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FROM ACTS TO COBRA: EVOLUTION OF CLOSE
AIR SUPPORT DOCTRINE IN WORLD WAR TWO

MAJOR MICHAEL L. WOLFERT REPORT #88-2800

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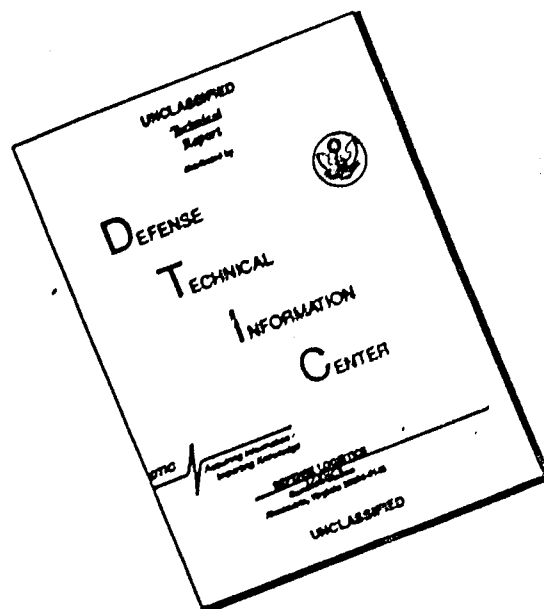
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REPORT NUMBER 88-2800

TITLE FROM ACTS TO COBRA: EVOLUTION OF CLOSE AIR SUPPORT DOCTRINE IN
WORLD WAR TWO

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313th FIGHTER



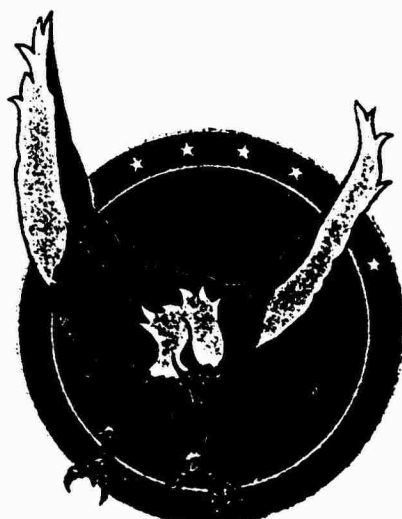
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354th FIGHTER



355th FIGHTER



356th FIGHTER



367th FIGHTER



389th FIGHTER



CONTINUED

366th FIGHTER



390th FIGHTER



391st FIGHTER



394th FIGHTER



397th FIGHTER



493d FIGHTER



494th FIGHTER



508th FIGHTER



509th FIGHTER



510th FIGHTER



511th FIGHTER



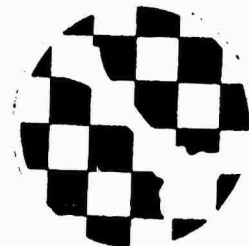
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514th FIGHTER



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This report is dedicated to the pilots and maintenance crews of these squadrons who flew the P-47 to provide close air support for American soldiers after the Normandy invasion until V-E Day. Their accomplishments stand as the epitome of joint CAS efforts in American military history.

PREFACE

"From ACTS to COBRA" is a historical monograph about how the American Army developed its close air support doctrine during the Second World War. During my course on "World War II," numerous scholars requested information about the "armored column cover" tactics used by the American Ninth Air Force during OPERATION COBRA in 1944. They wished to know how these tactics evolved and were applied during the war. My research provided only sketchy details about these tactics and did not adequately answer their questions. Usually I had to refer these requests for information to historians at Air University or the Army War College. The Simpson Historical Center, here at Maxwell, was the only place with sufficient historical records to research these questions. The myriad of unit and oral histories, and primary documents in the Center provide insights into how Lt Gen Quesada and his pilots became experts in close air support. It is from those records that this report was written. This manuscript is not a complete report of how tactical air power was used during the Second World War, but is an indepth analysis of how the American Army Air Force developed a concise, clear tactical doctrine for CAS.

Before the war, neither ground nor air commanders thought about how to use air power to support land campaigns. Although Army doctrine called for the Air Force to provide "air umbrellas" over ground forces, the Air Corps during the interwar years did not develop the equipment or procedures to implement that doctrine. The disastrous defeat at Kasserine Pass in 1943 forced the Army and its Air Force to directly develop the aircraft, communications equipment, and tactical doctrines for an efficient air-ground team. Patton's race through France in 1944 resulted from those efforts.

Between the wars, many Army officers did not study their profession. These officers became expert administrators who could adroitly handle the administrative and routine tasks required to command a peacetime Army, but they did not develop the modern mechanized and air power doctrines required to win a mobile war. This professional malaise, coupled with severe budget constraints and American isolationist sentiments, created an American Army which entered the Second World War poorly prepared intellectually or organizationally for the rigors of modern combat. The Air Corps Tactical School (ACTS) stood as one exception to the anti-intellectualism of this period. ACTS developed a curriculum to study air power history and to develop modern force structures to implement those fundamental air power principles discovered by its students and faculty. Yet this prestigious school failed to develop a broad-based air power doctrine or force structure. By the mid-1930s, ACTS became wedded to the strategic bombardment mission. The paucity of funds, coupled with an indifferent Army leadership, caused the Air Corps to develop primarily a bomber force before the war began.

CONTINUED

The American military's CAS doctrine was developed during the war. Using the British experience after the Battle of Britain, Air Vice Marshal "Maori" Conningham and Field Marshal Montgomery created a basic CAS doctrine which became Allied doctrine after the Casablanca Conference in 1943. After the disastrous defeat at Kasserine Pass in 1943, American officers began to seriously develop procedures and doctrines to integrate air and land forces into an effective team. The Ninth Air Force, created to provide close air support for the Allied invasion in Normandy, trained the forces, equipped them, and deployed them to the continent in 1944. When the hedgerows restricted movement of Allied forces inland, air power became more important to American ground forces. The creation of armored column cover tactics by Lt Gen Quesada prior to OPERATION COBRA finally developed an effective CAS air-ground team. Gen Patton's liberation of France in 1944 resulted from this new tactical concept and team.

Close air support is by its nature a difficult joint activity. It requires that air and ground forces communicate their requirements in a clear understandable language, understand how air power can best assist ground forces to gain their campaign objectives, and appreciate the unique principles which affect each service. An Army or an Air Force must train and prepare its forces for war during peacetime. If this training is realistic and complete, pilots and ground commanders will understand their doctrines and know how to employ them when the war begins. During the interwar period, the Army did a poor job integrating air and ground forces and developing a CAS doctrine. Although they did not lose the war, these commanders had time to overcome their doctrinal and organizational deficiencies. In the next war, the military will probably not be as fortunate. The air-ground teamwork required to win the AirLand Battle must be developed during peacetime through realistic exercises and an assimilation of the lessons learned during World War II.

During the preparation of this report, many colleagues, archivists, and key participants assisted me. Lt Gen Elwood R. Quesada's frank answers during our interview gave me insights into how Ninth Air Force and our tactical forces evolved during the war. To meet and work with this air power pioneer was an honor I will never forget. My close friend and colleague, Lt Col Philip S. Mellinger, Director of Military History at the Air Force Academy, graciously read my manuscript and offered valuable criticisms to improve it. With his deep understanding of air power history, his comments provided me with additional sources and a sounding board for my general conclusions. Lt Col David MacIsaac at the Center for Aerospace Doctrine, Research, and Education (CADRE) helped me to shape the project and to direct my initial research efforts. I sincerely wish to thank both of these scholars for their support.

CONTINUED

I also wish to thank Drs. Rob Johnson and James Kitchens at the Simpson Historical Center for their support during this project. They continually helped me to find, use, and photograph documents and pictures from the unit histories. Their concern for my project was truly appreciated. Mrs. Ruth Griffin, the Air University Inter-Library Loan librarian, did a superb job ordering books and documents from the Command and General Staff and Army War Colleges. These materials included items from the Bradley and Gillem Papers, and the Chester B. Hansen Diaries. From these ground commanders perspectives, my research project became more balanced. Dr. Richard H. Sommers, at the Army's Military History Institute, graciously photocopied these materials for me and promptly responded to my requests. To both of these professionals, I again express my thanks. Finally, Maj Thomas O. Jahnke, my adviser, continually read and commented on my project. His comments improved this report. I thank Tom for his support and friendship.

The photographs in this paper came from two main sources: the Simpson Historical Center and the Kuter Papers at the Air Force Academy. These pictures should give my readers an appreciation of the procedures, equipment, and lifestyles of American fighter pilots during the Second World War. They should also show the key role engineers and logisticians played in creating a viable tactical air force. Without their herculean efforts, IX and XIX TACs could not have done their jobs. These men truly made substantial contributions to how air power and Allied CAS doctrine evolved.

This paper includes numerous quotes from reports, letters, and unit histories. In order to preserve the integrity of these documents, I have not attempted to alter the language or tone of any quote. For me to correct the grammar, misspellings, and erratic punctuation of these author's work would be an act of disrespect for the integrity of the documents and the ultimate expression of patronization. I have limited my bracketed comments to only those areas absolutely necessary to enhance clarity of the quote. As a result, a few inconsistencies appear in the paper. The standard use of aircraft designation is one such area. The terms "Army Air Corps" and "Army Air Force" are often used interchangeably. In this report, the former term refers to the air power organization prior to the summer of 1941; and the latter refers to that period from 1941 to the end of the war.

CONTINUED

My bibliography does not totally conform to standard academic citations. The use of parenthetical numbers refer to my sources. The first number reflects the book or document; and the second refers to the page citation. Additionally, my bibliography divides those sources used to prepare the report and additional sources which might assist future scholars at the Air University and other academic institutions to better understand Allied tactical air power during the Second World War.

Finally, I gratefully acknowledge the support and contributions of my wife, Diane, and my daughter, Elizabeth, in the preparation of this paper. Without their loving support and patience, this manuscript would never have been completed.

ABOUT THE AUTHOR

Major Michael L. Wolfert, a native of Columbus, Ohio, graduated from the United States Air Force Academy in 1974. He held various operational and staff assignments in the Strategic Air Command and at the Air Force Academy. During his operational flying, he flew over 2800 hours in various aircraft, including the KC-135, UV-18B, T-37, T-38, F-104, and Mirage IIIE. Major Wolfert is a graduate of the Squadron Officer's School and the Air Command and Staff College. He holds a Master's Degree in Systems Management from the University of Southern California, and a Master's Degree in German Military History from Northern Michigan University.

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From December 1983 to August 1987, Major Wolfert served as an Instructor and Assistant Professor of Military History at the Air Force Academy. While assigned to the Department of History, he was the Course Chairman for the core military history course, "Introduction to Military History," and the "World War II" course. He also flew the UV-18B to support Academy Parachuting Programs, served as the Department Executive Officer, Executive Secretary for the Harmon Memorial Lecture Series in Military History, and as Deputy Director for the Twelfth Military History Symposium.

Major Wolfert is currently a member of the residence class of the Air Command and Staff College and will serve as the Executive Officer for the Chief of Air Force History after graduation. His decorations include the Meritorious Service Medal, Air Force Commendation Medal with one oak leaf cluster, and the Combat Readiness Medal.

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GLOSSARY

JC	Armored Column Cover Tactics
ACTS	Air Corps Tactical School
AGCP	Air Ground Coordination Party. The unit which coordinated CAS requests between land and air units.
Airdrome Parties	Those engineers and maintenance personnel who construct and support aircraft from forward aircraft landing grounds prior to that field becoming operational.
Air Superiority	That degree of air control wherein the opposing air forces cannot contest your command of the air over a particular area at the crucial time in a battle. This control is limited to only that location and that time; it is one step below air supremacy.
Air Supremacy	That degree of air superiority wherein the opposing air force is incapable of effective interference. (JCS Pub 1)
Air Umbrella	Use of aircraft to fly continuous support over ground forces by the American Army during TORCH.
ALG	Aircraft Landing Ground.
ALO	Air Liaison Officers. Pilots assigned to ground units to coordinate all CAS requests from the ground forces to operational flying units.
ASC	Air Support Command was the basic Army Air Force organization prior to 1944.
CCS	Combined Chiefs of Staff
Close Air Support	Air action against hostile targets which are in close proximity to friendly forces and which require detailed integration of each air mission with the fire and movement of those forces. (JCS Pub 1)
COC	Combined Operations Center.

CONTINUED

COAC Chief of the Air Corps

COBRA The Allied breakout from the Normandy beachhead on 25 July 1944. Patton's Army then commenced its drive through Northern France to Germany.

CROSSBOW Codename for Allied interdiction of German V-1 and V-2 rockets and launching facilities.

FDP Forward Director Posts. These officers used BACU radars to control CAS and to vector pilots to armored columns or to enemy aircraft.

FEBA Forward Edge of the Battle Area

FLOT Forward Line of own troops.

FORTITUDE Churchill's deception plan to make Hitler believe the main Allied attack would come at Calais, not Normandy.

FSCL Fire Support Control Line

FSCL Doctrine Current AirLand Battle concept. The ground commander controls all ground operations from the FLOT to the FSCL. All firepower used to subdue enemy ground forces to include CAS will be identified and directed by the ground commander so he will be able to best shape and control the battle. Operations beyond the FSCL do not need to be coordinated between air and ground component commanders. Beyond the FSCL, the air component commander can independently accomplish interdiction of the enemy's lines of communications and supply.

FUSA First United States Army, commanded by Lt Gen Omar N. Bradley from D-Day to 1 August 1944 and Lt Gen Courtney Hodges from 1 August to 8 May 1945. It was teamed up with IX TAC as an air-ground team.

CONTINUED

FUSAG First United States Army Group. It was the fictitious army created by Churchill to deceive Hitler into believing the main Allied landing in 1944 would come at Calais, not Normandy.

G-1 Administrative staff within the United States Army.

G-2 Intelligence staff within the United States Army.

G-3 Operations staff within the United States Army.

G-4 Logistics staff within the United States Army.

GLO Ground Liaison Officers. Ground officers from infantry and armor units assigned to flying units in IX Fighter Command. These officers provided excellent cross communication of problems and needs for CAS by ground forces.

Interdiction An action to divert, disrupt, delay or destroy the enemy's surface military potential before it can be used effectively against friendly forces. (JCS Pub 1)

Jabo Jaegerbombers or "hunter/dive bombers." The Germans gave this nickname to the Allied fighter-bombers during COBRA.

JCS Joint Chiefs of Staff.

NATAF Northwest African Tactical Air Forces.

NUSA Ninth United States Army commanded by Lt Gen Simpson. It was paired with XXIX TAC as an air-ground team.

OVERLORD Allied plan to invade Normandy in 1944.

CONTINUED

POINTBLANK Allied air offensive to destroy the fighting capability of the Luftwaffe. Strategic and Tactical aircraft interdicted German airfields, aircraft production facilities, and oil depots and refineries. American fighters also attacked railroad marshalling areas, trains, and German aircraft. The result was Allied air supremacy for OVERLORD.

TAC Tactical Air Command. These units, composed of fighters, fighter-bombers, and medium bombers, provided close support for ground forces, and interdicted interdiction missions to isolate the battlefield. TACs replaced air support commands in April 1944.

TALO Tactical Air Liaison Officers. These pilots worked to coordinate ground requests for CAS. After armored column cover tactics were created, these officers were used in lead tanks to coordinate application of air power against ground targets to support armored mobility during Patton's drive through France in 1944.

TCC Tactical Control Center.

TORCH The American invasion of Northern Africa in 1942.

TUSA Third United States Army commanded by Lt Gen George S. Patton, Jr. from 1 August 1944 to 8 May 1945. It was paired with Weyland's XIX TAC as an air-ground team.

Ultra Allied Codename for intelligence information gained through the breaking of the German code.

WDFM War Department Field Manual

EXECUTIVE SUMMARY



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REPORT NUMBER 88-2800

AUTHOR(S) MAJOR MICHAEL L. WOLFERT

TITLE FROM ACTS TO COBRA: EVOLUTION OF CLOSE AIR SUPPORT DOCTRINE IN WORLD WAR II

When the United States entered the Second World War, its Army did not have a well-defined close air support doctrine. During the interwar years, budget constraints, isolationist sentiments, and professional apathy within the service caused the Army to focus solely on peacetime administration. As a result, the war fighting skills of the American military atrophied during the interwar years. In the Air Corps, officers began in the 1920s to study how air power could best be employed in the next war. Historical experience during World War I highlighted four major air power missions: counter air, interdiction, close air support, and bombardment. The first three missions had been proven during the war, and the strategic ideas of Brig Gen William Mitchell, Air Marshal Giulio Douhet, and Air Marshal Hugh Trenchard supported an independent strategic bombardment mission for air power.

During the interwar period, the Air Corps Tactical School would become the intellectual mecca for air power doctrinal development. From 1921 to 1940, Air Corps officers would study tactics at ACTS. During this period, instructors studied the ideas of Brig Gen Billy Mitchell and Air Marshal Giulio Douhet. From their theoretical works, these officers began to see strategic bombardment as the primary mission of air forces. After 1935, when the B-17 and Norden bomb sight became available, these officers had a weapons system capable of accomplishing this doctrine.

CONTINUED

The official War Department stand, noted in its field manuals, was that close air support was the primary mission of air power. War Department Field Manual 31-35 stated this doctrinal position clearly in 1942. Yet the Army had not pressed its Air Corps to develop and practice effective close air support between the wars. Further, the Army's inattention to and clear direction of its Air Corps permitted the latter organization to create strategic bombing as its primary mission. Given the paucity of funds available between the wars, the Army did not have sufficient funds to develop and practice modern theories of mechanized and air warfare prior to Hitler's invasion of Poland in 1939. As a result, the Army and its Air Corps were woefully unprepared for war.

After the Americans invaded North Africa in 1942, the lack of training, poor communications between the Army and its Air Force, and lack of a CAS doctrine would influence how American troops fought. As a result of the problems noted during TORCH, the Allies would develop a combined CAS doctrine at the Casablanca Conference in 1943. This new doctrine, which reflected the British combat experience from 1939 to 1943, provided the Allies with an effective basic CAS doctrine which caused organizational reforms and created prioritized air power missions. Although the organizational changes and the new list of air power priorities solved most of the structural problems, these two changes did not satisfactorily provide answers about how to develop operational and tactical CAS doctrines to better integrate air and ground forces.

In late 1943, the American Joint Chiefs of Staff created the Ninth Air Force to organize, train, and equip air units to support Eisenhower's Normandy invasion forces. Under the direction of Lt Gen Brereton and Brig Gen Pete Quesada, this new command created a training program to prepare tactical forces for all three tactical missions -- air supremacy, isolation of the battlefield, and close air support. This training program assured each pilot was qualified to accomplish each mission correctly. Ninth Air Force operations during POINTBLANK (the air campaign to destroy the Luftwaffe prior to D-Day), gave these new aircrews combat experience and confidence. POINTBLANK also resulted in complete destruction of German transportation systems needed to sustain their forces in France; destruction of German aircraft and oil production facilities; and destruction of the Luftwaffe prior to D-Day. Therefore, the Allies had complete air supremacy from D-Day until the end of the war in Europe.

CONTINUED

Since the Luftwaffe could not attack our ground forces and the Wehrmacht had been isolated from its supplies, Ninth Air Force aircrews could now focus on close air support for Army ground forces. During their training period in England, these crew developed the basic principles for radar control and improved communications with ground forces. After COBRA, the breakout from the beachhead area, Gen Quesada and his crews began to use two new tactics: armored column cover and armed reconnaissance to provide more effective CAS. Armored column cover required four or eight ship formations to continuously fly over each Allied armor column as it advanced. This close cooperation worked because Quesada had put aircraft radios and tactical pilots in each lead tank. The constant communication created by this new tactic permitted Patton to accomplish his infamous dash through France in 1944. Armed reconnaissance permitted tactical pilots to destroy any enemy formations, tanks, or artillery in front of the armored column. By ranging forward about 30 miles, these aircraft effectively interdicted each target. With the threat destroyed, Patton's tanks could continue their advance. Speed and mobility became the trademark of this effective air-ground teamwork.

On 1 August 1944, the Third Army and its air counterpart, XIX Tactical Air Command, became operational. Their operations from inception through September rewrote tactical CAS doctrines. The effective integration of Brig Gen Weyland's XIX TAC as the "airborne artillery," reconnaissance force, and "flank protector of the Third Army" proved how effective air and ground forces could be integrated. Their remarkable accomplishments during the battle for France highlight how efficiently and effectively Weyland and Patton were able to create the epitome of air-ground teamwork. Only at Khe Sanh during the Vietnam War, would American air and ground forces duplicate this efficiency.

The current AirLand Battle doctrine developed by the United States Army requires that our military effectively integrate air and ground forces during a future war. To accomplish this mission, our forces must be trained as a cohesive unit, have the ability to communicate with each other, and be dedicated to the joint operations concepts effectively demonstrated by the XIX TAC/Third Army team during World War II. "From ACTS to COBRA" documents how this historical success was achieved and identifies lessons from World War II which can form the foundation for a new air-ground team required to win the AirLand Battle.

Victory smiles upon those who anticipate the changes in the character of war, not upon those who wait to adapt themselves after the changes occur. . . .

Giulio Douhet Command of the Air (1927)

Chapter One

INTRODUCTION

The image of close air support and its role in World War II has been one created by Hollywood in the movie Patton. Americans perceive that air and ground forces cooperated and coordinated their activities in absolute precision created by total mental telepathy. Although XIX Tactical Air Command and Third Army did become a superior air-ground team, close air support doctrinal development and Air Corps-Army cooperation before World War II did not predict that such close cooperation between the Army and its Air Corps would ever evolve. In fact, the United States Army entered the Second World War without an effective close air support (CAS) doctrine, without the equipment to provide CAS for the Army, and with diametrically opposing views of airpower within the Army and the Air Force. The American military would have to create a close air support doctrine and to develop the aircraft, communication equipment and control agencies to implement that doctrine during the war. From the disaster at Kasserine Pass to Patton's dramatic dash of Patton across France in 1944, American close air support doctrine would be defined, developed and honed in the crucible of war. This paper addresses how that doctrine developed from the initial combat during OPERATION TORCH and documents the superior air support given American forces after the COBRA breakout from Saint Lo in 1944.

The airplane was first used in combat during the First World War. In that war, certain roles and missions were employed. When the war ended, the American Army believed the primary role of the aircraft was pursuit aviation. This philosophical approach would dominate Army thinking during the interwar period. Constrained by tight budgets, created by strong American feelings of isolationism and altruistic belief in arms control, the Army's doctrinal shortsightedness would inhibit the creation of an effective close air support doctrine prior to OPERATION TORCH in 1941. Lt Gen Laurence S. Kuter best explained this doctrinal deficiency

In World War II, battles were lost because of unsound organization, control and employment of airpower. However, although mistakes were made, time was on our side. In World War II there was time in which we could learn, time in which we could correct unsound doctrine -- and there was time to apply valid doctrine, time to win subsequent battles, and finally, time to win that war. (53:1)

To establish a baseline, Chapter Two defines how air power doctrine during the interwar period evolved. It will focus on the political legacies of the First World War -- isolationism, pacificism, and arms control -- to define how these three factors affected the force structure and doctrinal development

within the Army and its Air Corps. This chapter also further reviews how close air support doctrine evolved. Through a thorough review of the various field manuals and documents, an individual can identify the emphasis placed on air power, especially close air support, and see weaknesses in our pre-war doctrine. This chapter will also trace the development of air power doctrine developed by the Air Corps Tactical School (ACTS). This school was tasked by the Chief of the Air Corps to create and to validate air power doctrine. The prejudice for strategic bombardment within this school would become an inhibiting factor in how close air support doctrine evolved and was responsible partially for our lack of a cohesive, comprehensive CAS doctrine in 1942.

Chapter Three reviews the use and abuse of American air power during OPERATION TORCH. Without an adequate close air support doctrine, the Air Corps, particularly XII Air Support Command and later, Northwest African Tactical Air Command, would learn vital lessons and would create the foundations of American close air support doctrine which would be employed in Europe for the remainder of the war. This chapter addresses the organizational and doctrinal changes which occurred in the North African and Italian campaigns. With a common understanding of basic doctrine, the Army Air Force and the Army could now create effective tactical doctrines to further improve close air support efforts.

Chapter Four describes how these tactical improvements, armored column cover, integration of excellent command and control, and creation of mutual trust and respect within both the Army and its Air Force created an environment for effective cooperation between air and ground forces after the Normandy invasion and its subsequent breakout from Saint Lo (OPERATION COBRA) in July 1944. OPERATION COBRA has become the epitome of American close air support during war. Only at Khe Sanh and Pusan would American air power duplicate this effective cooperative experience.

Chapter Five describes the interrelationship between the Third Army and its air arm, XIX Tactical Air Command (TAC). Without XIX TAC protecting his flank, General Patton would not have been able to accomplish his dash across France in 1944. An indepth study of this operation provides excellent examples of how effectively close air support can integrate itself into the operations of an army. The lessons learned from this operation will stand in stark contrast to the ineffectiveness of our CAS operations in North Africa.

The Epilogue will define historical lessons which can be used to improve our joint operations with the Army today and which can serve as a foundation for future doctrinal development. This chapter also serves as a reminder of the dynamic process by which doctrine evolves. We, as military officers, must realize that we are responsible for developing the doctrine, equipment and cooperation required to accomplish command of the air. Although our predecessors at the Air Corps Tactical School effectively developed strategic bombardment doctrine, they can be faulted for not creating a balanced air force doctrine which would include the aircraft and the doctrine required to better integrate our air power with our land power.

The airplane is now the arbiter of the nation's destiny. . . . The airplane is the future arbiter of the world's destiny.

. . . Brigadier General William Mitchell (1929)

Chapter Two

AVIATION BETWEEN THE WARS

When the First World War ended, the United States was the leading economic, political and military power. However, she continued her historical precedent of rapid disarmament of her air, land and sea forces. It would be only a few months before she would enter into a period of self-imposed isolationism that would affect her foreign policy and the development of her military forces during the interwar period. When the Nye Commission publicized its position that arms merchants who sold weapons to the belligerents in World War I had really brought us into the war, the American public tended to believe this position, and to become more isolationist. The isolationist position of the America First Organization, led by Charles Lindbergh, further reinforced these American attitudes. As a result, the United States tended to rely upon her vast, broad oceans and her navy as the first line of her defense. Most people felt America would have plenty of time to mobilize if she were again threatened. Following the advice of the America First Organization and other isolationist groups, Americans believed the United States should have never been involved in the First World War. They encouraged their Congressmen to follow George Washington's advice -- to avoid foreign entangling alliances. Upon this solid isolationist foundation, the United States avoided future commitments to Europe and relied upon arms control, particularly naval controls, to eliminate threats to our navy and our nation. The three major treaties negotiated at the Washington Naval Conference in 1921-22 are the best example of this sentiment. It was in this isolationist environment that our military would evolve during the 1920s and 1930s.

While the nation did not think about war, the Army, especially the Air Corps, debated and reviewed the lessons of the recent war. It was within this intellectual context that air power doctrine evolved during the interwar period. In order to understand the problems of doctrinal development and the role of close air support doctrine, this chapter will review the lessons learned in the First World War, the role of the Air Corps Tactical School, and level of cooperation between the Army and its Air Corps from 1918 to 1942.

AIR POWER LESSONS OF THE FIRST WORLD WAR

Aviation was still in its infancy during the First World War. Although flimsy aircraft had captured everyone's attention, they truly had a minimal effect upon the conduct of that war. But the major roles and missions of the aircraft were defined during that conflict: pursuit, observation, attack and bombardment. Although we had experimented with each mission, only pursuit and attack were proven to be effective uses of air power. The inability of Brig Gen William Mitchell to employ strategic air power prior to the end of the war would be an influential weakness in the doctrinal development within the Army

until 1922. In short, pursuit aviation and observation/reconnaissance were the only effective air power missions demonstrated during the First World War. Therefore, every War Department Field Manual from 1918 to 1942 would stress the importance of pursuit aviation as the primary role of aviation within the Army. Every ground commander would begin the Second World War with the perspective that air power was an ancillary/auxiliary force to ground power. By 1917, war experience had proven certain principles about the proper way to apply air power. These key principles were defined as:

1. Aerial superiority was prerequisite to successful air operations.
2. The only truly effective means of establishing and maintaining control of the air was through a determined offensive against the hostile air force.
3. When air attacks against both hostile air forces and vital rear areas were carried out in depth, enemy reconnaissance and pursuit action against friendly front lines decreased.
4. By limiting the air service to reconnaissance and observation, the Army failed to take full advantage of military aircraft which could either bomb enemy economic resources or strafe his forces.
5. In battle, the air arm was more effective if concentrated under a single command. (33:5)

Both the ground and air officers developed different perspectives during the interwar period about how air power should be properly employed. Ground commanders, led by Lt Gen Lesley J. McNair, stressed that no technological breakthroughs had occurred to demand a change in air doctrine. The primary role of aviation, in their mind, was to win air superiority. But once air superiority was won, aircraft should focus on supporting ground forces and their operations. Further, they believed each ground commander should command his own air assets. These resources should be employed as an "air umbrella" over his forces to both assist ground operations and to increase the morale of the ground forces. Therefore, each ground commander would employ his air power in "penny packets" which violated the principles of unity of command and economy of force.

In contrast, air commanders believed that air power had a vital, more important mission -- strategic bombardment. Following the ideas of Mitchell, Douhet, and Trenchard, these officers felt that air power could win a war without land or sea forces. By destroying the enemy's vital centers, strategic bombardment could decrease the morale of the civilian population and our adversary's economic capability to continue the war. These two factors would bring about the collapse of the enemy, and end the war. Therefore, most air commanders believed air forces were independent and coequal to land and sea forces. Further, they advocated consolidation of all air resources into one organization, commanded by an airman, who would decide how these air resources would be allocated. Any attempts to tie aviation to ineffective "air umbrellas" which supported ground forces were a waste of effort doomed to fail, and would fritter away air resources which could be more effectively

utilized under a "unified air commander."

In short, we see that a philosophical difference existed between air and ground commanders during the interwar period. Each side further divided the battlefield environment differently. The army tended to believe air power should be employed as close to the front lines as possible so ground forces could be better protected. The Air Corps, however, believed close air support and interdiction missions started at the far range of indigenous artillery support within each ground organization. These organizational and philosophical differences created misunderstanding within the Army and its Air Corps that were not resolved prior to the North African campaign. In order to understand how air power doctrine evolved after First World War, we must study the curriculum and attitudes of the major doctrinal organization in the Air Corps, the Air Corps Tactical School.



Figure 1: Air Corps Tactical School Building at Maxwell Field
(USAF Photo)

ROLE OF THE AIR CORPS TACTICAL SCHOOL

The Air Corps Tactical School (ACTS) was the intellectual mecca for air power theory during the interwar period. It was formed in 1921 to educate air officers in tactics, strategy, and aeronautics. Officers attending this school had to have completed at least one year of service with an Air Service organization. It was not the intent of the school to produce specialists in these academic fields, but to provide a broad based education for future squadron and higher commanders. (34:5) In 1923, the Commander of the Air Corps expanded the role of the ACTS to include doctrinal development and validation for the Air Corps Board. (33:26) Officers were required to fly and to prove their ideas. Those ideas proven by the ACTS pilots would then become a basis for doctrinal change. (46:7-8) By 1930, the Air Corps Tactical School would openly preach the ascendancy of strategic bombardment as the primary role of the Air Corps. (15:318) Following Mitchell's ideas, instructors trained their students to believe that strategic bombing had now eclipsed pursuit aviation in importance to the Air Corps. Within the intellectual discussions of the ACTS, the future leaders of the Army Air Corps during World War II debated and developed a well-defined, conceptually solid doctrine for strategic bombardment.

While the strategic bombardment doctrine developed, pursuit and close air support doctrines were not defined nor tested by the Air Corps Tactical School. These doctrines failed to develop for three reasons: lack of available technology, tight budget constraints, and institutional weaknesses within the Air Corps Tactical School. Due to a lag in development of bomber aircraft, the Air Corps Tactical School could not attempt to test and validate their bombardment ideas until after 1926. (36:38-9, 44) During the 1930s, aviation technology continued to provide more reliable aircraft, engines and instruments. Technological breakthroughs in the B-9, B-10, and Project A programs would provide the strategic bombing advocates a viable weapon system to fulfill their mission -- the B-17. This aircraft, when coupled with the Norden Mark XV bombsight, created a system capable of projecting air power over 2000 miles to a target with pinpoint accuracy. It was this system which evolved from the far-sighted doctrinal approach of the Air Corps Tactical School instructors, particularly Harold George, Laurence Kuter, Kenneth Walker, Donald Wilson, Haywood Harsell, and Robert Olds. These key bombing ideas had been proposed by Brig Gen William Mitchell, and were honed by the Air Corps Tactical School instructors during their academic debates. The rapid increase in bomber technology allowed these officers to validate their theories and to build the B-17 fleet which would become the proposed backbone of our air fleet when World War II started in 1939.

Pursuit and attack aviation were not as fortunate. During the early 1930s, American aircraft producers were unable to build a fighter aircraft capable of the speeds and altitudes attained by the B-9 or B-10. As a result, the pursuit pilots at the Air Corps Tactical School did not have an aircraft capable of disproving the crucial penetration ideas proposed by the bomber advocates. It was this weakness which would further impede the development of fighter tactics during the interwar period. Those tactics which were developed came from the work of Claire Chennault and his flying teams. The concepts of two ship formations, mutual support, and attack profiles for bomber formations were a result of his work. (15:319-22) Exercise scenarios developed by bomber pilots tended to reduce the effectiveness of pursuit

aviation. The rules of engagement for these exercises usually shielded the bombers from their weaknesses. During a 1931 exercise at Wright Field, the umpire concluded that "due to increased speeds and unlimited space it is impossible for fighters to intercept bombers and therefore it is inconsistent with the employment of [the] air force to develop fighters." (36:58-9) As a result, the air staff and the Office of the Chief of the Air Corps (OCAC) truly believed Douhet's assessment that "pursuit aviation was an auxiliary force." These attitudes would not be changed until the United States entered the Second World War.

