



UNDERSTANDING THE TACTICAL AIR WAR

handbook

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National Archives and Records Administration Photo

REMEMBER: OUR MEN AND MACHINES
ON THE GROUND LOOK A LOT LIKE
THEIRS.



Air Force Historical Research Agency Photo

A B-26 MARAUDER FLIES OVER THE
NORMANDY INVASION FLEET.



Air Force Historical Research Agency Photo

RAIL CARS AFTER A POUNDING BY
ALLIED FIGHTER BOMBERS.

Welcome to the Tactical Air War!

So you thought you were going to be a "knight of the air," jousting high in the clean blue sky, far above the clouds and even farther from the mud and squallor of the war on the ground.

Instead you find yourself in a fighter bomber, scraping over hostile territory at 200 feet with the terrain rising to meet you. You're flying down the muzzles of massed antiaircraft guns and dodging small arms fire to attack enemy airfields, trains, tanks, trucks, and troops. Performing masthead-level attacks on enemy shipping adds its own thrills and threats. Some of your targets have more and bigger guns than a whole formation of bombers. If enemy fire doesn't get you, the blast and debris from your own low-level bombing and strafing can bring you down. In this kind of war there's more danger and less glory for everyone.

Welcome to the tactical air war, pal!



Air Force Historical Research Agency Photo

"WE TOOK A BIT OF A BEATING ON THE GROUND BUT BOY DID WE DISH IT OUT IN THE AIR."

--General Elwood "Pete" Quesada

"Schlachtfliegerei"

Schlacht means slaughter. **Schlachtfliegerei** means ground attack, the most dangerous and least glamorous part of wartime flying. There is no room here for romantic illusion, no pretense of chivalry; one is down on the deck where the targets (people, vehicles, installations, and fortifications) may be clearly seen. The ground attack pilot is exposed to every bit of flak, every machine gun, every rifle, every pistol. Denied him is the acclaim accorded fighter pilots. The chances of winning fame as a Schlachtflieger are as slim as those of survival....

--From Jay P. Spenser,
Focke-Wulf 190: Workhorse
of the Luftwaffe

WHAT REALLY HAPPENED: The lowdown on the tactical air war

BY MID-1943 THE AIR WAR IN EUROPE HAD SETTLED INTO A DEADLY PATTERN FOR FIGHTER PILOTS ON BOTH SIDES. MOST WERE INVOLVED IN THE STRATEGIC AIR WAR; ESCORTING OR ATTACKING BOMBERS WAS THEIR PRIMARY ROLE, AND COMBAT IN THE FRIGID SKIES AT 20,000 TO 30,000 FEET WAS THE NORM.

AS THE POSSIBILITY OF AN ALLIED INVASION OF THE CONTINENT TOOK ON GROWING CERTAINTY, THE TACTICAL AIR WAR IN THE WEST HEATED UP AND EMPHASIZED A DIFFERENT PILOT ROLE--FLYING CLOSE AIR SUPPORT. THIS ROLE PUT WOULD-BE HIGH FLYERS DOWN ON THE DECK FOR A DIFFERENT KIND OF WARFARE BASED ON AIR-GROUND TEAM-WORK. FIGHTER-BOMBER PILOTS WERE PART OF THE ARMY TEAM, WITH DIRECT RESPONSIBILITY TO ASSIST THE ADVANCE OF FRIENDLY FORCES ON THE GROUND, WHILE KEEPING ENEMY TROOPS AND SUPPLY LINES REELING UNDER BULLETS, BOMBS, AND ROCKETS.

THE GERMAN ARMY HAD ALWAYS VIEWED AIR POWER AS SUBORDINATE TO THE FORCES ON THE GROUND. CLOSE AIR SUPPORT, USING AIRCRAFT TO ASSIST THE ADVANCE OF TROOPS AND MOBILE FORCES ON THE GROUND, WAS A CENTRAL PART OF THE BLITZKRIEG ACROSS EUROPE BETWEEN 1939 AND 1940. IT WAS ALSO A BASIC FEATURE OF COMBAT IN THE CAULDRON OF THE EASTERN FRONT. AS THE WAR IN THE WEST INTENSIFIED, ESPECIALLY AFTER THE ALLIED INVASION OF FRANCE COMMENCED IN JUNE 1944, THE GERMANS PRESSED MORE AND MORE AIRCRAFT INTO TACTICAL SERVICE EVEN AS THE STRATEGIC BOMBING CAMPAIGN AGAINST

GERMANY INCREASED THE LUFTWAFFE'S NEED FOR HIGH-ALTITUDE INTERCEPTORS. BF 109 AND FW 190 PILOTS HAD TO STRAFE AND DIVE BOMB TO STOP OR SLOW THE FLOOD OF MEN AND MATERIEL OF THE INVADING ARMIES. JU 88 MEDIUM BOMBERS SWOOPED DOWN FROM NORMAL BOMBING ALTITUDE TO PLACE THEIR ORDNANCE WHERE IT WOULD DO THE MOST GOOD: RIGHT IN THE LAPS OF THE ENEMY. EVEN THE NEW GERMAN JETS SAW SOME SERVICE IN THE TACTICAL AIR WAR.

THE ALLIES TOOK LONGER TO FULLY EMBRACE THE POTENTIAL OF A TACTICAL ROLE FOR COMBAT AIRCRAFT, BUT PERFECTED CLOSE AIR SUPPORT BETWEEN 1943 AND 1945 BY ADDING NEW TECHNOLOGICAL VARIATIONS TO THE TACTICAL THEME. ALLIED PILOTS (BEING DIRECTED BY AIR FORCE LIAISON OFFICERS ON THE GROUND TO ENEMY GROUND TARGETS, FRIENDLY FORMATIONS IN NEED OF ESCORT, OR INCOMING BANDITS) CARRIED OUT A BLITZKRIEG OF THEIR OWN AGAINST ANYTHING THAT MOVED IN THE ENEMY SECTOR. THUNDERBOLTS, LIGHTNINGS, MUSTANGS, TYPHOONS, TEMPESTS, AND SPITFIRES FLEW FIGHTER BOMBER DUTY TO SUPPORT THE WAR ON THE GROUND, WHILE MITCHELL, MARAUDER, AND MOSQUITO BOMBERS ADDED THE FORMIDABLE STRAPPING POWER OF MULTIPLE GUNS AND CANNON TO THE DESTRUCTIVE FORCE OF THEIR BOMBS.

FOR BOTH SIDES, DETERMINING THE PRECISE LINE BETWEEN FRIENDLY AND ENEMY TERRITORY IN A FLUID AND CLOSE-FOUGHT SITUATION ADDED TO THE DIFFICULTIES TACTICAL PILOTS ALREADY FACED.

Altitude is still your friend...but you've got less of it to work with!

From a tactical pilot's point of view, you've got one strike against you as soon as you leave your base and head into enemy territory--you're flying close to the deck without the luxury of altitude. Altitude is life to a fighter pilot, providing the high ground from which to attack enemy aircraft, as well as room in which to dive away from attackers. Flying five or six miles above the ground provides plenty of room for maneuvering, attacking, and evading.

For a fighter bomber pilot altitude is still your friend, but you've got a lot less of it to work with since most missions are flown at 12,000 feet or lower (usually much lower), right on down to the deck.

"The Mission of the Tactical Air Force"

MISSIONS--The mission of the tactical air force consists of three phases of operations in the following order of priority:

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 enemy installations that he requires for the application of air power.

Second priority--To prevent the movement of hostile troops and supplies into the theater of operations or within the theater.

Third priority--To participate in the combined effort of the air and ground forces, in the battle area, to gain objectives on the immediate front of the ground forces.

--From War Department
Field Manual FM 100-20:
Command and Employment of
Air Power (21 July 1943)

USAF Museum Photo Archives



A THUNDERBOLT CARRIES THE COMPLETE GROUND ATTACK ARSENAL: GUNS, BOMBS, AND ROCKETS.



DOUGLAS A-20 MEDIUM BOMBER IN LOW-LEVEL ATTACK ON CHERBOURG PENINSULA.

Air Force Historical Research Agency Photo

A few additional worries

In addition to reduced altitude and the hail of flak and small arms fire coming up at you as you approach targets on the ground, you have a few additional worries as a fighter-bomber pilot:

- Encountering airfield defenses. If you and your buddies swoop down to beat up an enemy airfield, the guy who flies through first is the lucky one, because he might catch the antiaircraft defenses off guard. By the time the rest of you approach the target those gunners are wide awake and filling the air with flak.
- Pulling up in time. Diving a heavy, powerful aircraft from low altitude makes for a thrilling pullout, if you're lucky. If you're not both attentive and lucky, you may fixate on the target until it's too late to pull out.
- Identifying appropriate targets--now! While you're thinking about the target, the flak, and the need to pull out before you become part of the landscape, you also need to make sure that the target you're attacking belongs to the enemy. Skimming along at low altitude and high speed over a crowded battlefield doesn't give you a lot of time to make vital decisions. Are those enemy troops? Are you sure the squat form of a heavy tank glimpsed through foliage is an appropriate target? You may never know for

sure whose cause will profit from the bombs you just dropped.

- And finally, getting caught in your own explosions. When you attack surface targets from low altitude you risk getting caught in explosions of your own making. Trains and motorized transport full of fuel and ammo, the volatile contents of fuel and ordnance dumps, and even locomotives with a boiler full of high-pressure steam--all of these targets can blow up in a big way, filling a once empty piece of sky with pinwheeling chunks of shrapnel. Even the roadway beneath enemy vehicles can be hazardous, as bomb blasts can heave hunks of pavement into the same airspace you're occupying.

Three Critical Factors for Fighter Bomber Pilots

...strafing passes... bring out three critical factors in a fighter bomber pilot's war.... One, any misjudgment, target fixation, or too-late attempts at aiming corrections will send the airplane into the target, ground, or nearby trees or other obstructions. Two, if the target is a load of ammunition or other explosives, it can--and very likely will--explode right in the pilot's face, sending up a fireball, truck parts, slabs of highway, still-to-explode ammo, and other debris right into the path of the airplane. Three, if a pilot is seriously hit by flak in [a] low-altitude attack, his chances of ever reaching enough altitude to allow a bailout are slim indeed....

--From Bill Colgan, *World War II Fighter Bomber Pilot*

Another little problem: Enemy fighters

While you're concentrating on the enemy below, don't forget the most dangerous and persistent threat any combat pilot faces: enemy fighters attacking from superior altitude. Getting bounced from above while going after ground targets is an ever-present danger, so you and your buddies have got to take turns flying combat air patrol over the target area to keep the opposition busy while the rest of the team beats up targets on the ground.

Now this kind of teamwork is what you joined up to do, right? Not quite. You'll be craning your neck and straining your eyes to spot incoming bandits, mixing it up with enemy fighters as you match your skills against skilled adversaries, but remember, this is dogfighting with a difference. Even if you're flying a relatively light and nimble fighter, your plane's ordnance load makes it heavier and less responsive; you can drop like a rock in a dive. Power and gravity combine to eat up altitude in a hurry, and the ground is never very far away.

If you're flying one of the heavy-weights in your air force's inventory, the ground can reach up and grab you. In a P-47 Thunderbolt or a Do 335 Arrow, or even a big German jet, you've got to juggle the need to get the target in your sights against the need to pull out in time. If you cut it too fine, you can haul back on the stick to point

the nose up at what appears to be the last moment and discover that your plane simply won't cooperate. With all its weight and power, it will continue to sink despite your best efforts and "mush" right into the ground.

"I don't believe in all this dive-bombing [stuff], it ain't natural."

Many new fighter-bomber pilots longed for the classic fighterpilot role they'd read and dreamed about, in which the ground was for the ground-pounders and the sky above the clouds was reserved for dashing aviators. This made for a difficult adjustment:

...fighter pilots were slow to appreciate the value of close-support operations. One flyer aptly summarized the rank-and-file perception of the new task when he said... "I don't believe in all this dive-bombing [stuff], it ain't natural."

