength. It was a woeful underestimation, and it only served to exemplify that the Luftwaffe's leadership had very little understanding of how to execute a counterair operation.

93. "Smashing Windup to the Ardennes Bulge Battle Was a Costly Experience for the Germans," *Impact* 3, no. 3 (March 1945): 2.

94. *Operational History of the Ninth Air Force*, bk. I, sec. IV, 5.