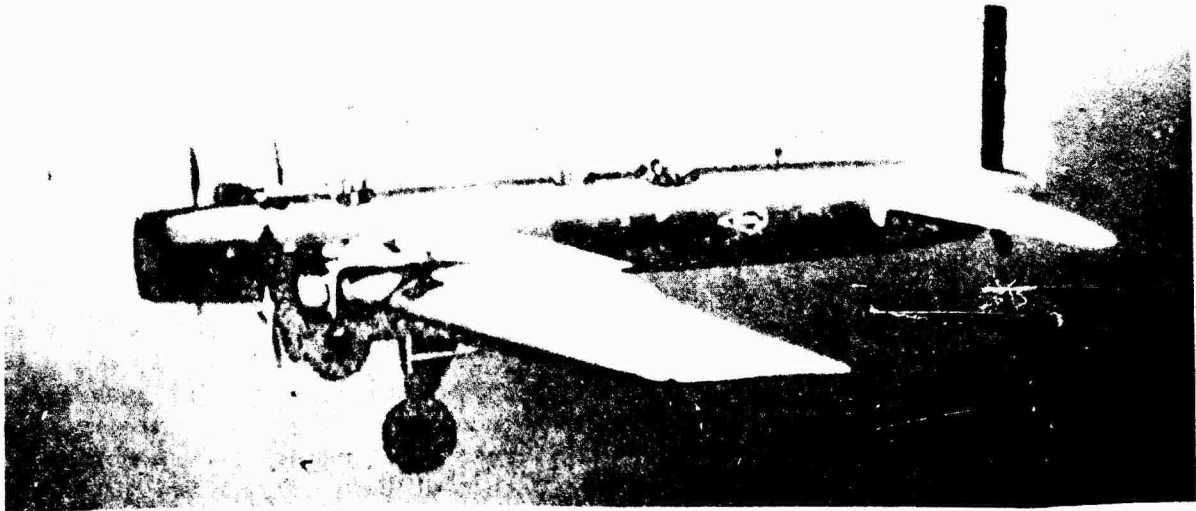


Figure 2: B-9 (USAF Photo)

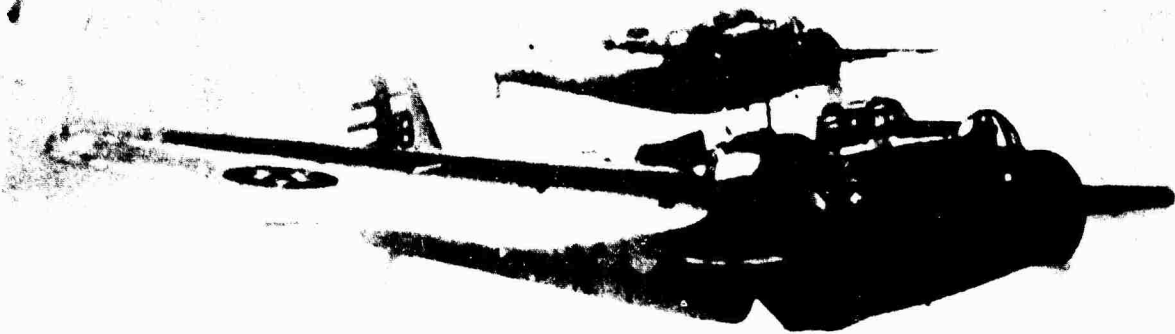


Figure 3: B-10 (USAF Photo)

Attack aviation became the orphan of air power. Although most of the War Department Field Manuals claimed that close air support was a primary mission for the Air Corps, attack aircraft and close air support doctrine were not sufficiently debated or developed by the Air Corps Tactical School. Even though most air officers were convinced that close air support doctrine was ineffective, few attempted to remedy this weakness or to develop attack aviation prior to World War II. (36:87) Even though the ACTS had a mission to develop attack aviation and close air support doctrine, after George Kenney departed the school in 1935 no one fought for this crucial mission or attempted to push for better attack aircraft. (36:66) When the American Army commenced its close air support operations in North Africa in 1942, American pilots would fly Spitfires and Hurricanes provided by the British. The United States would not provide aircraft for these missions until late 1942. The Army Air Force would have to learn in combat and depend upon the British combat experience for a clearly defined close air support doctrine since it had not developed concepts and doctrines for these missions prior to the war.

During the interwar years, the United States military experienced tight budget constraints. Often the American military had to depend upon aircraft developers to fund their own technological programs and then to peddle them to the War Department. Such was the case of the B-17, developed by Boeing in 1935. By pooling all its assets, the Boeing Company gambled that the Air Corps would purchase its bomber. This hypothesis was a tremendous gamble for Boeing, given the austere budgets which constrained military procurement during the interwar period. If the government had decided to purchase a different aircraft, Boeing would have been bankrupt. Fortunately, the Air Corps had \$600,000 available from a cancelled sea plane program to purchase 13 B-17s in 1936. (15:324) Although aircraft production assisted the bomber program, aircraft manufacturers did not attempt to risk their future on fighter or attack aircraft. This fact further restricted the Air Corps in its attempt to develop a balanced air force.

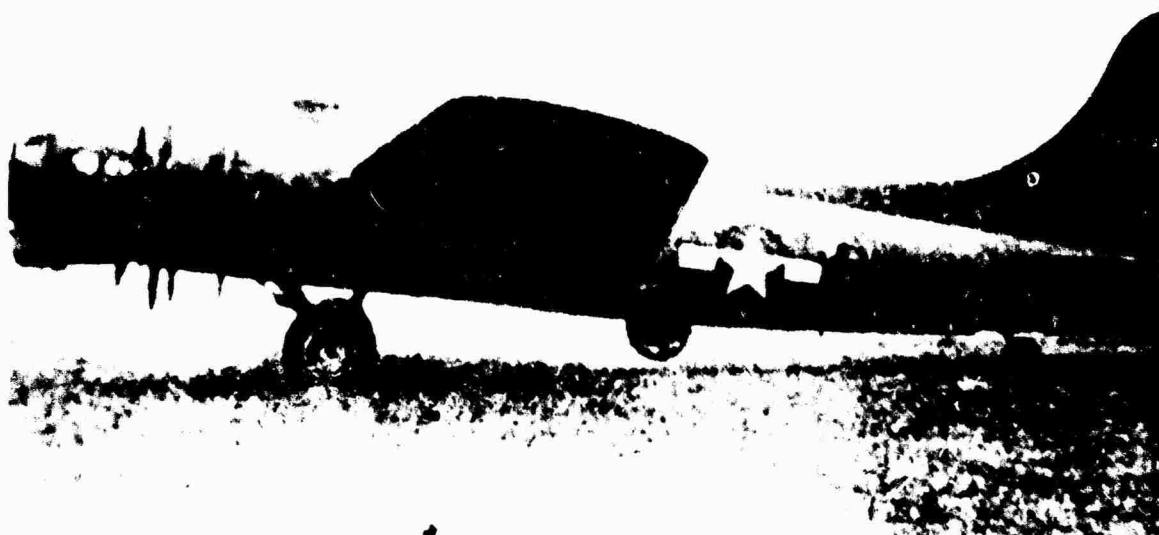


Figure 4: B-17 (USAF Photo)

Perhaps this fortuitous production of the B-17 was not a coincidence, but a result of aircraft producers noting the emphasis placed by the Air Corps on the strategic bombardment mission. There existed two institutional flaws within the Air Corps Tactical School which would determine how our air force would develop prior to World War II. These two factors were the "group think" mentality which pervaded the student body of the ACTS, and the lack of eloquent defenders of pursuit aviation within the school and the air staff.



Figure 5: "Three men on a Flying Trapeze"
The Air Corps' Flying Team at Maxwell Field (1934)
From L to R: William McDonald (alternate), Haywood Hansell,
Claire Chennault (team leader), and Luke Williamson.
[Photo from the Kuter Papers (USAF Academy, Colorado)]

Although most of the instructors at the Air Corps Tactical School had been fighter pilots, most students and instructors became unquestioning supporters of strategic bombardment. Individuals, like Hansell, Twining, Vandenberg, Partridge, and Eaker, had come to the ACTS as distinguished fighter pilots, but became key proponents of strategic bombardment after attending this school. Only Chennault, Quesada, and Weyland would escape this doctrinal change. These three officers would not only champion tactical air power, but would be the key leaders of our tactical forces during the Second World War. By 1926, bombardment had become the dominant air power mission. This institutional position resulted from the doctrinal ideas of Brig Gen William Mitchell. Many of his ideas came from the Italian Air Marshal Giulio Douhet, who had written his seminal work on airpower, Command of the Air, in 1921. The key concept Douhet proposed was that a nation must be able to gain and maintain command of the air. This concept meant that a nation must have sufficient power to operate uncontested in the skies over enemy territory, while denying this ability to his adversary. Further, Douhet proposed that the "battleplane" would be the offensive weapon of the future. It could strike deep into enemy territory to destroy the enemy's "vital centers" -- his industrial base and his cities, and to collapse the will of the civilian population to continue the war effort. Douhet also proposed that the battleplane would always get through. Pursuit aviation and anti-aircraft artillery would be unable to stop it or to keep it from accomplishing its

assigned mission. Even though Douhet's works had been translated by Capt George Kenney and three copies of his work were placed in the ACTS library, these translations were never read by ACTS faculty or students. (34:51) Through Brig Gen Mitchell's writings and lectures which became the key doctrinal positions of the Air Corps, the ACTS would be influenced by Douhet's ideas. The function of the ACTS "was not only to develop new ideas, but to attempt to coordinate individual notions into a unified and consistent body of doctrine." (36:47) In 1928, Col C. C. Culver, Commandant of the Air Corps Tactical School, proposed in a paper titled, "The Doctrine of the Air Force," that the air arm was an auxiliary arm to ground forces. Maj Gen James E. Fechet, Chief of the Air Corps, replied in a letter to Culver that the ACTS position was too conservative and it must be rewritten. In the future, Culver was told to abide closer to the ideas specified by OCAC. (36:48) As a result of this command influence, Air Corps doctrine shifted dramatically away from Army sanctioned pursuit and attack missions, and towards unilateral acceptance of the strategic bombing concepts proposed by the Air Staff. This influence would also permit Lt Col Donald L. Wilson, Deputy Commandant of the ACTS, to restructure tactical problems and exercises within the curriculum towards strategic bombardment questions and away from doctrinal issues pertaining to pursuit and attack missions. (36:31-2) Wilson perceived that pursuit aviation was solely defensive. "The net effect of his analysis was to restrict fighters to the interception of hostile bombers." He further

saw air defense of vital centers as a continuous need in case of involvement in war no matter where the theater of operations might be. Not until adequate defense was provided for all key areas of the nation would it be safe or proper to employ pursuit in [an] "auxiliary mission." . . . if that time was reached, a decision to use pursuit in such a fashion would have to be based upon demonstrated need and proof of effectiveness of fighters in auxiliary roles. (36:84)

In short, Wilson's perception of fighters and pursuit aviation closely resembled Douhet's stand in Command of the Air. (9:42-46) Even after 1935, when radar first appeared, instructors at the Air Corps Tactical School continued to believe that their doctrine of strategic bombardment was correct and needed no revisions. (36:60) This "group think" attitude about air power doctrine would also isolate the Air Staff from the new technological changes which might destroy the myth of an invincible bomber. Only after the initial sting of combat and our severe losses at Schweinfurt and Ploesti would we learn the value of fighter escort for our bomber formations; by then it would be too late to quickly develop these forces.

A second institutional weakness of the ACTS was that pursuit aviation did not have an eloquent spokesman to debate its role vis-a-vis bombardment. Most of the fighter pilots who were the experts in tactical aviation were not intellectuals, but were practical men. Chennault, Kenney, Vandenberg, and Quesada were practical officers who could see better ways of employing tactical air power, but who were not prepared to debate Hansell, Wilson, and the other bomber enthusiasts. Instead they attempted to improve tactics and work on coordination of small formations of tactical aircraft. Technology, as noted earlier, further undercut their ability to persuade the strategic bombardment school that fighter support was required for the bomber or that tactical air power must also be developed prior to the war. It would take

Chennault's initial successes in China and the North African failures to demonstrate this doctrinal weakness.



Figure 6: Donald Wilson, Chief, Air Force Section 1934-41;
Director, Department of Air Tactics and Strategy 1936 -40;
Air Corps Tactical School
(USAF Photo)

Air Corps officers were not encouraged to support the Army during the interwar period. Since the Air Corps was attempting to win its independence from the Army, any tactical officer who called for better cooperation with the Army and/or for funds for attack or pursuit aviation was an institutional heretic. (63) Chennault's unceremonious retirement in 1935 left a void in the ACTS. After that date, the school's institutional preference for strategic bombardment and a myopic view of how air power dominated debate until the Second World War commenced.

In sum, the Air Corps Tactical School was the intellectual center for air power development during the interwar years. It was challenged to educate air officers in tactics, strategy, and air operations prior to their attendance of the Command and General Staff College at Fort Leavenworth. Its' second mission was to debate, develop, and validate air power doctrine. During the 1930s, the instructors and students of ACTS would effectively create a strategic bombing doctrine, and validate the effectiveness of the Norden bomb sight and the B-17. However, due to technological factors, budget constraints, and an institutional preference for bombers, the Army Air Force would enter the Second World War without a balanced doctrine to effectively employ bombers, fighters and attack aircraft. Our fighter doctrine would evolve from the combat experience of Chennault and the Flying Tigers; however, we would not enter OPERATION TORCH (invasion of North Africa) with a clearly defined, concise, and validated close air support doctrine. We would have to learn from our war experiences and develop that doctrine in the crucible of war.



**Figure 7: Major General Claire L. Chennault
Chief, Pursuit Section, 1931-36, The Air Corps Tactical School
Commanding General, 14th Air Force, China
(USAF Photo)**

THE OFFICIAL VIEW OF AVIATION

During the interwar period, the War Department and the Army Staff defined how air power would be employed. Even though the ACTS helped to develop that doctrine it did not determine how its aircraft would be used. The conflicting view of air power and its role becomes evident after reviewing the field manuals which governed how air power was to be employed.

Throughout the interwar period, the Air Corps had attempted to gain its independence. From the Army Reorganization Act (1920) until 1942, numerous boards and Congressional acts confirmed that air power was an essential "combatant arm of the Army." This position was wholeheartedly endorsed by Henry Woodring, the Secretary of War, prior to the Second World War. Therefore, although the Air Corps believed it had a separate mission and was equal with land and sea forces, it was still an organizational part of the Army, subservient to ground commanders, in 1941. This fact gives rise to two differing perspectives. The Air Corps belief is that it should be used to employ air power in deep, strategic bombing raids against the vital centers of its adversary. It further believed that these deep B-17 raids, employing pinpoint bombing, would destroy the will and the capability of the enemy to resist. The ground forces, however, believed that air power was solely a support force. They viewed pursuit and attack aviation as the proper roles for its Air Corps. The War Department guidance during the pre-World War II years would reflect this latter attitude.

In War Department Field Manual (WDFM) 31-35, Air-Ground Operations, the tactical doctrine for air power was spelled out succinctly. Army Air Corps aviation was divided into a series of Air Support Commands. Each of these agencies was tied to a ground unit and would use fighter, observation, attack and bomber aircraft to support the ground forces. WDFM 31-35 clearly defined the role and relationship of air power to the army. It stated:

1. Air support aviation was "normally constituted into air support commands which ordinarily are parts of air forces."
2. The air support commander, normally functioning under the Army, theater, or task force commander, was to act as the air adviser to the ground commander.
3. Although no specific priorities were established, the missions of combat support aviation were listed as being: reconnaissance bombardment; attacks on defensive organizations; attacks on enemy reserves and reinforcements, especially those moving toward the front since they were more vulnerable than dispersed units; attacks on hostile mechanized forces before they made contact with the force they were to support; attacks on hostile aviation; and support of parachute and other airborne troops. (32:17-8)

These missions are not even remotely what the ACTS believed to be the best use of air power. This philosophical difference between the ground and air forces would not be resolved until America entered the war. In short, the Air Force would be tied to ground forces as an auxiliary force when America entered the war. This situation would not permit the Air Force to effectively employ its

forces because it violated the principles of unity of command, mass, and economy of force. As demonstrated in TORCH, the America military would have to change this relationship into one of equals if airpower was to effectively employ its flexibility and maneuverability in combat.

Further, WDFM 100-15, Larger Units, dated 29 June 1942, laid down the principles of air power for the Army. The "Foreword" to WDFM 100-15 stated

successful modern military operations demand air superiority, and prescribed that "the initial objective [of a campaign] must include attainment of air superiority." It further stated that in achieving air superiority, air forces had a broader mission than to create a condition essential to the success of ground forces. "Air Forces were to deny the establishment of and destroy existing hostile bases from which an enemy can conduct operations on the land, sea, or in the air; and they were to wage offensive air warfare against the sources of strength, military and economic, of the enemies of the United States in the furtherance of approved war policies."
(35:1-2)

This manual further defined "close air support" as one of the basic missions of air forces. However, the manual did not prioritize when close air support missions should be flown, and failed to define where that support would begin. It was this problem which would provide an out for the Air Corps.

Whereas the Army meant that close air support should commence at the battle line and extend forward into the battle zone; the Air Corps believed close air support should begin at the end of range of friendly artillery fire. Thus, there existed a gap where air power would not cover the ground forces. The Air Corps also believed its proper mission priority was: 1) air superiority, 2) strategic bombardment 3) isolation of the battlefield and 4) close air support. (35:2-3) The inability of the Army and its Air Corps to resolve these philosophical differences prior to our combat experience in North Africa would lead to mutual finger-pointing and decreased mission effectiveness. This debate is one area where joint exercises could have helped to improve cooperation between air and ground forces.

JOINT ARMY-AIR CORPS EXERCISES DURING THE INTERWAR YEARS

During the interwar years, the ACTS students did not study and develop doctrine in isolation. At infrequent intervals, these students would engage in war game exercises with students at the Army War College, Command and General Staff College, or the Industrial College of the Armed Forces. These exercises would be used to validate and test tactical and doctrinal positions in a wartime scenario. Beginning in 1934, ACTS students participated in field exercises with the Infantry School at Fort Benning. During these exercises, ACTS students demonstrated attack aircraft techniques against ground forces. (34:19) After the 1933 Army War College exercise, Lt Col John F. Curry, Commandant of the Tactical School, threatened to discontinue ACTS participation if the prevalent army bias that air power was a subordinate arm to land power and prohibitive restrictions upon the use of strategic bombardment resources were not changed. In 1934, the rules were relaxed

substantially. That exercise called for an attack on the rear lines of communications, accumulations of supplies and troops, and depots rather than targets in the immediate front lines. As noted by Maj Gen George S. Simonds, Commandant of the Army War College, the air phase of the maneuver that year resulted in more effective use of air power resources. (34:20) However, within a couple of years, austere budgets would cancel this program. Perhaps if this program had continued, better cooperation between air and ground commanders and their staffs would have resulted during the early campaigns in North Africa.

Under the leadership of Lt Gen Lesley J. McNair, Chief of Staff, General Headquarters Army, the Army began to test its warfighting capability in joint exercises after July 1940. McNair felt the Army could increase the experience of all combat arms, including the Air Corps, and improve cooperation between air and ground forces. During the late 1930s, many ground commanders still viewed the Air Corps as an auxiliary support arm for the infantry. These commanders had witnessed the increasing emphasis on strategic bombardment with increasing anxiety and believed the Air Corps was not prepared to provide close air support for ground forces. They had noted that few attack resources or fighter aircraft had been produced. Their worst fears would be confirmed in the 1941 combined arms wartime exercises in Louisiana and the Carolinas. (35:6-7)

In these exercises, McNair pitted two army-size teams, including air support, against each other. The objective was to increase the experience of our ground and air commanders, and to demonstrate the capability of new organizational reforms, new equipment, and the effects of Army training. The overall result of these exercises was that air-ground cooperation was non-existent and, according to McNair, the state of bombing was such that air power could not win a war by itself, as the ACTS instructors had promised. Therefore, McNair called for future exercises to improve cooperation between air and ground commanders. These exercises proved that the mechanized theories and new equipment in the Army were effective, but that air power had not yet proven itself to be a equal to ground and sea forces. (35:7-8). This conclusion would be used by McNair and other ground commanders to challenge funding for future bomber programs.

In 1942, McNair wished to create a massive air-ground exercise program. The master training program, dated 23 April, called for "nine weeks of training in air-ground cooperation." (35:9) The first four weeks would be devoted to ground classes to educate air and ground commanders so they could better integrate their resources with their counterparts. Two additional weeks would be devoted to improving air ground tactics and cooperation. The final three weeks would be corps-directed maneuvers to demonstrate actual air-ground operations and maneuvers. (35:9) Although his joint program was ambitious, it would take a far sighted man, like McNair, to get the air and ground elements of the Army to exercise their doctrine. If the Air Force would provide an Air Support Command to participate in these exercises, perhaps the Army and its Air Force could develop an effective close air support doctrine before troops landed in North Africa in November. Arnold had promised to cooperate fully with McNair in these exercises "to the full extent of availability of equipment, personnel, and air support units." (35:10) Shortages of equipment and inexperience of aircrews would limit the effectiveness of the Air Corps during these exercises. As Greenfield notes,

each Air Support Command had an authorized strength of 150 aircraft, most of these commands only had 53 aircraft available. (35:13) The following table depicts the types of aircraft available versus authorized allocations to support each Army Corps during these exercises.

AIRCRAFT AVAILABLE					
CORPS		PURSUIT/ ATTACK *	OBSERVATION/ LIAISON **	BOMBERS ***	TOTAL
I	Required	60	45	54	159
	Assigned	12	48	27	87
	Actual	7	28	18	53
IV	Required	48	36	54	138
	Assigned	--	53	27	80
	Actual	--	40	16	56
VI	Required	60	45	54	159
	Assigned	26	28	63	115
	Actual	13	13	38	64
VII	Required	48	36	54	138
	Assigned	8	35	18	61
	Actual	7	22	12	41
VIII	Required	60	45	54	159
	Assigned	2	48	7	57
	Actual	1	42	6	49

* High performance observation planes, both pursuit and attack aircraft

** Observation and liaison planes, used primarily as artillery spotters.

*** Bombers, both light and dive bombers.

SOURCE: Greenfield, Army Ground Forces and the Air-Ground Battle Team,
Army Ground Forces Historical Study Number 35, p. 14

TABLE 1: AVIATION IN SUPPORT OF GROUND FORCES, CORPS MANEUVERS,
12 JULY - 5 NOVEMBER 1942

From these figures, it is evident that Gen McNair was unable to effectively exercise and develop better coordination between our air and ground forces. One of the major reasons for the Air Corps inability to fully supply its Air Support Commands with enough aircraft to do their missions was our Lend Lease Program. As Brig Gen Kuter noted in the minutes of the War Department General Council on 7 September 1942, "The planes needed have been sent all over the world." The aircraft types, needed for effective air-ground training, "have been used as light or medium bombers," and no combat types of observation planes would be available for exercises with the ground forces until April 1943. (35:15) Without the adequate resources to conduct joint exercises, the Air Corps lost an excellent opportunity to improve relationships with its ground counterparts. Further, ground commanders would use this lack of support to reinforce their demands to control their own air assets when they engaged the German Army in North Africa. Therefore, we see that our lack of aircraft would support the "air umbrella" advocates within the Army. This attitude would lead to a complete breakdown of cooperation between our air and ground forces in OPERATION TORCH. It is also a paradox that Lt Gen McNair would be killed by a short bomb dropped during OPERATION COBRA in 1944. His efforts in 1941 and 1942, though commendable, would fail because of a lack of available aircraft and inexperienced Air Corps aircrews. Perhaps if the Army had paid more attention to its close air support mission during the early 1930s the aircraft and a well-defined doctrine would have been available to employ during these exercises.

SUMMARY

Experience in the First World War had proven that pursuit and attack aviation had been effective missions for an Air Force to perform. Yet during the interwar years, these missions would not be developed by the Air Corps. Although it stressed the importance of close air support as the primary air power mission and noted the importance of command of the air to controlling the battlefield, the Army and the War Department ignored the Air Corps and permitted it to develop its force structures and our strategic bombing doctrine in isolation with little interference from the Secretary of War until 1938. Although the First World War did not prove that strategic bombing could be an effective mission for air power, Hugh Trenohard, Billy Mitchell, and Giulio Douhet would propose how air power could win future wars. As a result, the Air Corps Tactical School, the intellectual center for air power doctrine, would stress the creation of a strategic bombing force capable of fulfilling Douhet's and Mitchell's air power concepts. During the interwar years, ACTS defined, practiced, and developed a coherent strategic bombing doctrine. Basically stated, this doctrine proposed that unescorted, pin-point strategic bombardment could destroy the "vital centers" of the adversary and would crush the civilian morale. These two results would compel our adversary to end the war. When in 1935, technology was available to build the B-17 and the Norden bomb sight, these bomber advocates would have developed a clear, concise theory of strategic bombing to effectively use this potent weapon system. The farsightedness of Hansell, George, Wilson, and Kuter remains the high tide of air power thought. However, these bomber advocates by stressing the role of the heavy bomber and strategic air power created an imbalanced force structure incapable of accomplishing every air power mission during the Second World War. What no one seemed to notice was how the Air Corps had thwarted the War Department's effort to develop a CAS force to support the ground forces. No procedures or common command relationships existed for large scale air-ground

operations. Both the Air Corps and the Army are at fault for not developing and exercising the force structures necessary to fulfill the CAS mission.

In sum, even though the ACTS was tasked to develop a balanced air force, it would not be able to do so because of four crucial factors: technological inadequacies in pursuit and attack aviation; austere budgets; institutional attitudes which reinforced their "group think" strategic bombing concepts; and finally, our lend lease commitments to England and our allies. As a result, the United States was not able to exercise nor to validate a clear, well-defined close air support doctrine. Therefore, we entered North Africa during OPERATION TORCH without the equipment and training to effectively employ a close air support doctrine, even if we had adequately developed such a doctrine. We would learn about close air support and develop our CAS doctrine in the crucible of war.

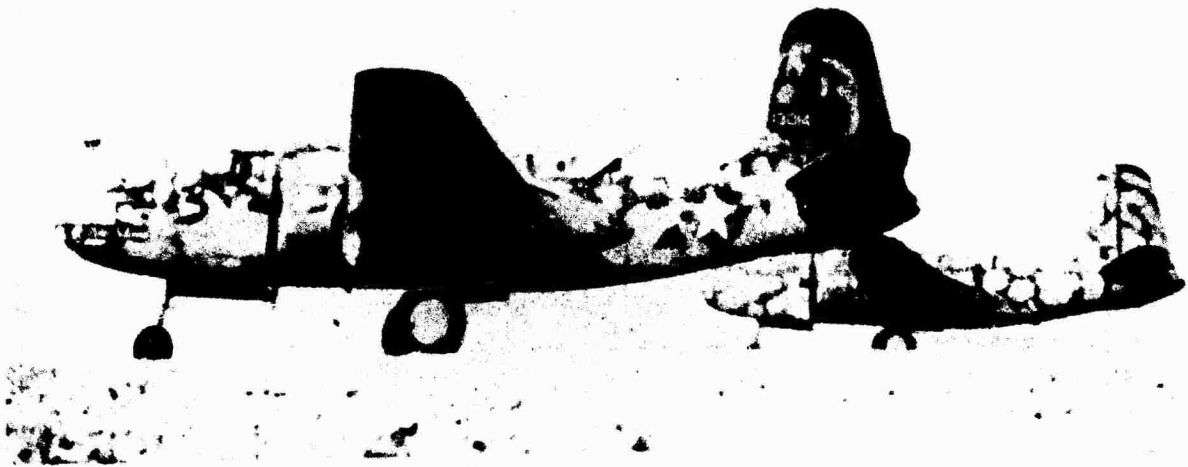


Figure 8: A-20 Aircraft in North Africa (USAF Photo)

Valid American air doctrine--understood, accepted, and followed--is one very important means of improving the chances that our country will be right the first time. And it is we American airmen, you and I who have the obligation of evolving and writing that doctrine. We have the obligation of guaranteeing that it is kept current and valid, and of doing our best to see that it is understood, accepted and followed.

. . . Lt Gen Laurence S. Kuter, in a speech to the
Air Command and Staff College on 9 November 1954

Chapter Three

CLOSE AIR SUPPORT IN OPERATION TORCH

The United States was ill prepared for war in 1942. Even though she had been able to mobilize her economy and to begin preparations for war prior to the Pearl Harbor disaster, the military was woefully inadequate to meet her needs. Lt Gen Brereton notes in his diary that at best America was "a third rate air power" when the war began. The entire Air Force on 1 October 1941 had only 64 first pilots and 90 copilots qualified for four-engine bombers; 97 first pilots and 108 copilots qualified for two-engine bombers; and 171 Pursuit pilots, not one person was qualified as a dive bomber pilot. (4:7) Many American officers had become peacetime soldiers concerned more with administration and drill than with "war fighting and war winning." When the American Army quickly expanded through conscription, these officers became the commanders and staff officers who directed America's military forces. Constrained by tight interwar budgets, the Army continually cut funds from its research and development programs. Consequently, the Army did not have modern tanks and aircraft; and it had not developed modern doctrines to employ these systems prior to the war. American combat units would feel the effects of this unpreparedness legacy until 1944. Finally, America did not have a well developed logistics base to produce modern weapons in 1939. It would take three years to develop the economic infrastructure to produce tanks, aircraft, and ships needed by the American military forces during the Second World War. Such was the situation when American forces were committed to OPERATION TORCH on 8 November 1942.

Although the United States did not have a well defined CAS doctrine when it entered the war, it could have copied the German, British, or Japanese models. Although tactical air power was still in its embryonic stage, the Spanish Civil War and the initial campaigns of the Second World War proved that tactical air power, especially CAS, was essential to successfully conduct a ground campaign. Lt Gen Elwood R. Quesada proposed in 1947 that three such models existed: the German Blitzkrieg, British cooperative model, and the Japanese model. (28:37-40) The German blitzkrieg concept most closely related to the United States Army doctrine outlined in WDFM 31-35. Under this concept, the Germans tied their tactical air power as an auxiliary to ground forces. During the interwar year, the Germans developed an effective close

air support doctrine both in the Spanish Civil War and honed this doctrine during the Polish and French campaigns. The one weakness of this doctrine was that it was a limited doctrine--limited in both space and time. The operational requirement to support ground forces caused German Luftwaffe leadership to develop a short range fighter force. These aircraft, the Me-109, Me-110, and Ju-87, could attack targets only within a range of approximately 250 miles. The one true advantage the Germans did have, however, was that they had created an effective organization and fluid communications which could quickly respond to Wehrmacht requests for CAS. During the North African campaign, Ju-87s, Me-109s, FW-190s, and Me-202s proved they could respond within five to ten minutes after receiving the CAS request. (47:32) However, the Luftwaffe's CAS doctrine placed primary emphasis on direct support for Wehrmacht ground forces within the battle zone; but ignored the effects of deep interdiction and isolation of the battlefield as proper means to support ground forces. (28:38) In short, the German model quickly and precisely attacked targets identified by the Wehrmacht. This narrow view of CAS assisted the ground forces, but ignored the proper missions of interdiction and isolation of the battlefield which might have quickly attained and maintained air superiority for German land offensives. The American Army leadership envied this close teamwork and wished the Army Air Force would follow this model.

The British experience in North Africa was entirely different. Having digested the lessons learned during the Battle of Britain, the RAF "constructed their philosophy on the foundation of air supremacy. They advanced the theory that air superiority must be established and maintained before a major ground campaign could be launched with reasonable assurance of success." (28:40) The RAF further espoused that tactical air power should "constitute a separate and distinct force, coequal but independent of the surface force." (28:40) The British desert experience proved that only by operating air and land power as equals had air power been able to effectively accomplish its air supremacy and deep interdiction roles. This relationship created a satisfactory environment for successful air-ground cooperation necessary for victory. American strategic observers attached to Middle Eastern Air Force from January 1942 until TORCH would learn these lessons and would attempt to implement them into American CAS doctrine prior to TORCH.

The Japanese model was an extremely effective example of how tactical air power could be employed. According to their doctrine, the Japanese gave preeminence to the air superiority and counter air functions. The Japanese had also noted the effectiveness of the RAF Fighter Command during the Battle of Britain, and attempted to create an air force capable of winning and maintaining air superiority before any land campaign commenced. (28:39) Although the Japanese had an effective doctrine for tactical air power, they did not correctly implement that doctrine during the Second World War. They continually violated the fundamentals of airpower by defending low priority targets with an over abundance of aircraft and air power. As a result, they misapplied the bulk of their air forces, continually overestimated the worth of a target, and showed a lack of appreciation of the timely nature of tactical air power. (28:39-40) These three factors would cause the eventual demise of the Japanese Air Force, particularly after the American logistical base began to out produce Japan in 1943.

As noted, tactical air power theories and CAS doctrines had been perfected by the Germans, British, and Japanese prior to America's entrance into the war; yet the United States military had not properly assessed this experience, nor changed its CAS doctrine prior to TORCH. The dull routine and the isolationist sentiments of the interwar years had created a group of Army officers who had not truly developed their professional expertise. These officers failed to study tactics, to note tactical developments, or to think about how the Army would be used in the next war. In short, these officers were intellectually unprepared for the staff and command responsibilities which they would assume after Pearl Harbor. Lt Gen Quesada paraphrased this situation: "We were terribly unprepared for war -- mentally and physically. American Airmen came to North Africa with poor equipment, little training, and an unsound tactical air power doctrine. . . . [but] we arrived in Africa with an abundance of ignorance." (63) In a true sense, these officers were no more prepared for command than the conscripts they would command. North Africa would be a true proving ground where these officers could develop their leadership and staff skills. As a group, American airmen were better prepared for the Second World War than were their other Army counterparts. The ACTS, although not perfect, had at least created an intellectual elite, schooled in the principles of air power, to lead the Air Corps.

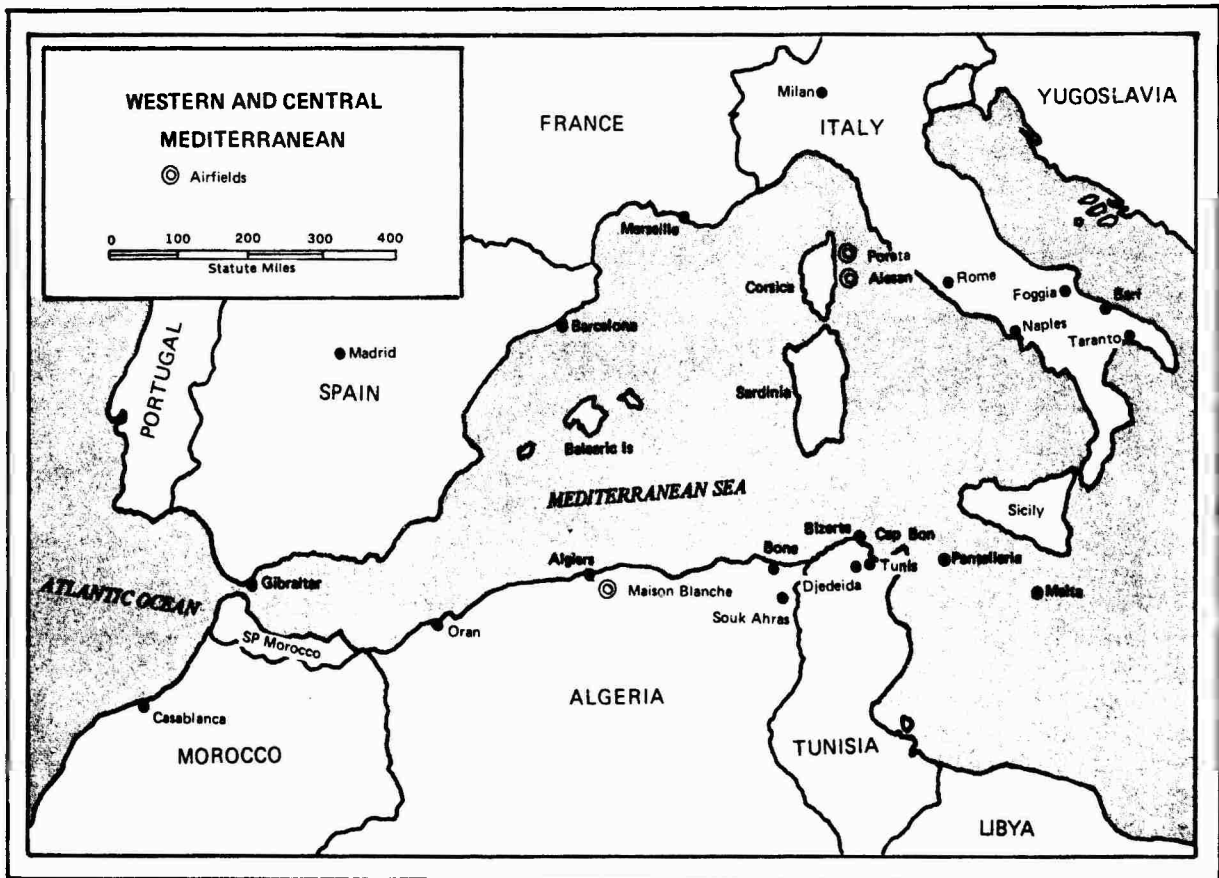


Figure 9: Western and Central Mediterranean (2:28)

America's involvement in North Africa can be divided into three distinct phases: Middle Eastern Air Force (MEAF) from January to November 1942; from the initial invasion in November 1942 to the Kasserine Pass disaster in February 1943; and the reorganization phase from Kasserine Pass until the German withdrawal in May 1943. Each phase would have its own unique problems. During the first phase, Maj Gen Brereton, Commander of MEAF, and his forces would assist the RAF to support the British Eighth Army. These American airmen flew Spitfires and Hurricanes, since no American aircraft were yet available. It was during this period that the Army Air Corps would be exposed to the advantages and disadvantages of the British tactical air power doctrines. Under the guidance of Air Vice Marshal Arthur "Maori" Coningham, the Americans would learn to accept the British three tiered priority system. Under this system, air superiority was the primary role of air power. Nothing else would be done until "command of the air" was won. After winning air superiority, air forces could then shift to deep interdiction campaigns to isolate the battlefield. During this phase, enemy lines of supply and communication were cut, and battle area interdiction would begin. Only after the first two phases had been successfully completed, would the RAF shift to close air support for the Army ground forces. Employing dive bombing and strafing attacks, aircraft would use radar and constant communications to effectively assist the ground forces as an air-ground team -- a team of equal and independent elements. It was from this experience that American air commanders drew their principles and concepts of air power prior to TORCH. During the second phase, operations would be conducted according to the doctrine outlined in WDFM 31-35 discussed in Chapter 2. However, before reviewing this phase, a discussion of American grand strategy and the decision to participate in TORCH is appropriate.