--Thomas A. Hughes, *Over Lord: General Pete Quesada and the Triumph of Tactical Air Power in World War II*

Results You Can See

"There were times we could actually see our troops move forward after we had knocked out a German 88 or tank that was holding up the column. We knew we were making a difference."

--Veteran fighter bomber pilot Quentin Aanenson

Air Force Historical Research Agency Photo



A GERMAN MK IV TANK DESTROYED
BY AERIAL ATTACK.

The payoff: Unique satisfactions

So given the catalog of dangers, why would you want to fly close air support missions? Because this job provides some unique satisfactions:

- Even if you're a loner--and many fighter pilots are--there's a lot to be said for being part of a team; especially if it's a winning team. Protecting your guys on the ground and helping them to advance by suppressing enemy troops and weapons adds real meaning to your part of the struggle.
- There's also a lot to be said for instant gratification--and few things are as gratifying to a combat pilot as seeing a tempting target blow up in a big way.
- Seeing close-up the effect of your guns, bombs, and rockets on the enemy does a lot for your confidence and your feeling that the results are worth the risks. Flying close air support also provides a sense of personal power and effectiveness that is only tempered by the fact that the "clean blue sky" of high-altitude plane-to-plane combat is replaced by distressing glimpses into the hellish landscape of the war on the ground.
- Another plus for the tactical pilot is the knowledge that just being there over the front lines gives a real lift to your guys on the ground, while depressing the spirits of the enemy.

- There's also plenty of encouragement in knowing that your contribution isn't just emotional--all armies understand that close air support plays an important role in making progress on the battlefield and in the theater of operations. Your missions are a significant part of the bigger picture. What you do or fail to do every day can contribute to the larger success or failure of your nation's forces in this war.

Air Force Historical
Research Agency Photo



A THUNDERBOLT SCORES A DIRECT
HIT ON AN AMMUNITION TRUCK.

The "Moral" Effect of Attack from the Air

Moral Effect--The moral effect of heavy air attack against land forces can hardly be exaggerated. Not only will air attack lower the morale of the enemy, but the sight of our own aircraft over the battlefield raises the morale of our own troops to a corresponding degree. Seeing enemy aircraft shot down has an encouraging effect.... On the other hand, the constant appearance of unmolested enemy aircraft tends to demoralize troops and disorganize plans. Apprehension of heavy air attack restricts military activity by ...confining troops to areas that afford concealment, and by preventing movement during daylight. Soldiers are naturally quick to react to the general air situation in their neighbourhood....

--Army/Air Operations
(British War Office, 26/GS
Publications/1127, 1944)

Events and People in the Tactical Air War

The campaign in CFS3...

As a pilot in Microsoft Combat Flight Simulator 3, you fly in the historical framework of the tactical air war in northwest Europe starting in mid-1943, but there's a significant difference. The skill and perseverance you and your squadron or Staffel bring to each battle can alter the tactical situation and the timeline of the campaign. This open-ended and flexible campaign means you can influence events, alter history, and extend the timeline to add new technology to your arsenal. How you handle these tactical and technological advantages will determine the outcome.

Before you take to the sky, it helps to understand what really happened during WWII. This will not only give you something to shoot at--but also something to shoot for.

In CFS3, it's 1943, and no one knows what's going to happen, or how the war will turn out--but here's the way it was.

...and what really happened

The campaign in northwest Europe during 1943 and 1945 marked a dramatic high point in the events of WWII and the fortunes of the warring nations. It began with the Third Reich in firm control of "Fortress Europa," and ended with Germany--and much of Europe--in ruins.



Air Force Historical Research Agency Photo

ACES OF THE 354TH "PIONEER
MUSTANG" FIGHTER GROUP.

The situation in mid-1943

In mid-1943 there were no dedicated tactical air forces operating in north-west Europe. Of course the tactical role was always part of the Luftwaffe's mandate, but most of its tactical efforts were focused against Russia. The Allied focus was on a strategic goal--using heavy bomber forces, escorted by fighters, to destroy Germany's ability to make war. German day- and night-fighter pilots' first responsibility was to attack the bomber formations that threatened the expanding Reich.

All this began to change as planning for the Allied invasion of Europe took shape. It became clear to the Allies that the invasion would never take place without air power. Air power techniques worked out in North Africa and Sicily during 1943 showed how effective tactical air power could be, and plans were put in motion to use this weapon to the fullest. Air power would pave the way for forces on the ground by providing close air support.

Pre-invasion activities

In 1943 the U.S. Ninth Air Force moved from Italy to England, and the RAF created the Second Tactical Air Force (2TAF). These Allied tactical air forces faced two daunting pre-invasion tasks:

- To disrupt the German army's ability to transport reinforcements and supplies by road, rail, or river.
- To reduce the Luftwaffe's ability to seriously impede the planned Allied invasion.

For its part, the Luftwaffe had to do its best to resist the mounting tide of Allied air and land forces, and to support the German army. Even in reduced circumstances, the Luftwaffe's best efforts remained formidable.



BRIDGE AT BULLAY, GERMANY
AFTER ATTACK BY THUNDERBOLT
FIGHTER BOMBERS.

Air Force Historical Research Agency Photo

The "Mighty Eighth" goes looking for trouble on the ground

Even before tactical air forces were in place, fighter pilots of the strategic U.S. Eighth Air Force (the Mighty Eighth) assigned to escort the heavy bombers into Germany were increasingly freed to roam further afield from their lumbering charges in search of enemy fighters. The idea was to find trouble before trouble found the bombers. To meet this threat, more Luftwaffe fighter pilots were ordered to take on the Allied escorts instead of focusing entirely on the bombers.

By January 1944, General Jimmy Doolittle, in charge of the Mighty Eighth, made destroying the German fighter force a top priority. To encourage his fighter pilots, Doolittle offered ace status to those who destroyed five aircraft on the ground. Some pilots who had won aerial victories by outflying their opponents complained that this was the "easy" way to become an ace, but flying into a wall of flak and small-arms fire while attacking an airfield didn't seem so easy to those who tried it.

In February, the Eighth Air Force launched its "Big Week" operation with a series of heavy bomber raids against the German aircraft industry coordinated with medium bomber and fighter bomber attacks on Luftwaffe assets in France, Belgium, and Holland. Throughout the spring, German fighter losses in the air and on the ground mounted; more significantly, the Luftwaffe lost half of its irreplaceable veteran pilots before the invasion began.



Air Force Historical Research Agency Photo

B-26G MARAUDER MEDIUM BOMBERS
IN ATTACK FORMATION.

The tactical air forces join the fray

The U.S. Ninth Air Force and the RAF's Second Tactical Air Force soon joined these efforts and, as winter turned to spring, the pre-invasion air campaign intensified. Two Tactical Air Commands of the U.S. Ninth Air Force (IX TAC under General Ellwood "Pete" Quesada and XIX TAC under General O.P. "Opie" Weyland) combined efforts with the British Second Tactical Air Force to smash rail transport, bridges, and airfields.

Phase 1: Railways. Sixty days before D-Day (D-60), the Allies' focus fell on rail centers, with fighter bombers (as well as medium and heavy bombers) striking marshaling yards and major rail junctions. The railway phase continued right up to and after the Allied armies fought their way onto the shores of France on June 6.

Phase 2: Bridges. At D-46, the Allies began to isolate the German troops that occupied the invasion battlefield from reinforcements and supplies by destroying bridges on the Seine below Paris and on the Loire below Orléans. Both medium bombers and fighter bombers participated in this phase, but the nimble fighter bombers proved to be the best tool to achieve the pinpoint accuracy this task required. Like the rail phase, this bridge-busting duty continued on after the Allied invasion had begun.

Phase 3: Airfields. At D-21, the Allies added German airfields within 130 miles of the invasion area to their target list. This phase continued until D-Day.

Between these attacks and the demands on German fighter resources resulting from the Allies' strategic bombing campaign, by June 6 the Luftwaffe simply wasn't a factor in Normandy. This situation wouldn't last for long, as the German fighter force wasn't finished yet. Within weeks the Luftwaffe increased its strength in Normandy, flying from small, improvised airstrips to avoid attack by Allied fighter bombers. Soon, the tactical air war would reach its furious height as the American, British, and German armies engaged in their winner-take-all struggle for control of Europe.

**"If I didn't have
air superiority,
I wouldn't be here."**

On June 24, Eisenhower's son John, a recent West Point graduate, rode with his father to view the invasion area.

"The roads we traversed were dusty and crowded. Vehicles moved slowly, bumper to bumper. Fresh out of West Point, with all its courses in conventional procedures, I was offended at this jamming up of traffic. It wasn't according to the book. Leaning over Dad's shoulder, I remarked, "You'd never get away with this if you didn't have air supremacy." I received an impatient snort:

"If I didn't have air supremacy, I wouldn't be here."

--Richard P. Hallion,
*Air Power Over the Normandy
Beaches and Beyond*

The invasion: Off the beaches-- and into the bocage

Once the invasion was under way, the Allied tactical air forces took on their toughest task: direct participation in the land battle. This included attacking enemy forces and providing close air support for friendly troops and armor on the ground.

On June 6, 1944, 150,000 Allied troops stormed ashore on the Calvados coast of Normandy. A cloud of Allied aircraft, newly adorned in black and white "invasion stripes" to make their identity clear to nervous gunners on the ground, controlled the air over the beachhead. American and British fighters flew continuously over the invasion area, ending their patrols with attacks on coastal defenses, enemy strong points, bridges, and rail targets. These attacks slowed the arrival of German reinforcements, giving the invading armies additional time to consolidate their toehold on the Continent.

Both invading armies made initial progress inland, but they soon ground to a halt as German resistance stiffened. The British were stuck outside Caen, blocked by the armor of Panzer Group West. The Americans punched their way off the beaches, only to find themselves stymied north of Saint-Lô by what General Omar Bradley called "the damndest country I've seen," the Norman hedgerow country, or bocage. This 20-mile swath of small fields

enclosed by towering ancient hedges saw some of the most vicious infantry combat of the war. American troops groped their way into the maze of hedgerows, which the Germans had already infiltrated, and came under attack from three sides in each gloomy enclosure. Every field was like a small fortress with pre-planned fields of machine gun, mortar, and artillery fire. With no more than a hundred yards of visibility this determined defense was unnerving. The bocage had been there for a thousand years, but nothing in the Allied planning had addressed fighting through this nightmarish terrain.

General Quesada on the Hedgerow Stalemate

"We were flabbergasted by the bocage.... Our infantry had become paralyzed. It has never been adequately described how immobilized they were by the sound of small-arms fire among those hedges."

--General Elwood Quesada,
U.S. IX TAC



Air Force Historical Research Agency Photo

P-38 LIGHTNING WITH BLACK AND
WHITE "INVASION STRIPES."

Ending the impasse

Goals set to be attained within days by the Allied command remained out of reach for weeks, and each small gain of ground came at a staggering cost. To end this impasse, the Allies once again turned to air power. Two operations, codenamed GOODWOOD and COBRA, were intended to break the stalemate on the ground by pouring ordnance onto the battlefield from the air.

GOODWOOD was designed to help the British break out of the stalemate around Caen and into the open country to the east, where tanks could operate effectively. The operation began on July 18 when 4,500 aircraft from the RAF Bomber Command and the U.S. Eighth and Ninth Air Forces attacked the area held by Panzer Group West. This enormous bombardment, violent enough to flip 60-ton tanks and drive hardened combat veterans into hysteria, allowed the British to force their way onto the Caen-Falaise plain. This forward movement was supported by the tactical air forces, which blasted enemy tanks, suppressed mortar and antitank fire, and delivered ordnance beyond the range of friendly artillery. However, within two days the advance lost its momentum, in part due to this operation's success in achieving its secondary goal of drawing German armor away from the American sector, where Bradley's forces were stuck in the bocage.