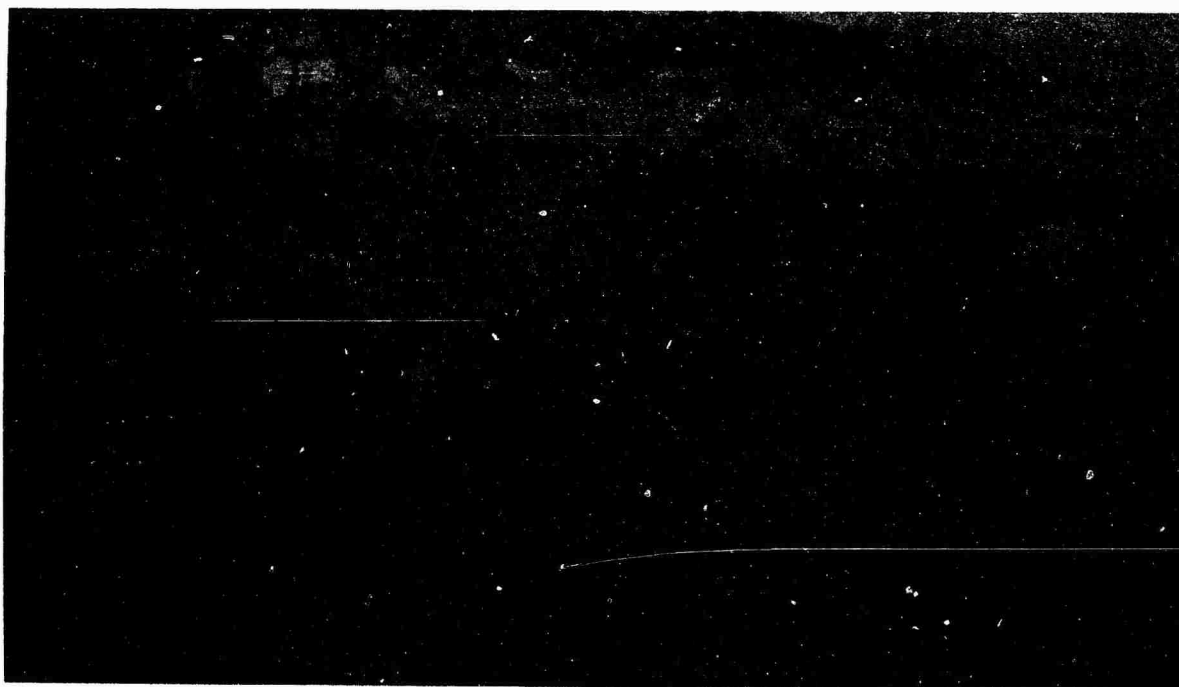


Figure 10: American Troops Landing in North Africa (USAF Photo)

WHY INVADE NORTH AFRICA?

There were three major reasons for committing American forces to battle in North Africa, but RAINBOW 5 was the primary reason. This grand strategic statement clearly defined that America's primary objective in the Second World War was to destroy Germany first. Since she was the strongest member of the Axis Alliance, American planners believed Germany's military and its industrial support base should be destroyed first. This policy statement also committed the United States to a strategic defensive posture in the Pacific. Yet the American military would not be ready to fight for many months after Pearl Harbor.

It would take our military almost a year after Pearl Harbor before American forces landed in North Africa. When the Second World War began, the United States Army consisted of approximately 300,000 soldiers and airmen. This force would swell to over 7 million men by 1944. To mobilize and train this force would be an unparalleled task. During the interwar years, our Army had forgotten how to train, to mobilize, and to deploy troops. A year was needed to mobilize, train and deploy America's new conscript army to North Africa. (19:229) Since Admiral Nimitz was now ready to commence his assault across the Central Pacific towards Japan in November 1942, many Army planners believed if American ground forces were not quickly committed in Europe, President Roosevelt might shift his attention from Europe to the Pacific as the battle for Guadalcanal was at a critical stage. On 24 October 1942, President Roosevelt sent a Memo to Gen Marshall and all the Joint Chiefs which asked for an increased priority for the Pacific War. (1:355) As a result, Army planners pushed for some action in Europe to show our support for Churchill and Stalin.

Second, Stalin demanded that the Anglo-American coalition open a second front. He hoped this threat would force the Germans move over 40 German divisions West. By August 1942, the German Sixth Army had advanced to Stalingrad; captured all of the Ukraine and most of the Caucasus; and destroyed most of Stalin's Army. Things were extremely desperate for the Red Army on the Eastern Front. Therefore, any Anglo-American attempts to open a second front in the West would assist Stalin to stop the German onslaught. Additionally, there was the possibility Germany might win on the Eastern Front in 1942. If she was victorious, she could redeploy her forces to the Atlantic to stop any future American and British invasion. This second front pressure convinced many American and British planners to support OPERATION TORCH.

Finally, although Gen Marshall and his planners favored a cross channel invasion into Northwest Europe, the United States did not have the forces or equipment to accomplish this strategy in 1942. The lack of realistic exercises and insufficient efforts to develop mechanized and air power doctrines during the interwar years caused American military planners to support a smaller operation while America prepared for a cross-channel invasion in 1943. North Africa could be used as a proving ground for our equipment, as an area to develop confidence in our leadership, and as a laboratory to hone and perfect modern doctrines. In summary, the synergistic effect of these three factors -- RAINBOW 5, the need for a second front, and a proving ground for our forces and equipment -- led Marshall to reluctantly

commit American forces to OPERATION TORCH.

IMPORTANCE OF OPERATION TORCH

TORCH would set the tone for Anglo-American strategy for the remainder of the war. This campaign was the first attempt by the Anglo-American coalition to conduct combined strategy and operations. The lessons learned during TORCH would define Allied organization, operational procedures, and doctrine for the remainder of the war. Allied failures in North Africa would teach the Americans and British invaluable lessons about mechanized and air warfare. TORCH would also cause our leaders to develop more realistic training programs for our forces, to better forecast logistical support, and to test our weapon systems in actual combat. Drawing upon our wartime experiences during the Casablanca Conference in January 1943, American and British political and military leaders would create an effective combined staff to direct the war, would define our grand strategy, and would establish proven air power doctrines. As a result, the Combined Chiefs of Staff would have a well-defined grand strategy, strong logistics base, and validated doctrines to employ its air, ground and sea forces in Europe from 1943 to V-E day.

Yet, OPERATION TORCH was a tremendous gamble. How would America get her troops across the Atlantic Ocean without being noticed, and possibly sunk, by German U-Boats? When these troops arrived, would the American Army have enough force to assault the beach, penetrate inland, and fight an offensive campaign against Rommel's Africa Korps? How would the United States sustain her forces logistically after the invasion? What would be the quality of her conscript forces and peacetime soldiers in combat? (59:21-2) These questions and others, plagued Marshall and his staff. It is apparent from these questions that American planners were not confident the Allies could win this campaign; yet it was time to commit American forces to battle in Europe.

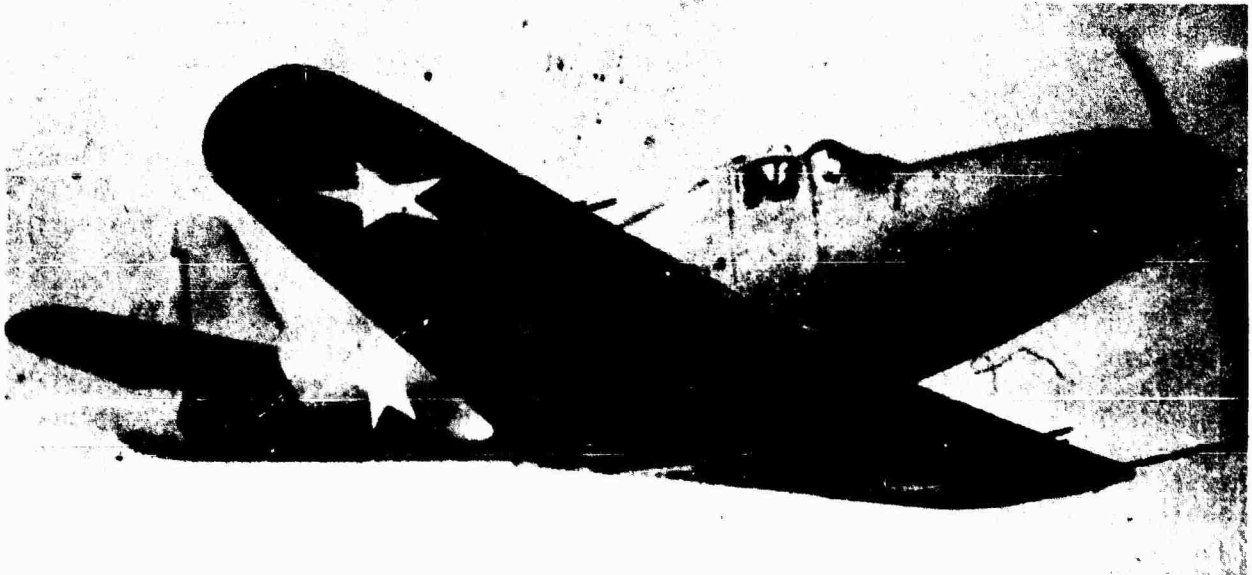


Figure 11: P-39 in North Africa (USAF Photo)

FOG AND FRICTION IN NORTH AFRICA

Air-ground coordination during TORCH was further hampered by three problems: weather, poor communications, and inter-arm prejudice between ground and air units. Weather in North Africa in the Fall of 1942 was not conducive to flying. The tremendous amounts of rain in North Africa turned sand runways and roads into quagmires. Often pilots would be able to land their aircraft, but would be unable to taxi clear of the runway because of the deep mud. Eisenhower and his staff attempted to solve this problem by using metal matting which could stabilize the surface. After prolonged periods of rain, these types of runways would sink into the mud. Additionally, our logistics system could not provide enough metal matting to build sufficient runways close to the front. Therefore, Air Corps aircraft operated from airfields over 100 miles from the front. The Army Corps of Engineers would have to build all-weather runways before Allied air units could properly accomplish their missions along the front. Gen Arnold believed the battle for the airfields dictated the whole North African Campaign. The all-weather airfields were not to be destroyed, but to be captured by ground forces so the Air Force could better accomplish its CAS and counter air missions. (1:326) This lack of forward airfields further exacerbated the short-range, short loiter time fighters had available in North Africa, and dramatically decreased XII ASC's ability to provide close air support for our ground forces. (59:22) Flying from their primary airfield at Bone, Allied fighters flew 114 miles to the front, had a loiter time of ten to fifteen minutes, and then had to return to base to refuel. (47:23, 25) In sum, "General Mud" became a major impediment to employment of Air Corps assets from November 1942 to February 1943.

Poor communications further eroded effective air-ground support efforts in North Africa. Communications between ground and air commanders were infrequent, primitive, and not time sensitive. Due to the organizational arrangement (see Diagram 1) used in North Africa, ground commanders directly communicated requests for close air support to the Air Liaison Officer (ALO) assigned to his headquarters. Because of overcrowded phone lines, these ALOs would often send a message, via motorcycle, to the pilots outlining the target and its location. (7:127) The fighter-bomber pilot would launch and then attempt to hit his target. In mid-December 1942, American air and ground units in North Africa possessed no Direction Finding equipment, radio range, or beacon equipment to control or direct their aircraft. (7:127, 90) Additionally, aircraft sent out to attack CAS targets had no means of communicating with the ground forces. (25:173) Unable to accurately define battle lines, to correctly identify friendly forces, or to accurately attack their targets, Air Force aircraft would often bomb or strafe friendly forces. (35:45) As a result, many AA gunners would shoot down any aircraft in their area. No radar net had been established to assist pilots or gunners to discriminate their targets. (27:189) Since many of these gunners had received no aircraft identification training, they often could not distinguish between friendly and enemy aircraft. The result was that many Allied fighters were shot down by their own ground forces. (35:69-70) This problem, directly attributable to lack of training and poor communications between ground and air forces, further increased the mistrust which existed between air and ground forces. Lt Gen McNair, Commander of Army Ground Forces Command, would

implement programs to improve aircraft identification and to improve air-ground cooperation during 1943, so that units arriving in the theater could avoid these problems. However, the real solution would not occur until the Air Staff permitted local units to schedule exercises and unscheduled training activity with ground forces after August 1943. (35:39) In sum, the lack of communications equipment and the inability to coordinate air-ground missions dramatically impacted upon the Air Force's ability to assist ground units during TORCH.

Four major factors further complicated Marshall's decision to use American ground forces in North Africa: insufficient training, equipment shortages, invalidated/incomplete doctrinal development, and unfamiliar desert conditions. Over 75% of Air Corps personnel came to North Africa either untrained or partially trained. This sad legacy of American isolationism would limit the Air Corps capability throughout TORCH. (7:59) Ground commanders suffered the same training weaknesses. Over 30% of the soldiers assigned to the 168th Infantry Division were militia men from southwestern Iowa; 200 of these men were reported missing in action during the first day after Rommel attacked this unit at Kasserine Pass. (19:240) Senior American commanders had never commanded any unit larger than a battalion prior to TORCH. Therefore, the myriad of larger unit administrative and organizational problems created would have to be worked out during combat. Additionally, many aircraft, such as the P-39, had not undergone sufficient prototype testing prior to their use in combat. (7:141). Even those aircraft which had been sufficiently tested still remained question marks for American planners. How would the P-38 prove itself against the Me-109? The military staffers and pilots truly did not know if our equipment could match the performance and maneuver standards of current European aircraft. In short, inexperienced aircrews and unproven American aircraft would have to prove themselves in North Africa. It was these factors which would cause many of America's initial failures during TORCH.

Equipment shortages continually affected cooperation of air and ground forces in North Africa. Maintenance officers soon found that the desert was inhospitable to aircraft. The blowing sand permeated every part of an aircraft and created unexpected maintenance problems which had not been forecast by the logisticians. (7:162) Combat damage, lack of spare parts, and desert conditions would quickly reduce operational readiness rates in Air Corps units to less than 50%. (7:36) For example, when Gen Arnold visited these units after the Casablanca Conference, only 90 aircraft were available to these three groups, even though each group was authorized 80 aircraft each. Arnold further made a note to improve and simplify our supply system when he returned to Washington. (1:401) In his memoirs, Arnold stated that "logistics were my biggest headache during the war." (1:305) These equipment shortages would affect the Air Force's ability to project air power against the Germans.

Additionally, America did not have a system to resupply or to deploy additional aircraft to North Africa. Each fighter unit deployed to North Africa brought spare parts and additional support equipment for two months combat operation. (47:1) However, these units had difficulty replacing combat and training aircraft, and aircrew losses. Often parts were cannibalized off one aircraft to keep other fighters airworthy. Since

American fighters had only a short-range capability of about 240 miles, these aircraft had to be delivered by ship or flown across the North Atlantic. Often, aircraft carriers, like the USS Ranger, were used to ferry P-40s and P-47s to a point off the Moroccan coast, where these aircraft would launch into the theater. General Arnold's staff also developed in 1942 contingency plans to use refitted cargo and tanker ships to carry aircraft to North Africa. (7:131; 1:401-2) An attempt to fly P-39s to Africa from England in January 1943 highlighted the short range of our fighters. Ten of the 28 fighters were forced to land in Portugal due to insufficient fuel. These aircraft were grounded by the neutral Portugese until after the war. (1:396) Despite these efforts, air commanders in North Africa never had enough aircraft to sufficiently accomplish their objectives until after March 1943 when an American logistical support system finally developed. This shortage of equipment would force Air Force commanders to demand that air power resources be tightly controlled and used only against major targets.

The American Army and its Air Corps entered North Africa without a well-developed CAS doctrine. Ground commanders continually stressed that air power was subordinate to ground power. WDFM 31-35, dated 9 April 1942, supported this position. It stressed that the Air Force was subordinate to the demands of the ground commander. It proposed that each Air Service Command (ASC) be attached to a ground unit, and that these air assets be allocated according to the will of the ground commander. As such, the air commander became a staff member, rather than an equal adviser, to the ground commander. (47:1)



Figure 12: P-40 in North Africa (USAF Photo)

MISAPPLICATION OF AIR POWER IN NORTH AFRICA

This doctrinal position, taken in WDFM 31-35, negated the two key advantages of airpower: flexibility and concentration. Ground commanders would often use scarce fighter and fighter-bomber assets in "air umbrellas" meant to cover ground movements and protect ground forces from enemy fighter activity. In practice, American experience with "air umbrellas" invalidated this WDFM 31-35 concept. To constantly provide cover over all Allied ground forces required Army Air Force pilots to continuously fly overhead each army formation in the theater. This practice diluted the concentrated firepower of Allied air power and gave the initiative to the Luftwaffe. So instead of protecting ground forces from German air attacks, "umbrellas" wasted vital air assets "waiting for something to happen." A report from Twelfth AF to General Arnold, dated 18 February 1943, highlights this problem.

On the 2d, XII ASC suffered serious losses in attempting to cover the wide front. The 33rd Group was severely taxed to provide the umbrellas and at the same time escort the bombers of the 47th and the P-39s of the 68th Observation Group, one squadron of which had arrived at Thelepte late in January. The first cover mission, 6 P-40s and 4 P-39s, encountered 20 to 30 Stukas escorted by 8 to 10 ME-109s over Sened Station. Although one JU-87 was destroyed, five P-40s were lost. Another reconnaissance mission of six P-40s and four P-39s which went out to the Kairouan area met four to six FW-190s and destroyed two, but two P-40s crash-landed in enemy territory and a P-39 was reported missing. The 47th caused a large explosion in a bomb dump on one occasion and failed to find the target on another mission during which two P-40s were lost fighting off a half-dozen ME-109s. (47:20)

Gen Eisenhower's "Report to the Combined Chiefs of Staff on Operations in Northwest Africa" further noted other problems with the air umbrella concepts demanded by his field commanders.

By late November it became evident that the enemy was present in Tunisia in considerable strength, and that he intended to stand and fight on the entire front. . . . British Spitfires could fly over the lines for not more than five to ten minutes, and the few P-38s available were insufficient to furnish continuous patrols. German Ju-87s were close to the front, and the extraordinary coordination of German air-ground communication made the enemy's air support available in the front lines within five to ten minutes of the demand. Under such conditions, German aircraft merely fled at the approach of Allied planes, and returned easily to the assault when the skies were clear. (47:20)

Brig Gen L. E. Oliver best summarized this situation on 5 February 1943. He told Army intelligence officers that "The air arm was unable either to protect allied ground troops from dive-bombers and strafing or to attack enemy ground troops holding up allied advance." (57:3) A breakdown of sorties flown by the XII ASC from 29 January to 4 February 1943 shows that 154 cover missions and 120 reconnaissance missions were flown, but no fighter sweeps were

attempted. The results were that XII ASC lost 24 aircraft in combat, while destroying only 8 enemy aircraft. (47:26) In a letter to General Hap Arnold, dated 12 May 1943, Brig Gen Kuter noted

Throughout the winter, the Allied strength in aircraft in Northwest Africa consistently exceeded that of the Axis. However, the superior air power inherent in our numerical advantage was never developed or exploited. The enemy was permitted to move, in lightly escorted and unarmed transports, as many as 1000 men per day from Italy and Sicily to airdromes in Tunisia which were only 80 miles distant from our own air bases. By air and by sea the enemy transported about 150,000 men with their armor and equipment and supported and then maintained them almost wholly from airdromes and seaports within range of Allied air forces. At the same time the enemy was steadily building up his air strength. During February it reached an average of 600 fighters, almost equally divided between Tunisia . . . Sicily . . . and Sardinia, with a total force of 1300 aircraft. During March this force rose to a total of 1375, including 685 fighters. . . . While the enemy buildup proceeded virtually unchecked, the sizeable forces of 242 Group and XII Air Support Command were occupied mainly with land targets in the battle area. Each ground commander naturally viewed the ground as well as air operations on his immediate front as of paramount importance and insisted that the air forces in his area be employed almost exclusively on his front. Each commander agreed that air superiority was necessary, but that the air war which could gain that superiority should be fought by someone else's air force. In contrast, the Axis air forces were moved freely up and down the front and were ordinarily able to strike in force against only such opposition as the Allied local air units could muster. From the point of view of the ground commander, the condition was habitually too precarious on his immediate front to permit "the diversion of air units allocated to support his ground forces from their direct support tasks to distant air force missions." . . . Because of such commitments and restrictions, XII Air Support Command was unable to develop anything resembling its offensive potential. Even the theoretically primary mission of direct attack in the battle area was inadequately fulfilled because of the constant employment of fighters in defensive tasks such as protective cover for the frontlines and escort. . . . From 13 January, when the Command became operational, through 14 February, nearly one-half of the total sorties flown by XII Air Support Command (880 out of 1801) were flown in support of reconnaissance, bombardment, or strafing missions. During this period, reconnaissance missions were numerous while only 18 missions of 172 flown were flown on fighter sweeps. (47:28A-28B)

In short, the defensive nature of the air umbrella concept stripped air power of its flexibility and its ability to concentrate its power upon the crucial targets within the North African Theater.



Figure 13: Brigadier General Laurence S. Kuter, Deputy Commander Northwest African Tactical Air Forces (USAF Photo)

Yet Army ground commanders were also disenchanted with the level of air support provided so far in North Africa. Many ground commanders believed that Air Corps officers were more interested in independence than in fulfilling their counter air and close air support missions for the Army. This key perception came from their experiences in the 1941 joint-corps level exercises in Louisiana and the Carolinas and the Air Corps commitment of its funds to the strategic bombing mission. The inability of the Air Corps to effectively protect American ground forces during the Tunisian campaign would further reinforce these fears within the Infantry. Further, although regulations stated that one Air Support Command would support one Army Corps, many ground commanders came to believe CAS aircraft would be more plentiful. During the 1937 and 1938 exercises, the Air Corps sent an ASC to participate in a Division level war game, the key ground commanders, Bradley, Friedendall, and Patton, would use this level of support as a benchmark by which to judge air support in North Africa. However, by regulation, this one ASC would support four divisions during combat. In short, many ground commanders had unrealistic expectations about how much air support they would receive. Thus, when they received less support in North Africa, they began to question the sincerity of air commanders' support for ground operations.

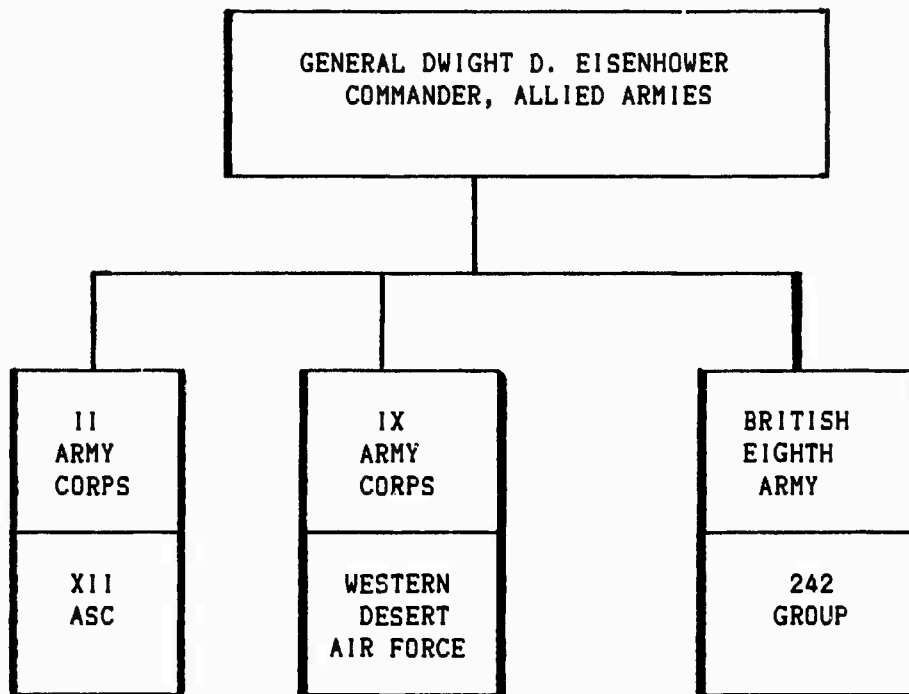


DIAGRAM 1: ALLIED ORGANIZATIONAL ARRANGEMENT PRIOR TO THE CASABLANCA CONFERENCE

DIFFERENT CAS PERSPECTIVES: THE ARMY VIEW

The entire American mobilization process was hasty, ill conceived, and haphazard. Not only did the United States enter the Second World War without a clearly defined CAS doctrine, but it had not developed through exercise or emulation, an organization capable of providing effective communications between the air and ground forces. Institutional biases within both branches, equipment shortages, inexperienced commanders and troops, and weather all combined to further cripple efforts to create an effective CAS team. These factors also reinforced the prejudices of the airmen and soldiers and caused each group to suspect the professional motivations of the other group. The entire experience from the initial landing at Casablanca and Oran in November until the Kasserine disaster in February 1943 was an antagonistic, adversarial relationship. The unsound organization, outlined in WDFM 31-35 (see Diagram 1); ill defined CAS doctrinal principles; and misapplication of air power principles, characteristic of this second phase, would demand that major organizational changes be implemented after the Casablanca Conference in January 1943. To understand the extent of uncooperation which existed during this second phase, both the Army and Army Air Forces viewpoints must be defined.

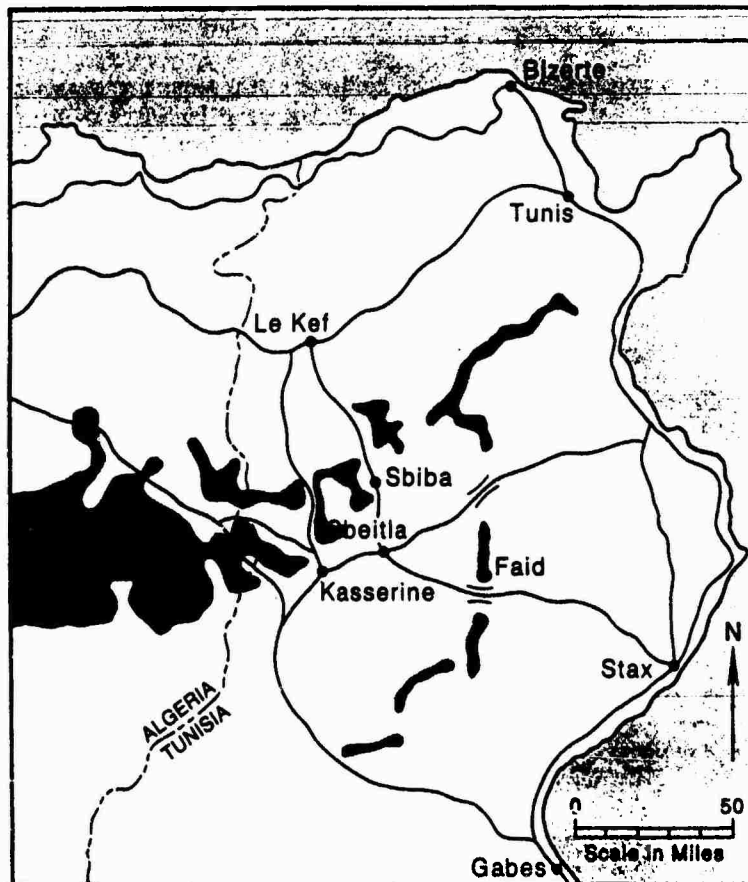


Figure 14: Area map of Tunisia, Faid and Kasserine Passes (19:244)

Rather than understand the problems which plagued air missions, ground commanders used these problems as a means to justify their complaints about an Air Force bias for strategic bombardment instead of CAS. These commanders would quote WDFM 31-35 to show how the Air Force was not meeting its obligations. In a letter to Gen Marshall, Brig Gen Paul M. Robinett, Commanding General, Combat Command B of the 1st Armored Division, succinctly paraphrased the views of his fellow ground officers:

My regiment has fought well, has had rather severe losses, but can go on. I have talked with all ranks possible and am sure that men cannot stand the mental and physical strain of constant aerial bombing without feeling that all possible is being done to beat back the enemy air effort. News of bombed cities or ships or ports is not the answer they expect. They know what they see and at present there is little of our air to be seen. (35:19)

This statement highlights the perspective problem which existed among air and ground commanders in North Africa. The ground commanders viewed the campaign from a narrow perspective. They saw the enemy opposite their line, noted how his Ju-87s and Me-109s could respond quickly to assist ground operations, and questioned why they did not have their own air force to defend themselves from this menace. Failing to note the lack of equipment, poor bases, effect of bad weather, and the effect of insufficient spare parts upon the Air Force, they began to question the will of the Air Corps to provide adequate air cover for ground operations. Assistant Secretary of War, Mr McCloy summarized this attitude succinctly:

It is my firm belief that the Air Forces are not interested in this type of work [CAS], think it is unsound, and are very much concerned lest it result in control of air units by ground forces. Their interest, enthusiasm and energy is directed to different fields [strategic bombing]. . . . what I cannot see is why we do not develop this auxiliary to the infantry attack even if it is of lesser importance . . . It may be the wrong use of planes if you have to choose between the two but to say that air power is so impractical that it cannot be used for immediate help of the infantry is nonsense and displays a failure to realize the Air's full possibilities. It is just as bad as was the tendency of the Ground Forces, some time ago, to confine air operations to such work. (35:50)

These ground commanders ignored the lead time needed to produce the aircraft, train the crews, and deploy them. The Army Air Force had not developed attack aviation to the same level as it had strategic bombing. Therefore, these aircraft would have to be designed, tested, and then sent to the front -- this was a very time consuming process. In sum, the grandiose plans described by these commanders were both unrealistic and infeasible in 1942. The Air Force would not be able to provide this level of support until July 1944 after the aircraft production facilities were built, pilots were recruited and trained, and the base infrastructures were prepared to house these forces. However, the demands for "air umbrellas" over ground advances would remain a constant cry throughout the war.



Figure 15: An inviting target: Rommel's aircraft around Tunis
(USAF Photo)

THE AIRMAN'S PERSPECTIVE OF CAS DOCTRINE

Air commanders had a broader view of the war. Instead of using aircraft in "penny packets" or "air umbrellas," air commanders demanded that air power be concentrated against major targets whose value dictated such an effort. In the early phases of the North African campaign, the Allied Air Forces did not have enough force to keep Nazi planes from attacking American troops. Although the Army Air Force enjoyed a two-to-one quantitative advantage over the Luftwaffe, it did not have enough aircraft to fight a defensive battle against the Germans. The front was too broad, all-weather runways too few, and communications too primitive to provide the "air umbrellas" required to intercept every German fighter. For example, at Faid Pass on 31 January 1943 most of XII ASC's operations were tasked to provide "air umbrellas" for II Corps -- solely a defensive mission. During the air battle which occurred, XII ASC lost 2 planes for each enemy aircraft shot down. On 2 February while attempting to umbrella the whole front, XII ASC lost 10 P-40s while shooting down only 2 enemy planes. (47:25) These types of campaigns demonstrated that air power was not being effectively employed. However, XII ASC had enough aircraft to assault and to destroy the Germans if its resources were properly employed. Having seen the effects of deep interdiction and isolation of the battlefield while assigned to RAF units during the El Alamein Campaign, senior airmen believed air power should be used to sever the lifelines to Rommel's Africa Korps. Through the destruction of his capability, rather than his will, the American airmen believed they could best support ground forces. Given the availability of bomber aircraft and the shortage of fighter/bombers in the theater, this strategy was probably more realistic.



Figure 16: North African Air Commanders (USAF Photo)
From J to R: AC Harry Broadhurst, AVM Sir Arthur "Maori" Coningham,
AM Tedder, and Brig Gen Larry Kuter.
(Photo from Kuter Papers, USAF Academy)

The British CAS strategy more effectively applied the principles of air power--flexibility, concentration, and offensive action. Trenchard, Mitchell, and Douhet's theories continually preached these key principles. To employ air power under the "air umbrella" concept noted in WDFM 31-35 violated the principles of flexibility and concentration -- crucial to successful air operations. Further, WDFM 31-35 directed that air support missions be directed offensively against enemy field fortifications, tanks and motor transport, but not against enemy airfields. Moreover, it directed that "enemy aircraft are not normally the object of attack by air support aviation." (Paragraph 26) Only "when other air forces are inadequate or not available [would] the destruction or neutralization of hostile aircraft and anti-aircraft by support aviation . . . be necessary." (47:19) Both the defensive doctrine of WDFM 31-35 and unsound organizational arrangements which were the doctrinal foundations of WDFM 31-35 caused Allied air power to be ineffectively used in North Africa.

To be effective, the airmen stated, air power must gain and maintain command of the air. Then, and only then, could air power be shifted to its secondary and tertiary roles: interdiction and close air support. By destroying the ships supplying North Africa, by destroying the airfields, and by deep interdiction, the second level mission could be achieved. Only then could air assets be committed to support ground commanders and their operations. The experience of the Royal Air Force and the MEAF, prior to TORCH, proved that this strategy was the proper way to use air power. Thus, both air and ground commanders took intractable doctrinal positions either for or against the "air umbrella" concept noted in WDFM 31-35. Only after the disaster at Faid and Kasserine Passes in February would true cooperation begin.