In the American sector, operation COBRA benefited from the British breakout effort. Devised by General Omar Bradley, COBRA began on July 25 with a massive but botched aerial bombardment that blasted holes in the enemy lines and sent German forces reeling, but also killed or wounded hundreds of U.S. troops. Bradley quickly capitalized on these gaps; his First Army forces attacked across a moonscape of bomb craters in an advance that moved four armored divisions almost 35 miles--all the way from the hedgerows around Saint-Lô to the open country near Avranches. As the speed of the assault increased, good weather allowed IX Tactical Air Command fighter bombers, under the command of General Elwood "Pete" Quesada, to provide devastating close air support. Guided onto targets by Army Air Force liaison officers riding in command tanks, Thunderbolts and Mustangs littered the roads with the burning wrecks of German vehicles. This air-ground teamwork proved to be a winning combination that would come into its own in the Allied dash across France and into Germany.

No Headlines for Tactical Pilots, but High Praise from Omar Bradley

...On June 20, Bradley asked Quesada to thank his pilots for "the fine work they have been doing and the close cooperation they have given the ground troops. Their ability to disrupt the enemy's communications, supply, and movement of troops has been a vital factor in our rapid progress in expanding our beachhead. I realize that their work may not catch the headlines any more than does the work of some of our foot soldiers, but I am sure that I express the feelings of every ground-force commander, from squad leaders to myself as Army Commander, when I extend my congratulations on their very fine work."

--Thomas A. Hughes, *Over Lord: General Pete Quesada and the Triumph of Tactical Air Power in World War II*

The breakout: Air-ground teamwork and the dash across France

On August 1, with the momentum of the breakout growing, Bradley activated the Third Army under the command of General George S. Patton. From now on, Weyland's XIX TAC would support the Third Army advance, while Quesada's IX TAC was assigned to aid Bradley and the First Army.

Patton's forces raced west from Normandy into Brittany, and then pushed south into the Loire valley before swinging east toward Le Mans. Bradley's First Army also swung to the east to provide added pressure on the Germans. Meanwhile, General Bernard Montgomery coordinated the advance of his British and Canadian forces in a drive south from Caen, catching German General von Kluge's Seventh Army between Allied pincers and effectively encircling it.

To support this increasingly rapid movement, the tactical air commands had to revise their priorities and methods. Pre-planned missions didn't work in a fluid and rapidly changing situation--by the time the fighter bombers arrived at their objective, friendly forces might already have taken it. Two types of impromptu missions proved especially effective in this environment:

- Flying armed reconnaissance missions, pilots received radioed updates on the current location of the "bomb line" that marked the boundary between

friendly and hostile territory. They also reported threats on the ground and hammered enemy troops, tanks, and guns wherever they found them.

- At the same time, armored column cover missions coordinated air power with tanks by radio to protect the advance of friendly armor while suppressing enemy resistance. With little air opposition, pilots were often given permission to sweep the roads up to 30 miles ahead of the columns they were assigned to protect, clearing the way for a rapid advance.

The result of using these two new types of missions was a far more rapid advance than even the Allies had anticipated, creating a growing threat to all German forces west of the Seine. This threat became reality when the Germans planned a counterattack. The Allies intercepted and decrypted von Kluge's orders and, combining resistance on the ground with air strikes, they stopped the German counterattack at Mortain.

On August 15, the Canadian First Army took Falaise, and the Allied armies, converging from the north, south, and west, squeezed the retreating German forces into a "pocket" between Falaise and Argentan. This pocket was less than 15 miles wide and was shrinking rapidly, with the only exit to the east.

Armored Column Cover Speeds the Allied Advance

Four- and eight-ship flights hovered over the lead elements of armored columns, ready to attack on request, to warn the tanks of hidden opposition, to eliminate delaying actions. These flights never returned to base until new flights came to relieve them. With this airplane cover always present...obstacles, which might have taken hours to surmount, were eliminated in a few minutes.

--Air-Ground Teamwork
on the Western Front
(published by Headquarters,
Army Air Forces,
Washington, D.C.)

The Falaise "pocket": Tac air in all its glory and horror

The next four days demonstrated the full and terrible potential of tactical air power. As more and more German troops and armor were crowded into the shrinking pocket, British and U.S. fighter bombers reduced the milling men and vehicles to a bloody, burning shambles.

Rocket-firing Typhoons and strafing Spitfires, in coordination with Allied infantry and armor, relentlessly pounded the packed enemy columns. U.S. Ninth Air Force pilots flew deep interdiction missions against enemy road, rail, and bridge targets, as well as aggressive sweeps to maintain air superiority, swatting down Luftwaffe fighters before they could get into the air.

Allied tactical pilots stayed on the job as long as the daylight lasted, flying as many as five or six missions a day, stopping only to refuel and re-arm. The air over the Falaise pocket was so crowded with aircraft that coordination became an issue, and midair collisions took a toll among pilots focused on destroying the enemy.

As the Allied advance gained momentum and the carnage reached a crescendo, one Allied air objective changed significantly. Instead of destroying bridges and routes by which German forces and supplies could enter the area, bridges were to be left intact for the pursuing Allied ground forces; the goal now was

to prevent the Germans from escaping and reforming the remnants of the Seventh Army to fight another day.

Thus bottled up, 10,000 German soldiers died along a road that came to be called the le Couloir de la Mort--the "Corridor of Death." Another 50,000 were taken prisoner. And the remnant of von Kluge's army--perhaps 20,000 men--managed to escape to the east only after abandoning almost all their vehicles and heavy weapons. Some fighter bomber pilots who swooped down to strike the fleeing enemy were shocked by the devastation and carnage. What they found was a hellish scene beneath a blackened sky full of the smoke and stench of the battlefield. The piled corpses of men and horses, the shattered and burning remnants of soft-skinned and armored vehicles, and a litter of abandoned equipment were all that remained along the cratered roads near Falaise.

For those who had wondered about the effectiveness of tactical air power, Falaise was a gruesome revelation. Even for those who had counted on its effectiveness, the results, while beneficial to the Allied cause, were disturbing.

Falaise: A Scene from Dante--or Hieronymous Bosch

"The battlefield at Falaise was unquestionably one of the greatest "killing grounds" of the war. I encountered scenes which could be described only by Dante."

--Allied Supreme
Commander Dwight Eisenhower

* * *

Perhaps the twisted allegories of Hieronymous Bosch would have been more fitting a choice, for Dante, at least, offered hope.

--Air Force Historian
Richard P. Hallion, *Air
Power Over the Normandy
Beaches and Beyond*

The race toward the Rhine

As the remnants of the shattered Seventh Army fled eastward, additional German forces in Normandy swelled the retreat. However, like all major German retreats of the war, this was an organized and disciplined process. Despite hot pursuit by the Allied armies and continuing harassment by the tactical air forces, 240,000 Germans got across the Seine in the last dozen days of August and streamed toward Belgium, Luxembourg--and Germany. Patton's army began its pursuit on August 21 by crossing the Seine, and in the next ten days pushed almost 200 miles eastward to the river Meuse. Other British and U.S. forces liberated Paris on August 25 and pushed on into Belgium and Luxembourg.

Seeking an opportunity to counterattack, the Germans deployed troops near the mouth of the river Scheldt, denying the Allies use of the vital port of Antwerp. This move was part of a plan (called "Autumn Mist") to drive an armored wedge through the Ardennes forest and across the Meuse to Antwerp, separating the British in the north from the Americans in the south. The resulting struggle, which began with an assault that bulged and almost broke the Allied lines, is better known as the Battle of the Bulge.

The Battle of the Bulge

Like many major actions of the Second World War, the outcome of the Battle of the Bulge was decided by air power. When the Germans began their last major offensive of the war on December 16, the dense, heavy cloud cover over the battle zone made low-level fighter bomber patrols difficult to impossible, temporarily negating Allied air superiority, but also limiting the effectiveness of the German tactical aircraft assembled to assist the offensive.

For this fight all Allied tactical air power--including the U.S. Ninth Air Force's IX and XIX Tactical Air Commands and the British Second Tactical Air Force--was concentrated under the command of RAF Air Marshal Arthur Coningham, who in turn assigned General "Pete" Quesada of the U.S. IX TAC to control air power on the north side of the bulge, while the British 2TAF focused on the south side. There were three Allied air priorities:

- To achieve and maintain air superiority over the battlefield.
- To cooperate with ground forces in the destruction of enemy weapons and transport.
- To interdict enemy supplies by attacking road, rail, and communication centers.

Jack Stafford Follows Orders on His First Mission

"Ready for your first show, Staff?" asked Woe Wilson. "Keep up with me. I'll be busy enough without looking after you--just watch my arse."

We took off for the French coast. Woe watched the heading--I watched Woe's tail.

When we returned the intelligence officer asked if we had encountered much flak. "Yes, quite a bit," said Woe. "Dieppe was the heaviest but they hosed us a bit from all the other ports."

I stood there, my mouth open. "Flak! What bloody flak?" Good-natured laughter rocked the room.

Woe said, "He was watching my arse and doing it well." Just then a ground staff man approached with a jagged piece of steel in his hand. "This was just removed from your aircraft's spinner, Staff."

-Veteran fighter pilot
and CFS3 historical advisor
Jack Stafford

Strict radio silence had kept the Germans' plans from being intercepted, and the surprise was complete when 24 *Wehrmacht* divisions crashed through the Allied lines. Twenty-four hundred tactical aircraft had been assembled to support this thrust, and a 60-mile-wide breach in the Allied line quickly became the westward "bulge" that gave this battle its name. For three days the Allied air forces fought the Luftwaffe above the cloud cover, keeping the German fighters from carrying out their close-support duties beneath the overcast and claiming 136 victories in the process. The Luftwaffe pilots were hampered not only by bad weather, but also by inadequate training and lack of experience in tactical air support, since by this stage of the war their leadership understandably emphasized air-to-air combat skills to counter the tactical bombing campaign that was reducing German cities to rubble.

The Battle of the Bulge took place over some of the roughest terrain in Europe, during the hardest winter in memory. The weather soon deteriorated to the point that, for the four days between December 19th and the 22nd, Allied and German aircraft alike could hardly get off the ground. Once again, the opposing air forces were fighting on equally unfavorable terms.

To restrict enemy supplies and slow the German advance, Eisenhower's strategy required U.S. forces to take and hold the crossroads at Saint Vith and Bastogne, an already perilous task that became practically impossible without tactical air support. The "bulge" soon grew to its maximum depth, extending about 50 miles west of what had been the American lines. U.S. forces soon evacuated Saint Vith, but the 101st Airborne Division hung on at Bastogne.



U.S. SOLDIERS GET SOME CHOW
IN THE WINTER LANDSCAPE OF THE
"BATTLE OF THE BULGE."

National Archives and Records Administration Photo

Patton's "weather prayer" pays off

Chafing at the uncooperative weather that made life miserable for infantryman and airman alike, General George Patton ordered the Third Army chaplain to devise a "weather prayer" to be published throughout the Third Army by December 14, two days before the Battle of the Bulge began:

"Almighty and most merciful God, we humbly beseech thee, of thy great goodness, to restrain these immoderate rains with which we have had to contend. Grant us fair weather for battle. Graciously hearken to us as soldiers who call upon thee that, armed with thy power, we may advance from victory to victory, and crush the oppression and wickedness of our enemies, and establish thy justice among men and nations. Amen."

This higher version of "air-ground teamwork" apparently did the trick, and on December 23 the murky weather that had hung over the Ardennes broke, unleashing Allied air and ground forces and dooming the last major German offensive of the war to failure.

With massive numbers of American and British fighter bombers filling the sky and blasting ground targets at will, the Luftwaffe could no longer affect the situation on the ground. Even returning from a mission was dangerous for German pilots, as their Allied counterparts

timed airfield attacks to coincide with the return of fighters low on fuel and ammunition.