In summary, neither the Army nor the Air Corps was happy with way air power had been applied during the second phase of American involvement in North Africa. Army ground commanders still felt they had received inadequate cover from Stuka and German fighter attacks. Their preconceived belief that air commanders stressed strategic bombardment over CAS made it easy for ground commanders to question the sincerity of Air Force attempts to assist Army ground forces. As such, these infantry officers continually demanded more aircraft be used in "air umbrellas" to cover ground operations and to improve the morale of the soldier. The Air Force, on the otherhand, felt its resources were being frittered away "waiting for something to happen" in "air umbrellas" along the whole front. This defensive doctrine violated the principles of flexibility and concentration which permitted air power to accomplish its offensive thrust. Although the MEAF had been able to effectively use tactical air power to gain control of the air and to interdict deep targets along the lines of supply and communication, the XII ASC felt it had been hampered in its role to best protect and assist American ground commanders by accomplishing these two roles. Even though the Allies had a two-to-one qualitative advantage over the Axis Air Forces, the Allies had suffered a two-to-one loss rate during the second phase -- unacceptable losses given the long logistical route from America to North Africa. Paradoxically, the Army and its Air Force would have to divide their roles into independent commands before true cooperation would exist between Allied air and ground forces. Each independent force would be led by an air or ground commander whose professional training would permit him to properly

employ his forces in a CAS role. Only then would the Army and the Army Air Force establish an organizational system capable of providing joint planning and create an effective CAS doctrine. Through these two efforts, air and ground cooperation would improve. This radical reorganization would occur after the Casablanca Conference in January 1943.

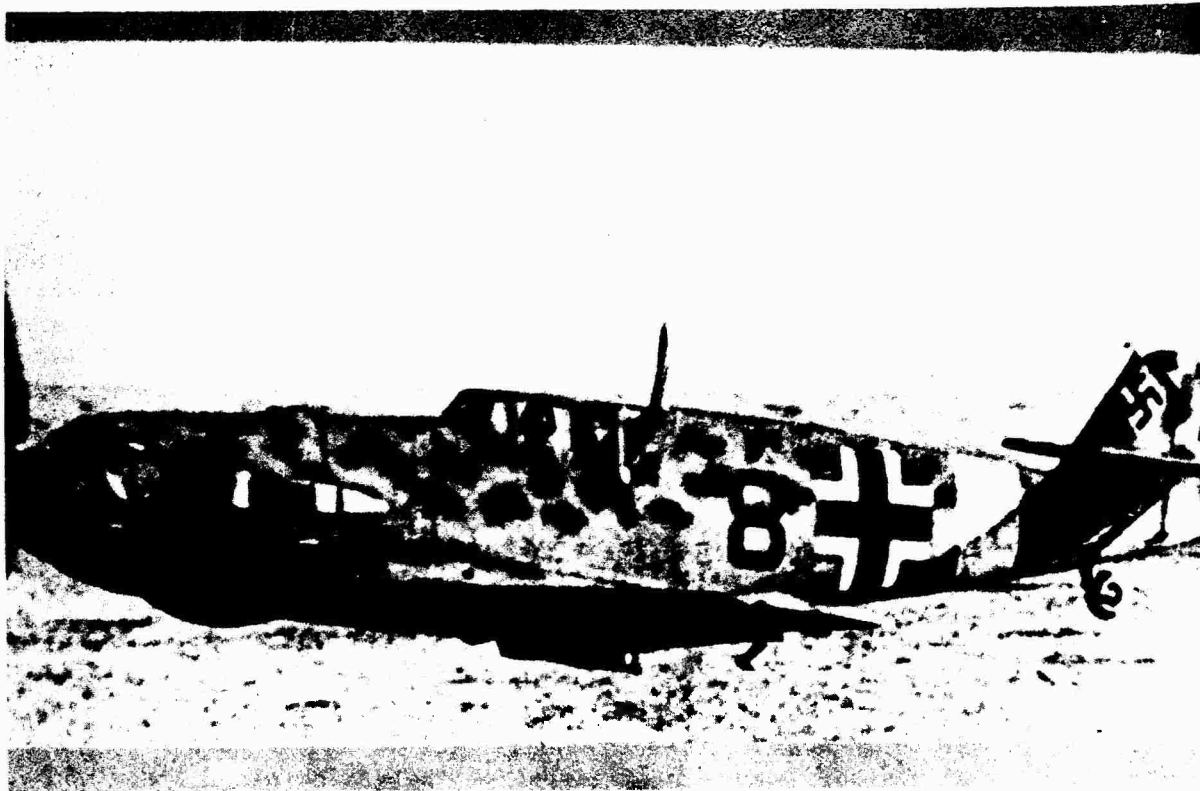


Figure 17: German Me-109 in North Africa (USAF Photo)

THE CASABLANCA CONFERENCE: EVOLUTION OF A COMBINED CAS POLICY

On 31 January 1943, President Roosevelt, Prime Minister Churchill, and their military staffs met at the Anfa Hotel for the Casablanca Conference, codenamed SYMBOL. It was here that Anglo-American leadership would define our grand strategy, hammer out organizational and military doctrines for strategic bombing and close air support, create the Combined Chiefs of Staff, and outline operations to be conducted in 1943. This Anglo-American Conference spelled out the organizational structures, grand strategic goals, and joint doctrines for strategic and tactical air power for the rest of the Second World War. As such, Casablanca was the most important Allied conference during the war.

At Casablanca, a unified CAS doctrine evolved. (2:30) Based upon the British experience in North Africa since 1940, this doctrine would be shaped by the thoughts of Air Vice Marshal Sir Arthur "Maori" Coningham and Field Marshal Bernard Montgomery. Employing the cooperation principles developed during the El Alamein Campaign, Montgomery and Coningham had become a very effective air-ground team. It was the principles of equality, flexibility, and concentration, proven by the Western Desert Air Force in 1942, which would become the foundation of Allied tactical air power. The key principles of air support defined by the Montgomery-Coningham team were:

1. Air and ground commanders must have their headquarters alongside each other and must work to carefully coordinate common plans of action toward one goal -- winning the battle.
2. The overall plan must conform to the air situation even if it involves the postponement or curtailment of the ground plan. This philosophy will result in fewer casualties and economy of force within the theater.
3. Once the joint air-ground plan has been decided and coordinated, the air commander must do his best to implement by correctly applying his forces to the key objectives and within the principles of air war.
4. The first aim of the Air Force Commander must be to gain the initiative and, with it, air supremacy over the battlefield. When he has achieved this goal, he can go ahead with the more direct support for the joint air-ground plan of operations.
5. The whole of the ground forces must thoroughly understand what air support means. They must realize that "out of sight" of ground forces does not mean that the ground forces or their needs are "out of the minds" of the airman. (47:49)

Coningham and Montgomery brought these key concepts to the Casablanca Conference where they eloquently proposed the acceptance of the British model of CAS by the newly created Combined Chiefs of Staff.

Field Marshal Montgomery believed land and air power were separate arms which should be controlled by the unique principles of each arm. He stated that

The soldier commands the land forces, the airman commands the air forces; both commanders work together and operate their respective forces in accordance with a combined Army-air plan, the whole operation being directed by the Army commander. (32:1)

He further defined the fundamental differences between Army and Air Forces which needed to be recognized by ground commanders.

The Army fights on a front that may be divided into sectors, such as a Brigade, Division, Corps or an Army front. The Air front is indivisible.

An Army has one battle to fight, the land battle. The Air Force has two. It has first of all to beat the enemy air, so that it may go into the land battle against the enemy land forces with the maximum possible hitting power. We have not, as yet, secured sufficient superiority to finish the air-to-air battle off completely, but have been pretty near it and we have been able to concentrate up to 80% or 90% of our hitting power on the enemy land forces.

The fighter governs the front, and this fact forces the centralization of air control into the hands of one air commander operating on that front. I think it is generally accepted that with adequate fighter superiority and bomber forces the air has a governing influence on what happens within reach on the ground and on the sea.

And finally, there is no doubt that in this technical age it needs a life of study and specializing for a sailor, a soldier or an airman to learn his profession. He is never free from the problems of development, particularly in war, and I therefore cannot accept the possibility that any man, however competent, can do the work of the other service without proportionately neglecting his own. In plain language, no soldier is competent to operate the Air, just as no airman is competent to operate the Army. (emphasis added) (32:1)

ORGANIZATION OF AIR FORCES AND ALLIED COMMANDS IN THE
NORTH AFRICAN THEATER
FEBRUARY 18, 1943

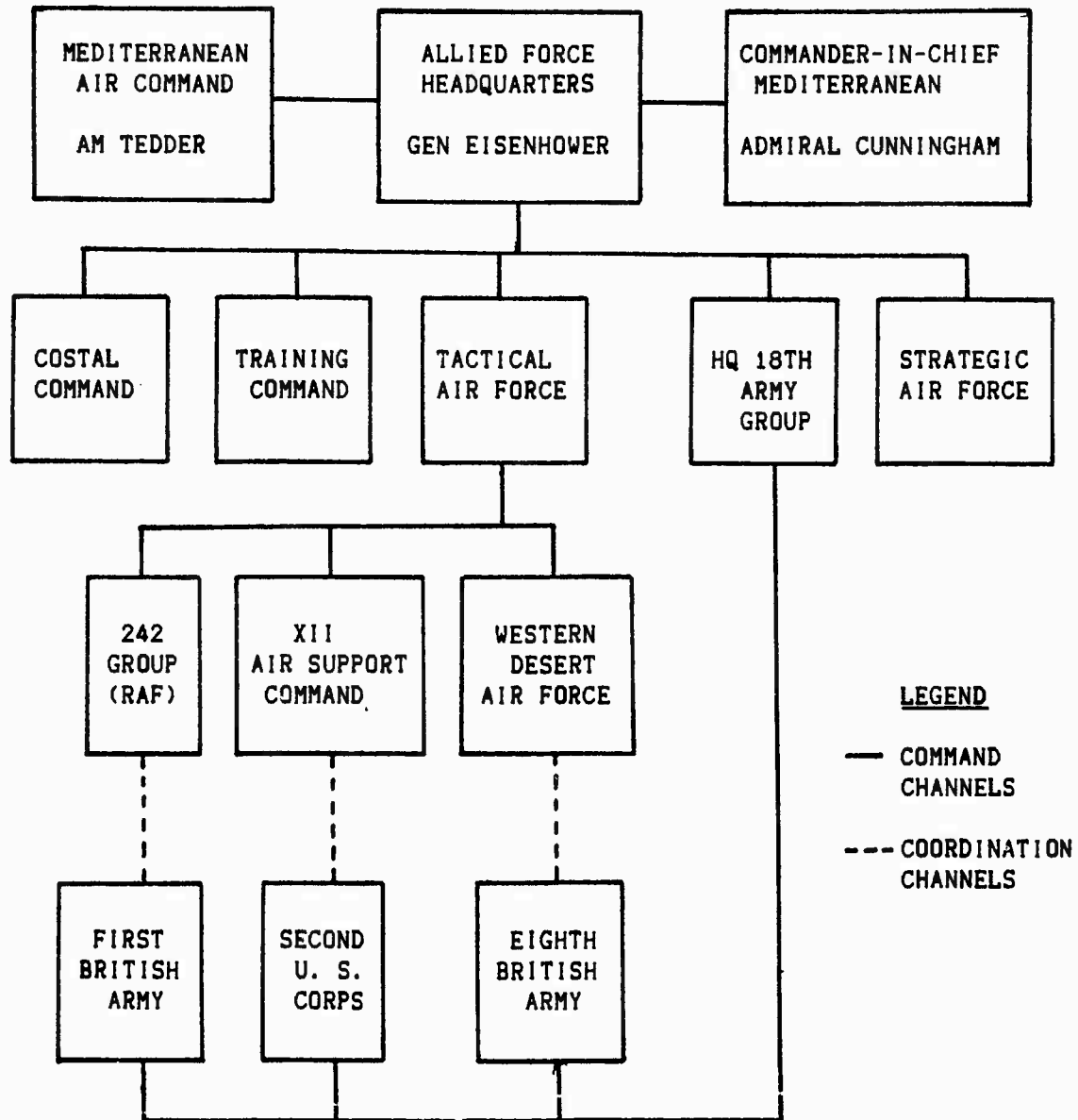


DIAGRAM 2: POST-CASABLANCA ALLIED ORGANIZATION

The Combined Chiefs of Staff (CCS) would accept these doctrines as the guiding organizational principles upon which to create a unified CAS doctrine in 1943. However, the equality of ground and air commander demanded that air and ground commanders be promoted to equal rank as their counterpart. This principle of coequality of land, air and sea power meant that three equal commanders would determine the military strategy of the Anglo-American forces. In practice, this equality assured that Gen Arnold would have to attain equal rank to his British counterparts. Further, the basic independent, but equal status afforded air power after Casablanca would establish a precedent for an independent Air Force in 1947. Diagram 2 depicts the organizational set up after Casablanca. Two key changes should be noted. Instead of separate British and American units, the CCS created the Mediterranean Air Command, led by Air Marshal Tedder. Under this organization was the Malta Air Force, Northwest African Air Forces, and Eastern Air Command. The Northwest Africa Tactical Air Forces was further split into functional air forces: Tactical Air Command, Coastal Command and Training Command. Finally, each agency of the Tactical Air Forces was married to an Army -- XII ASC to Second U.S. Corps; Western Desert Air Forces to the British Eighth Army; and RAF 242 Group to the British First Army. It was through these latter linkages the principles of cooperation would apply. These new organizations would be activated on 18 February 1943.

On 19 February, Air Marshal Coningham enunciated the key doctrinal principles for the Northwest African Tactical Air Forces in his General Operational Directive, dated 16 February 1943. Coningham's directive renewed the offensive spirit in his tactical air forces. His doctrine would be a familiar one to those experienced in the Western Desert Air Force Operations:

The attainment of this objective [maximum air support for land operations] can only be achieved by fighting for and obtaining a high measure of air supremacy in the theater of operations. As a result of success in this air fighting over our land forces will be enabled to operate virtually unhindered by enemy air attack and our Air Forces be given increased freedom to assist in the actual battle area and in attacks against objectives in [the] rear [areas]. . . . The course of action I propose to adopt to achieve this object are:

1. A continual offensive against the enemy in the air.
2. Sustained attacks on enemy air fields. (55:43;7-168)

With these pronouncements, Coningham abandoned the "air umbrella" desired by American ground commanders. He believed the only way to defeat air power was to destroy the aircraft available to the enemy. Rather than destroy these aircraft piecemeal, NATAF would assault supply lines from Italy and Sicily while simultaneously attacking enemy airfields by offensive fighter sweeps. Since the Germans did not make a provision for replacing their crews and planes in North Africa (1:370), this approach would erode German combat strength -- which would not be replenished. As a result, Allied quantitative advantage would quickly increase by this counter air strategy and our aggressive logistical resupply effort began in March. This approach also would maximize the potential of Allied limited tactical assets while forcing the Germans onto the defensive. In short, Coningham shifted the whole

emphasis of the air war from a defensive to an offensive strategy. He further defined his air power priorities as three clearly defined phases of air power. Phase I would be to gain air superiority; Phase II, to isolate the battlefield; and Phase III, to protect and aid ground forces in their land campaigns. Shortly after the reorganization, Rommel's Afrika Korps attacked II Corps at Kasserine Pass. This battle precipitated a crisis between air and ground commanders.



Figure 18: Air Vice Marshal Sir Arthur "Maori" Coningham
(Photo from Kuter Papers, USAF Academy)

When Rommel attacked at Kasserine Pass on 17 February, he caught the American II Corps totally by surprise. The inexperienced American troops were almost routed by the Germans. The entire mobilization process, including the organization and training of the American Army has been hasty, largely improvised, and incomplete. Only McNair's efforts to properly train and to identify weaknesses in Army doctrine saved the Americans from a major defeat at Kasserine. McNair's large scale Corps-level exercises in 1942 had revealed many deficiencies in basic infantry skills and basic command and leadership skills within the officer corps. Shortages of equipment and weapons further hampered the proper preparation of the American Army for this battle. Most American units would arrive in North Africa with only 50% of the allowed equipment. Non-combat units were lucky to arrive in theater with 30% of their allocations. (47:75) The rapid mobilization process left "insufficient time to permit individuals and units to acquire and become proficient in the doctrine, weapons, and equipment, and [to develop the] skills required" for modern warfare in 1942. (19:240)

Yet many American soldiers entered North Africa overconfident in their ability and unprepared for the battle-hardened German Afrika Korps they would meet at Kasserine Pass. Over 30,000 Americans were assigned to II Corps in the Kasserine area. During the battle, 300 died; almost 3000 were wounded; and nearly another 3000 were missing in action. It would take 7000 replacements to bring II Corps up to its authorized strength. (19:261) Yet

this significant defeat caused American Army leaders to reassess their mechanized and air power doctrines. In short, American soldiers at Kasserine paid with their lives the price of battlefield experience and insufficient training which became a legacy of our isolationist attitude during the interwar period.

Kasserine Pass would sound the death knell for the "air umbrella" CAS doctrine identified in WDFM 31-35. American ideas of time and space -- the two key factors in the strategist's equation -- would have to change. The American Army still approached the Second World War with a limited perspective of modern warfare. Without adequate training in modern air and mechanized doctrines, ground commanders viewed time and space as they had in 1918. The failure to develop modern tanks and aircraft, the failure to adequately develop modern CAS and mechanized doctrines, the inability to exercise corps-level units prior to 1941, and the lack of professional development of the Army officer corps virtually guaranteed that America would fail at Kasserine Pass. The Army would have to adjust to the increased tempo and breadth of the modern battlefield. American leadership and manpower had the potential to excel, but it would take the stark reality of the organizational and doctrinal weaknesses underscored by the Kasserine defeat to force needed reforms and modern doctrines upon the American Army. (19:240) The American Army quickly assimilated these key lessons and developed modern mechanized and CAS doctrines during Phase III of the North African Campaign.

The newly created NATAF was unable to fully use its resources during the first two days of the Battle for Kasserine Pass. Plagued by unflyable weather, poor airfields, logistical constraints, and poor communications with II Corps, NATAF CAS efforts were inadequate to meet the German threat. When the weather cleared on 20 February, Coningham sent every fighter and fighter-bomber assigned to 242 Group, XII ASC, Coastal Command, and the Western Desert Air Force to attack Rommel's tanks in the Kasserine Pass. Assaulting the Germans from five different sectors simultaneously, the NATAF forced the Afrika Korps to retreat. (55:40) The Battles at Kasserine and Faid Passes substantially reduced the striking power of NATAF. As of 27 February, only 352 fighter and fighter-bomber aircraft were available to Coningham and NATAF. With an operational readiness rate of 35%, NATAF could only use 123 aircraft for its early March operations against the Luftwaffe. (47:11-15) By mid-March, spare parts and new aircraft began to arrive in Africa to reinforce Coningham's command. Now he could take the offensive against the German air and ground forces during the Battle for Tunis.

THE BATTLE FOR TUNIS: END OF THE NORTH AFRICAN CAMPAIGN

The final phase of the Allied Campaign in North Africa would be fought for the key ports of Bizerte and Tunis (see Figure 14). During this final phase, Allied air power would follow the Coningham's directions. As long as air support units operated at the beck and call of ground commanders, air power was unable to shift and concentrate its effort from one area to another area, and from one target system to another target system according to an overall strategic plan. The reorganization after Casablanca on 18 February knit all the tactical air units in Africa into an operational chain of command with its own air commander-in-chief solely responsible to Gen Eisenhower, the Supreme Commander. The old "air umbrella" system had now been replaced with a series of coordinated air strikes to destroy the Luftwaffe and then to support the Allied ground commanders. NATAF would now take the offensive.

During the initial drives for Tunis, NATAF proved the organizational changes and the new strategic plan were correct. From 21 to 25 March, XII ASC flew 525 sorties, approximately 1/3 of those flown by NATAF, to escort light and medium bombers in their attacks against enemy airfields. Additionally, fighter aircraft flew fighter sweeps across the German landing grounds in Southern Tunisia to intercept and destroy enemy aircraft forced aloft by the bombing. While resistance was slight, for the first time, XII ASC claimed a better than 2 to 1 ratio of victories to losses. (55:62) These initial successes further proved Coningham's three phase priority strategy was correct.

By the end of April, the Allies had total mastery of the air around Tunis and over the Mediterranean Sea. The constant assault by tactical fighter/bombers against Luftwaffe airfields and by strategic bombardment of German shipping lanes from Italy and Sicily had emasculated the fighting capability of the Luftwaffe. During the first week of April, NATAF flew 1388 sorties. Almost half of these missions were fighter sweeps which destroyed 60 enemy aircraft, and probably destroyed 11 other aircraft. (55:64) Further, the Germans were forced to admit that the Stuka could not survive in this environment. (55:64) For all practical purposes, the Ju-87 Stuka was removed from North Africa. This weapon system which so effectively terrorized American ground forces in December and January, was now withdrawn from Africa to Italy. In short, the Allies in April had won total air supremacy; destroyed all German depots, supply, and shipping; and attacked every German fighter base in Africa. During the final push for Tunis, NATAF would now concentrate on close support for Allied ground activity.

During this final month, Allied air and ground forces would experiment with new procedures for identification and coordination of air-ground CAS efforts. The use of identification panels, radio nets, and joint planning would improve cooperation between ground and air forces. However, this period was too short to further hone, define, and document effective CAS operational and tactical doctrines. These two levels of doctrine would be developed during the Italian and post-OVERLORD Campaigns.

WDFM 100-20: REVISED CAS DOCTRINE

The CAS doctrine employed by Coningham's NATAF became the official Army Air Force doctrine on 23 July 1943 when the War Department published WDFM 100-20, "Command and Employment of Air Power." The first three paragraphs of this manual declared the independence of air power:

LAND POWER AND AIR POWER ARE CO-EQUAL AND INTERDEPENDENT FORCES;
NEITHER IS AN AUXILIARY OF THE OTHER.

THE GAINING OF AIR SUPREMACY IS THE FIRST REQUIREMENT FOR THE SUCCESS OF ANY MAJOR LAND OPERATION . . . LAND FORCES OPERATING WITHOUT AIR SUPERIORITY MUST TAKE SUCH EXTENSIVE SECURITY MEASURES AGAINST HOSTILE AIR ATTACK THAT THEIR MOBILITY AND ABILITY TO DEFEAT THE ENEMY LAND FORCES ARE GREATLY REDUCED. THEREFORE, AIR FORCES MUST BE EMPLOYED PRIMARILY AGAINST THE ENEMY'S AIR FORCES UNTIL AIR SUPERIORITY IS OBTAINED.

THE INHERENT FLEXIBILITY OF AIR POWER IS ITS GREATEST ASSET. THIS FLEXIBILITY MAKES IT POSSIBLE TO EMPLOY THE WHOLE WEIGHT OF THE AVAILABLE AIR POWER AGAINST SELECTED AREAS IN TURN. . . . CONTROL OF AVAILABLE AIR POWER MUST BE CENTRALIZED AND COMMAND MUST BE EXERCISED THROUGH THE AIR FORCES COMMANDER. . . . THE SUPERIOR COMMANDER WILL NOT ATTACH ARMY AIR FORCES TO UNITS OF THE GROUND FORCES UNDER HIS COMMAND EXCEPT WHEN SUCH GROUND FORCE UNITS ARE OPERATING INDEPENDENTLY OR ARE ISOLATED BY DISTANCE OR LACK OF COMMUNICATION.

These statements reflect the combat experience of NATAF during the Battle for Tunis. Further WDFM 100-20 accepted Coningham's three phases of air warfare as the proper strategy. First priority must be given "to gain the necessary degree of air superiority. . . . The primary aim of the tactical air forces is to obtain and maintain air superiority in the theater. . . . Air superiority is best obtained by the attack on hostile airdromes, the destruction of aircraft at rest, and fighter action in the air. This strategy is much more effective than any attempt to furnish an umbrella of fighter aviation over our own troops. Coningham's strategic decision to destroy the Luftwaffe in February was the key command decision of the air war in North Africa. Control of the air permitted the Allies to execute their plans and to extend their lines of communications during the North African Campaign. Moreover, it permitted the Allied air forces to provide close air support for the ground forces during the final assault on Tunis in May 1943. (25:166-7) Without air superiority, these two missions could not have been accomplished.

Second priority was "Isolation of the Battlefield." "The disruption of hostile communication . . . , the destruction of supply dumps, installations, and the attack on hostile troops concentrations in rear areas will cause the enemy great damage and may decide the battle." The Allied ability to isolate the battlefield was hardly less impressive than its ability to destroy the Luftwaffe. Through a combination of strategic and tactical bombing, the Allies were able to destroy most of Rommel's supplies before they reached Africa. These interdiction missions eroded Rommel's ability to win the

campaign in 1943. (25:168-9)

Third priority was to "combined actions with ground forces." "The destruction of selected objectives in the battle area in furtherance of the combined air-ground effort. . . . Massed air action on the immediate front will pave the way for an advance. However, in the zone of contact, missions against hostile units are most difficult to control, are most expensive, and are, in general, least effective. . . . Only at critical times are contact zones profitable." CAS experiences in North Africa left much to be desired as far as American ground commanders were concerned. However, no one would argue that CAS had not improved by the end of the campaign. Many of the frictions which kept the Army and the Air Force from cooperating with each other had been removed. Through a joint planning policy, air and ground commanders began to cooperate to provide more responsive CAS. But, the subtle details to produce an effective air-ground team would have to be worked out in subsequent campaigns.

The lessons learned in TORCH had been effectively integrated into this revision of WDFM 100-20. A copy of this annual is provided in Attachment C to this paper. Based largely on Montgomery's "Notes on High Command in War," WDFM 100-20 clearly defined the roles and missions for Allied air power. It accurately portrayed the Allied experiences after the Battle of Kasserine Pass, but it was not truly a complete doctrinal statement. The operational and tactical doctrines required to implement these principles of air power would have to be defined during the Italian Campaign and after the Normandy invasion in June 1944. It is interesting to note that the Army Air Force published this new annual without the approval of the Army Ground Forces. Therefore, this annual tended to confirm ground officers view that the Air Staff did not wish to cooperate with ground troops. (35:47-9) Regardless of these attitudes, at least the Army Air Force had a workable doctrinal statement from which to employ air power in future campaigns. By the end of the war, ground commanders, including Lt Gen Patton, would find that the doctrinal statements in WDFM 100-20 properly defined how air power could best support ground forces.

SUMMARY

The Anglo-American allies had taken the first step toward developing and implementing an effective CAS doctrine in North Africa. Modeled on the British experience prior to TORCH, the new organizational arrangement and the emphasis on offensive tactical air rather than defensive "air umbrellas," had removed many of the frictions which existed between American air and ground commanders. The key lessons learned in North Africa were:

1. Air power must be viewed from an air perspective. To attempt to define or to limit the application of air power principles to a subordinate role to sea or ground forces was to lose the two key characteristics of air power -- flexibility and concentration of effort.
2. Ground commanders cannot effectively employ air power. They think of fronts and divide the operational theater into small areas to be attacked by corps, divisions, and battalions. However, the air front is indivisible. A nation must be able to gain control of the air over the whole theater. To effectively employ air power, a commander must understand these key concepts. Only through a prolonged period of professional study can an air or ground commander understand those principles that guarantee success in his combat medium. To attempt to permit an air or ground commander to define the goals and objectives for his counterpart is pure folly. Air commanders must command the air according to those unique principles which define how to properly apply air power for the ultimate goal of the the joint strategy. Likewise, ground commanders must control their forces. Only by close cooperation of both elements can both air and ground employment guarantee success for the commander.
3. To effectively win a campaign, air power must win two battles, the one to gain air supremacy, and the other to support land and sea forces.
4. The deeper air power strikes behind enemy lines, the wider and more prolonged will be the total effect on the whole campaign. Although the sight of friendly aircraft over ground forces can produce a tremendous boost in morale, air umbrellas and piecemeal use of air power restricts the full impact of air power. Unless available forces are unrestricted, this strategy will result in less than optimum results for both ground and air commanders.
5. The underlying cause of ineffectiveness of air support operations in North Africa was our inability to concentrate our air effort on particular objectives. Too much aviation was available to ground forces for direct support missions even during periods of inactivity and not enough was available to attain air superiority. Three reasons -- unsound organization, the predominate influence of ground commanders, and equipment shortages -- caused the Army Air Force to ineffectively accomplish its CAS responsibilities during TORCH.
6. To effectively orchestrate air and group power toward the main theater objective, air and ground forces must be closely integrated. To effectively coordinate air power to the overall ground objective, planners must be collocated. The creation of air and ground liaison officers with their

opposite service counterpart, establishment of an G-2 air and G-3 air, and daily planning conferences to coordinate air and ground missions for the next day's objectives was essential. After the Casablanca Conference, when these reforms were made, air and ground forces started to coordinate and to plan more effectively their missions. For the first time in the war, air planners had an established communication medium and a definition of roles and missions to guide how air power should be used. The abandonment of WDFM 31-35 doctrine and use of the British model resulted in this improved communication and support for Allied ground forces.

When Tunis fell in May 1943, most of the logistical and organizational impediments to an effective air-ground team and a proper CAS doctrine had been removed. The Allied Air Forces now had a responsive organization, had well define roles and missions for tactical air power, and had developed a basic CAS doctrine. Only further development of the operational and tactical doctrines needed to be defined before the Army and its Air Force could become an effective air-ground team. Operations in Italy and Northwest Europe after the Normandy landings would create these doctrines.

The axiomatic requirement that victory can only be achieved by the attainment of supremacy on the land, sea and in the air has never been so fully proven as in this total defeat of an enemy who never controlled the sea, who tried to substitute strategic artillery for a defeat in the air, and whose armed forces were crushed and homeless over-run by the combined power of our supremacy in all these three elements.

. . . General Omar N. Bradley, at Wiesbaden, Germany
on 15 July 1945

Chapter Four

CLOSE AIR SUPPORT IN OPERATION COBRA

The combat experience gained during OPERATION TORCH helped the United States Army and its Air Force to develop valid basic doctrines for CAS and mechanized warfare, but it did not overcome the three main problems which continually eroded the efficiency of their forces -- lack of training, inadequate logistics, and poor communications between air and ground forces. Only through concentrated effort and close cooperation would these operational and tactical doctrine problems be eliminated prior to OPERATION OVERLORD, the invasion of France in 1944. Although WDFM 100-20 defined the new organizational and mission priorities for how future air power should be used, this manual and its doctrinal precepts needed to be taught to pilots and validated in combat prior to D-Day. Ninth Air Force aircrews which would accomplish these new CAS doctrines needed to be recruited, trained, and equipped prior to their use during OVERLORD.

CREATION OF THE NINTH AIR FORCE

The concept of a Tactical Air Force first evolved during combat operations in North Africa. Brig Gen Kuter continually pleaded with the Air Staff to abandon the Air Support Command structure and to create a flexible organization devoted solely to tactical air power. It would be composed of fighter-bomber, fighter, and light- and medium-bombers which would gain air superiority, isolate the battlefield, and provide close air support for American ground forces. The inherent flexibility of this force mixture would meet the challenges of the modern battlefield. After the Casablanca Conference, Gen Marshall and his staff began to study seriously the merits of Kuter's proposed organizational reform. During May 1943, Gen Marshall tasked the Bradley Committee to review lessons learned in North Africa, and to suggest organizational changes to better streamline Allied air and ground forces. The committee visited Allied Air Force units in the United Kingdom and surveyed units in North Africa. After an extensive review of Allied air operations, Brig Gen Follett Bradley proposed a new organizational arrangement be used in England. Instead of the single air unit concept, he proposed two

separate units be created to support both Army Groups which would land at Normandy. (41:11-2) Each command would possess light- and medium-bombers, fighters, and fighter-bombers. The Ninth Air Force, which evolved from this staff decision, would support the First United States Army (FUSA); and the Second Tactical Air Force would support Montgomery's 21st Army Group.

The Ninth Air Force was created on 16 October 1943 to provide tactical air support for OVERLORD and subsequent continental operations. Initially, the command was little more than a skeleton staff organization formed from staff members of the Middle Eastern Air Force and Eighth Air Force. Its immediate mission was to create the tactical fighter crews required to support Allied ground forces after the invasion. Lt Gen Brereton, Commander of Ninth AF, and his staff had to build the bases; prepare quarters; and develop training curricula to transition fighter, fighter-bomber, and attack pilots from training to combat aircraft -- an awesome task. The recent air power failures, which Gen Eisenhower believed had resulted from insufficient training, were not going to be repeated during OVERLORD. Ninth Air Force crews would be completely trained in all facets of air power before they were committed to combat. The lack of adequate training, poor logistics support, and unacceptable communications procedures between air and ground forces which had hampered the American forces' combat effectiveness in North Africa would not reoccur during the invasion.

What made the Ninth Air Force unique was its composition. It effectively blended proven combat leaders from North Africa, like Brig Gen Quesada and others, with raw pilots recently graduated from pilot training. (8:134) These young pilots did not receive flight training in their combat aircraft until they arrived in England. (8:108) Due to the fluid tactical nature of the war, many combat lessons had not yet been introduced into American stateside flying training. Brig Gen Quesada, Commander of the IX Fighter Command, and his staff developed a comprehensive ground and flying training program to acquaint these pilots to Europe, to their new aircraft, and to combat flying. A Ninth Air Force Training Memorandum, dated 8 November 1943, ordered each commander to provide needed training for each new pilot and called for weekly progress reports to be sent to Ninth AF Headquarters.

New pilot instruction tended to fall into two categories, indoctrination and initial training, and "in service" continuation training. During the first phase, pilots would receive a minimum of 44 hours of pilot qualification training in their new aircraft, to include night flying, and basic administrative in-processing. Pilot ground training included general airport and local field rules, English flying rules, radio procedures, safety instructions, and aircraft recognition. Ground units would receive immediate lectures in airdrome defense, basic weapons review, physical conditioning, and defense against chemical attacks. (41:92-4) During Phase II, pilots received the full benefit of combat training. Each pilot learned formation flying, combat techniques, and weapons familiarization on the gunnery range. Pilot training during this phase also included map reading, radio and homing procedures, additional formation flying, instrument flying, different attack profiles, navigation, air-to-ground strafing techniques, squadron formations, high altitude climbs to 30,000 feet, low altitude flying, bombing practice, night flying, and rendezvous procedures. (41:100-2) Ground school covered classes in airdrome control, air-sea rescue, dinghey drill, security

procedures, and prisoner of war interrogation techniques. (41:102) In short, Ninth Air Force air crews received a broad-based comprehensive training program meant to prepare them for all aspects of combat. When the initial qualification training was complete, Ninth Air Force pilots would fly joint training against the RAF and begin air-ground cooperation missions with the First United States Army (FUSA) ground forces. This realistic combat training prepared American pilots for all three phases of air combat listed in WDFM 100-20. Occasionally, Ninth Air Force Headquarters would conduct special lectures in airpower for flight and squadron commanders. One such lecture series, conducted on 24-25 January 1944, was especially significant "not only because of the diversified subject matter, but also because of the imposing "faculty" that gave the lectures:"

"Origins and Role of the Ninth Air Force." Lt Gen Lewis H. Brereton, Commander of Ninth Air Force.

"The Principles of Air Support" Lt Col Larocque.