Now Allied medium bombers joined in to cut off rail transport into the area, while U.S. and British fighter bombers pursued enemy tank columns down increasingly narrow roads. Once they hit the lead tank, the immobilized column could be destroyed in detail, a scene played out over and over again. German troop concentrations suffered the same fate as the tank columns. Thunderbolts bombed enemy positions just a few hundred yards from friendly forces. German road and rail traffic fell under the same hammer blows.

By Christmas Eve, the German advance ground to a halt. On Christmas day, the Allies counterattacked, Patton relieved the 101st Airborne in Bastogne, and Montgomery's forces attacked from the north to cut off a German retreat. Allied tactical aircraft ruled the skies over the battlefield, but they would soon face the Luftwaffe in a decisive air battle.

The Tactical Air War from Two Points of View

"We took a bit of a beating on the ground but boy did we dish it out in the air."

--General "Pete" Quesada,
IX TAC after the
Battle of the Bulge

* * *

"The Third Reich received its death blow in the Ardennes offensive.... The American fighter bomber destroyed us."

--General der Jagdflieger
Adolf Galland

The Luftwaffe's last gamble: Operation Bodenplatte

With their final ground offensive collapsing under the intolerable pressure of Allied tactical air power, the Luftwaffe planned an all-out air assault on 27 Allied airbases in Belgium, Holland, and France. The goal of Operation *Bodenplatte* ("Baseplate") was to break the air supremacy of the Allied fighter force and allow the weakened Luftwaffe to focus on the strategic bomber threat. Set for early morning on New Year's Day--January 1, 1945--it was a desperate gamble that would cost the Luftwaffe dearly.

Poor planning, inadequate briefings, a lack of experienced pilots, and poor coordination with flak gunners on the ground cost the Luftwaffe a third of the 900 aircraft it threw into this large-scale surprise attack. More significantly, over 200 pilots, including almost 80 experienced leaders and commanders, never lived to see more than the first day of 1945. About a third of the aircraft lost fell to "friendly" antiaircraft gunners, some of whom remained uninformed about the flight schedule. In other cases, bad weather delayed takeoff, putting pilots in the air over batteries that had expected them earlier.

The one thing *Bodenplatte* pilots had going for them was surprise. The last thing the Allies expected was a massive attack by an air force they

knew was on the ropes, least of all on New Year's morning. Some Allied airfields suffered extremely heavy damage, while others were visited ineffectually by very small numbers of fighter bombers. It took awhile for the Allied air forces to react, but they were soon flying multiple sorties to blunt or entirely stave off the low-level attacks.

By the end of the day nearly 500 Allied aircraft had been destroyed, almost all of them on the ground, with the heaviest damage falling in the British sector. This was a weighty blow, but all of these wrecked aircraft were replaced within a couple of weeks, while German losses, especially in pilots, were irreplaceable. Now the full weight of the Allied tactical air forces fell on the German army, making it impossible to move troops or supplies on the ground without drawing the unwelcome attentions of free-roaming fighter bombers with their guns, bombs, and rockets.



WRECKED THUNDERBOLT ON U.S.
AIRFIELD AT METZ, FRANCE AFTER
GERMAN ATTACK, JANUARY 1, 1945.

Air Force Historical Research Agency Photo

By January 18, the Battle of the Bulge was over. For Germany, the outcome was a double catastrophe: its last offensive in the west was decisively defeated on the ground, with the loss of 100,000 men and 600 tanks, and the Luftwaffe was finished as an effective fighting force at a time when Allied air power had never been greater. With Russian armies advancing into Germany from the east and British and American armies advancing toward the Rhine from the west, the outlook for the Third Reich was bleak.

To the Rhine--and beyond

In February, the western Allies started their push toward the Rhine. Their goal was to drive the German armies back into Germany and encircle them. To achieve this, forces under Montgomery pushed toward the southeast, while the U.S. Ninth Army drove northeast. To slow the Allied advance north of the Rhine, the Germans had flooded the Ruhr valley (the gateway to the industrial heart of the Reich), but by February 23 the waters had subsided. American armies crossed the Ruhr into Germany, while to the south, the Allies pushed through the remnants of the "West Wall" into west-central Germany. (The West Wall, also known as the Siegfried Line, was an array of concrete pillboxes and antitank defenses stretching 300 miles from Basel to Cleves.)

On March 7, the Americans achieved a major coup by capturing, intact, the Ludendorff bridge over the Rhine at Remagen. Allied troops and vehicles poured across and soon established a solid bridgehead east of the Rhine. Over the next two weeks, U.S. forces crossed the Rhine and built up their bridgehead to solidify their position. In the last week of March, the British crossed the Rhine at several points north of the Ruhr.



EIGHT RAF SPITFIRES ON PATROL.

Air Force Historical Research Agency Photo



OUT WITH THE OLD, IN WITH THE NEW: THE USAAF OCCUPIES A GERMAN AIRBASE AT FRANKFURT.

Air Force Historical Research Agency Photo

The situation as it was in the spring of 1945...

These aggressive Allied moves in March, supported by tactical and strategic air power, clinched the encirclement of German Army Group B and opened the way for the Allied drive eastward to the Elbe River. On April 25, U.S. and Russian forces linked up at Torgau on the Elbe, effectively splitting Germany in two and ending organized German resistance. With the fall of Berlin to the Russians and the suicide of Hitler on April 30, control of the crumbling Reich fell to the Führer's chosen successor, Admiral Doenitz. A cascade of regional surrenders--in Italy, Holland, Denmark, and Germany--culminated in the unconditional surrender of all German forces, signed for Doenitz by General Alfred Jodl, on May 7, 1945.

...and the flexible timeframe and tactical situation in CFS3

While the tactical air campaign in CFS3 is rooted in the historical events described in this Handbook, as a CFS3 pilot, you have more opportunity to influence short- and long-term events and outcomes than any pilot on either side enjoyed between 1943 and 1945. Your own performance and persistence can alter the tactical situation and the timeline at every major turning point in this long and grueling struggle--in the pre-invasion battle to control transport routes in north-

west France, in the Normandy campaign and the Allied breakout, in the battle for France, in the Battle of the Bulge, in the fight for the Rhine and the Ruhr, and in the final run to victory or defeat.

Along the way you can increase your advantage by earning the privilege of flying advanced aircraft that would have remained out of reach in a strictly historical scenario. While you may be able to take advantage of assets, including personal skill and advanced technology to take lesser objectives or even the enemy capital, one major aspect of the tactical air war as it really happened remains: No matter how good you and your squadmates are, no matter how awesome your aircraft and weapons may be, the grim realities of your job as a tactical pilot never change. Flying at low altitude over masses of enemy troops, guns, and vehicles leaves no room for romantic illusions about the glamour of war. Danger is ever-present, and glory is hard to come by.

The Nighttime Air War Adds Extra Dangers

"In 1942 I flew 40 missions for the RAF. Piloting a Wellington bomber on night missions was the most hair-raising duty I ever did. Everyone was trying to put you out of action--enemy night fighters, antiaircraft guns, searchlights, mid-air collisions, and weather all teamed up to make it miserable and hazardous.

In 1943 I transferred to the USAAF, flying 48 night missions in P-61 Black Widows. To locate and destroy targets such as trains, vehicles, and airfields, we would enter enemy territory at low altitude--200 to 500 feet. We used radar and the radio altimeter to avoid obstacles and the terrain, and followed the rail lines and highways until sighting a target, which was difficult unless the moon was out. Then we would use our bombs, cannon, and machine guns."

--Veteran combat pilot
and CFS3 historical advisor

Al Jones

Key Players in the Tactical Air War: The CFS3 Hall of Fame

The tactical air war didn't grab a lot of headlines, and didn't produce many aces. Like the foot soldiers who formed the other side of the air-ground team, tactical pilots had a rough job to do, and faced many dangers without much chance of winning individual fame. For that reason this "Hall of Fame" focuses primarily on leaders of the tactical air war, individuals who formulated doctrine on the use of tactical air power and then put that doctrine into practice in the air over Europe. The pilots who translated doctrine into combat reality are represented by our three historical advisors, men who stepped up to the dangerous job of teaming with the guys on the ground during the momentous events of WWII, and then returned to their lives as veterans who put those events behind them.

About Leadership and Pilot Initiative

A look at the leaders on both sides who were instrumental in forming tactical air doctrine in WWII reveals an interesting difference of approach, a difference with important implications for the pilots who had to transform doctrine into ordnance on the battlefield.

Germany took an early lead in developing the collaboration of air and ground forces, and used the Spanish Civil War of

1936-1939 as a proving ground for new weapons and techniques. This experience paved the way for the *Blitzkrieg* of 1939 to 1940, when Germany stunned the world by rapidly defeating Poland, France, Belgium, Holland, and Denmark with coordinated attacks by armor, air power, and mobile infantry. Throughout the war Germany used this combination of forces wherever possible. However, the Luftwaffe leadership failed to refine its use of air power, while the Allies embraced new technologies and techniques that made their tactical air forces into sharper, more focused and effective weapons.

This failure put German pilots at a double disadvantage. As Allied material superiority grew to an overwhelming flood of military power directed against Germany, the problem was compounded by leaders preoccupied with maintaining favor and casting blame instead of assuming responsibility for the success of their pilots.

What made the Luftwaffe a formidable weapon as the war went on was the dedication, skill, and perseverance of its pilots. The often murky nature of combat in the air low over the battlefield always demanded a high degree of pilot initiative for all nationalities, but for German pilots that initiative took on greater importance, given decreasing direction from above.

GENERAL WILLIAM "BILLY" MITCHELL (1879-1936)

"Billy" Mitchell was an air power pioneer, visionary, and evangelist. He was also an irritant to American military commanders who lacked his vision and enthusiasm. As commander of American combat squadrons in World War I Mitchell was one of the first to show what the airplane could do to advance the war on the ground, proving it to be a potent weapon against enemy positions and surface targets on land or sea.

Mitchell joined the U.S. Army in 1898 and showed an early interest in technology, first as a telegrapher in the Signal Corps. When the Signal Corps formed its Aeronautical Division, Mitchell bought his own flight lessons. By 1913 he informed a congressional committee that America was falling behind in what he saw as a vital new technology. In 1917 he was sent to observe air operations in Europe, and, with America's entry into the war, he was soon in charge of fighting units and promoted to Brigadier General.

In September 1918 Mitchell planned and led a bombing attack on the German-held St.-Mihiel salient in which almost 1,500 aircraft dropped their bombs on German positions in coordination with an infantry assault on the ground.

After the war, Mitchell tirelessly advocated an independent Air Service and sought every opportunity to demonstrate what air power could do. In 1921, to the

dismay of naval officers who saw the battleship as the ultimate expression of military power, Mitchell led Army bombers in trials that sank a variety of vessels, including a submarine, a destroyer, a cruiser, and finally the captured German battleship Ostfriesland. This earned him enemies in high places, as did his criticism of government policies and defiance of the military leadership.

In 1924, after a visit to Japan, Mitchell wrote a report that warned of Japanese ambitions in the Pacific. He foresaw a war with Japan that he said would begin with an aerial attack on American naval and air facilities at Pearl Harbor, starting with bombardment of the base on Ford Island at 7:30 a.m., to be followed by an attack on Clark Field in the Philippines.

In 1925, after accusing Army leadership of criminal negligence in the loss of the airship Shenandoah, he was court-martialed for insubordination and resigned from the service. Mitchell died in 1936, before he could see air power triumphant in World War II. In 1941 Lee Atwood, vice president and chief engineer of North American Aviation, proposed naming the new B-25 medium bomber



"BILLY" MITCHELL: IN THE 1920S HE SHOWED THE SKEPTICS WHAT AIR POWER COULD DO.

Hulton Archive/Getty Images

in honor of Billy Mitchell, and although it was unusual to name aircraft for real people living or dead, the Army Air Corps agreed. No one could have devised a more appropriate honor, as the B-25 Mitchell went on to prove its worth as a potent weapon in all theaters of operation, from Doolittle's Tokyo Raid in 1942 through the end of the air war in Europe.

Although his court-martial was never reversed, Mitchell was honored posthumously in 1946 with a unique Special Congressional Medal of Honor featuring a likeness of Mitchell in aviator's helmet and goggles.

"Billy" Mitchell's special Congressional Medal of Honor, awarded posthumously in 1946.



Billy Mitchell on the Tasks of Tactical Air Power

Billy Mitchell's definition of the air objectives of the St.-Mihiel offensive was one of the first systematic statements about the role of what would become tactical air power:

"We had three tasks to accomplish: one, to provide accurate information for the infantry and adjustment of fire for the artillery of the ground troops; second, to hold off the enemy air forces from interfering with either our air or ground troops; and third, to bomb the back areas so as to stop the supplies from the enemy and hold up any movement along the roads."

--Alan P. Wilt,
*Coming of Age: XIX TAC's
Roles During the 1944
Dash Across France*

GENERAL ELWOOD "PETE" QUESADA (1904-1993)

A year after General Billy Mitchell was ejected from the U.S. Army Air Corps, 21-year-old Elwood "Pete" Quesada won his wings as a flying cadet. In WWII he would gain fame as head of the IX Tactical Air Command, a role in which he was both an active leader and an innovator, adopting new technologies to refine and perfect air-ground teamwork.

The son of a Spanish businessman and an Irish-American mother, Quesada was born in Washington, D.C. in 1904. As part of the crew of an Army Fokker monoplane called the Question Mark, he helped set a sustained flight record in 1929 by remaining aloft for over 150 hours, during which the plane was refueled in the air 42 times. In 1934 he was chief pilot on the Army's New York-Cleveland airmail route.

Quesada's career moved rapidly once WWII began. Promoted to Brigadier General at the end of 1942, within months he led the XII Fighter Command in North Africa and flew combat missions in Tunisia, Sicily, Corsica, and Italy.

In 1943 he was sent to England as head of the IX Fighter Command to prepare for the Allied invasion of Normandy. His primary responsibility was to teach what he had learned in tactical operations in Italy. At the end of 1943, he was put in charge of the IX Tactical Air Command and directed its operations in the field. He set up his headquar-

ters in Normandy on D-Day+1, and moved it constantly to keep up with the rapidly advancing front lines.

Under Quesada's leadership, IX TAC provided close air support for the American invasion forces. He was quick to appreciate the command-and-control possibilities of radar and radio coordination, and originated the idea of enhancing air-ground cooperation by sending Army Air Force liaison officers with ground forces, often in the lead tank of a moving column. One of his biggest challenges was to convince "seat of the pants" pilots to put their trust in "newfangled gadgets." His leadership in directing IX TAC's air campaign, his support of General Omar Bradley's First Army after the breakout in Normandy, and his leadership of American tactical air power in the Battle of the Bulge were major contributions to the Allied success in Europe.

Promoted to the rank of Lt. General in 1947, Quesada retired from the Air Force in 1951 and was named first head of the Federal Aviation Administration in 1959. He died in 1993.



General Elwood "Pete" Quesada, head of the U.S. IX Tactical Air Command.

Air Force Historical Research Agency Photo

GENERAL OTTO PAUL WEYLAND (1902-1979)

As head of the XIX Tactical Air Command from 1944 to 1945, O.P. "Opie" Weyland provided the perfect partner in the air to George S. Patton's hard-driving Third Army on the ground. Together they made history during Patton's dash across France and into Germany after the Normandy invasion. This was the high point in a long and distinguished career that began with a commission in the U.S. Army Air Service in 1923 and culminated with Weyland's appointment as commanding general of the United States Air Force's Tactical Air Command in 1954.

Weyland arrived in Europe as a new brigadier general in November, 1943, and four months later was assigned to head XIX TAC. Under his leadership XIX TAC wrote new chapters on the possibilities of air-ground teamwork, becoming a fast-moving and hard-hitting force that kept pace with and protected Patton's armored columns and lines of supply as the Third Army surged forward, at times covering 20 miles a day. Once the Allied armies managed to break out of the invasion beachhead, XIX TAC set records for mobility, moving its headquarters five times during the month of August.

In conjunction with General "Pete" Quesada's IX TAC, Weyland's XIX TAC pilots flew three, four, or even five missions a day, bombarding road and rail transport and bridges. German tanks, trucks, guns, and troops all came in

for a pounding by the tactical air commands. The port of Brest fell in part due to the relentless assault of XIX TAC on shipping and port facilities, and by the end of December, Weyland's fighter bombers were attacking the enemy near the German border.

Patton called Weyland "the best damn general in the Air Corps," and offered this commendation for the unwavering support of XIX TAC:

The superior efficiency and cooperation afforded this army by the forces under your command is the best example of the combined use of air and ground troops I have ever witnessed.

Due to the tireless efforts of your flyers, large numbers of hostile vehicles and troop concentrations ahead of our advancing columns have been harassed or obliterated. The information passed directly to the head of the columns from the air has saved time and lives.

I am voicing the opinion of all the officers and men in this army when I express to you our admiration and appreciation of your magnificent efforts.

Air Force Historical Research Agency Photo



DYNAMIC DUO: GENERAL O.P. WEYLAND (RIGHT) WITH GENERAL GEORGE S. PATTON.

SIR TRAFFORD LEIGH-MALLORY (1892-1944)

Trafford Leigh-Mallory fought on the ground in WWI until 1916, when he transferred to the Royal Flying Corps. By 1918 he commanded a squadron, and by 1938 had risen to the rank of Air Vice-Marshal. During the Battle of Britain from 1940 to 1941, he led RAF Fighter Command's No. 12 Group in the English Midlands.

In 1942 Leigh-Mallory became head of RAF Fighter Command, and in 1943 he was knighted and made Chief Air Marshal. In 1944 he was named commander-in-chief of the U.S. and British units that formed the Allied Expeditionary Air Forces, which included the U.S. Ninth Air Force and the British Second Tactical Air Force. In this role he was responsible for the air component of air-ground teamwork in the invasion of Europe. One of his major achievements in this period was the "Transportation Plan," to devastate rail transport and facilities vital to the German resupply effort. His collaboration with Allied leaders, including Bradley and Montgomery, provided some high points in the Anglo-American military alliance.

In November 1944 Leigh-Mallory was assigned to head Allied air forces in Southeast Asia, but died in a plane crash before he could assume command.

Air Force Historical Research Agency Photo



TRAFFORD LEIGH-MALLORY
BRIEFS RAF PILOTS IN FRANCE,
SEPTEMBER 1944.

SIR ARTHUR "MARY" CONINGHAM (1895-1948)

Arthur "Mary" Coningham was born in Australia and educated in New Zealand. This New Zealand connection earned him the nickname "Maori," which over the years became "Mary." He served with the New Zealand Expeditionary Force in WWI before transferring to the Royal Flying Corps in 1916. Assigned to a squadron in 1917, by the end of the war he had scored 14 aerial victories and won numerous decorations for gallantry.

Early in WWII Coningham led RAF forces in support of Montgomery's campaign in North Africa, and developed an approach to air power ultimately adopted by Eisenhower in Europe. He called for the concentration of air power against key objectives, under the command of air officers. His most successful application of this doctrine came in 1944 when, as commander of the RAF's Second Tactical Air Force (2TAF) and the Advanced Allied Expeditionary Air Force (AAEAF), he unleashed 2TAF on German forces from Normandy to the Battle of the Bulge and beyond. In cooperation with the U.S. IX and XIX TAC, Coningham's airmen made significant contributions to the success of the Normandy invasion and Allied victory.

In 1945 Coningham took charge of the RAF Flying Training Command. He retired in 1947; the following year his aircraft disappeared while on a commercial flight to Bermuda.



Sir Arthur "Mary" Coningham.

Imperial War Museum Photo

REICHSMARSCHALL HERMANN GÖRING (1893-1946)

Göring's career as an airman got off to an impressive start in the First World War, in which he amassed 22 aerial victories and won his nation's highest decoration, the Pour le Mérite, popularly called the "Blue Max." He finished the war in charge of the squadron formerly led by WWI's ace of aces, Manfred von Richthofen, the "Red Baron."

In postwar Germany Göring became second only to Hitler in the hierarchy of the Third Reich, and in 1935 was put in charge of the resurgent Luftwaffe. Early successes in Spain and during the Blitzkrieg of 1939 to 1940 showed the world what air power could do, but his leadership had reached its pinnacle.

In the Luftwaffe, Göring had created a magnificent fighting machine, but squandered it by refusing to adapt to changing circumstances. His management of the Battle of Britain during 1940 and 1941 was a debacle of miscalculation for which he blamed his own pilots. This pattern continued as Germany's military situation deteriorated and pilots came to view the grandiose Reichsmarschall with contempt. Given this leadership vacuum at the top, the responsibility for using the air weapon with any degree of effectiveness fell to the field commanders who had to lead from the cockpit, and pilots who were willing to push themselves to the limit to achieve some success against the enemy.

With the collapse of the Reich, Göring surrendered to American forces. Ever ingratiating when it served his purpose, he sang the praises of the USAAF, while ignoring the dogged six-year contribution of the RAF:

"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 Rundstedt would not have been stopped in the Ardennes. And who knows but that the war would still be going on."

--Hermann Göring,
in Thomas A. Hughes, *Over Lord:
General Pete Quesada and the
Triumph of Tactical Air Power
in World War II*



Hermann Göring.

Bettmann/Corbis

FELDMARSCHALL WOLFRAM VON RICHTHOFEN (1895-1945)

A cousin of Germany's "Red Baron," Wolfram von Richthofen became an early exponent and practitioner of close air support in Europe in the 1930s and in WWII. He served in the Imperial army until 1917, and then transferred to the Flying Service. He won eight victories as a pilot in Jagdgeschwader Richthofen, the fighter squadron named for his famous cousin. After the war he earned an engineering doctorate, and returned to the newly reformed Luftwaffe as a technical expert in 1933.

In 1936, von Richthofen became commander of a small air force sent to Spain on behalf of the Fascists under Francisco Franco. In 1938 he was sent back to Spain in charge of the much larger Legion Kondor, a force that tested dive-bombing and other close air support techniques that would later be part of Germany's Blitzkrieg, the "Lightning War" of mobile forces.

Once WWII began, von Richthofen served in the Polish, French, Balkan, Greek, and Russian campaigns as commander of Fliegerkorps VIII. In this role he became a foremost promoter and practitioner of close air support using the dive-bombing capabilities of the Junkers Ju 87 Stuka.

During the siege of Stalingrad von Richthofen was tasked with supplying the encircled Sixth Army. By 1942 he rose to command the nearly 2,000 aircraft of a Luftflotte ("Air Fleet"), and, early in 1943, Hitler made him the youngest field marshal in the German army. He assumed command of Luftflotte 2 in the Mediterranean, but in 1944 was diagnosed with a brain tumor, and ended his active service late that year. He died in July, 1945.



Wolfram von Richthofen.

Imperial War Museum Photo

Acknowledgements

As always, a lot of diligent research has provided the realistic underpinnings for this latest version of Microsoft Combat Flight Simulator. In addition to reviewing some of the huge volume of published materials documenting the WWII air war (see Recommended Reading in this handbook for a sampling), we visited archive and museum venues to conduct research, ensuring that Combat Flight Simulator remains "as real as it gets." We thank the following organizations and people for their assistance.

* * *

Air Force Historical Research Agency, Maxwell AFB, Alabama, USA.

Located on Maxwell Air Force Base in Montgomery, Alabama, the Air Force Historical Research Agency (AFHRA) is the primary repository of Air Force historical materials. This archive contains some 70,000,000 pages of original Air Force documents dating back to 1918, including WWII-era unit histories, combat reports, and period photos. The AFHRA also authors and translates historical studies on many aspects of military aviation, including the WWII air war.