"The Organization and Operation of the Air Support Command." Maj Gen Elwood R. Quesada, Commander of Ninth Air Support Command (later Ninth Tactical Air Command).

"Functioning of Radar in Air Support." Lt Col Garland.

"Fighter and Fighter-Bomber Operations." Col Strecker, Chief of Training, Ninth Air Force.

"The Organization and Operation of Medium Bombardment." Brig Gen Samuel E. Anderson, Commander of Ninth Bomber Command.

"The Organization and Operation of the Airborne Division." Maj Gen William C. Lee.

"The Organization and Operations of the Troop Carrier Command." Brig Gen B. F. Giles, Commander of Ninth Troop Carrier Command. (41:104)

Each lecturer was a combat leader and pilot, and squadron or higher level commander. These lecture series taught squadron commanders and their staffs how to train and employ their combat forces. In short, Ninth Air Force commanders and pilots were fully prepared for all phases of aerial combat because of the unique combat training developed by Gens Brereton and Quesada. Their support forces would be equally prepared for their combat missions prior to D-Day.

Since the Ninth Air Force would be required to move to the continent immediately after the invasion force established a beachhead, Gens Quesada and Brereton demanded that both aircrew and their support forces must be highly mobile. The entire concept under which all Ninth Air Force units were organized and trained was that flexibility and mobility were the key ingredients of modern warfare. North Africa proved how air power could flexibly strike at major targets within a theater. But if air power is to retain that flexibility, it must have a mobile system to build, support and maintain forward airfields. It is mobility within the ground force structure

which permits the air elements to retain their flexibility. Therefore, mobility for ground units equates to the same tactical advantages for their air counterparts. (2:2-3) The "Ninth Air Force was organized, trained and equipped so that its headquarters and tactical units could move individually or collectively at a moments notice. All major units were organized into mobile streamlined components, which could contribute to the flexibility, speed, and striking power of the whole." (2:3) During exercises from November 1943 to April 1944, units moved within two hours to a new location and began immediate operations.



Figure 19: Major General Elwood R. Quesada (USAF Photo)

The mobility concepts outlined in Ninth Air Force Memorandum 50-3, dated 26 November 1943, were practiced continually prior to the invasion. Exercise DUCK, a simulated invasion scenario in south Cornwall in May 1944, and Exercise FOX, a joint Army/Navy exercise, were the largest exercises, but they were not the only ones used to prepare support and ground personnel for their combat missions. (41:113-4) Numerous command post exercises prepared senior commanders for the rigors of command and tested their planning skills prior to D-Day. These exercises were meant to simulate actual combat conditions, with a minimum of simulation. Everything that had to be moved with the unit was loaded on trucks to sent to the new operating location. Only when there was a shortage of trucks would simulation be permitted (41:114), and then ground crew members would block off the ground and simulate loading the truck with the required equipment. Lessons learned from these mobility and command post exercises would pay tremendous dividends for aircrews, support personnel, and commanders after the D-Day landing.

In March 1944, Ninth Air Force established an exchange program with the Twelfth Air Force in Italy and a joint advanced gunnery course for fighter-bombers with the RAF at Milfield. The Twelfth AF exchange program permitted Ninth Air Force pilots to fly air-to-ground combat missions in Italy. These officers would then return to England where they would teach the new CAS techniques and radio procedures to their squadron mates. After an

initial training period, these units would then attend a two week concentrated course in bombing at Milfield. While there, each pilot had to fly five dive and five low-level bombing missions; and each squadron flew three dive and three glide bombing missions as a unit. (41:104-5) With only 60 pilots per class, individual attention was sufficient to improve each pilot's skills. (41:106) Each pilot received an indepth critique after each bombing pass to help him perfect his bombing procedures. Instructors encouraged each pilot to experiment with new tactics and techniques for dive-bombing, ground strafing, and rocket firing attacks. Proven tactical procedures were then incorporated into the curriculum for pilots who attended the Milfield Range Program. By mid-March, Ninth Air Force crews were ready for combat.

OPERATION POINTBLANK: THE ALLIED AIR FORCES GAIN AIR SUPREMACY

Although the Ninth Air Force had been escorting Eighth Air Force bombers over the continent since January, the command did not truly gain a full measure of combat experience until April 1944. During this phase, Ninth Air Force fighters and fighter-bombers would escort strategic bombers assaulting the transportation, industrial, and petroleum networks on the continent; attack the German vengeance weapons, the V-1 and V-2 rockets (CROSSBOW targets); and accomplish deep interdiction. The ultimate success of these three operations would be demonstrated on D-Day. Allied leaders noted at the Casablanca Conference that a bombing campaign would be required to destroy the Luftwaffe and the transportation infrastructure prior to OVERLORD, POINTBLANK became that effort. If the Allied Expeditionary Air Forces (AEAF), commanded by Air Marshal Leigh-Mallory, could not destroy the Luftwaffe and isolate the invasion area, OVERLORD would be doomed to fail. From March until D-Day, Allied tactical air power would seek out the Luftwaffe, on the ground and in the air, and destroy it.

The fighter pilots, tired of bomber escort missions, wished to attack ground and air targets. POINTBLANK offered not only an operational release from the dull routine bomber escort mission, but also it became a proving ground for new tactics and operating procedures for both interdiction and CAS. From August 1942 until April 1944, the Luftwaffe had grown at an alarming rate. German bomber production had been reduced from 1760 to 1450, while fighter production rose from 720 to 810 per month. "If this trend was allowed to continue unchecked, Allied air authorities feared a German fighter strength of 3000 planes would be available to oppose the bombing offensive." (41:118) Without a long-range fighter escort, the increased size and vitality of the Luftwaffe threatened Allied bomber missions. If this threat were not destroyed, not only would the invasion be unlikely, but the whole daylight bombing offensive might end as well. (41:118) Allied planners decided the Luftwaffe must be brought to combat and destroyed. The resulting operations plan was POINTBLANK.

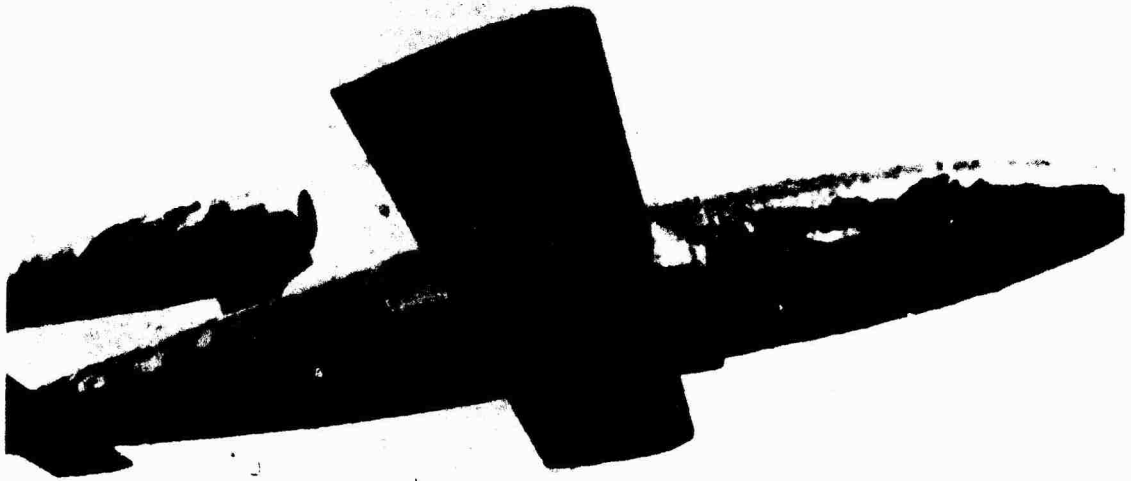


Figure 20: V-1 Rocket (USAF Photo)



Figure 21: V-2 Rocket (USAF photo)

The primary tactical air power missions for POINTBLANK were 1) bomber escort, 2) CROSSBOW/NOBALL targets (V-1 and V-2 weapons in the Calais region), 3) identified targets in the weekly target set established by AEF (These would include oil, transportation networks, electrical plants, etc), 4) German airfields, and 5) German industrial targets. The overall POINTBLANK objectives were to destroy the Luftwaffe and German aircraft production

facilities. Allied planners believed the Luftwaffe would oppose POINTBLANK with all their air assets. This commitment of German fighters would result in a war of attrition which the Germans could not win. Allied fighters could then eradicate the Luftwaffe fighter threat to the Allied bombing offensive and subsequent Normandy invasion force. (41:119)

By the end of March 1944, enough P-51s were available in theater to launch a full attack on the Luftwaffe. Many Ninth Air Force pilots were tired of the dull routine of bomber escort. Since these missions would not be their primary mission after the invasion, fighter pilots questioned why they were not able to accomplish their more traditional fighter roles -- air superiority, interdiction, and even CAS. During April, Allied planners released Ninth Air Force fighters from escort duty only, and permitted them to accomplish the Phase I and Phase II operations defined in WDFM 100-20. Under the new program, P-51s would engage the Luftwaffe, strafe ground targets, and interdict key rail networks. P-47s would still provide escort for the bomber formations, but they would also begin to interdict the transportation system, key bridges, and CROSSBOW targets. P-38s would provide bomber escort, light interdiction support, and reconnaissance. In short, Ninth Air Force fighters would be free to engage the enemy and destroy his ability to assault our bombers or invasion force.

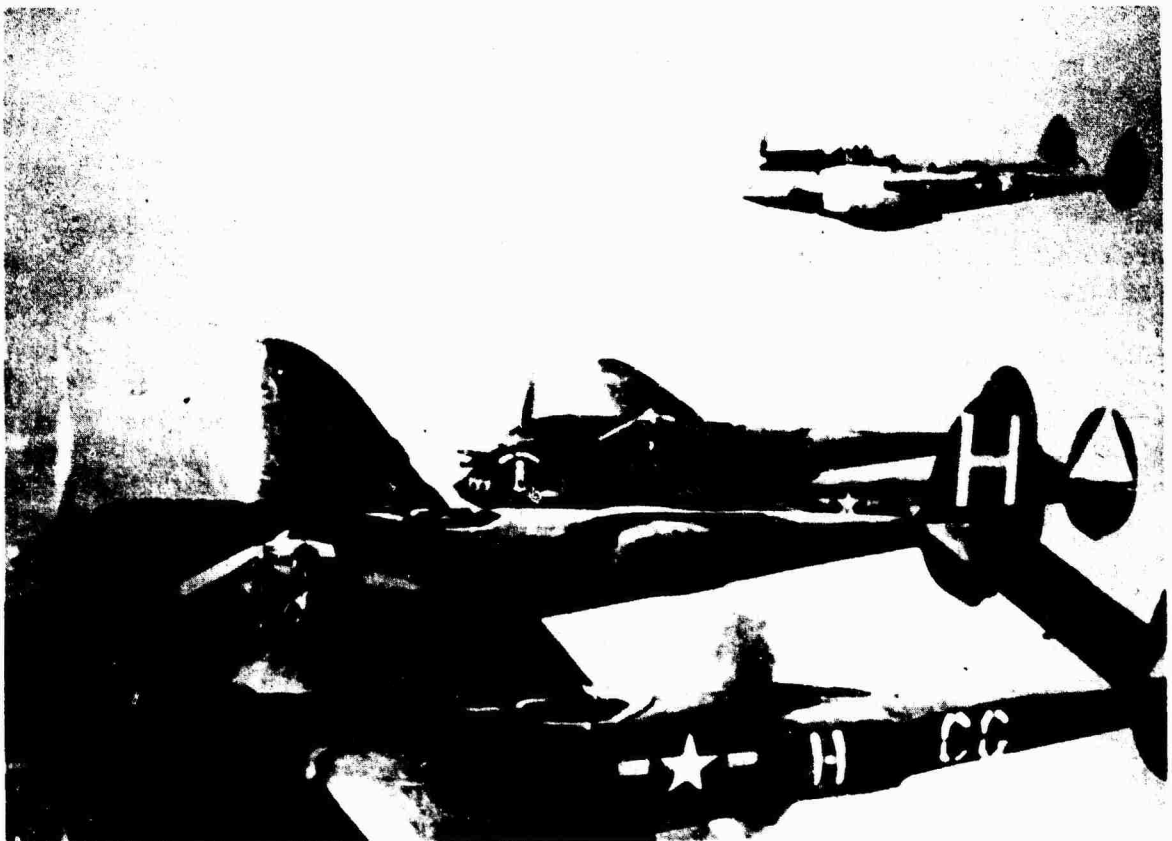


Figure 22: P-38s in Flight (USAF Photo)

Equally important, the Ninth Air Force pursued a policy of centralized planning, but decentralized execution of all air power missions. During this second phase, Quesada encouraged his pilots to experiment with every available tactic and technique against every target system. Following this order, P-47s attacked CROSSBOW targets from steep dive angles to low-level assault profiles. They used bombs, .50 caliber machine guns, and NAPALM to attack these targets. After each mission, pilots reviewed the success of each tactic against each target and developed standard mission profiles and weapon loads to best destroy bridges, rail networks, and the V-1 rockets. This period of free reign experimentation created a flexible mindset within the Ninth Air Force which would pay dividends later during COBRA. Overall, tactical doctrines established during this period would become the standard procedures for later continental operations.

Prior to D-Day, Allied air power had to gain control of the air over the invasion area. WDFM 100-20 gave air superiority first priority in its mission hierarchy. This manual stated that "This [air superiority] will be accomplished by attacks against aircraft in the air and on the ground, and attacks against those enemy installations which he requires for the application of air power." Allied pilots would attack German airfields, aircraft production and oil producing facilities during their attempt to destroy the Luftwaffe from January until June 1944. Through a combined strategic and tactical bombing program, all three major target systems would become impotent prior to D-Day.

The Eighth Air Force accomplished the majority of the damage against the Luftwaffe. From January to March, its aircrews would assault major industrial targets intended to draw the Luftwaffe into combat. (8:175) The "Big Week" assault from 21 to 25 February highlight the effectiveness of this plan. During this offensive, the Eighth lost 137 bombers and the Fifteenth Air Force lost 89, while losing only 28 fighter escorts. (21:229) While the Eighth Air Force could afford to these losses, the Luftwaffe fighter losses became unmanageable. The Luftwaffe lost 292 pilots in January and 434 in February. (21:228) However, "Big Week" only began the process which would last until D-Day where the Luftwaffe fighter strength was emasculated. Table 2 reflects Luftwaffe fighter pilot and aircraft losses from January to May 1944. In this new attrition warfare, the Germans steadily fell further behind the Allies. While American air power continue to grow prior to D-Day, the full effect of Spaatz's attacks on fuel production, coupled with Luftwaffe fighter pilot losses, assured Allied air supremacy for the remainder of the war.

The Ninth Air Force successfully destroyed the Luftwaffe and its airfields prior to D-Day. During April, 28 airfields, ranging from the coastal region to Orleans and Reene, were subjected to 30 attacks. (42:31) Although few airfields were destroyed, standard attack profiles and weapons were identified for future operations. In May, enemy airfields were given a higher priority. Allied planners desired to neutralize all airfields within 130 miles of the assault area in Normandy. From 1 May to 5 June, 36 airfields within this area were attacked by over 30 dive-bombing and 11 strafing attacks. (42:32-3) Hangar areas, dispersal fields, and support facilities at nine key airfields suffered significant damage during these raids. Damage to enemy runways, landing grounds, and taxi strips would continue to increase as D-Day approached. Continual attacks further assured that German engineers had

insufficient time to repair these facilities prior to the invasion. (42:34)

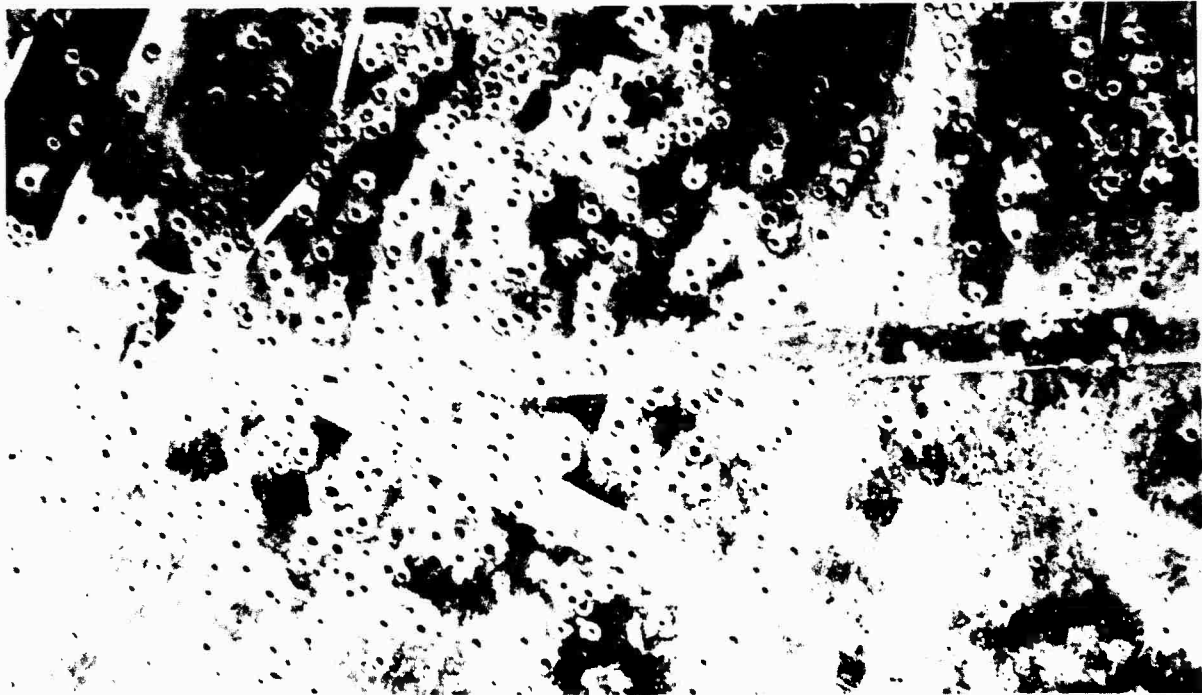
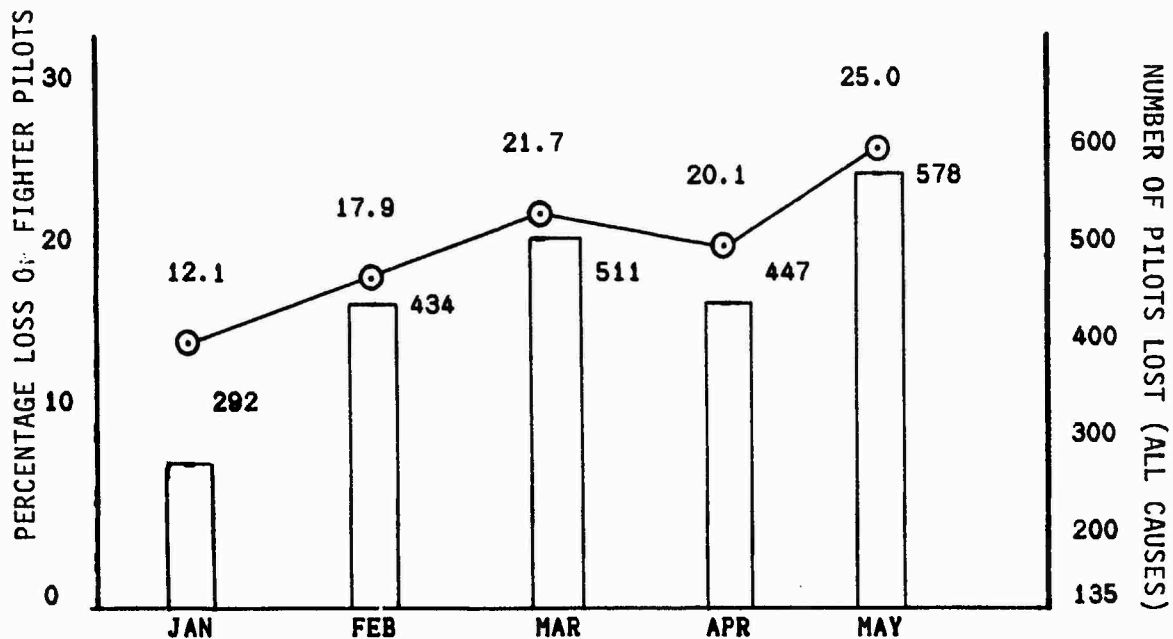


Figure 23: German airfield after a visit from IX TAC (USAF Photo)

The assault on the Luftwaffe fighter force was equally impressive. P-51s gained command of the air, and later were able to destroy much of the increased strength of the Luftwaffe. The combination of strategic and tactical bombing on airfields, and the fighter sweeps to destroy enemy fighter aircraft resulted in total air superiority for the Allies during the invasion. On D-Day the Germans flew only 750 sorties; but only 70 single-engine fighter sorties were targeted against the landing area in Normandy. (2:51) In short, Allied fighters had accomplished their phase 1 goal: complete air superiority by D-Day.

German aircraft and oil production suffered severe losses during the POINTBLANK campaign. Table 3 highlights the effect of Allied bombing of German fuel and oil production from August 1944 to February 1945. Prior to the war, Germany was a net oil importer. Of the 7,500,000 tons of petroleum products she used in 1938, about two-thirds were imported. When she invaded Poland in 1939, Germany had only six months oil reserves available. (8:172) Through the capture of the Romanian oil fields and increased production of synthetic oil, Germany produced enough oil to meet her military needs. By 1944, the Allies now had sufficient aircraft to attack this vital industry. Not only was fuel needed to fly combat aircraft, but also Allied attacks against oil curtailed German pilot training efforts. These new pilots were needed to replace the combat veterans lost to Allied fighters during the "Big Week" and subsequent air campaigns. By the end of war, German pilots received only minimal training before they were sent into combat. When compared with the extensive training American pilots received, these Luftwaffe pilots were ill prepared for war.



Total Fighter Pilot Losses Jan - May 1944 2262
 Average Fighter Pilot Strength 2283
 Percent Loss 99%

LEGEND

Percent of Fighter Pilots Lost Each Month (All Causes) ———
 Number of Fighter Pilots Lost Each Month (All Causes)

TABLE 2: LUFTWAFFE FIGHTER PILOT LOSSES JANUARY TO MAY 1944 (21:228)

	PERCENT OF FUEL CAPACITY PRODUCED	PERCENT OF AVIATION FUEL CAPACITY PRODUCED
August 1944	46	65
September 1944	48	30
October 1944	43	37
November 1944	60	65
December 1944	59	56
January 1945	51	33
February 1945	40	5

TABLE 3: GERMAN FUEL PRODUCTION FOR 1944 - 1945 (21:260)

By February, German industry was unable to produce enough fuel to support Luftwaffe operations. Starting in August, Hitler and the High Command began to curtail tactical air operations in France due to inadequate fuel reserves. Continual raids by Eighth and Ninth Air Force crews in May, June, and July had severely crippled the Luftwaffe and its ability to defend the Wehrmacht during and after the invasion. (21:258-60) Albert Speer, the German Minister of Production, stated after the war that the oil attacks of May 1944 "brought about the decision of the war." (8:179)

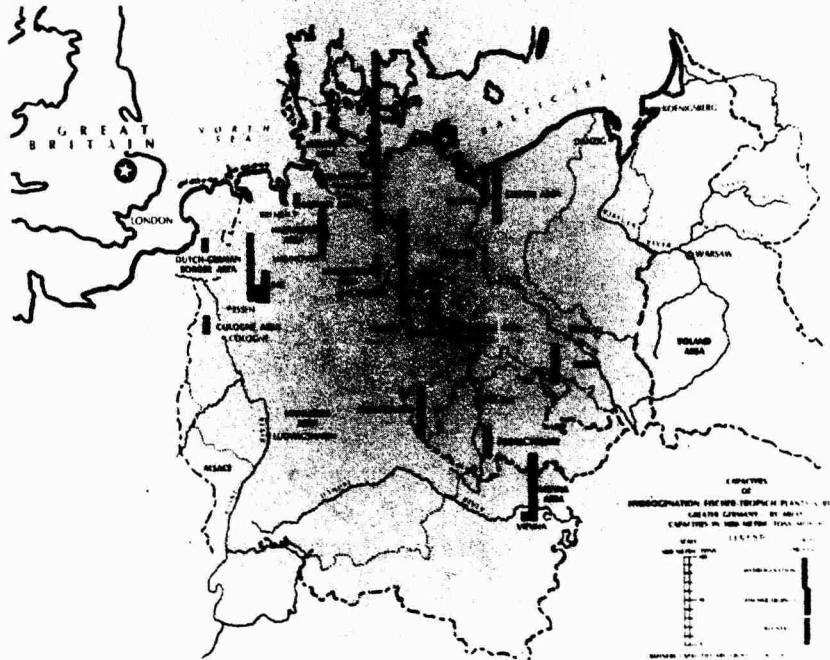


Figure 24: Map of Allied Interdiction of German Oil Production Facilities. (USAF Photos)

The attacks on German industry and oil production supplemented the counter air program. The overall goal of all Allied air planning was to destroy the Luftwaffe prior to the invasion. Each command attempted to engage and destroy as many aircraft as possible during POINTBLANK. The lack of aircraft and fuel continually hampered Luftwaffe operations during May and June 1944. On 5 June, Luftflotte 3, responsible for defending Normandy, possessed 815 aircraft, but only 609 were in commission. (21:265) On D-Day, Luftflotte 3 launched less than 100 sorties, including 70 single engine fighters. During the day, the Germans lost 39 aircraft, had 21 damaged, and lost an additional 8 aircraft to noncombat causes. (21:265) The Allied air forces on D-Day flew over 14,000 missions to support the invasion, while losing only 127 aircraft. By the end of the day, almost 156,000 Allied troops, including over 23,000 airborne troops were safely ashore. Yet the Luftwaffe was hardly seen during the day. During the spring, Allied fighter pilots and gunners severely damaged the Luftwaffe.

From 1 February until 1 June 1944, 8445 German fighters had been destroyed or damaged beyond repair by the Allied air forces. (8:178) Table 4

gives an order of battle for Luftwaffe assets on 30 June 1944. By D-Day, the Luftwaffe could not contend with the numerical superiority of Ninth Air Force. In short, Allied air forces had won total air superiority prior to D-Day, and they would guarantee total air supremacy during the remainder of the war in Europe. The synergistic effect of the strategic bombing of Germany's aircraft and oil production industries, coupled with the concentrated air offensive to destroy the Luftwaffe prior to the invasion, had truly accomplished their goal to destroy the offensive capability of the German Air Force. Now Allied pilots could concentrated on Phase II operations.

Distribution of German Fighters, End of June 1944

Western Front	425
Norway	40
Defense of the Reich	370
Eastern Front	475
Balkans	65
 TOTAL	 <hr/> 1375

SOURCE: Murray, Luftwaffe, p. 269

TABLE 4: DISTRIBUTION OF GERMAN FIGHTER AIRCRAFT (30 JUNE 1944)

WDFM 100-20 defined Phase II operations as those attacks "to prevent the movement of hostile troops and supplies into the theater of operations or within the theater." Through attacks against the transportation system in France, against German airfields and gun emplacements, and against the V-1 and V-2 weapons, Allied pilots totally isolated of the Normandy beachhead area prior to D-Day. However, this interdiction campaign would also be used to reinforce the FORTITUDE deception plan. FORTITUDE attempted to make the Germans believe that the Allied invasion would occur at Calais, not Normandy. According to this plan, Gen Patton would lead the First United States Army Group (FUSAG) during the "real" invasion of the continent. To assure the credibility of this plan, Allied planners directed that two-thirds of the Allied attacks on the continent occur in the Calais area. (8:168) The destruction of targets in Calais not only reinforced the plan, but also destroyed the German's ability to reinforce their Seventh Army. The railroads, bridges across the Seine River, and vengeance weapons were the key targets assaulted in Northern France. After the Normandy invasion, Hitler would continue to believe that OVERLORD was a feint, and prohibited Rundstedt from moving units from the Fifteenth Army into the Normandy area to reinforce the German Seventh Army.

Pre-invasion interdiction of railroads, bridges, and airfields had totally isolated the Normandy battle area. Allied fighters had completely sealed off the Normandy area. Every major bridge across the Seine River had been destroyed; railway systems were completely demolished; and numerous

CROSSBOW targets were destroyed. The German ability to resupply and sustain their forces in Normandy had definitely been diminished by these attacks. Continual attacks on these systems would assure the Germans were not able to match the Allied buildup of men and material once the invasion was started. By 19 May, railway traffic had declined by about 30% -- to the point where Allied planners believed that military transportation would be affected. (8:156) Additionally, the German infantry was a horse drawn effort, by destroying the railroads, the Allies forced the Germans to walk to the front. This process would take time and fodder for the horses. In any regard, the German effort to resupply or reinforce the Western regions would be further impeded. The brilliant campaign to destroy the bridges over the Seine River was a total success. The total battle against enemy transportation systems totally isolated the Normandy battlefield. Anglo-American aircraft dropped over 76,000 tons of bombs prior to D-Day, and would drop an additional 78,000 tons on French and German railroads during the Battle for France. (8:160) By mid-July, traffic would be almost at a total standstill as only 23% of pre-invasion rail supply would be available to Rundstedt's forces. (8:160) The Wehrmacht was unable to move effective reinforcements or supplies into the Seine-Loire triangle prior to or after the invasion. German reinforcements were deployed piecemeal to the Normandy area. Allied fighter-bombers forced units to divide into platoons after they left Paris for the front. Not only did these troops have to march into the combat zone, but they also had to avoid the deadly effects of Allied fighters which effectively isolated the battlefield area. Thus, the Allied Transportation Plan was an unqualified success as it prevented the Wehrmacht from winning the battle of the post-landing build-up. (8:160)

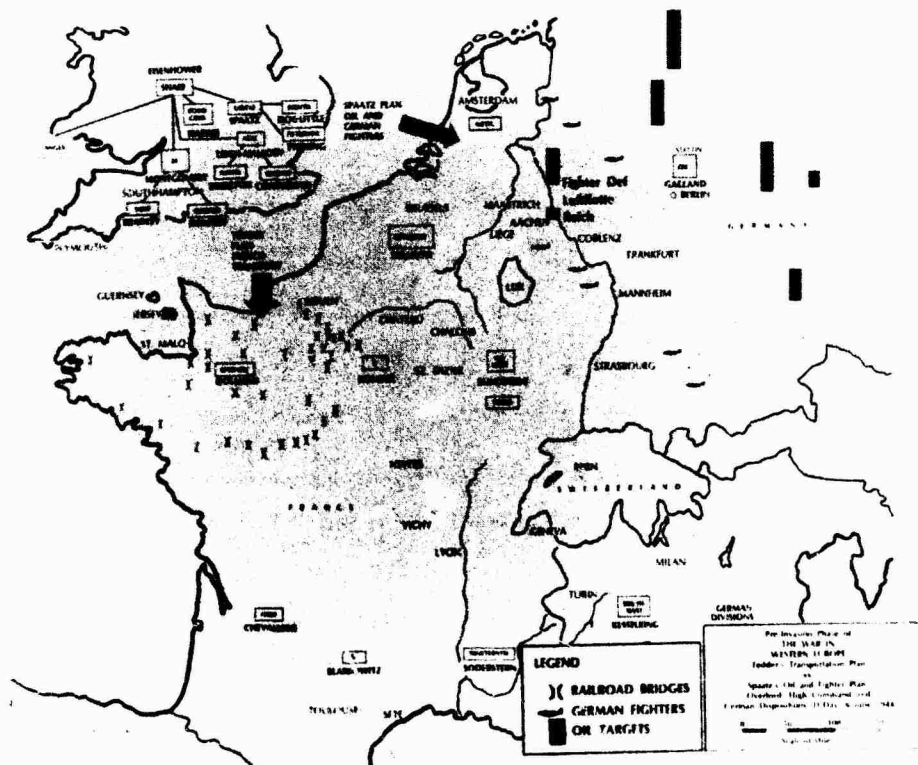


Figure 25: Map of Allied interdiction before D-Day (USAF Photo)

The interdiction campaign offered tactical advantages for Allied tactical air power, as tactics and procedures were developed during these operations which would affect future operations. The most important advantage of these attacks was the confidence and combat experience gained by Allied airmen. During their assault on the CROSSBOW targets, P-47 pilots learned to identify skillfully camouflaged targets. These skills proved invaluable during COBRA when CAS targets needed to be destroyed. Gen Quesada believes the interdiction skills learned during pre-D-Day operations permitted his forces to provide effective CAS to the FUSA after the invasion. His crews were able to successfully identify, attack, and destroy enemy troop concentrations, armored columns, and resupply efforts during their deep interdiction missions. (63) With both Phase I and Phase II objectives accomplished, the Ninth Air Force would be free to provide CAS support for American ground forces after the invasion.

AMERICAN CAS ORGANIZATION AND PROCEDURES PRIOR TO D-DAY

CAS procedures had changed tremendously since TORCH. During the Sicilian and Italian Campaigns, the Allies learned to plan jointly, to communicate effectively with ground forces, and to discriminate friendly forces from the enemy. The organizational and tactical doctrines established in these two campaigns spilled over to the Ninth Air Force from its exchange program with Twelfth Air Force. This exchange program permitted Quesada's pilots to assimilate effective ideas into their own CAS efforts and to innovatively propose even better tactics during future campaigns. This area truly proved the practical nature of IX TAC and its commander. These pilots became practical men who were willing to accept responsibility to improve their overall effectiveness. Each pilot's acceptance of corresponsibility for command and tactical development assured the decentralized control established during the England training period was successful when these crews got involved in combat.

After the North African Campaign, American ground and air commanders began to create an effective organization to enhance their joint planning and execution of CAS support. Diagram 3 depicts the WDFM 31-35 CAS organization which existed in 1942 during TORCH. Diagram 4 reflects the improved CAS coordination organization which evolved from the Allied experiences in North Africa, Sicily, and Italy during 1943 and 1944. Two new positions, G-2 (Intelligence) - Air, and G-3 (Operations) - Air, were created in the headquarters staff to better coordinate air and ground operations. These two officers worked side-by-side with their counterparts, G-2 and G-3, to provide effective joint planning for all ground operations. Additionally, each unit from company to division in the army had its assigned Air Ground Coordination Party (AGCP) to coordinate air support for each unit below division level. These officers, later renamed Tactical Air Liaison Officers (TALOs), answered each request for CAS. If they felt the requested support was valid and a higher priority than those pre-planned CAS missions, the TALO forwarded it up the chain of command to the division level. All division requests, after being consolidated, were sent to the Combined Operations Center which assigned either airborne aircraft or launched additional aircraft to meet the requested support. Located near to the Combined Operations Center, the Tactical Control Center (TCC) monitored and controlled all aircraft within the target area. Through the use of the Microwave Early Warning (MEWS) radar sets and plotting boards, officers in the TCC could instantaneously contact any fighter/bomber to redirect him to the target. Forward Director Units possessed smaller radar and direction finding equipment to identify and contact fighters within their areas of responsibility. Whereas Allied air and ground forces were unable to communicate with each other in North Africa, by D-Day this elaborate system permitted ground commanders to request and attain CAS support within minutes. During the post-invasion fluid battle, American ground forces would receive sufficient CAS support through this new command and control system.