Archivists Lynn Gamma, Ronald Myers, Dennis Case, Joe Caver, and Milton Steele provided invaluable assistance in guiding us to documents and photos that have made a significant contribution to the depth, realism, and atmosphere of CFS3.

* * *

The Me 262 Project, Everett, Washington, USA.

We had the rare opportunity to see, photograph, and record the first of the Me 262 Project's newly built replicas of this historic aircraft. Our thanks to Jim Byron, and Bob Hammer, and Chief Pilot Wolfgang Czaia for providing access and information that helped us model our own simulated Me 262 for CFS3.

* * *

Kalamazoo Aviation History Museum, Kalamazoo, Michigan, USA.

This museum is currently restoring one of the Curtiss XP-55 Ascender prototypes. Registrar Bill Painter and Executive Director Robert Ellis provided some rare reference material on this exotic aircraft, including copies of the original flight and erection manual and maintenance manuals. Their help has made our modeling of the Curtiss

XP-55 Ascender more accurate than it otherwise could have been.

* * *

Pima Air and Space Museum, Tucson, Arizona, USA.

The Pima Air and Space museum maintains an enormous fleet of aircraft and related documentation, including an international archive of data on the B-26 Marauder. Archivist Stephanie Mitchell has been extremely helpful in providing access to copies of Marauder wind tunnel and flight test data, the B-26 erection and maintenance manual, pilot reports, and other details that help make our Marauder "as real as it gets" in CFS3.

* * *

Museum of Flight, Seattle, Washington, USA.

Craig Spencer, Jennifer Hawkins, and the Restoration Staff of the Museum of Flight have provided access to their archive, and have put us in touch with a number of veteran pilots, including members of "Pappy" Boyington's "Black Sheep." Information and input from these resources have been instrumental in our efforts to accurately model WWII aircraft and their flight characteristics.

* * *

Our Historical Advisors

No WWII flight simulation can be complete without input from those who flew the real thing, and we have been fortunate to recruit the following two veteran aviators as historical advisors.

* * *

Jack Stafford left his native New Zealand in January 1943, and was assigned to the RAF's 486 (New Zealand) squadron as a Sergeant Pilot in November. Based at Tangmere, he flew Hawker Typhoons in dive-bombing and ground-attack operations. In 1944 he flew Hawker Tempests on fighter sweeps, shipping strikes, and ground-attack missions before D-Day. He shot down eight V1 "buzz bombs" over southern England between June 19 and August 29, 1944, including two on the 4th of July. In September 1944 Jack flew fighter cover for the airborne attack to capture the Arnhem and Nijmegen bridges in the Netherlands. As part of the RAF Second Tactical Air Force in Belgium, he attacked locomotives in the campaign against enemy rail transport. On Christmas Day 1944 he shot down a German Me 262 when his squadron intercepted two of the jets. He also shot down a Bf 109 south of Munster, one of a group of seven orbiting over a group of American P-47 Thunderbolts.

And on April 12, 1945 he shot down a long-nosed Fw 190D. For these achievements he was awarded the Distinguished Flying Cross. Retired but still vigorous, Jack lives in Rotorua, New Zealand, where he enjoys boating, water skiing, and an occasional flight (now as a passenger) with local pilots.



Photo courtesy Jack Stafford

RNZAF Flight Lieutenant Jack Stafford, 1944.



J. Seal Photo

Jack Stafford on Anzac Day, 2000.

* * *

American pilot **Al Jones'** war started early, when he became a volunteer in the Royal Canadian Air Force in 1940. He was assigned to a squadron in England, then went to North Africa where he flew 40 missions in RAF Wellington bombers. In 1943 Al transferred to the USAAF and was assigned to a night fighter squadron, flying Bristol Beau fighters before switching to the P-61 Black Widow. He flew night intruder missions in Italy in 1944 (during the

German retreat up the Italian boot) and in Belgium early in 1945. His primary missions were to intercept German nocturnal air activity, and to stop road and rail movement of enemy troops and equipment. After the war Al became a test pilot with Boeing and rose to become Chief Pilot of Flight Crew Training.



Photo courtesy Al Jones

USAAF night fighter pilot Al Jones, 1944.



Photo courtesy Al Jones

Al Jones on the Boeing 747 simulator.

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Recommended Reading

Case Studies in the Development of Close Air Support, ed. Benjamin Franklin Cooling. Washington, D.C.: Office of Air Force History, United States Air Force, 1990.

This Air Force University publication contains a series of studies on the evolution and techniques of close air support. Its chapters on Sicily and Italy and the battle for France during WWII provide a short but comprehensive view of the tactics and techniques that made close air support a vital ingredient of the Allied victory.

Aanenson, Quentin, A Fighter Pilot's Story. Produced in association with WETA-TV, Washington, D.C.

This 1994 PBS documentary provides a harrowing three-hour look

into the life of a Thunderbolt fighter-bomber pilot in the thick of the European campaign, from D-Day to the end of the war. What makes Aanenson's account so compelling is its modest, yet resolute tone in narrating dramatic and dangerous events. His humanity and his sense of duty combined to make this thoughtful man a veteran who still struggles with some of his wartime experiences. For more information on Aanenson, or to acquire a copy of this documentary, see <http://pages.prodigy.com/fighterpilot/>.

Air-Ground Teamwork on the Western Front: The Role of the XIX Tactical Air Command During August 1944. (An Interim Report Published by Headquarters, Army Air Forces, Washington, D.C., Office of the Assistant Chief of Air Staff, Intelligence.)

This Army Air Force study provides a lucid overview of the hectic and pivotal events in the tactical air war during August, 1944, when cooperation between American ground and air forces defined the modern concept of tactical air power.

Army/Air Operations (1) General Principles and Organization (British War Office, 26/GS Publications/1127, 1944).

This wartime publication summarizes the British view of air-ground teamwork, and provides a clear understanding of tactical air objectives, especially when read in conjunction with its American counterpart, *War Department Field Manual FM 100-20: Command and Employment of Air Power* (21 July 1943), described below.



Air Force Historical Research Agency Photo

Little schlepper, big gun.



Air Force Historical Research Agency Photo

German junkers ju 88 medium bomber.

Colgan, Bill, *World War II Fighter-Bomber Pilot*. Manhattan, KS: Sunflower Press, 1988.

Colgan's account of a Thunderbolt fighter-bomber pilot's duties in Italy and Southern France dramatically depicts the special dangers of flying close air support.

* * *

Galland, Adolf, *The First and the Last: The Rise and Fall of the German Fighter Forces, 1938-1945*. New York: Henry Holt & Co., 1954.

Galland's history of the German fighter forces gives a glimpse into the workings of the Luftwaffe fighter force during its best and worst times. It also chronicles, in highly readable fashion, the career of this 104-victory ace, who survived many a scrape and lived to tell the tale.

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Air Force Historical Research Agency Photo

Wrecked P-38 Lightning.

Girbig, Werner, *Six Months to Oblivion: The Defeat of the Luftwaffe Fighter Force Over the Western Front, 1944/1945*. Atglen, PA: Schiffer Publishing, Ltd., 1991.

Girbig's history of the Luftwaffe's final months in WWII throws a dramatic light on pilots who fought on against all odds, culminating with an exhaustive account of the disastrous Operation Bodenplatte on New Year's Day, 1945.

* * *

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

Hallion's study of battlefield air attack puts the tactical air war world of CFS3 into historical perspective. Starting with the earliest examples of the tactical use of aircraft, it traces the development of this technique from its beginnings as a novelty and sideshow to its WWII high point as an essential and war-winning component of the air-ground team.

* * *

Hughes, Thomas A., *Over Lord: General Pete Quesada and the Triumph of Tactical Air Power in World War II*. New York: Crown Press, 1995.

Hughes' biography of General "Pete" Quesada provides a detailed analysis of the contribution his IX Tactical Air Command made to Allied victory. Its account of the momentous events of 1944 and 1945 and the role of tactical air power in shaping those events provides a helpful perspective on the workings of the Allied air-ground team.

* * *

Rust, Kenn C., *The 9th Air Force in World War II*. Fallbrook, CA: Aero Publishers, 1967.

Rust provides a comprehensive look at the workings of this key tactical air force and its participation in the battle for France.

* * *

Shaw, Robert L., *Fighter Combat Tactics and Maneuvering*. Annapolis: Naval Institute Press, 1985.

Many consider Shaw's textbook on fighter tactics to be the bible for those who seek combat success in aircraft, either real or simulated.

* * *

Sortehaug, Paul, *The Wild Winds: The History of Number 486 RNZAF Fighter Squadron with the RAF*. Dunedin, NZ: Otago University Press, 1998.

Through interviews and photographs Sortehaug brings to life the history of this aggressive team of New Zealand Tempest pilots and their contribution to Allied success in the air war over Europe. Jack Stafford, one of our Combat Flight Simulator historical advisors, flew Hawker Tempests in 486 Squadron, and some of his most colorful experiences are narrated here.



Heavy bomber contrails mark the way to Germany.

Air Force Historical Research Agency Photo

Spick, Mike, *The Ace Factor: Air Combat and the Role of Situational Awareness*. Annapolis: Naval Institute Press, 1988.

In this study Mike Spick focuses on a key factor for fighter pilot success: maintaining a constant awareness of an ever-changing situation and reacting to the threats and opportunities of the moment.

Spick, Mike, *Allied Fighter Aces of World War II: The Air Combat Tactics and Techniques of World War II*. London: Greenhill Books, and Mechanicsburg, PA: Stackpole Books, 1997.

Spick, Mike, *Luftwaffe Fighter Aces: The Jagdflieger and Their Combat Tactics and Techniques*. London: Greenhill Books, 1996.

In these two volumes Spick demystifies the tactics and techniques of combat pilots. His discussion of the aircraft and the men who flew them, and his description of air combat maneuvers all contribute to this excellent overview of the fighter pilot's job in WWII.

War Department Field Manual FM 100-20: *Command and Employment of Air Power* (U.S. War Department, 21 July 1943).

This document sums up what the U.S. Army Air Force had learned about air power and its application up to the middle of WWII. It provides an invaluable understanding of USAAF objectives and the techniques used to attain them.



German patrol boat with triple 20-mm antiaircraft guns.

Air Force Historical Research Agency Photo

Wilt, Dr. Alan F., *Coming of Age: XIX TAC's Roles During the 1944 Dash Across France*. <http://www.airpower.maxwell.af.mil/airchronicles/aureview/1985/mar-apr/wilt.html>

Dr. Wilt prepared this study for the Air War College, Maxwell AFB, Alabama. Focusing on Patton's dash across France, supported by Gen. O.P. Weyland's XIX Tactical Air Command, it clarifies the missions and doctrines that defined the historic success of XIX in the crucial months of August and September, 1944.

* * *

Smith, J.R. and Kay, A.L., *German Aircraft of the Second World War*. Baltimore: The Nautical and Aviation Publishing Company of America, 1972.

Swanborough, F.G. and Bowers, P., *United States Military Aircraft Since 1909*. Washington, D.C.: Smithsonian Institution Press, 1989.

Thetford, Owen, *Aircraft of the Royal Air Force Since 1918*. Baltimore: The Nautical and Aviation Publishing Company of America, 1988.

These three volumes cover aircraft flown by the Luftwaffe, U.S. forces, and the RAF in admirable detail. Their drawings, photos, and comprehensive text make them excellent, in-depth research tools.

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The "Osprey Aircraft of the Aces" series, which includes the following volumes:

Morgan, Hugh, and Weal, John, *German Jet Aces of World War 2* (Osprey Aircraft of the Aces, vol. 17). London: Osprey Publishing, 1998.

Price, Alfred, *Late Marque Spitfire Aces 1942-45* (Osprey Aircraft of the Aces, vol. 5). London: Osprey Publishing, 1995.