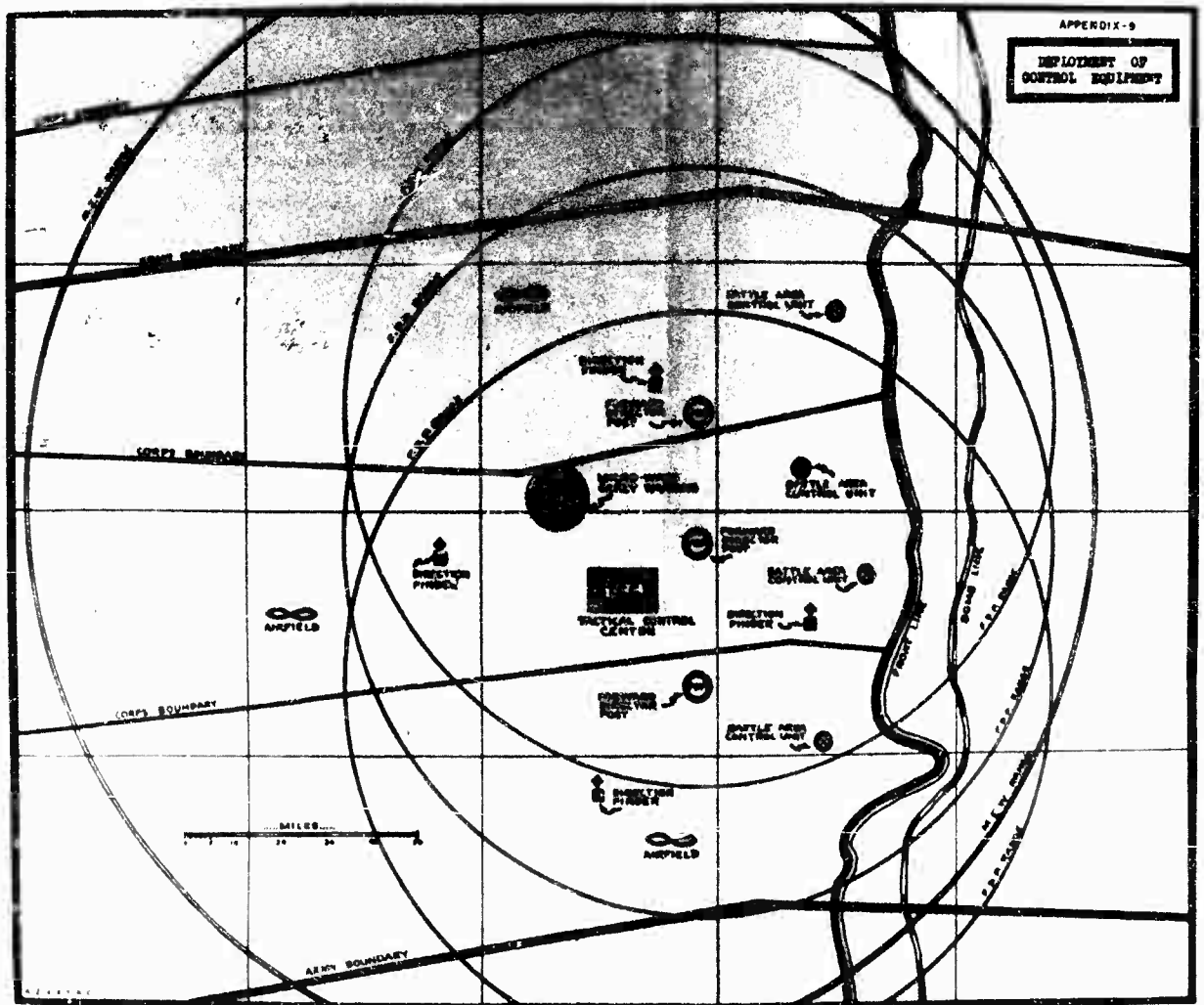
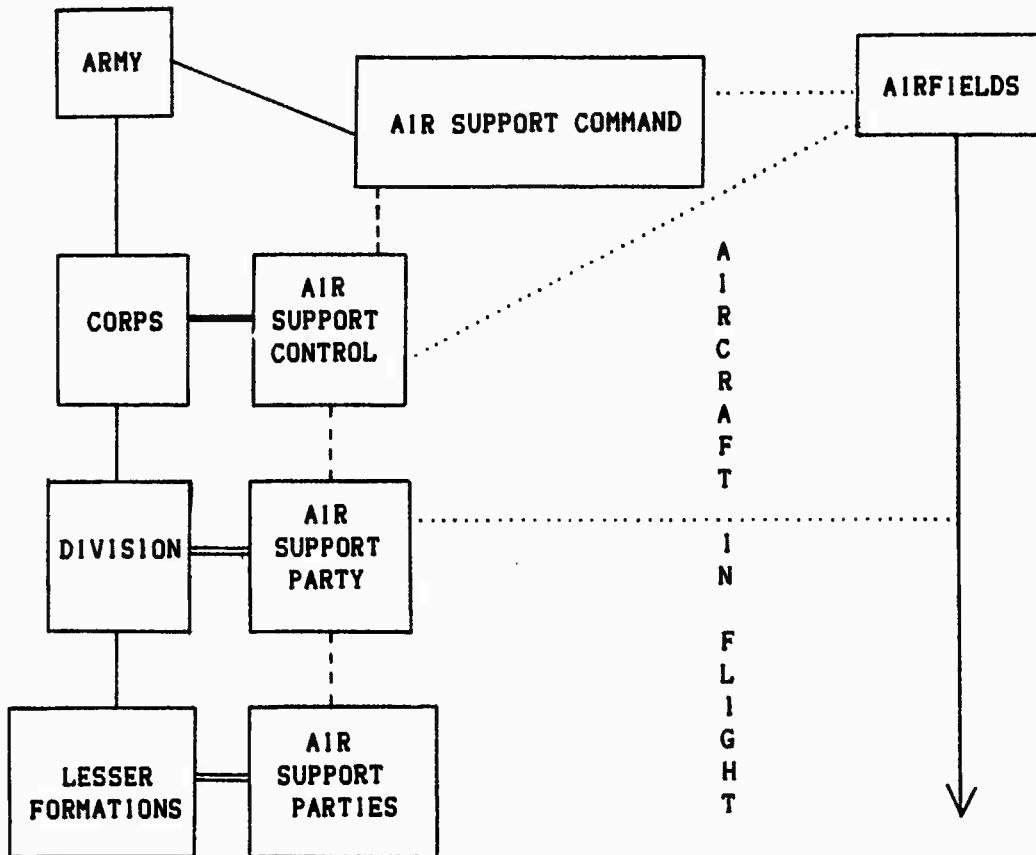


Figure 26: Allied Radar Network (USAF Photo)

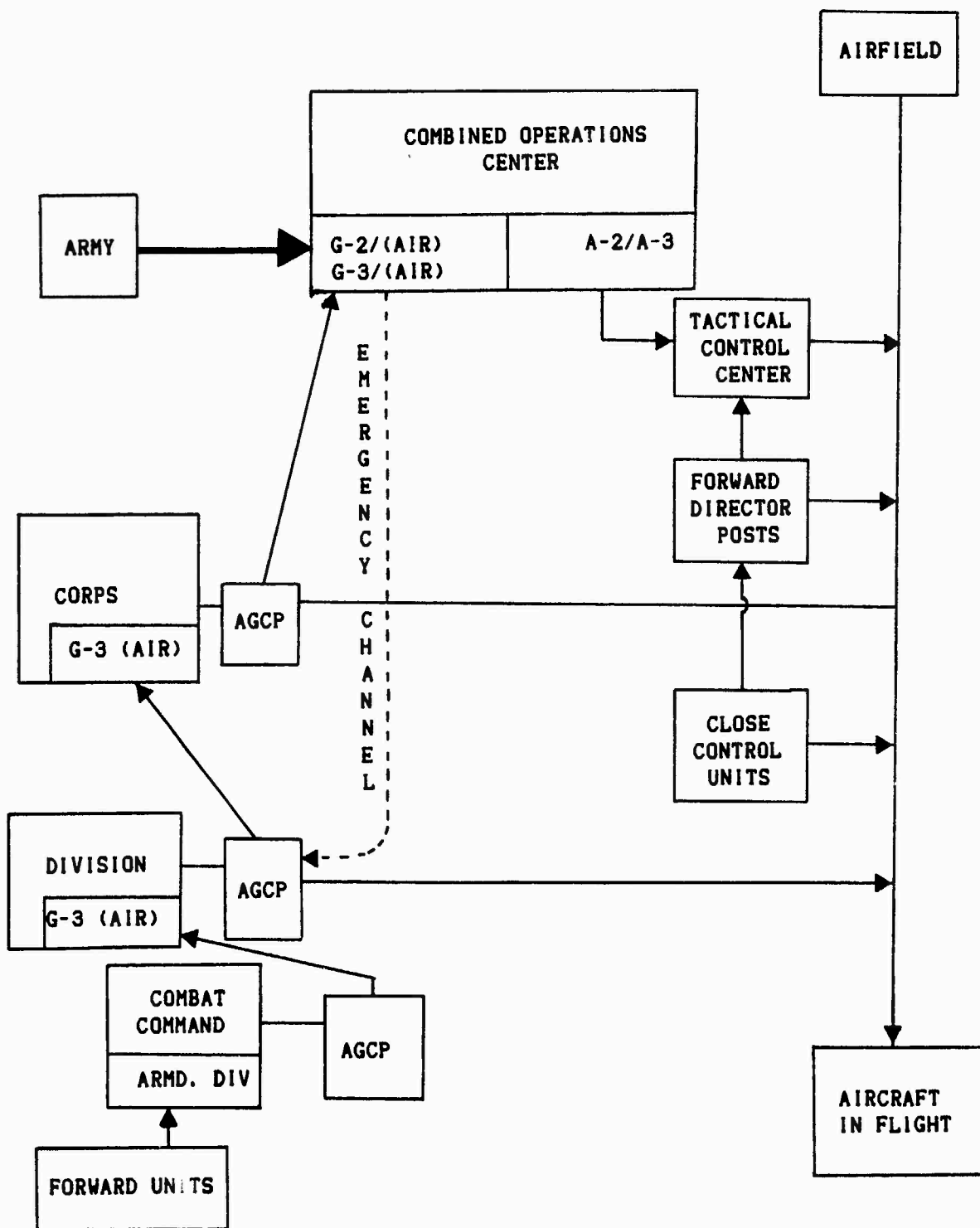
ORGANIZATIONAL DIAGRAM FOR CAS (1942)



NOTE: If an Air Support Command was attached at the Division level, it would have direct lines to air fields.

SOURCE: WDFM 31-35, April 1942, Figure 1.
AFSHRC Reel B 1716, Frame 2014
(26:41)

DIAGRAM 3: U. S. ARMY AIR FORCES CLOSE AIR SUPPORT ORGANIZATION



SOURCES: AAFEB-ETO, "Tactics and Techniques Developed by the U. S. Tactical Air Commands in ETO." (1 Mar 1945), Appendix 1a, Reel A1174, Frames 0440-0442, 0459-0462; AAFEB-ETO, "The Effectiveness of Third Phase Operations in the European Theater, 4 May 1944 to 8 May 1945," 281, Reel A1175, Frame 0289. (26:42)

DIAGRAM 4: ALLIED COMMAND AND CONTROL OF TACTICAL AIR POWER IN EUROPEAN THEATER OF OPERATIONS 1944-45

To further improve communications and coordination between air and ground forces, the American Army created the Ground Liaison Officer (GLO) position. These officers were assigned to each wing and squadron within Ninth Air Force. Their primary mission was to gather intelligence about ground operations and to suggest ways to improve cooperation between the pilots and the front lines. As such, these officers would assure that planned air support truly met the needs of ground forces. Since these officers were combat veterans from the infantry or armor, they could best identify ways to improve and streamline joint operations between Allied air and ground forces. The continual cross flow of information between air and ground units closely tied these units into an effective team. The Saint Lo breakout and subsequent Third Army assault through Northern France resulted from this new spirit of cooperation between air and ground units created by the TALO/GLO programs. Much like their air equivalent, the TALO, the GLO became an invaluable part of the CAS system as he taught pilots about tank and infantry tactics. Since these pilots now understood the basic principles of land warfare, they could identify ways to better integrate their CAS efforts with Allied ground force objectives.

The Advanced Headquarters concept implemented by Ninth Air Force assured CAS was properly coordinated by top air and ground commanders. When an Army unit moved forward, the equivalent air component moved forward with its equivalent ground command. For example, when First Army moved to the continent on D-Day, IX TAC moved to the same location. By collocating air and ground headquarters, Gen Bradley and Maj Gen Quesada were able to jointly plan air and ground operations. Each evening, air and ground commanders would meet to review the day's operations, and to pre-plan CAS operations for the next day. The meeting was attended by both commanding generals, their G-2, G-3, and key planners. During this meeting, a priority arrangement was made for CAS. Maintenance problems, weather, and overall objectives helped to identify the amount of effort available and CAS targets for the next day. These meetings were also used to answer questions about daily CAS procedures and policies. The agreed upon list of CAS targets would then be sent to tactical units by the G-3 (Air) by 0200 each morning. These nightly planning conferences assured that air and ground plans were effectively integrated to meet theater level objectives for the campaign.



Figure 27: IX TAC Advanced Headquarters in France (USAF Photo)

Ninth Air Force developed a three tiered CAS request system. Pre-planned requests identified by air and ground commanders permitted each to best integrate their efforts to upcoming operations. When a ground commander planned a new offensive, he would request CAS support through his G-3 (Air) to IX TAC. Air commanders would then schedule maintenance and operations training around these surge periods. Ordinary requests from ground commanders were identified each day. These missions would be prioritized at the evening planning meetings; those missions accepted by the Army Commander would then be scheduled for the next day's air operations. Immediate requests for aid were handled as they occurred. When a ground commander needed immediate CAS, he would request it from his AGCP to Corps. At each level, the air or ground commanders could deny the request. When available artillery support was present, senior ground commanders would direct that it be used. When a Corps Commander accepted the immediate CAS requests, they were then sent to the COC for processing. The first available aircraft would then be sent to meet the CAS request. The average elapsed time from acceptance of the CAS request to bombs on target was less than an hour, usually less than 20 minutes. Through the creation of an effective joint planning organization, integrated communication system, and priority system to handle CAS requests, the Ninth Air Force proved it could quickly and efficiently meet ground commander's CAS needs.

To further meet the CAS needs of ground forces, the Twelfth Air Force in Italy created the first modern Forward Air Controller (FAC) techniques. Through integration of radar into their operation, pilots and TALOs were able to monitor the progress of ground forces across the battlefield. They also were able to train ground forces how to use identification panels, smoke, and other systems to identify their positions, and to mark the bomb line and target for fighter-bomber pilots. Additionally, pilots started to use radios in jeeps to direct aircraft to ground targets during CAS missions. The "Rover Joe" system, as this FAC program was called, truly integrated the air-ground team together and improved bombing accuracy as these pilots could identify targets in a common reference for their counterparts in the air. The use of key ground references, such as church steeples and ridge lines, coupled with vector position and range, gave pilots a better idea of where their targets were located. As the system became more sophisticated, pilots used artillery liaison aircraft or colored artillery smoke shells to pin-point mark targets for CAS pilots. These initial efforts to become an integrated air-ground CAS team would be further developed during OPERATION COBRA by IX TAC.

The CAS support system developed during Allied combat in Sicily and Italy created the initial operational and tactical CAS doctrines which the Ninth Air Force would use after the Normandy invasion. However, it was the Ninth Air Force which Gen Eisenhower tasked to support Allied ground forces during the invasion. These procedures would initially prove to be satisfactory, but the fluid nature of ground combat in Northwest Europe would be different from the combat which existed in Italy. Ninth Air Force crews further refined these CAS procedures and expanded their CAS efforts into new tactical areas by August 1944. In sum, Quesada's crews were adequately prepared to accomplish their CAS missions, but they would further hone and develop better CAS doctrines after OVERLORD commenced.

AIR FORCE SUPPORT FOR OVERLORD

On D-Day, Allied air power flew over 14,000 sorties to protect the beach landing areas. The IX Fighter Command, which had operational control of both IX and XIX Tactical Air Commands (TAC), provided 18 fighter groups to support the Allied ground forces. Five groups were assigned to fly beach high cover; two covered the convoy enroute; five struck targets in Normandy; and six provided CAS for ground forces on the beach. (42:70) Table 4 highlights Ninth Air Force efforts to support the invasion. The Luftwaffe was hardly seen during the D-Day invasion. Only three aircraft were seen by the American P-38s flying high cover on 6 June. Additionally, over the British beaches, only 36 enemy fighters were observed. (17:212) Jagdkorps 11, the tactical arm of Luftflotte III, responsible for the Normandy area, had only 50 to 121 aircraft available to meet the Allied invasion threat. It flew 250 sorties against the invasion force, but the majority of these missions were against Allied shipping, not tactical aircraft in the beach area. (23:137) Other Axis air efforts on D-Day were inland from the landing area. Attacks against bombers attacking the bridge and transportation systems drew the majority of Luftwaffe attention. (23:137) In sum, Allied forces in the assault area enjoyed total air supremacy. The efforts to destroy the Luftwaffe during the Allied POINTBLANK Campaign had been a total success. With air supremacy guaranteed, Ninth Air Force units now shifted to Phase II operations to isolate the battlefield and to prevent the buildup of enemy land forces against the beaches. Allied air support to Omaha Beach best exemplify the type of support given American ground forces by IX TAC.

When V Corps became welded to the beach area by enemy fire, IX TAC responded by silencing five gun positions, attacking six bridges in the Carentan area, and strafing enemy troops approaching the beach area. On 7 June, 467 IX TAC aircraft would fly 35 squadron strength missions against targets of opportunity close to the Normandy beach area. Using 1000 pound general purpose bombs, these pilots attacked highways, railroads, and troop concentrations. (42:83) Each fighter-bomber came to Normandy with enough fuel to loiter in the area for 30 minutes. This extra time permitted the COC to identify targets, and to vector flights to the target. (42:83) Ground commanders during D-Day reported excellent results during each air support mission during D-Day. (42:84) On the evening of 6 June, over 130,000 Allied soldiers were safely ashore in Normandy. Although the Germans had ample opportunities to commit their XXI Panzer Division, Rundstedt failed to do so. With these troops ashore, the "Battle of the Buildup" began.

The two key Allied military instruments during this second phase of OVERLORD would be air and sea power. Through their constant attack against enemy highways, bridges, and troop concentrations, Allied air power permitted the First United States Army (FUSA) to reinforce its position and to create a large lodgment on the continent. By 18 June, when an unexpected hurricane hit Normandy, the British had landed 314,547 men, 54,000 vehicles, and 102,000 tons of supplies; and the Americans had landed an additional 314,504 men, 41,000 vehicles, and 116,000 tons of supplies. (22:175) Although these troops were ashore, the lodgment area failed to move forward from the beach area. By 12 June, Allied ground forces had been able to move inland only fifteen to twenty miles; but all five beachhead areas had been joined into a

unified lodgment. (8:197) Army requests for CAS remained quite low due to the nature of the front and to the communication difficulties experienced by the First United States Army. (8:197) Therefore, Allied tactical air power could concentrate on Phase I and Phase II operations. The unimpeded delivery of supplies to the beach area from Navy ships continued during this period. Soon, the small Allied pocket became quite crowded with men and material. Allied equipment and personnel lined up from the front line all the way to the beach -- an inviting target for the Luftwaffe. But the Luftwaffe was unable to attack this rich target, as Allied air power maintained total air supremacy over Allied ground troops in Normandy.



Figure 28: Allied Supply Dump in Southern England prior to D-Day
(USAF Photo)

<u>Medium Bombers</u>	<u>Dis-</u> <u>patched</u>	<u>Attack-</u> <u>ing</u>	<u>Tons on</u> <u>Target</u>	<u>Aircraft</u> <u>Missing</u> <u>in Action</u>
Medium altitude visual bombing	1005	817	1,435.605	11
Pathfinders	6	6	6.00	-
Total	1011	823	1,441.805	11
 <u>Fighter-Bombers</u>				
Assault area cover	1016	976		
Troop Carrier escort	514	497		
Dive bombing escort	32	32		
Dive Bombing	577	560	386.16	9
Total	2139	2065	386.16	9
 <u>Troop Carrier</u>				
Glider Tugs	104	103		2
Troop Carriers	821	805		21
Gliders	104	104		104
Total	1029	1012		127
 <u>Reconnaissance</u>				
Photo Reconnaissance	80	52		-
Visual Reconnaissance	89	87		2
Weather Reconnaissance	14	14		-
Artillery Liaison	2	2		-
Photo Reconnaissance Escort	7	7		-
Total	192	162		2
 Grand Total	 4371	 4062	 1,827.765	 149

TABLE 5: NINTH AIR FORCE SUPPORT FOR D-DAY (42:6)

From the sixth to the thirtieth of June, Allied airmen flew 163,403 sorties over the continent, of which 130,000 sorties directly supported the invasion. Luftflotte III, on the other hand, even though reinforced from Luftflotte Reich with additional fighters, only flew 13,829 sorties. Insufficient pilot training, caused by Spaatz's attacks on German oil production facilities, translated into high loss rates for the Luftwaffe. "In France, the Luftwaffe lost 931 aircraft on operations with a further loss of 67 noncombat losses; in Luftflotte Reich, the Germans lost an additional 250 aircraft on operations, with 183 more aircraft destroyed due to other than combat causes." (21:268) By June 11, the Luftwaffe had to withdraw five Gruppen from France. The heavy loss rates, coupled with an inability to replace lost pilots, forced the Luftwaffe to remove these aircraft. (21:268) As noted in Table 2, German fuel production had dropped 60%, while the Ploesti production in Romania was reduced to 70% of its capacity as a result of Allied strategic bombing raids during April and May. The continual pressure placed on the Luftwaffe by Allied air power during June assured the Allies maintained total air supremacy during the force buildup period.

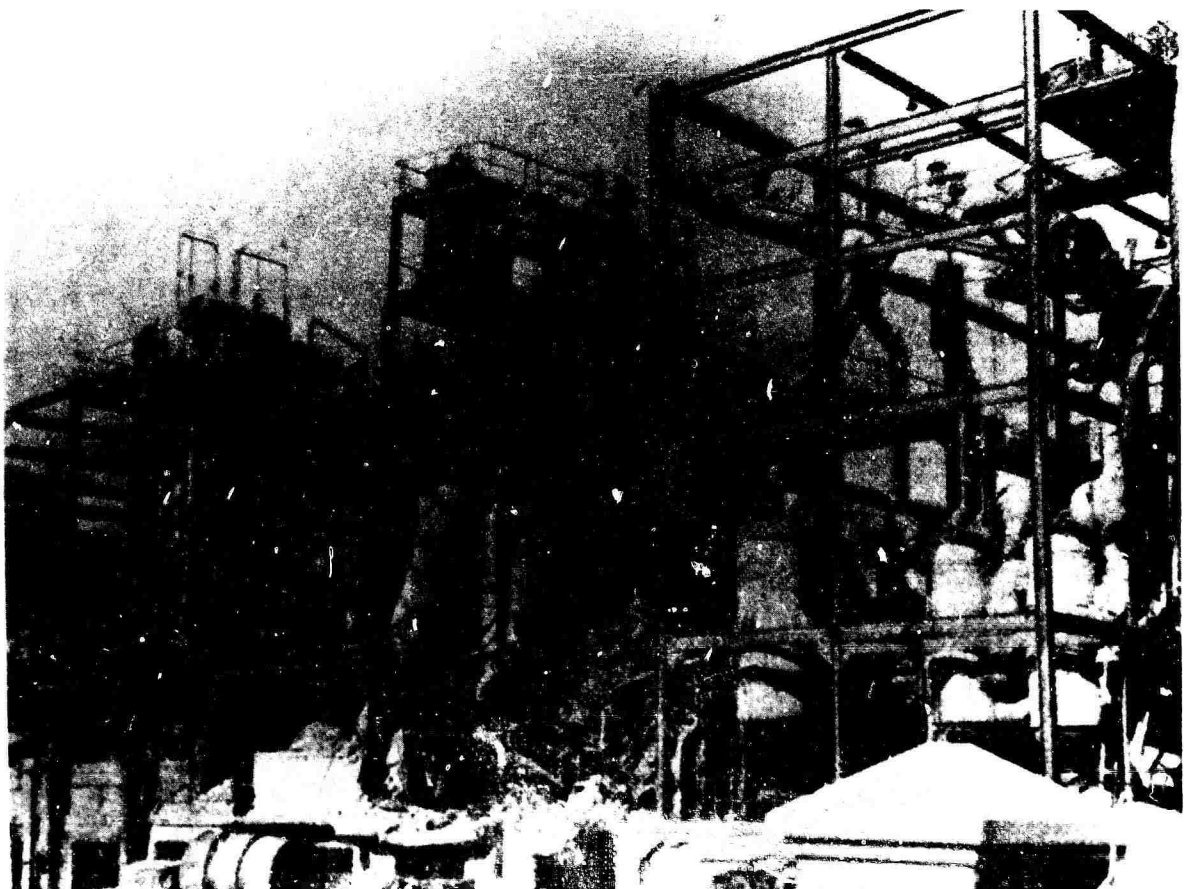


Figure 29: Destroyed German Oil Cracking Facilities. (USAF Photo)

Allied pilots continued their incessant pressure upon the transportation system within France during and after the invasion. The success of the Allied continuous interdiction campaign in France was heavily dependent upon accurate information about where targets still existed and about German railroad and bridge repair efforts. Without reliable information, Allied planners retargeted areas based upon an estimated repair time developed by the Operations Research staff. (8:212) From 6 June to 31 July, RAF, 8th, and Ninth Air Force pilots flew over 15,000 sorties against and dropped over 35,500 tons of bombs on freight yards. (8:214) During the same period, Allied planes flew over 16,000 sorties and dropped over 24,500 tons of bombs on bridges. (8:214) During the 24 flying days in July, IX TAC alone flew over 150 interdiction missions, usually in group strength, against railroads, highways, and bridges. (8:212) Allied aircraft continually frustrated the Wehrmacht's attempts to rebuild bridges across the Seine River. French railway records during June indicate that only one train was able to cross the Seine interdiction line. (8:215) In short, the interdiction efforts were equally successful. Many historians believe air power's most important contribution to the Battle in Normandy was the total isolation of the battlefield by Allied strategic and tactical aircraft during the build up phase.

German operational reports highlight the effectiveness of the Allied interdiction campaign. The persistent policy of attacking locomotives caused particular problems for the Wehrmacht. In June, the Germans acknowledged the "loss of 551 locomotives . . . from bombing, strafing, and sabotage." (8:217) By 21 June, persistent Allied fighter-bomber attacks on trains caused the German High Command to issue an order restricting daylight traffic to only those trains absolutely required by the Seventh Army. Not only did the German Army have to restrict daytime railroad operations, but also high value equipment, such as tanks, were no longer moved by rail. Since the useful life of German tank treads was only 600 miles, many of these tanks arrived at the front requiring major maintenance before they could be used in combat. Individual car traffic suffered the same fate. The common fighter attacks caused staff cars to use both forward and rear spotters to guarantee their safety. (8:218) Even Rommel was not exempt from these attacks. During July, his car was strafed by Allied fighters. Although he was not killed, Rommel's injuries caused him to take a leave of absence from his command. A German Seventh Army war diary entry best summarizes the effects of Allied interdiction campaigns. On June 11th, the diary noted "Troop movements and all supply traffic to the army and within the army sector must be considered as completely cut off." (8:222) In short, the German logistics support for the Seventh Army had been dramatically reduced. Allied planners estimated that only 3,000 tons of supplies reached the front, while German staff officers estimated that their daily needs were close to 7,000 tons. (8:223)

The shortage of supplies within the Seventh Army had been felt prior to D-Day. Restrictions had been placed on the use of ammunition and fuel. To combat the initial invasion, the Germans had used the majority of their fuel and ammunition. Yet, due to the effectiveness of the interdiction program, future supplies would not be quickly arriving to the front lines. Further, even reinforcements were slowed by the Allied interdiction efforts. Replacement soldiers were forced to march five days from Paris to the front; tanks forced to drive from Paris often arrived at the front requiring periodic

maintenance and replacement of their treads; and when motorized equipment was able to run the "gauntlet" to the front, the lack of fuel degraded their effectiveness. (8:221-4) Further, Allied air power inhibited German operations. Gen Freiherr Heinrich von Luttwitz, Commanding General of the 2d Panzer Division, best summarized the German dilemma:

The Allies are waging war regardless of expense. In addition they have complete mastery of the air. They bomb and strafe every movement, even single vehicles and individuals. They reconnoiter our area constantly and direct their artillery fire. . . . The feeling of helplessness against enemy aircraft . . . has a paralyzing effect, and during the [bombing] barrage the effect on inexperienced troops is literally 'soul searching.'" (8:227)

Although the Allied interdiction was effective, it would be foolhardy to give full credit for the success of the Allied invasion to this campaign. It took a concentrated effort by air, land, and sea forces to assure that the Allied armies were able to land and remain on the continent. It also took a lot of luck! German intelligence, which was not very good during the war, assisted the Allies during their invasion efforts. Prior to D-Day, the Germans estimated the Allies had 93 divisions in Great Britain. In fact, the Allies only had 31. (13:311) This overestimation of the Allied order of battle caused German planners to believe the FORTITUDE psychological operations campaign that the Normandy invasion was a feint. The real invasion would be led by General Patton and would attack Calais. Throughout the initial campaign to assault the beaches and build up the lodgment, Hitler continually stressed that the Fifteenth Army, located in Calais, would not be moved to Normandy. Only after Lt Gen Patton took command of the Third United States Army on 1 August did the Germans begin to realize that the Normandy invasion would be the only assault on the continent. But by that time, it would be too late for the Germans to terminate the Allied threat in France. (13:314-5) By the end of July, the Allies had almost a million men in France, along with a half million tons of supplies and 177,000 vehicles. (13:320-21) The Allies had won the Battle of the Buildup, now they could attempt to breakout from the Normandy beachhead.

THE BATTLE OF THE HEDGEROWS

From the initial landing on D-Day, the advance toward Caen and Saint Lo had bogged down completely. Gen Eisenhower and his staff continually stressed OVERLORD must win three main objectives quickly after the beachhead had been established. The Allies had to capture the Brittany peninsula and its ports; had to gain space to maneuver, for administration, and for construction of air fields; and to engage the German Army in battle. (5:1990) But it was not the Germans who truly stopped the Allies, but the geography, particularly the tremendous Norman bocage. These large earthen walls several feet thick and five feet high surrounding thousands of irregularly shaped fields continually slowed the Allied advance. Norman terrain certainly gave a tremendous advantage to the German defenders. As the infantry advanced, they were assaulted by snipers from every side; German tanks used well-disguised locations to fire point-blank shots at American tanks and mechanized equipment; and German commandos used automatic rifles to hit the softer underbelly of American tanks which exposed their treads and bellies when coming over the hedgerows. Although Americans might not face as many German tanks due to the success of the Allied interdiction, they would be confronted by these tanks in the best defensive country in France. It was the hedgerows that negated the Allied advantages in mobility and relegated the majority of the fight in Normandy to Allied infantry units. In short, Norman geography totally supported a positional warfare reminiscent of the First World War trenches. The fear of being bogged down in the hedgerow country had been the nightmare of Allied planners; it appeared their fears had become a reality. (23:167)



Figure 30: American Infantrymen in the Norman Hedgerows (USAF Photo)

American Army units were not organized properly for this type of warfare. The emphasis in the United States Army was on mobility. The creation of an excellent series of light and medium tanks attested to this proclivity. As Gen Eisenhower noted in a message to Gen Marshall, "None of our present ammunition for the 57, 75, and 76 mm guns, and 105 mm Howlitzer], can penetrate the front armor of the Panther or Tiger tanks and, due to the restricted terrain and narrow roads in which we are fighting, we are unable consistently to attack these tanks from a favorable angle." (5:1973) In this "battle of the hedgerows," the German large tanks with excellent 88 mm guns had a distinct advantage. Gen Bradley and his Corps commanders would have to use a large infantry force to identify, attack, and destroy the German gun positions. But, the American Army did not possess an abundance of infantry units. Bradley had pushed for each Corps to have four, instead of two or three infantry divisions, and one armored division. But Allied planners had established a force structure which reduced the infantry's role. However, Lt Gen McNair, Commander of Army Ground Forces responsible for designing and training American combat units, had attached tank battalions to every infantry division. The problem was infantry commanders had not been trained in proper infantry-tank cooperation during their pre-invasion training. Just as the airmen had learned from their initial mistakes in North Africa that cooperation must be practiced if it is to be effective in combat, so American infantry units would learn an invaluable lesson in doctrinal development in Normandy. (23:185-6) By the time American units extricated themselves from the bocage, a majority of its infantry would have died to learn this lesson.



Figure 31: American Rhino Tank (USAF Photo)

(Note the blade attached to the front of the tank, it permitted the tank to drive through the hedgerow in a level attitude.)

Yet the key problem was tank-to-tank confrontations. The American Sherman tank was built for mobility, not firepower. The limited power of the Sherman would become evident quickly in the bocage as its 75 mm gun was no match for the heavily armored rival Panthers and Tigers, which possessed an 88 mm, high-velocity gun. (23:185) Balancing between firepower and armor, and weight, Army staff officers opted for mobility. They rationalized that if their tanks were inferior to enemy tanks in firepower, the quantitative and mobility advantages would offset this deficiency. Yet when the Shermans found themselves confronted with superior German tanks, which they could not penetrate, in the restrictive confines of the bocage, "the willingness to expend Shermans offered little comfort to those crews who were forced to expend themselves as well." (18:193) Gen Bradley would have to find a way to counter this threat to his forces.



Figure 32: German Panther Tank (USA Photo)

To further compound the problem, American tank destroyer and antitank guns attached to infantry units did not possess enough high-velocity penetrating power to destroy the German tank threat. The only weapon system which provided sufficient penetration and firepower was the P-47. It would be air power which the infantry would rely on to solve the tank problem. (23:186) The infantry would truly bear the brunt of the fighting in the bocage. In June and July, infantry units would relentlessly attack German

fixed positions. Their attacks would result in an inordinately large percentage of infantry casualties during this phase of operations. Although infantry units were only 14% of those American forces which fought in Normandy, they would account for 85% of all American casualties (over 63% were riflemen) during June and July. (18:210-1) In sum, the bocage aggravated the inherent infantry, anti-tank weapon problems, and highlighted insufficient infantry training problems which would slow the Allied advance from the beachhead inland towards the main Allied objectives. To solve these problems, American ground commanders would turn to the artillery and IX TAC's aircrews. Two major events in June raised the air-ground cooperation which existed between IX TAC and FUSA. On 17 June, IX Fighter Command units began to occupy permanent bases in France created by Allied engineers. Also, Allied fighter-bombers were able for the first time to experiment with the new radar controlled COC operations which had been developed in England. These new radar procedures permitted fighter-bombers to more successfully find and attack their CAS targets. (42:97) The well-practiced CAS procedures, honed by hours of gunnery practice in England and the POINTBLANK interdiction program, would now rescue the besieged ground forces.