Scutts, Jerry, *Mustang Aces of the Ninth & Fifteenth Air Forces & the RAF* (Osprey Aircraft of the Aces, vol. 7). London: Osprey Publishing, 1998.

Scutts, Jerry, *P-47 Thunderbolt Aces of the ETO/MTO*. (Osprey Aircraft of the Aces, vol. 24). London: Osprey Publishing, 1998.

Scutts, Jerry, *P-47 Thunderbolt Aces of the Ninth and Fifteenth Air Forces*. (Osprey Aircraft of the Aces, vol. 30). London: Osprey Publishing, 1999.

Stanaway, John, *P-38 Lightning Aces of the ETO/MTO*. (Osprey Aircraft of the Aces, vol. 19). London: Osprey Publishing, 1998.

Thomas, Chris, *Typhoon and Tempest Aces of World War 2*. (Osprey Aircraft of the Aces, vol. 27). London: Osprey Publishing, 1999.

Weal, John, *Bf 109 F/G/K Aces on the Western Front*. (Osprey Aircraft of the Aces, vol. 29). London: Osprey Publishing, 1999.

Weal, John, *Focke-Wulf Fw 190 Aces of the Western Front* (Osprey Aircraft of the Aces, vol. 9). London: Osprey Publishing, 1996.

This series, published by London-based Osprey Publishing, includes a volume on the aces who flew every major fighter aircraft in each theater of WWII. The authors are leading experts who have published numerous titles, and each volume includes excellent drawings, photos, and color plates of the unique aircraft flown by individual aces. These are great reference books, except that they lack an index, so expect your copies to become well-thumbed as you discover, and rediscover, key information.

* * *



Two B-26 medium bombers with "invasion stripes" to discourage fire from nervous Allied gunners.

Air Force Historical
Research Agency Photo

Glossary

A

AA, AAA: Antiaircraft fire, antiaircraft artillery.

abschuss: (German) A fighter victory; literally a "shoot down."

Abschwung: (Luftwaffe) An evasion maneuver allowing a pilot under attack to reverse direction, trading altitude for speed. Consists of a half-roll followed by a half loop. (USAAF) Split-S. (RAF) Half-roll. Can also be used to attack an aircraft flying in the opposite direction at a lower altitude.

ace: Since WWI, a pilot who has shot down at least five enemy aircraft.

aerodrome: (RAF) An airfield or airbase; includes airfield and related facilities. From the French, but adopted into English and sometimes (later) called an "airdrome."

ailerons: Movable control surfaces on the outer trailing edge of an aircraft's wings that cause it to bank or roll left or right.

air force: (USAAF) A fighter unit consisting of 16 fighter groups, ~768 aircraft.

airspeed indicator: The instrument that displays an aircraft's speed relative to the air in which it is moving.

airspeed: The rate at which an aircraft moves through the surrounding air. Pilots use several types of airspeed during flight. For example, indicated airspeed (IAS) is the speed shown on the airspeed indicator (usually in knots). Pilots use IAS to control an aircraft and manage its performance. Calibrated airspeed (CAS) is IAS corrected for instrument and installation error. True airspeed (TAS) is IAS corrected for changes in atmospheric temperature and pressure. Pilots use TAS to solve navigation problems.



Ground crew attaches a fuel drop tank to a P-47 Thunderbolt.

altimeter: A highly sensitive barometer which shows an aircraft's altitude above mean sea level by measuring atmospheric pressure.

angle of attack: The angle between the wing and the oncoming airflow--the relative wind. The angle of attack is related to the direction in which an aircraft is moving, not to the angle the wing makes with the horizon. As angle of attack increases, so does the amount of lift a wing produces.

Ami: (German) Slang for American.

angels: Altitude expressed in thousands of feet.

Anzac: (British Commonwealth) A military man from Australia or New Zealand (originally a WWI acronym for the Australian and New Zealand Army Corps).

API: (U.S.) Armor-Piercing Incendiary ammunition.

Ascender: A Curtiss XP-55 rear-engine fighter with pusher propeller.

ASP: Antisubmarine patrol.

ASW: Antisubmarine warfare.

augered in: Crashed.

Air Force Historical Research Agency Photo

B

B-25: A North American Mitchell twin-engine medium bomber.

B-26: A Martin Marauder twin-engine medium bomber.

bail out: To parachute out of an aircraft.

bandit: (USAAF) Enemy fighter.

bank: The minor rotation of an aircraft about its longitudinal (nose to tail) axis, causing one wing or the other to dip or rise; controlled by the ailerons; see roll.

Bf 109: A single-engine fighter designed for the Bayerische Flugzeugwerke by Willy Messerschmitt.

bingo: (U.S.) The point in a mission at which remaining fuel dictates an immediate return to base.

Blitzkrieg: (German) "Lightning war"—the highly mobile form of warfare used most successfully by the Wehrmacht between 1939 and 1941.

bocage: The Norman hedgerow country, a 20-mile swath of small fields enclosed by towering ancient hedges south of the D-Day invasion beaches.

bogey: (USAAF) Slang for an unidentified aircraft.

Bomphoon: RAF pilot slang for a bomb-carrying Hawker Typhoon.

boresight: The aligning of guns and gunsights. Having a target in perfect firing position is "boresighting him."

"bought the farm": Crashed. Originated when USAAF pilots were obliged to pay for damages incurred after crashing on private property.

bounce: To attack unsuspecting enemy aircraft, usually from above and behind.

break!: A warning to friendly fighter aircraft that they are under attack and must break formation to take immediate evasive action.

bunk flying: Hashing over (discussing) a mission in the barracks.

buster: (U.S. terminology) To proceed at best-sustained speed.

C

CAP: Combat Air Patrol (over/in the vicinity of friendly forces).

CAVU: The weather term for Ceiling and Visibility Unlimited.

Chandelle: This evasive maneuver is simply an abrupt climbing turn almost to the point of stalling. It allows the pilot to quickly gain altitude while changing direction.

chattanooga: (USAAF) Air-to-ground attacks on rail targets.

circus: (USAAF, RAF) A ruse, using many fighters and few or no bombers, to decoy enemy fighters.

close air support: The air objective in air-ground teamwork; low-level operations to remove obstacles (such as enemy tanks, troops, and guns) from the path of friendly troops on the ground.

close escort: A fighter mission in which the fighters must remain in close contact with the bombers they are escorting, not searching for or pursuing enemy fighters.

CO: Commanding Officer.



German halftrack mounts a 37 mm antiaircraft gun.

Air Force Historical Research Agency Photo

combat box: (USAAF) A large, mutually defensive heavy bomber formation, generally consisting of 18, 27, 36, or 54 aircraft; devised by Curtis LeMay.

crate: (USAAF) Slang for plane.

D

D-Day: (USAAF, before the Allied invasion of Europe 6/6/44) The planned day on which a major operation was to be launched (at "H-Hour"). After the successful invasion, D-Day came to mean the famous Sixth of June, when the Allies landed in France.

dead reckoning: The navigation of an airplane solely by computations based on airspeed, course, heading, wind direction and speed, ground speed, and elapsed time. The term derives from "deduced" reckoning. Also known as "ded reckoning."

deadstick: A powerless landing.

"the deck": Ground (or sea) level; the surface over which you are flying.

deflection: The angle of a target aircraft relative to the aircraft shooting at it.

dicke Autos: The Luftwaffe code word for Allied heavy bombers; literally, "fat cars."

division: (USAAF) 16 aircraft (two eight-plane sections).

Do 335: A Dornier "Pfeil" twin-engine fighter.

dumbo: An air-sea rescue aircraft.

E

element: (USAAF) A two-plane formation; equivalent of the German Rotte.

elevators: Movable control surfaces on an aircraft's horizontal tail surface that control its pitch (nose-up or nose-down attitude).

ETA: Estimated Time of Arrival.

ETD: Estimated Time of Departure.

ETO: European Theater of Operations.

F

feathering: Aligning stopped propeller blades with flight path to reduce drag and stop rotation.

fighter group: (RAF) A fighter organization consisting of ~350 fighter aircraft, about 20 squadrons. (USAAF) 48 fighter aircraft.

fighter sweep: (RAF) An offensive sortie without escort responsibilities. (USAAF) Rodeo. (Luftwaffe) Freie Jagd ("free chase").

finger four: (RAF) A four-aircraft formation. (Luftwaffe) Schwarm. (USAAF) Flight.

firewall: The partition immediately aft of the engine. Opening the throttle to maximum position is "going to the firewall."

"fish": (U.S.) Slang for a torpedo.

flak: Antiaircraft fire; acronym from the German FlugAbwehrKanonen. Light flak batteries might consist of multiple 20- to 40-mm cannon. Heavy flak guns ranged from 75 to 150 mm, throwing shells that exploded above 20,000 feet, spraying out 15-30 pounds of steel shrapnel.

flaps: Movable control surfaces on the inner trailing edge of an aircraft's wings that increase lift when deployed, usually for takeoff or landing.

flare: To pull back on the stick just prior to landing. Flaring bleeds off airspeed and makes sure your rear wheel touches first. In carrier landings, flaring also helps put your tail hook low enough to catch the cable.

"flat-hatting": (U.S.) Making very low, spectacular, unauthorized flights; showing off.

flight: (USAAF) A unit consisting of four aircraft (two two-plane elements); also called a division.

G

flipper turn: (U.S.) A sharp, steeply banked turn.

Fw 190: Focke-Wulf "Würger" single engine fighter.

free chase: (RAF) An offensive fighter sweep without escort responsibilities, used to draw up enemy fighters.

freie Jagd: (German) Literally "free chase"--an offensive fighter sweep without escort responsibilities, used to draw up enemy fighters. (USAAF) Rodeo.

full bore: Maximum engine power.

fuselage: The body of an airplane that holds the crew and passengers or cargo. From the French fuselé, for "spindle-shaped."



Air Force Historical Research Agency Photo

Bad news for Allied aircraft: a German 88 mm Flak gun and crew.

Gs: A measurement of the load factor, or apparent gravity, experienced by an aircraft during flight. One G represents the force of gravity exerted on a body at rest. When an aircraft climbs, turns, or changes speed, it experiences G forces. For example, a level turn with a 60-degree bank imposes a 2G load on an airplane and its occupants.

Go 229: A Gotha twin-engine jet fighter bomber, designed by the Horten brothers as the Ho IX and manufactured by the Gothaer Waggonfabrik; thus assigned the official designation Go 229.

group: A fighter unit consisting of (USAAF) 48 aircraft or (RAF) up to 350 aircraft.

Gruppe: (Luftwaffe) A fighter unit consisting of 30-40 aircraft.

Gustav: Luftwaffe slang for the "G" model of the Messerschmitt Bf 109 fighter (the E and F models were called "Emil" and "Franz").

H

half-roll: (RAF): An evasion maneuver allowing a pilot under attack to reverse direction, trading altitude for speed. Consists of a half-roll followed by a half loop. (USAAF) Split-S. (Luftwaffe) Abschwung. Can also be used to attack an aircraft flying in the opposite direction at a lower altitude.

hangar flying: Pilots comparing ideas and impressions about flying specific aircraft. (See also bunk flying.)

heading: The direction in which the aircraft is pointed, usually referenced to magnetic north.

"hit the silk": Parachuting; bailing out.

"Holy Moses": U.S. pilot slang for the five-inch High-Velocity Aircraft Rocket (HVAR), reflecting its destructive power and pilot enthusiasm.

homeplate: (U.S. slang.) A pilot's "home" airfield.

Horrido!: (Luftwaffe) Fighter code word: "I've shot down an enemy aircraft!"

Hun: (RAF, USAAF) Slang for Germans.

HVAR: (U.S.) High-Velocity Aircraft Rockets (five-inch diameter); slang name "Holy Moses."

I

IFF: Identification, Friend or Foe; an electronic system for identifying friendly or hostile aircraft.

Immelmann: An aerobatic maneuver in which an airplane reverses its direction while gaining altitude (said to have been invented by WWI ace Max Immelmann). The maneuver begins with a half loop, at the top of which the pilot rolls the plane upright.