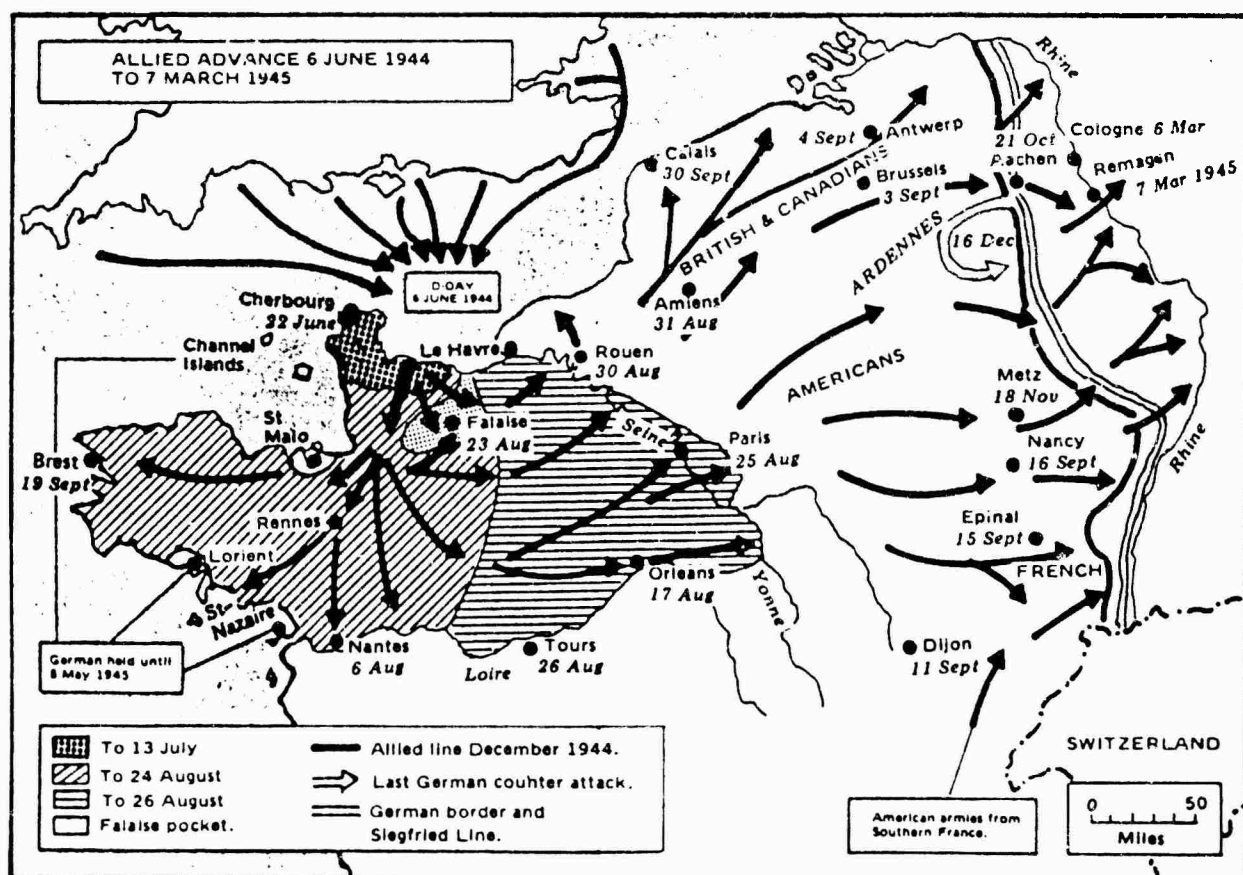


Figure 33: Map of Western Europe (2:50)

EVOLUTION OF ARMORED COLUMN COVER TACTICS

The combination of American artillery and air support for ground operation in Normandy would begin to pay dividends in July. Yet the breakthrough needed to unleash Allied armor into the plains of Northern France had not come (see map in Figure 33). British attempts to take Caen were blunted by German panzer counterattacks. Gen Eisenhower and his staff began seriously to consider the need for a second invasion force to relieve pressure in Normandy. The lack of sufficient ports to accept supplies, coupled with stagnation of the ground situation, had totally bogged down shipments from England to the continent. Although OPERATION GOODWOOD, the British assault on Caen on 18 July, was not successful, it had tied down German panzer units North of Saint Lo where Gen Bradley planned to launch OPERATION COBRA on 24 July. Although not planned as a major assault to breakout from Normandy, COBRA would become the breakout which changed the whole character of the European war.

COBRA's main objectives were to capture the Brittany Peninsula and to surround the German Seventh Army opposite the American VIII Corps. Gen Bradley planned to use strategic and tactical aircraft to blast a hole in the German lines. Using Saint Lo as a spring board, Gen Collins' VII Corps would lead the Allied advance through this breach. Perhaps the most significant element of this plan was that it called for increased cooperation of air and ground forces to develop the breach and to cover Collins' advance. The close relationship which existed between Gen Bradley and Gen Quesada during COBRA and afterwards would be a high mark of CAS cooperation during World War II. At the evening CAS conference on 20 July, Quesada and Bradley created the new armored column cover tactics which proved so invaluable during the upcoming COBRA offensive.



Figure 34: The American Ground Commanders
(Gens Bradley, Hodges, and Patton) (USAF Photo)

Gen Bradley complained to Gen Quesada that his armor was not receiving enough support by P-47s used for CAS. To alleviate this problem, Gen Quesada recommended that all the armor be concentrated in one unit. He promised if this reorganization occurred, he would put VHF radios and experienced fighter pilots from his units in the lead tanks of each column. (When Gen Quesada made this promise, he did not know if he had enough radios or pilots "willing" to make this close liaison work.) (63) By cycling four or eight ship formations, IX TAC could continually cover the entire armored force. The instantaneous communications between tanks and aircraft enhanced the ability of each system. The pilots in the lead tanks could accurately identify enemy positions for the P-47 formation leaders. By using terms familiar to his pilot comrades, the TALOs clearly defined each target by pointing out geographical points readily identifiable to the pilots flying overhead. These pilots then used their 500 pound general purpose bombs and eight 50 caliber machine guns to destroy the target. The P-47s, flying at from 200 to 500 feet above the ground, provided an airborne reconnaissance for the tank formation. (31:41) From their vantage points, these pilots could tell the tank formations the best routes to travel, locations of enemy traps, and possible problems ahead of the column. Although these tactics were not practiced prior to their use in combat, this armored airborne or armored column cover (ACC) tactic was a logical expansion of the ground assault techniques developed by IX TAC to attack trains and CROSSBOW targets -- two target sets which could only be destroyed by accurate bombing. The CROSSBOW targets also were usually well camouflaged and hard to find. The low level attack profiles developed to destroy these missiles when coupled with Quesada's excellent radio system differed only slightly from the new ACC tactics established by IX TAC. (31:38; 63) This tactic would prove invaluable when "protecting armored formations and running interference for the armored spearhead of the column by destroying or neutralizing ground opposition that might slow it down or stop it." (31:41) After the Planning Conference that evening, Quesada sent an operations order to each tactical fighter unit attached to IX TAC describing the new operational tactic approved that evening. Initially, IX TAC placed radios in only 15 tanks. (63) From this modest beginning, American commanders created an excellent air-ground team. When first used on 26 July, ACC tactics proved to be extremely effective during the development and continuation of the breakout.

To create a narrow front for his infantry troops, Gen Bradley planned for tactical and strategic aircraft to blast a large hole through the German lines before his infantry troops would commence COBRA. To avoid unnecessary cratering which would slow Allied ground troops, only light bombs would be used. The target area would be 7000 yards wide and 2500 yards deep. To assure friendly troops were not hurt, infantry units would be moved 800 yards north of the target area. Additionally, Bradley recommended the strategic bombers make their approach parallel to the target. This requirement would assure that short bombs landed on the southside of the St Lo - Periers highway which separated Allied and German lines. However, pilots preferred a perpendicular attack profile. By limiting their exposure to enemy flak and antiaircraft artillery, a perpendicular attack would reduce Allied aircraft losses. To counter this argument, Bradley suggested Allied aircraft use the sun for concealment. (14:220) Regardless of the attack profile, the St Lo

highway would be an unmistakably clear landmark for bombers.



Figure 35: American Ground Troops at St. Lo (USAF Photo)

Although scheduled to begin on 21 July, COBRA actually started on 24 July when Allied air power launched a carpet bombing attack prematurely upon the target area. Air Chief Marshal Leigh-Mallory had set the H-Hour for COBRA as 1300 on 24 July. However, the weather in the attack area that morning was overcast. Finally, after deciding the weather was too poor to conduct the raid, Leigh-Mallory sent a message to England to terminate the attack, but he was too late. Approximately two minutes later the first bombs began to fall. In accordance with the plan, six groups of fighter bombers from IX TAC and three bombardment divisions (approximately 1600 heavy bombers) from Eighth Air Force were already enroute to the target. Three of the fighter-bomber groups received the recall message and returned to base. However, the other flights, ignorant of the recall, proceeded to the target area. The fighter-bombers came in first. They accurately hit their targets south of the St Lo highway. Since no precise radio channels had been designated for emergency communications, no means existed to reach the bomber aircraft within the target area. The first formation of 500 bombers arrived to find that visibility in the target area was too poor to continue the attack, they then proceeded to secondary targets. The second formation found weather conditions to be so bad that only 35 bombers were able to identify the target. These aircraft proceeded to drop their bombs. Between the second and third formations, the weather conditions improved slightly. This formation of about 300 bombers dropped over 550 tons of high explosive and 135 tons of fragmentation bombs before they received the recall message. (14:228-9) Some of these bombs landed north of the Saint Lo - Periers Road killing 25 and wounding 131 men in the 30th Infantry Division. (14:229) The 24 July bombing also alerted the German Seventh Army of the impending invasion.

On 25 July, Allied air and ground forces again commenced COBRA. For the second COBRA bombardment several alterations were made in the air plan. Those

six targets north of the Saint Lo highway were assigned to indigenous artillery units. Also, a special weather reconnaissance aircraft was sent to obtain the current weather conditions before the bomber force approached the target area. Third, the bomber formations were asked to fly as low as possible and to attempt to bomb their targets using visual techniques. With these minor changes, the Allied air armada approached the target a second time.

As had occurred on 24 July, combinations of fighter-bombers and heavy bombers would assault the target area parallel to the Saint Lo highway. Over 1500 heavy bombers, flying in groups of twelve, dropped over 3300 tons of bombs; over 380 medium bombers dropped an additional 650 tons of high explosive and fragmentation bombs; while four groups of over 550 fighter-bombers dropped 200 tons of bombs and large amounts of napalm on the target area. (14:234) The fighter-bombers led the parade by accurately attacking their targets just in front of the infantry troops waiting to attack the Germans. The medium bombers followed second, they also hit their targets. The last group, the heavy bombers began their attack. The first wave dropped their bombs south of the highway directly on top of the Germans. However, the prevailing wind from the south, began to drift the smoke from previous bombing over the Saint Lo road. Not only were the infantry's marker panels lost in this haze, but the bomber crews could no longer see the highway. Flying at 12,000 feet and under pressure of enemy anti-aircraft artillery and flak, each succeeding wave approached closer to friendly lines. When the smoke cleared, 111 American troops were dead and an additional 490 soldiers were wounded. (14:235-6) Lt Gen McNair, who had come forward to watch the bombing, was killed by this attack. Although Allied troops were stunned, their commanders pushed them forward to assault German positions on the other side of the road. Inauspiciously, COBRA had finally begun.



Figure 36: General McNair and his Family (Photo from Kuter Papers)
(General McNair is standing on the left side of the fireplace)

Yet there are certain lessons which can be drawn from these two short bomb episodes. American planners placed too much faith in the success of the bombing effort. Reminiscent of North Africa, Allied ground commanders overestimated the power of air power. They felt every German position would be totally destroyed. When infantry units engaged the Germans, they found a worthy adversary ready to protect the bombed area. Allied planners also mistakenly believed strategic bombers could match the accuracy of the IX TAC fighter-bomber crews. This assumption was totally incorrect. Strategic bomber crews had not been trained in CAS procedures, nor had they previously been used in such a tight corridor to provide CAS for ground forces. The errors which caused the needless deaths and injury to American soldiers should have been foreseen. Finally, the lack of sufficient planning was evident. Not only had the bomber crews not been given an emergency frequency to contact ground forces in the COBRA assault area, but also Leigh-Mallory had not developed an adequate recall procedure to terminate the mission. His vacillation and indecisiveness directly led to the casualties suffered on 24 July. Yet the bombing campaign had been a success.

On the other side of the hill, German troops were unprepared for the invasion. The aborted assault on 24 July had been interpreted by German commanders as a successful defense by German troops. This interpretation nourished German confidence. As such, the first bombing attack had the effect of a perfect ruse. (14:238) Believing the threat had subsided, Generalmajor Fritz Bayerlein, Commander of the Panzer Lehr, thinned his outpost north of the highway and moved these troops directly into the area scheduled for saturation bombing. For two hours and forty five minutes Allied aircraft attacked these German positions, Bayerlein reported to Gen Kluge, who had replaced Rundstedt as Commander in Chief in the West,

The planes keep coming, as if on a conveyor belt . . . My flak has hardly opened its mouth when the batteries received direct hits which knocked out half the guns and silenced the rest. After an hour I had no communication with anybody, even by radio. By noon nothing was visible but dust and smoke. My front lines looked like the face of the moon and at least 70 percent of my troops were out of action -- dead, wounded, crazed, or numbed. (13:334)

Dazed German troops pulled themselves from the rubble to meet the American troops as they advanced across the cratered area. Miraculously some German guns survived the assault. American troops, dazed by two days of bombing by their own air forces, cautiously attacked the German positions. With memories of the bocage sniper attacks, infantry units timidly crept forward. By sunset, Lt Gen Collins' Corps had failed to reach its objective, yet American commanders began to ponder the strength of the German positions. Had Bayerlein been able to evacuate his forces prior to the second bombing attack? Were the Germans prepared to launch a counter attack after the American overextended themselves? These questions weighed on Collins' mind that night. Believing the Germans were not ready, Collins decided to commit his armor through the breach the next day. As future events would show, the Panzer Lehr Division had been totally destroyed, only a shallow facade opposed Collins' July 26 attack.



Figure 37: Field Marshal von Rundstedt (USAF Photo)

From 26 to 31 July, IX TAC continually assaulted German positions around Coutances. The IX AF Daily Summary Report documents that IX TAC pilots flew 9185 sorties, dropped 2281.15 tons of bombs, confirmed destruction of 78 enemy aircraft received credit for probable kills on an additional 27 aircraft from 25 to 31 July. (51:5) Commencing on 26 July, the new ACC tactics were first used in combat. Table 5 summarizes those ground targets destroyed by IX TAC during the first week of OPERATION COBRA. The high number of tanks and motor transports destroyed directly reflects the success of the new ACC and armed reconnaissance tactics employed by Quesada's crews.

SUMMARY OF IX FIGHTER COMMAND GROUND CLAIMS FROM 25 TO 31 JULY 1944

<u>CATEGORY</u>	<u>TOTAL VEHICLES DESTROYED</u>
Tanks	384-38-379
Motorized Transport	2287-47-527
Railroad and Highway Bridges	37-7-37
Railroad Lines cut	46
Railroad Cars	194-12-155
Locomotives	14-12-1
Road Junctions Damaged	85
Horsedrawn Vehicles	125-0-65
Troop Concentrations Successfully Attacked	38
Gun Emplacements Successfully Attacked	71
Artillery	71-0-33
Military Occupied Buildings	45-6-46
Supply Dumps	12-0-3

NOTE: First figure denotes vehicles confirmed destroyed; second figure reflects vehicles probably destroyed; and third figure reflects unconfirmed vehicles destroyed.

SOURCE: Daily Operations Summary, IX TAC (51:6)

TABLE 6: NINTH AIR FORCE GROUND CLAIMS DURING THE FIRST WEEK OF OPERATION COBRA.

Starting with the commencement of COBRA, IX TAC devoted the majority of its fighter bombers to close support for FUSA. Seventy-nine percent of its missions on 26 July; 54% on 27 July; 43% on 28 July; 51% on 29 July; 36% on 30 July; and 59% on 31 July were CAS missions flown to support FUSA. (48:--)

During operations on 26 July, IX TAC units flew seventy-two squadron strength missions to provide column cover for Bradley's tank forces; this support rate would continue at this level or higher during the critical period until 31 July. (8:240) The character of the conversations between tank and air crews on 26 July highlight the effect of this new tactic. In one instance a tank commander asked a flight of P-47s "is the road safe for us to proceed?" The fighter-bomber leader replied, "Standby and we'll find out." In their sweep forward, the four P-47s spotted and destroyed four German tanks on the road ahead. Returning to the air over the column, the planes radioed: "All clear. Proceed at Will." (8:240) In another conversation, a single Sherman tank was surrounded by German panzers, but the covering fighter-bombers noted his plight and managed to disperse the menace. This type of cooperation became characteristic of the new air-ground CAS procedures employed by IX TAC during July. By August, German tankers would often evacuate their equipment, leaving the engine running, to avoid the deadly firepower of the P-47s flying patrol over the Allied tank columns.



Figure 38: German vehicles destroyed by Allied aircraft in the Roncey Pocket (USAF Photo)

ACC was only one mission used by the IX TAC to destroy the enemy's armor and fighting ability. A second mission was armed reconnaissance. Fighter-bombers were fragged to fly ACC for 30 minutes. At the end of this watch, another flight would replace the first. If the first flight had not used its weapons, it proceeded forward of the armored column to hit targets of opportunity in the area. The ranging of aircraft along roads often uncovered enemy truck and armor concentrations. On 29 July, a flight of P-47s found an unusual sight, a long enemy convoy near Roncey. This long line of armor was a fighter pilots paradise! The first flight to attack the column radioed the controller at the Tactical Control Center (TCC) about this large formation. Employing withheld fighter-bombers used to answer immediate CAS requests, the TCC vectored aircraft to this area for the remainder of the day. From 1510 to 2140 hours, Thunderbolt flights attacked, returned to base, refueled and rearmed, and took off again to hit this target. By sunset, 66 tanks, 204 vehicles, and 11 guns were destroyed; an additional 56 tanks and 55 vehicles were damaged by this attack. Even the infantry got involved in this affair. One infantry general shouted into his tank radio: "Go to it! Get one for me!" (8:242) Two days later, Allied armored units found the roads impassable because of the carnage created by the fighter-bomber activity in the Roncey pocket. Using bull dozers, engineers pushed the debris aside so the Allied tank columns could pass. As Allied soldiers remained free from German air attack and daily saw the effects of their own close air support from the fighter-bombers, their morale soared. In the future, ground forces grew accustomed to seeing these unusual "calling cards" left by IX TAC units performing armored column cover and armed reconnaissance missions for the First Army.

SUMMARY

The Ninth Air Force created an unusually effective CAS doctrine during its short existence. The very idea of an air command working directly to support a ground unit was more than a novelty, it was almost unheard of within the annals of military history. For the United States Army Air Force to create such a force, given its experiences in North Africa and its earlier doctrinal roots, would have been highly unlikely. Yet it was from the combat experience in North Africa that Lt Gen Brereton and Brig Gen (later Maj Gen) Quesada learned that improvements could be made to assure better CAS for American ground forces. The entire training program from October to April in England had been spent to develop, to train, and to hone a fighter force well schooled in tactical air power. The combat support for POINTBLANK, during the interdiction of the transportation system and CROSSBOW targets, gave an unusual confidence and aggressiveness to Quesada's young pilots which encouraged them to innovate with new tactics and procedures to improve their interdiction and CAS missions. From this spirit, rose the new armored column cover tactics that guaranteed American success during and after COBRA. Although American airmen now had an effective operational and tactical CAS doctrine, XIX TAC, created on 1 August to support Patton's Third Army, would further extend and perfect new definitions for CAS doctrine as they became an unusually successful air-ground team during the Battle for France which resulted after the COBRA breakout.

In many ways, Ninth Fighter Command was a mirror image of its commander, Maj Gen Quesada. Although only 40 years old, Quesada was an American air power pioneer. He had been involved in the first air refueling mission, the flights to South America, and the initial units to deploy to North Africa. An unusually practical man, Gen Quesada did not attempt to apologize for errors, but strove to fix problems. When some of his units were tasked to provide reconnaissance for naval units in North Africa, he temporarily assigned them to Admiral Cunningham. The evolution of armored column cover tactics reflected the same practical nature. Throughout his career, he continually demonstrated he was a risk taker. From his leadership style, pilots in the Ninth Air Force developed a similiar approach to operational problems. Their experimentation with different tactics to destroy CROSSBOW targets is just one example of how these men learned to take responsibility for creating better tactical doctrines. Yet this practical approach to combat, coupled with an indepth training program which insured each pilot was ready for combat, permitted Allied air and ground forces to develop a superb CAS doctrine during the Second World War. Through Quesada's encouragement, Ninth Air Force pilots felt comfortable taking responsibility for the development of new tactical doctrines for CAS. Without Gen Quesada and his unusual commitment to tactical air power, it is doubtful American airmen would have developed such an intimate relationship with their ground counterparts.

Everything depends on air supremacy, everything else must take second place. The supremacy of the sea is only an appendage of air supremacy. Look at the development in the European war and the developments in the situation in the Pacific area. Even the strongest fleet is of no value if the enemy has air supremacy. It can no longer leave its port or does so only to be destroyed.

The country that has air supremacy and vigorously strengthens its air power over all other forms of armament to maintain its supremacy, will rule the lands and the seas, will rule the world. The proper conclusions with respect to leadership and planning of armament must be drawn from this fact. A strong and independent Air Force command, but far above the others, or an Air Force command on equal footing with the command of the rest of the Armed Forces.

. . . Lt Gen Karl Koller, Chief of the German Air Staff (1945) to the United States Strategic Bombing Survey (Interview #9)

Chapter Five

CLOSE AIR SUPPORT AFTER OPERATION COBRA

From D-Day until COBRA's breakthrough, Allied forces were unable to expand their beachhead. Although Eisenhower and his planners assumed allied troops would quickly expand the beachhead inland, the bocage country in Normandy restricted movement of ground forces. The bocage, an area marked by small fields bordered with deep drainage ditches and stout, impenetrable hedges, was excellent for a defensive stand. Each hedge had become a fortress from which German troops sniped at and ambushed American soldiers and tanks; each field became a dangerous open space across which enemy fire was brought to bear; and each road became an obstacle to impede Allied advances. By mid-July the situation in Normandy was far from satisfactory. Although American troops had been able to widen the beachhead to the west and to capture Cherbourg, the Allied advance had stalled a mere 20 miles from the Atlantic Ocean. (49:1-2) Effectively, American troops were dammed up behind the hedgerows. Despite their ability to move soldiers and mounds of material to the continent, their advance stalled prior to COBRA. After the Saint Lo breakout, the logjam broke. The creation of the Third Army, commanded by Lt Gen George S. Patton, Jr., and XIX TAC, commanded by Brig Gen Otto P. Weyland, created an air-ground team which would exploit the COBRA breakthrough and turn it into a breakout which destroyed the German Army in Western France. The tactical problem then was simple -- to break out this mass of Allied military power, to roll up the German defenders, and to continue the offensive into the plains of France where unlimited maneuver was possible. (49:2) Gen Bradley assigned these missions to the Third Army and XIX TAC.

Gen Patton, an experienced cavalry officer, believed Allied commanders were too timid during their advance from the Normandy beachhead. All too often, he thought, infantry officers failed to show the boldness and aggressiveness required to successfully push forward from the bocage. Their slow, deliberate advances were too predictable and too cautious. To overcome this problem, Patton demanded that his newly created Third Army exploit its major advantage -- its mobility. His plan called for his army to advance through the Saint Lo area, turn east, and advance into the heartland of Germany. This strategy reflected the American way of war, a war based upon total destruction of the enemy's capability to make war. Ever since the American Civil War, Army officers continually studied Grant's strategy of annihilation and believed that his strategy was the only sure route to success in war. Patton was no different from his predecessors in the United States Army. But his means to pursue this strategy was unique. It was a adroit blending of history, geography, and his assessment of America's tactical strengths -- mobile, medium armor and air power. Patton's philosophy of war required his troops to advance as quickly and as deeply as possible. His columns must not be concerned with geographical locations, but must focus continually upon the German center of gravity -- the heartland of Germany. Take the war to the German people, destroy their army, and punish the German leadership. These were Patton's true objectives during his war in Europe. His intentions were to destroy the cohesiveness of German commanders, and their lines of communication and supply. There were no "strong points" for his troops to capture, except for the Brittany ports at Brest and Lorient. All other pockets of resistance would be left for the infantry.



Figure 39: The Third Army Team: Patton and Weyland
(USAF Photo)

One problem did exist in Patton's plan. When his armor came upon concentrated enemy armor formations, how would they destroy the larger, heavier German tanks? To accomplish this feat, Patton needed a force which could maintain an equally rapid ability to advance and to destroy the enemy. Artillery normally fulfilled this role; however, it was too slow and cumbersome for Patton's tanks. To rely upon artillery would slow his advance and permit the German commanders to accomplish a skillful retreat. Instead, Patton coupled his tanks to Weyland's aircraft and pilots. The immediate firepower and shock created by flights of P-47s might even permit Patton to more quickly accomplish his objectives. These aircraft could provide invaluable reconnaissance and protect Patton's armored columns. The valuable information gained from P-47s flying armored column cover and armed reconnaissance missions permitted the Third Army to exploit immediate opportunities to destroy German armor and supply convoys in the Roncey, Falaise, and Mons pockets. Therefore, XIX TAC became Patton's airborne artillery force. Married to the XIX TAC, the Third Army requested Weyland's pilots to fly continuous ACC and armed reconnaissance missions to search out and to destroy enemy armor. Through their joint effort, Patton's rapid advance through France was assured. Following the breakout from St Lo, the paralysis of the hedgerows ended abruptly and the war of movement began. The Third Army, assisted by XIX TAC, would smash out of the beachhead through the Seventh Army. Coupling speed with boldness, Patton's army liberated France and Belgium, and reached the West Wall before the Germans could regroup.

When XIX TAC became operational, its pilots had already been in combat for over five months. Some of its crews had been involved with bomber escort and POINTBLANK operations since January. These crews had been part of IX TAC during its pre-OVERLORD campaigns and during COBRA. Their successful attacks against bridges, railroads, and troop concentrations proved these pilots were qualified to accomplish any tactical mission which Patton's forces demanded. During their post-invasion activities, many tactical fighter units developed a rapport with their supported armor units which further cemented the communications and tactical ties between these air and ground units. Since these fighter units would remain married to the same armor units, Patton inherited a well-organized, cooperative force structure which would permit him to fully exploit the mobility of his armor while receiving fire support and reconnaissance from his tactical air crews above each armored column.

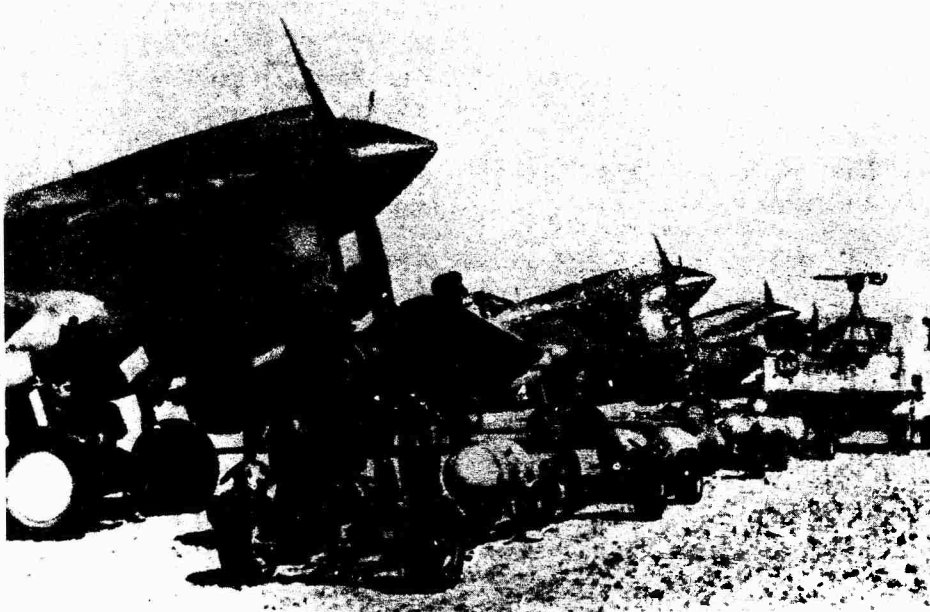


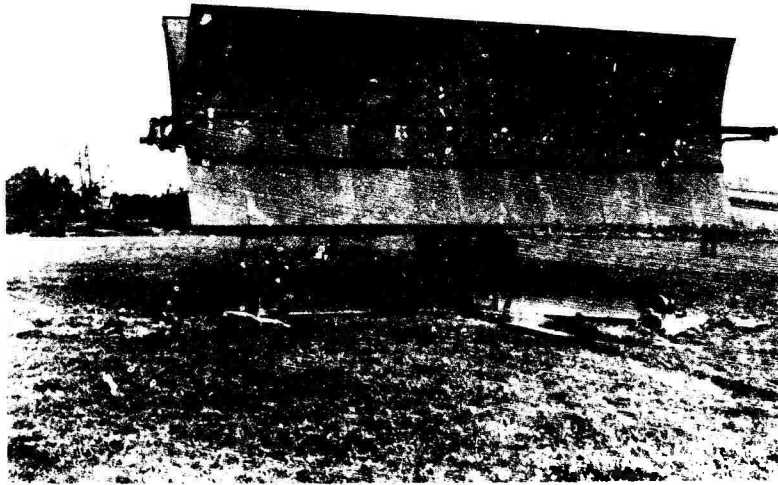
Figure 40: American P-47 aircraft (USAF Photo)

The P-47 was the primary weapon system used to provide CAS for the Third Army. A rugged, reliable aircraft, the P-47 carried two 500 pound general purpose bombs, and over 4500 rounds for its eight .50 caliber machine guns. It had a cruising speed of 250 knots and a radius of action of 300 miles. It truly proved itself as the perfect machine for CAS. Employing a low-angle, on the deck, attack profile, P-47 aircraft would skip bombs or ricochet bullets into enemy armor. From their experience against the CROSSBOW targets, Thunderbolt pilots learned how to find even cleverly camouflaged enemy tanks and troops. In one instance, a P-47 pilot even discovered and destroyed two artillery guns hidden in two large hay stacks. By the end of the month, enemy tank crews and convoy drivers would abandon their equipment when they heard P-47s in their area. It became common for advance elements of Patton's armored forces to find enemy tanks with their engines running. German troops soon referred to P-47 pilots as the "Jabo," a shortened reference to the "jaegerbombers," or hunter or dive bombers. From their perspective, without air support from the Luftwaffe, German troops were the hunted prey of Allied P-47s.

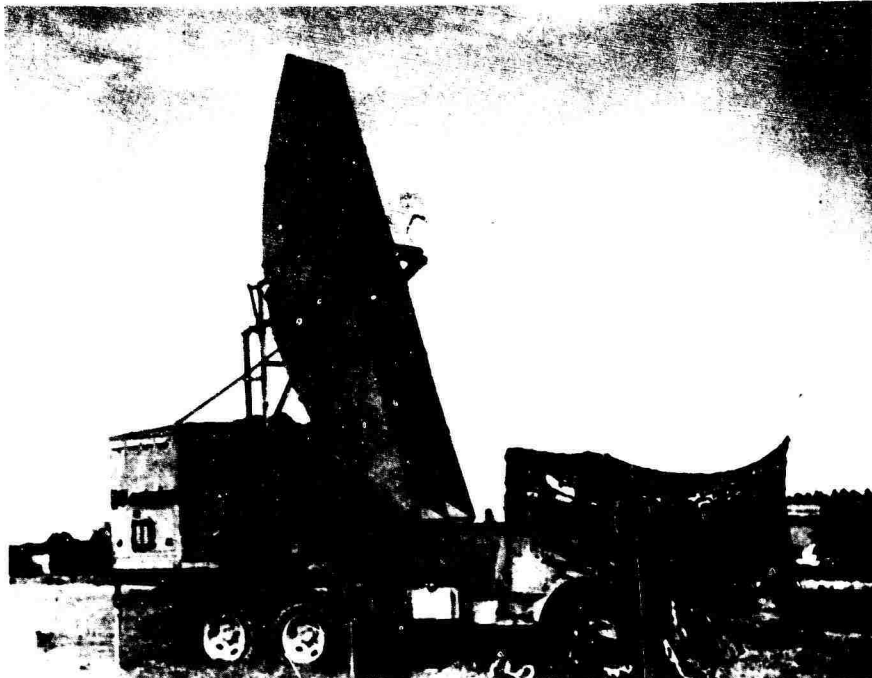
Three major problems restricted the Third Army and XIX TAC during their August offensive -- logistics, communication problems, and inadequate numbers of airfields for XIX TAC. After Allied armies landed in Normandy, supplies continued to arrive on the beachhead. From D-Day to 25 July when COBRA commenced, supplies continued to arrive on the Normandy beachhead in Normandy. Since the Allied armies were unable to advance, mounds of munitions and other supplies accumulated on the beaches. In June and July, Bradley had enough trucks to move these supplies from the beaches to the front lines. The short distances these trucks had to drive did not strain the logistics system. However, in August, the situation changed radically as the Third Army started its advance from Saint Lo first southward, then towards the east. The truck

convoys which according to the original plan were to move munitions and fuel to within 40 miles of the front lines, found they did not have enough motor transport to accomplish this mission. Often trucks had to move fuel and supplies over 175 miles to the front. Given the finite number of trucks available, these trucks drove round the clock to provide supplies for the First and Third Armies. By late August, these truck convoys consumed about 300,000 gallons of fuel each day, fuel the Third Army needed if it were to continue its advance. (49:18) So as Patton moved forward, Allied logisticians were less able to meet his supply needs.

Fuel was also a major logistical problem in 1944. The hurricane which hit Normandy in mid-June disrupted the tanker delivery schedule. Aviation gasoline was the hardest hit by this storm. In June and July, IX TAC used an average of 100,000 gallons per day; by August, when IX and XIX TAC conducted operations, this figure swelled to over 200,000 gallons per day. (49:18) During the pre-OVERLORD planning, Allied logisticians prepared to build numerous pipelines from the beachhead area to the front lines. The Army's inability to quickly isolate and to pacify German military units within the Saint Lo - Mortain - Vire area impeded the construction of a major fuel pipeline to forward air fields being constructed in August. While engineers worked to build the pipeline, Patton's Third Army moved forward toward Paris. During this interim period, overburdened truck transport carried sufficient quantities of fuel to XIX TAC and the Third Army. The speed of Patton's advance assured these engineers would never catch up with the fluid battlefield created by Patton's rapid advance through Northern France. Insufficient storage of adequate fuel supplies on the continent during the beachhead buildup prior to COBRA further exacerbated the fuel shortage during operations in the Fall Of 1944. Prior to COBRA, American units' most critical need was munitions. Over 80% of all supplies flown to the continent during that phase were different types of ammunition. (49:19) To provide sufficient munitions to the Army, logisticians removed fuel and other supplies from their ships and aircraft. This crucial decision assured fuel shortages during the post-COBRA period. Perhaps if the G-4 had been brought more directly into the planning for COBRA and subsequent offensives this fuel crunch could have been solved. Regardless of the cause, during their advance through France and towards Germany, the Third Army and XIX TAC experienced numerous fuel shortages which restricted their operations.