Indianer: (German) Fighter slang for American fighters; literally "Indians."

intruder mission: An offensive, small-scale sortie over enemy territory to destroy enemy aircraft near their own airfields while they are taking off or landing. A secondary aim is to dislocate the enemy defense. Mostly, but not always, flown at night.

J

Jabo: (German) A fighter bomber, from Jagdbomber.

jackpot: (USAAF) Air-to-ground attacks on German airfields.

Jagdflieger: (German) A fighter pilot.

Jagdgeschwader: (German) A fighter unit consisting of ~120 aircraft.

Jagdstaffel: (German) A fighter squadron consisting of 10-12 aircraft.

Jagdwaaffe: (German) A Luftwaffe fighter force, consisting of single-engine fighters and twin-engine Me 110 and Ju 86 "destroyers."

Jim Crow: (RAF) Reconnaissance flights over the English Channel in search of shipping targets for attack by fighters and fighter bombers.

Ju 88: A Junkers twin-engine medium bomber.

"Jug": (U.S.) The nickname for the Republic P-47 Thunderbolt fighter, due either to the plane's resemblance to a milk jug, or as a commentary about its squat, blunt-nosed appearance. The British believed it to be an abbreviation for "Juggernaut" because of the P-47's massive power, size, and weight.

K

Katschmarek: (German) Slang for wingman, the pilot of the trailing aircraft in a two-plane Rotte who is required to stick with his leader (i.e., following his lead). Literally, "a dim-witted recruit."

Kette: (German) A v-shaped three-plane formation. (RAF) A "Vic." An airshow formation used early in the Battle of Britain and replaced by the "Finger Four" or Schwarm formation.

KIA: Killed in Action.

kite: (RAF) Slang for plane.

knot: Short for nautical miles per hour. One nautical mile (nm or NM) = 6,076 ft (1,852 m) or about 1.15 statute miles per hour. Therefore 100 knots equals about 115 mph (185 km/h), 150 knots equals about 172 mph (278 km/h), and 200 knots equals about 230 mph (370 km/h). Note that "knots" by definition assumes "per hour."



German halftrack with four-barreled 20 mm Flakvierling can ruin a pilot's day.

Air Force Historical
Research Agency Photo

L

landing gear: The wheels, struts, and other equipment that an aircraft uses to land or maneuver on the ground.

LCI: Landing Craft, Infantry.

LCT: Landing Craft, Tank.

lift: The upward force produced by an airfoil such as a wing interacting with the air. Lift acts at right angles to the relative wind or the aircraft's flight path. Lift, one of the four fundamental forces in flight, is opposed by weight.

Lightning: A Lockheed P-38 twin-engine fighter.

loop: An aerobatic maneuver in which an aircraft flies in a complete vertical circle. An outside loop, begun at the top of the circle, is considerably more difficult to perform, because the pilot encounters negative G-forces throughout the maneuver.

LST: Landing Ship, Tank.

Lufbery: A (WWI) defensive maneuver in which several fighters circle for mutual protection. Because of the power, speed and firepower of WWII aircraft, this maneuver was not very successfully employed in either theater.

Luftflotte: (German) An air fleet, consisting of ~350 fighter aircraft and ~1,500 bombers.

Luftwaffe: The German air force.

LVT: Landing Vehicle, Tracked.

M

magneto: A device that creates an electric current by rotating a magnet. The crankshaft turns the magnetos, which provide the electrical energy to fire the spark plugs. This arrangement ensures that the spark plugs fire even if the aircraft's battery and electrical system fail.

Marauder: A Martin B-26 twin-engine medium bomber.

Marsden Matting: Pierced Steel Planking (also called "PSP") used to create temporary airstrips; notoriously slick in wet conditions.

meatwagon: Slang for ambulance.

Me 262: A Messerschmitt "Schwalbe" twin-engine jet fighter (also built as the "Sturmvogel" fighter bomber).

MIA: Missing in Action.

Mitchell: A North American B-25 twin-engine medium bomber.

"Mossie": (RAF) A nickname for the de Havilland Mosquito bomber, also called the "Wooden Wonder" for its plywood construction.

"mush": The tendency for a diving aircraft to keep losing altitude despite being pulled into a "nose-up" attitude.

Mustang: A North American P-51 fighter.

N

noball: Missions against V 1 and V 2 rocket sites.

nose-over: To rapidly lower the nose relative to the horizon; decrease pitch. On the ground, nose over refers to an aircraft tipping forward or doing a somersault.

O

ops: Shorthand for "Operations." "Fighter ops" refers to fighter operations in general. Each mission is called a Fighter Operation, or "F.O."

orbit: (RAF) To circle a given point or present position.

P

P-38: A Lockheed Lightning twin-engine fighter.

P-47: A Republic single-engine Thunderbolt fighter.

P-51: A North American Mustang single-engine fighter.

P-80: A Lockheed Shooting Star single-engine jet fighter.

pancake: The radio code for "land immediately."

pauke-pauke: (German) The fighter code word for "Attack!" Literally, "rat-a-tat."

Pfeil: (German) "Arrow"; the Dornier Do 335 twin-engine fighter.

pitch: An aircraft's rotation about its lateral (wing tip to wing tip) axis, determining its nose-up or nose-down attitude; controlled by the elevators.

pitot tube: A small metal probe, usually attached to an aircraft's wing, that measures ram air pressure. This data is used to calculate aircraft speed. The pitot tube usually has a heater to prevent ice from blocking the device. (Named after Henri Pitot (1695-1771), a French scientist.)

POW: Prisoner of War.

PSP: Pierced Steel Planking, also known as Marsden Matting--used to create airstrips; notoriously slick in wet conditions.

PTO: Pacific Theater of Operations.

R

R.A.F.: Britain's Royal Air Force.

ramrod: (USAAF, RAF) A bomber-escort mission.

ranger: Operations of squadron or wing strength (12-36 aircraft), as free-lance intrusions over enemy territory, the main aim being to wear down the enemy fighter force.

razorback: Describes early versions of the P-47 and P-51 fighters in which the aft fuselage deck rises behind the pilot's head and the canopy can provide only limited rearward vision. Eventually these were replaced by "bubble canopy" versions in which the aft fuselage deck was cut down to the level of the pilot's shoulders.

relative wind: The speed and direction of air striking an airfoil; that is, the air flow caused by an aircraft or airfoil's movement through the air.

revetment: A horseshoe-shaped embankment used for protecting parked aircraft against bomb blasts.



German troop carrier with 37 mm antiaircraft gun.

rhubarb: (USAAF, RAF) A small-scale harassing fighter operation against ground targets.

roadstead: Operations by fighters, or bombers escorted by fighters, to attack by dive-bombing or low-level bombing attacks on ships at sea or in harbor.

rockoon: RAF pilot slang for a rocket-firing Hawker Typhoon.

rodeo: (USAAF) Offensive sortie without escort responsibilities, used to draw up enemy fighters. (RAF) Fighter sweep. (German) Freie Jagd ("free chase").

roll: An aircraft's rotation about its longitudinal (nose to tail) axis, controlled by the ailerons. See also: bank.

Rotte: (German) A minimum fighting unit of two aircraft; leader and wingman.

rudder: The movable control surface on the vertical portion of an aircraft's tail (attached to the fixed portion, or fin); controls the aircraft's yaw, causing the plane to skid left or right.

RV: Rendezvous.

Air Force Historical Research Agency Photo

S

"saddle, in the": (U.S.) Being immediately behind a target aircraft and ready to attack.

sandwich: A tactic by which two fighters turn to keep an attacking fighter between them, making the would-be attacker the target.

saunter: (RAF) Minimum cruising speed.

Schwalbe: "Swallow"; a Messerschmitt Me 262 twin-engine jet fighter (also built as the "Sturmvogel" fighter bomber).

Schwarm: (German) A four-aircraft formation consisting of two Rotten (see Rotte).

scramble: (RAF) To jump up, run to the aircraft, and take off in the shortest possible time.

section: (USAAF) A unit consisting of eight aircraft (two four-plane flights).

Shooting Star: A Lockheed P-80 jet fighter.

Skytrain: (U.S.) The military (C-47) version of the Douglas DC-3 transport.

slewing: In Microsoft® Combat Flight Simulator and Flight Simulator, a method of rapidly changing aircraft position, direction, location, or altitude without flying there in real time.

sortie: A combat mission; originally an armed attack made from a place surrounded by enemy forces.

Spitfire: A supermarine single-engine fighter.

splash: (U.S. slang) Enemy aircraft shot down into the water.

Split-S: (USAAF) An evasion maneuver allowing a pilot under attack to reverse direction, trading altitude for speed. Consists of a half-roll followed by a half loop. (RAF) half-roll. (Luftwaffe) Abschwung. Can also be used to attack an aircraft flying in the opposite direction at a lower altitude.

squadron: A British or American fighter unit consisting of 12 (sometimes 16) aircraft.

Staffel: (German) A squadron of 10-12 aircraft.

strafing: (RAF/USAAF) To attack a position or troops on the ground with machine gun or cannon fire from a low-flying aircraft. Adapted into English from a WWI German slogan, "Gott strafe England" ("God punish England").

strike: Combat flight against ground or sea targets.

stud: (USAAF) A dive-bombing mission.

Stuka: A dive bomber (specifically, the famous Junkers Ju 87 dive bomber); from Sturzkampfflugzeug.

Sturmbock: (German) A specially armed and armored version of the Focke-Wulf Fw 190 fighter carrying 30 mm cannon and 21 cm rockets. Literally, "battering-ram."

Sturmvogel: "Stormbird"; the fighter bomber version of the Messerschmitt Me 262 twin-engine jet fighter.

sweep: An offensive formation flight of fighters or fighter bombers, made with the object of drawing the enemy fighter force into combat.



Watch out for this one: a Panzer IV tank chassis with quadruple 20 mm flak guns.

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T

TAC: (USAAF) Tactical Air Command (as in IX TAC and XIX TAC).

TAF: The British Tactical Air Force (as in 2TAF).

Tail End Charlie: The last plane in a formation.

Tallyho!: (RAF) Am about to attack (or have sighted enemy).

Tempest: A Hawker single-engine fighter bomber, successor to the Typhoon.

Thunderbolt: A Republic P-47 fighter.

Tommy: (German) Slang for Englishman.

Typhoon: A Hawker single-engine fighter bomber.

U

USAAF: The United States Army Air Forces; until 1947 the Air Force was part of the U.S. Army, not a separate service branch.

V

Valhalla: (German) A large formation of aircraft.

VE Day: "Victory in Europe" day, 5/8/45, when the Germans surrendered unconditionally to the Allies.

Vampire: A de Havilland single-engine jet fighter.

vector: (RAF) The course the pilot is following.

Vic: A basic British three-plane formation, in the shape of a "V."

Vmax: Sustained top speed in level flight.

W

WAFS: (U.S.) Women's Auxiliary Ferrying Squadron.

WASPs: (U.S.) Women Airforce Service Pilots.

waveoff: A signal from the landing signal officer not to land aboard the carrier, but to go around for another try.

Wehrmacht: The German army.

WIA: Wounded in Action.

windmilling: The action of a freely rotating propeller on a dead or stalled engine.

wing: (RAF) A fighter unit consisting of three squadrons (36 aircraft). (USAAF) A unit consisting of several 48-plane groups.

wingman: (RAF, USAAF) The pilot of the trailing aircraft in a two-plane element; required to stick with his leader (i.e., following his lead).

Würger: "Shrike"; A Focke-Wulf Fw 190 single-engine fighter.

X

XP-55: A Curtiss Ascender rear-engine fighter with a pusher propeller.

Y

yaw: An aircraft's rotation in the horizontal plane, about its vertical axis (turning left or right); controlled by the rudder.



Thirsty fighter: ground crewman refuels a P-38 Lightning.

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