NEWS Azimuth Radar



NEWS Height Finding Radar

Figure 41: NEWS radar network. (USAF Photo)

While Ninth Air Force trained in England, it had developed an intricate system of radar and communications centers to assist its fighter forces. Two of the five microwave early warning (MEW) radars were operational on the continent when COBRA commenced. These units could scan enemy airspace and identify fighter units which might threaten Allied air and ground forces. Through the Tactical Control Center, fighters or fighter-bombers were vectored to airfields and fighter formations before they could attack our forces. Each MEW radar possessed a range of 150 miles under favorable conditions. These radars were the best offensive device available to Ninth Air Force to guide its fighters to enemy formations and to reduce the possibility of fighter-bomber aircraft being surprised by enemy aircraft. (49:16) Using "Y" service (radio transmission intercepts) with MEWS, Allied controllers gained an accurate picture of Luftwaffe operations. By 20 August, "Y" information discerned that enemy fighters operated large formations three times daily at regular intervals from airfields and satellite fields northeast of Paris. Using this information, IX TAC directed fighter sweeps to take advantage of the Luftwaffe's predictability. On 25 August, Allied attacks against enemy bases around St. Quentin resulted in claims of 20 enemy aircraft destroyed, 3 damaged, and 6 probables at a cost of 6 aircraft. A second raid in the Tergnies-Laon area resulted in additional claims of 21 enemy aircraft destroyed, 3 damaged, and 16 probables at a cost of another 11 aircraft. (49:17) These fighter sweeps assured that the Luftwaffe was unable to challenge our fighter-bomber crews or Bradley's ground forces during the Battle for France. Yet as Patton's formations sprinted forward, the radar coverage became less reliable. Until the MEWS radars were repositioned closer to the front, XIX TAC aircrews and the Third Army armored columns could be threatened by enemy fighter operations. Allied engineers could not lay land lines quick enough to maintain communications with TUSA. Unable to communicate with TALOs and division headquarters, to identify the front line, and to monitor CAS along the bomb line, radar controllers relied on returning pilots to identify TUSA's location. The Ground Liaison Officers (GLO), attached to XIX TAC fighter units, attended pilot intelligence debriefs and sent hourly reports to tell Bradley and his staff where Patton was currently fighting.



Figure 42: American Engineers Building a Runway for XIX TAC.
(USAF Photo)

While Patton's army rolled eastward, Weyland's XIX TAC remained tied to airfields in Normandy. From D-Day until 27 August, IX Engineer Command constructed 76 airfields for IX and XIX TAC. (49:13) These airfields, constructed of hessian mat or metal sheets, were 5000 feet long. But before engineers could construct an airfield, infantry units had to pacify the area. In Patton's wake, while the infantry attempted to eliminate German resistance, engineers continued to build advanced landing grounds (ALG) for XIX TAC. Although they tried, airdrome squadrons were woefully short of matting and materials to construct ALGs quickly enough to meet XIX TAC's tactical needs. From 1 to 6 August, Patton's forces moved over 130 miles. Two of the three fighter-bomber groups in XIX TAC were assigned to fly armored column cover for the 4th and 6th Armored Divisions which Patton sent southward toward Avranches on 1 August. The further Patton advanced, the more limited became the loiter time available for XIX TAC crews flying ACC for Patton's advancing armored columns. The rapid refueling and rearming of ACC aircraft created a severe strain on XIX TAC. To assist Weyland, Maj Gen Quesada assigned IX TAC units temporarily to XIX TAC. The five "loaned" units provided enough aircraft to provide adequate cover for each armored column. Also, Ninth Air Force removed the requirement for fighters to cover ACC fighter-bombers early in August -- a true testament to the air supremacy assured by Allied air power for its ground forces. Ninth Air Force daily operational reports note only four instances of German aircraft attacking Allied ground troops during August. Further, these attacks were made by two-ship formations which were quickly scattered or destroyed by Allied aircraft flying ACC or armed reconnaissance mission. This move truly demonstrated the flexibility of air power to meet Bradley's CAS needs and enhanced the striking power of Patton's advance.

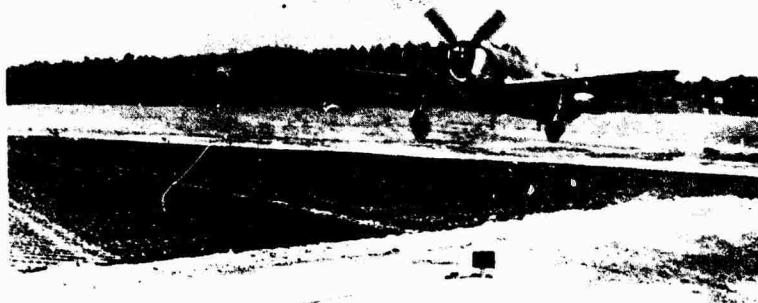


Figure 43: P-47 Landing on a Hessian Mat Runway. (USAF Photo)

The fluid nature of the battlefield made it hard for XIX TAC to properly identify current battle lines. Through use of VHF radios, colored panels, and other identification markings, TUSA kept the P-47s aware of their position. The closely integrated communication network assisted XIX TAC pilots to assure they did not attack friendly forces. But as tankers and pilots became more comfortable with their tactical relationship, bomb lines ceased to exist. Ninth Air Force pilots had proven they could accurately deliver any type of munition close to any ground force. The skills developed during the CROSSBOW and bridge interdictions, and careful identification of targets, made Patton and his ground forces confident XIX TAC aircrews would not hit their positions. Employing tactical reconnaissance aircraft as forward air controllers, XIX TAC aircrews were able to drop their bombs within 300 yards of TUSA formations. During the Battle of the Bulge, these crews used specially equipped fighters, directed by MEWS radars, to provide CAS in low visibility and poor weather. As a result, Third Army units ceased to identify the bomb line, but directed their pilots accurately to enemy positions.

XIX TAC MISSIONS TO SUPPORT THIRD ARMY

When Gen Patton took command of the Third Army, a new operational approach to combat in France began. Since Patton was a cavalry man, he viewed war differently from the infantry commanders who had directed American troops before 1 August. He saw war as a mobile environment where his tanks, the modern cavalry, could exploit their mobility and quantitative advantage over the Wehrmacht. Through deep penetrations into the German rear areas, the Third Army could envelop the Seventh Army, destroy its lines of supply, and permit the Allies to quickly win the Battle for France. But Patton's operational assessments could come true only if Weyland's XIX TAC could maintain air supremacy. Patton had no doubts this precondition would be met. In sum, Patton unleashed a war of annihilation upon the German Seventh Army. Whereas infantry leaders timidly advanced through the bocage and became tied down at every cross roads, Patton's forces would advance quickly toward only one goal -- the heartland of Germany. They would leave every strong point for the infantry to handle.

Gen Patton's advance through France turned the interdiction role of aircraft inside out. XIX TAC had been created to provide CAS for Patton's Third Army; yet the nature of Patton's drive through France would redefine the CAS mission. Boldness and speed were Patton's formula for success. In order for his plan to be successful, XIX TAC must be as mobile as his tanks. Quesada's emphasis on mobility after Ninth Air Force's creation assured XIX TAC and its support units were mobile enough to cover Patton's rapid advance through France. The creation of armored column cover and armed reconnaissance tactics provided the basic tactical doctrines and communications mediums required to effectively integrate Patton's forces with Weyland's aircraft. And the innovative attitude inculcated in Ninth Air Force operations since April, gave the aircrews the confidence and discipline to assure ACC and armed reconnaissance tactics were successful. This attitude also helped XIX TAC pilots to adjust to the fluid battlefield environment present during the Campaign for France. In short, the close cooperation which existed between XIX TAC and the Third Army was the culmination of Quesada's entire concept of air power and how it could effectively be used to support ground forces. The successful assault of Patton's armor through France would vindicate Quesada's foresight and practical approach to war.

Patton's advance through France created new roles and missions for Weyland's aircrews. While its aircrews flew predominantly armored column cover tactics and armed reconnaissance missions, Patton wanted the fighter-bombers to prevent the movement from, not to, the battle area. (56:5) In this fashion, the Third Army would be able to cut off the German Seventh Army from its retreat from Normandy. Using his armor's speed and maneuverability, Patton wanted to avoid major resistance areas and to create havoc in the enemy rear areas. His advance after COBRA would employ five major spearheads to encircle the Seventh Army and drive for the Siegfried Line in Germany. Daily these five columns would be covered by Weyland's P-47s. Continually, these pilots would destroy enemy strong points, provide reconnaissance for armor columns, and protect Patton's flank from Elster's Army south of Patton's position. These aircraft would also be used to block Rundstedt's retreat route from Normandy.

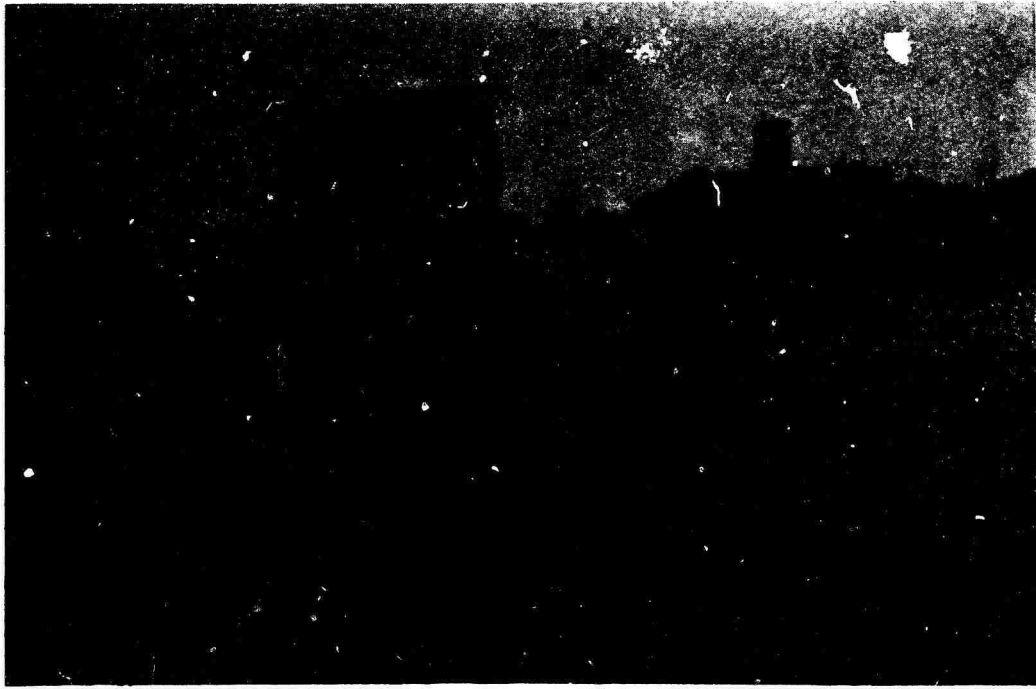


Figure 44: Bridge Destroyed by XIX TAC. (USAF Photo)

During August, Patton's tank columns averaged over 20 miles a day. Given the fluid nature of the battlefield, Weyland and his pilots found it impossible to preplan any CAS for the Third Army. Instead, XIX TAC relied on its pilots to keep radar controllers and Bradley's Twelfth Army Group staff appraised of Patton's position. When returning from each mission, pilots reported to the Forward Director Units and GLOs where the front line was currently located. In this fast moving, fluid battlefield, ground forces used colored panels to identify their positions for Allied aircrews, and smoke to identify enemy targets they desired the fighter-bombers to attack. Unable to preplan any operations, Weyland ordered his pilots not to attack any target unless they had visually identified it. As pilots approached the target area, they contacted the TALOs in each tank column for a briefing. During these communications, pilots learned where the friendly troops were and about problems in the area. Pilots used this information to plan their actions, and prepare themselves for armed reconnaissance, which usually followed their ACC watch.



Figure 45: Fighter Operations Control. (USAF Photo)

The majority of XIX TAC's missions were close air support missions, particularly ACC. Between 10 and 14 tanks in each armored division carried VHF radios, identical to those used by fighter-bombers. Flying in four and eight-ship formations, XIX TAC flights loitered overhead of each armored column as it advanced. These aircraft were ready to attack enemy tanks, to eliminate delaying forces, and to scout ahead of each column. Every 30 minutes a new flight would replace the first, releasing it to conduct armed reconnaissance ahead of the flight. Any targets of opportunity found by these advancing aircraft were quickly destroyed. With this aircraft cover always present, obstacles which would have taken the armor hours to destroy were eliminated in minutes by XIX TAC's crews. (56:7-8) Enemy forces came to fear the fighter-bombers and their accurate, unrelenting attacks. Often ACC aircraft would not have an opportunity to use their weapons. After being relieved by their replacements, these flights would fly ahead of the column to conduct armed reconnaissance. Patton's tanks became accustomed to the "calling cards" -- destroyed armor, trucks, and buildings -- left by these attacks. The new mobility created by this air-ground teamwork permitted Patton's rapid advance through France.

Armed reconnaissance missions were also assigned to XIX TAC units during this campaign. Often these crews would hit bridges 40-50 miles behind Patton's advance. With these structures destroyed, German troops could be funneled into open areas more conducive to tank operations. These aircraft were also used to protect key bridges which Patton had identified as crucial

to his high speed advance. When enemy engineers attempted to detonate these bridges, P-47s would sweep down and disperse them. Armed reconnaissance was also used to protect Patton's flanks from German counterattack. When Gen Elster tried to consolidate and mass his forces, aircraft from XIX TAC would destroy the massed formations. Through such actions, Patton's lines of supply and communication to Bradley were secure despite his rapid advance. After weeks of constant attack by XIX TAC, on 14 September, Gen Botho Elster agreed to surrender his 20,000 troops south of the Loire River. "Keep the 'JABO' off my men," he said, "and they will march north to the BEAUGERCY Bridge and surrender." (45:54) In recognition of XIX TAC's success protecting Patton's southern flank, Gen Elster asked Brig Gen Weyland, jointly with Lt Gen Patton, to accept the surrender of his besieged army. (45:54)

After the 14th of August, most of the ACC missions flown by XIX TAC became armed reconnaissance sorties. Without any targets to destroy, the airborne cover flights of Thunderbolts, spent their time over the tank columns, then assaulted the open fields and any targets of opportunity in the battle area. These sorties skew Ninth Air Force statistics for the remainder of the war. Although these aircraft were dispatched for ACC, these sorties were reported as Phase 11 -- interdiction missions in the daily statistics kept by the units. When assessing the true nature of close air support from September 1944 to May 1945, this accounting procedure must be noted. When one reviews the daily statistics for Ninth Air Force fighter operations during August and September, approximately 55% of each days missions were truly close air support for the Twelfth Army Group.



Figure 46: "Calling Cards" of XIX TAC. (USAF Photo)

XIX TAC OPERATIONS DURING AUGUST

During August these pilots flew every imaginable tactical air power mission -- long-range bomber escort, interdiction of rail and transportation systems, armored column cover, and armed reconnaissance. Yet it was these latter two missions which would occupy XIX TAC crews. During the month, XIX TAC flew 12,292 bomber sorties to support Third Army advances. In these campaigns, XIX TAC destroyed 4,058 motor vehicles, 466 tanks and other armored vehicles, 598 horse-drawn vehicles, 246 locomotives, 2,956 railroad cars, 155 barges and other river craft, 18 merchant vessels, and 8 naval vessels. (44:A1) Further, XIX TAC crews cut 122 railroad lines and destroyed 222 gun positions, 39 marshalling yards, 11 ammunition dumps, 13 fuel and supply dumps, 3 radar installations, 17 airfields, 7 headquarters, 44 troop concentrations, and 58 barracks and enemy buildings. (44:A1-2) Yet it is not these accomplishments which made the XIX TAC unique.

During the month, XIX TAC took on five separate major assignments: guarding Patton's Loire flank, neutralizing enemy air power, flying armed reconnaissance, providing close cooperation for Allied ground forces, and assisting in siege operations against Brest, Lorient, St. Malo, and the Ile de Cezembre. In each instance Weyland's crews provided superb assistance to Patton and his subordinate commanders. Despite Patton's rapid advance, limited communications, and logistical problems, XIX TAC crews proved themselves to be superb members of Patton's air-ground team. One campaign which demonstrates this fact was the attempted encirclement of the Seventh Army.

After the COBRA breakout, Hitler ordered his ground troops in the West to stand fast and to counterattack against Bradley's forces at Mortain. Their objective was to drive through the American lines to Avranches. If Hitler could attain this objective, he would be able to dissect American ground forces in Normandy. The overwhelming Allied air supremacy, coupled with ULTRA information, doomed Hitler's counteroffensive. American P-47s pulverized German units advancing toward Mortain and caused severe logistics problems for German operations after COBRA. The exposed German position, however, gave Bradley an opportunity to encircle the German Seventh Army. If Patton's forces could link up with the Canadian Army at Falaise, Allied troops would control the only escape route available to Rundstedt's Army Group B. Patton redirected XV Corps from the Loire to Argentuan. While covering this force, XIX TAC sought targets of opportunity within the German pocket. Although the Allies were unable to close the pocket. Ninth Air Force crews from IX and XIX TAC destroyed a majority of the Germans equipment. Of the 70 tanks which began the initial attack against XXX Corps at Mortain on 8 August, IX Fighter Command destroyed 40 the first day. By the morning the 9th, German Seventh Army reports indicated that only 25 tanks were still operational. (14:479) On 13 August, 37 Thunderbolt pilots from the 36th Fighter Group found between 800 to 1000 German vehicles of all types milling around in the pocket west of Argentuan. Within an hour, P-47s had blown up or burned out between 400 and 500 enemy vehicles. The fighter bombers continued their attacks until they ran out of bombs and ammunition. One pilot, with empty guns and bomb shackles, dropped his belly tank on 12 trucks and left them all in flames. (52:29-30) By the end of the battle, 7 German armored divisions had managed to get only

1300 men, 24 tanks, and 60 artillery pieces across the Seine River. Allied forces had killed 10,000 and captured over 50,000 Germans. (16:455) Allied air and ground forces had destroyed 220 tanks, 160 assault guns, 700 towed artillery pieces, 130 anti-aircraft guns, 130 half tracks, 5000 other vehicles, and 2000 wagons during the Battle in the Falaise gap. (23:315) In short, the campaign had been a tactical success. Yet if Bradley and Montgomery had cooperated better, the whole German Seventh Army would have been destroyed. Of the 24 German division commanders, 20 had managed to escape to fight another battle.

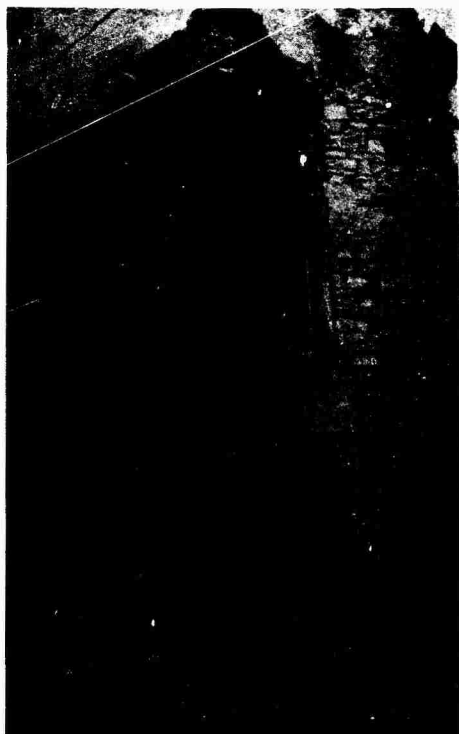


Figure 47: Rundstedt's Headquarters After a Visit From XIX TAC.
(USAF Photo)

Patton attempted a second encirclement of the routed Germans at Mons. During the battle for the Mone pocket, the 3rd Armored Division took between 7500 and 9000 prisoners on 3 September. Ninth TAC claimed it destroyed 851 motor vehicles; 50 armored vehicles, 652 horse-drawn vehicles, and took 485 prisoners. In three days, Patton's armies had taken an additional 25,000 prisoners, remnants of the 20 disorganized Seventh Army divisions. Those elements of the German Fifteenth Army Hitler sent to Falaise to assist Rundstedt's retreat were caught in the Mone pocket. Although Patton and Weyland destroyed most of their equipment, once again, the Germans were able to withdraw before Patton could close the pocket. Yet the Third Army would see these troops again during the Battle of the Bulge in December.

By mid-August, German soldiers were totally demoralized, everywhere they looked they saw Allied fighter-bombers. An 18-year old prisoner, captured from Falaise, informed his Allied interrogators that he and his company had no food for four days after the fighter bombers smashed their field kitchen.

Another prisoner, a junior officer in the 363rd Infantry Division, said, " You have bombed and strafed all the roads, causing complete congestion and heavy traffic jams. You have also destroyed most of our gasoline and oil dumps, so there is no future in continuing to fight." (56:20) On August 14, over 400 enemy soldiers waved a white flag when Thunderbolts from the 405th Group circled over head. These troops began lining up and marching in an orderly fashion toward Allied lines. (52:31) During their attack on the Falaise pocket, Allied soldiers killed two Germans for every one which survived. The German Seventh Army, and part of the Fifteenth Army which had come to assist it, had been annihilated. Gen Eisenhower stated in his diary that:

The battlefield at Falaise was "unquestionably one of the greatest killing grounds of any war." . . . Roads, highways, and fields were so choked with destroyed equipment and with dead men and animals that passage through the area was extremely difficult. Forty-eight hours after the closing of the gap I was conducted through it on foot, to encounter scenes that could be described only by Dante. It was literally possible to walk for hundreds of yards at a time, stepping on nothing but dead and decaying flesh." (10:279)

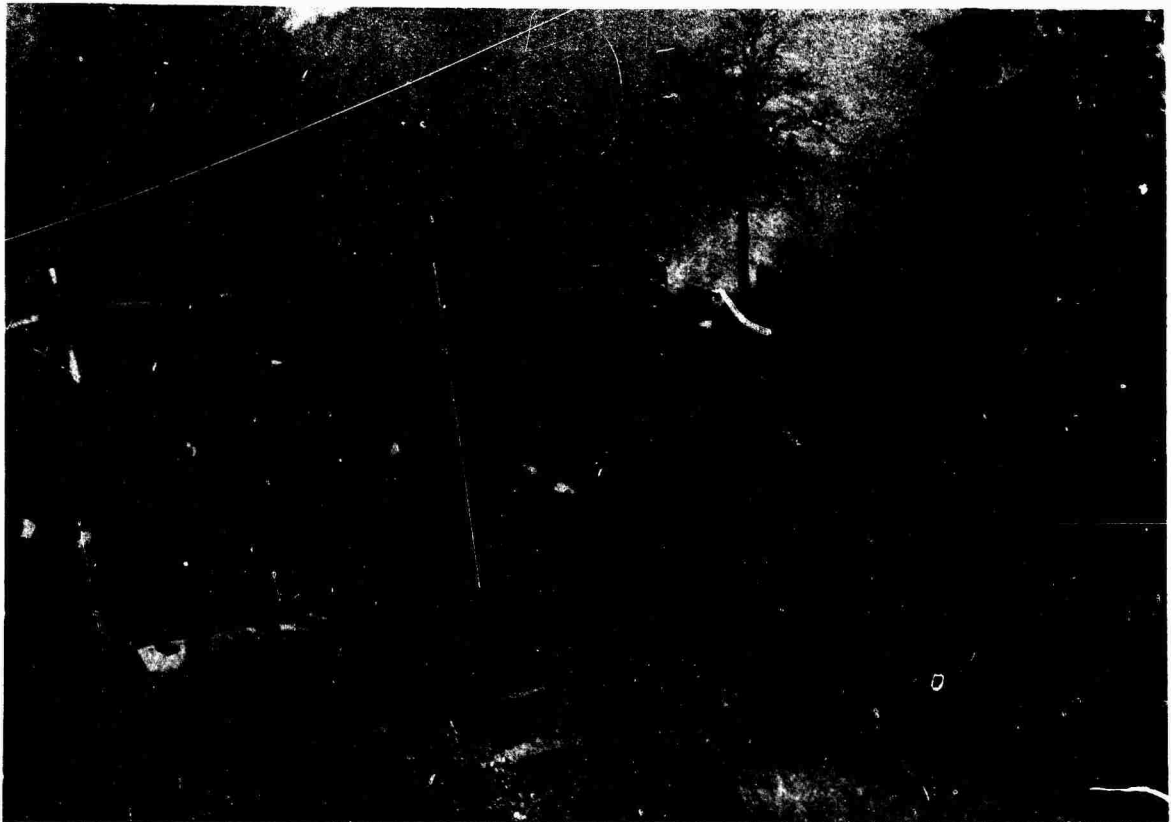


Figure 48: Destroyed German Vehicles in the Falaise Pocket. (USAF Photo)

SUMMARY

After their assault on the Falaise and Mons pockets, the TUSA/XIX TAC team devoted their attention to liberation of the remainder of France. During their operations, XIX TAC continued to provide immediate close support for every TUSA armored column and to guarantee complete air supremacy. Although logistics slowed their advance outside Metz in late September, Patton's effective air-ground team had amassed an unequalled record for joint CAS operations. During August and September, they had liberated France and advanced into Belgium. XIX TAC had flown 23,306 sorties to support Patton's Third Army; dropped 3870 tons of bombs; and destroyed 6180 motor transport vehicles, 662 tanks, 522 locomotives, 3778 railroad cars, 21 bridges, 432 gun emplacements, 909 horse-drawn vehicles, 198 enemy aircraft in aerial combat, and 100 aircraft on the ground. Additionally, these crews attacked 69 marshalling yards and 45 supply dumps; cut 375 rail lines; strafed 76 troop concentrations and 23 airfields; and bombed 392 factories and buildings. (52:--) These awesome tactical accomplishments demonstrate the effectiveness of the aircrews who flew with XIX TAC.

Yet it was the tactical CAS procedures developed by XIX TAC as it supported Patton's Third Army which best epitomize how integrated air and ground forces had become. The constant advances of Patton's armored columns may have strained Weyland's aircrews and maintenance support forces, but they also demonstrated how the flexibility of air power noted in WDFM 100-20 could be employed. Throughout the whole campaign, XIX TAC's aircraft flew continuous air cover over each of Patton's armored columns and refined new CAS procedures to assure each column could advance unrestrained by enemy ambushes and attacks. The ACC missions, developed by Quesada in July, demonstrated that air and ground commanders could operate in a cooperative, rather than an adversarial manner. Truly, American air and ground forces had come along way since their disastrous CAS efforts in North Africa. The extensive Ninth Air Force aircrew training, honed by interdiction missions against CROSSBOW and transportation targets, assured that IX Fighter Command, IX and XIX TAC were fully prepared to support their ground counterparts after D-Day. Credit must be given to Gen Quesada and Weyland for their foresight and courage to develop CAS doctrines and crews to implement such a strategy. Perhaps Gen Patton summarized how far American air and ground forces had come in the citation to Gen Weyland's Bronze Star Medal.

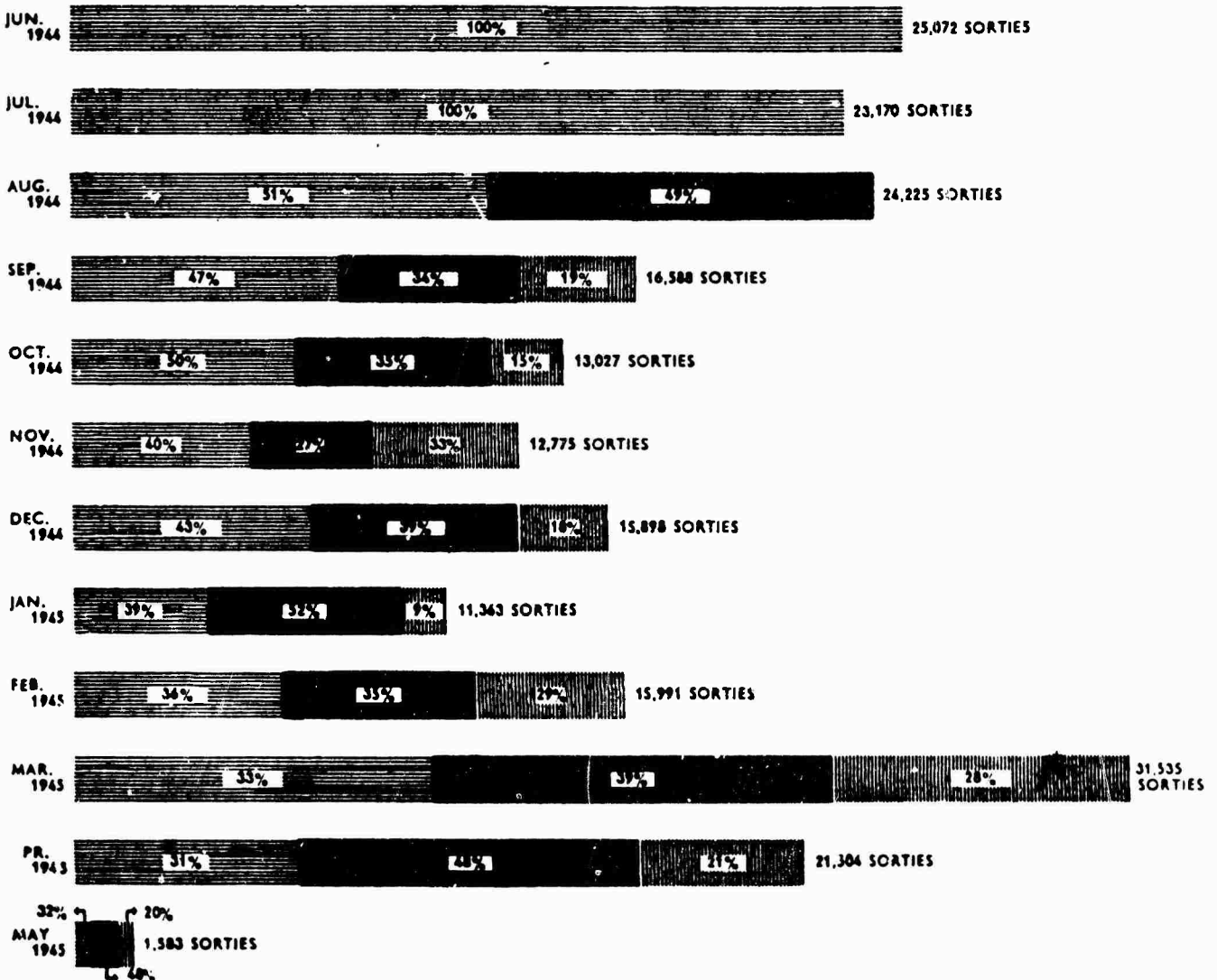
The superior efficiency and cooperation afforded this army by the forces under your command is the best example of the combined use of air and ground forces I have ever witnessed. Due to the tireless efforts of your flyers, large numbers of hostile vehicles and troop concentrations ahead of our advancing columns have been harassed or obliterated. The information passed directly to the head of the columns 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.

MONTHLY DIVISION IN FIGHTER BOMBER COOPERATION

ARMY	SORTIES	PERCENTAGE
FIRST US ARMY	114,644	53.9%
THIRD US ARMY	66,364	31.3%
NINTH US ARMY	31,323	14.8%
TOTAL	212,731	100.0%

LEGEND

FIRST ARMY 
 THIRD ARMY 
 NINTH ARMY 



(This division between armies of actual fighter bomber cooperation sorties is based on location of targets attacked and is believed to be generally accurate, being the result of a study of Ninth Air Force Daily Summaries of Operations.)

Figure 49: Fighter Bomber Support for Twelfth Army Group (31:26)

There is no doubt that joint planning has made the efforts of ground and air more effective. At the Army-TAC level, at least, insofar as it applied to Ninth U. S. Army and XXIX Tactical Air Command, it is felt that the joint planning was entirely satisfactory. Little was left to be desired. This statement does not mean that perfection has been reached. It is expected that improvement can and will be made during future operations.

. . . Lt Gen William H. Simpson, Commander of the
Ninth U. S. Army (1945)

EPILOGUE

Gen Simpson's statement effectively summarizes the close air support mission; by its very nature, CAS is a joint mission. Yet, as noted, during the interwar period, the American Army and its Air Corps failed to cooperate with each other, to effectively train their crews and ground forces in CAS procedures, and to develop a clear, precise CAS doctrine. Plagued by institutional indifference, budget constraints, and evolution of the strategic bombardment mission, the American Army did not devote sufficient attention to its CAS mission. The defeat at Kasserine Pass in 1943 became the turning point for CAS. After that battle, Allied leaders began to solve the three major CAS problems: inexperienced pilots and ground forces, lack of communications procedures, and inadequate doctrine to integrate their forces into an effective air-ground CAS team. During and after COBRA, IX and XIX TAC established the crucial communications linkages with their ground units. By using Army Air Force VHF radios in lead tanks, Quesada and his crews effectively integrated the firepower of their aircraft to support directly and to shape the battlefield for Gens Patton and Hodges. The complete integration of this air-ground team assured American soldiers could exploit their mobility, destroy their German counterpart, and avoid high casualty rates. By daily providing CAS support for the FUSA and TUSA, Ninth Air Force crews and their supported ground soldiers gained confidence in the ability of and advantages of close air support. Only through continual use of these CAS doctrines did the full synergism of this new integrated air-ground team evolved into an effective fighting force which permitted Gen Bradley to defeat the Germans in France during 1944.

THE FUNDAMENTAL PRINCIPLES OF CAS

Although the United States Army had not properly developed the force structure, doctrine, and procedures to conduct close air support missions prior to the Second World War, North Africa provided ample opportunities for the American Air Force and Army to develop a CAS doctrine. The initial Allied failures in North Africa came from three main areas: poor training, inexperience, and bad communications. Each of these problems should have been solved during peacetime exercises. But there was not enough money or interest in the Army until 1940 to provide realistic wartime exercises to permit the American military to develop an effective air-ground team prior to North Africa. The British, also, were slow to develop a clear CAS doctrine, but by

the time America entered the war, they had assimilated enough combat experience to derive the basic principles of modern airpower. The close association of Montgomery and Coningham permitted the British military to solidify these precepts into a basic doctrine. These basic concepts became Allied CAS doctrine after the Casablanca Conference in 1943. Now Allied airmen had a mission priority by which to plan and control the air war. They would gain air superiority first, then isolate the battlefield, and finally, assist the ground forces to attain their campaign objectives. It was this basic doctrine which guided Allied air leaders for the remainder of the war.

The training and combat experience Ninth Air Force pilots gained in England prior to D-Day gave them the operational and tactical CAS doctrines they needed to support Bradley's armies after the invasion. Coupling the basic doctrine with new equipment and tactics, these crew members developed the armored column cover and armed reconnaissance tactics which so effectively integrated air power with land power during and after OPERATION COBRA. By the end of the war, the United States military had a well-defined, well-coordinated CAS doctrine. During the euphoria which characterized the post-war period, many of these CAS doctrines atrophied. Eight years later, when the United States became involved in Korea, the American Army and Air Force had to relearn these lessons again in combat. Our Vietnam experience again demonstrated the American military was unprepared to conduct CAS. In short, after each war in this century, those CAS skills and doctrines proven successful in combat have to be relearned after the war commences. If this trend holds true for the next war, then the current Army AirLand Battle Doctrine is doomed to fail.

Although history does not repeat itself, there are certain lessons which can be learned from past wars which can improve American warfighting ability; the CAS doctrines used by Ninth Air Force fall into this category. The United States cannot expect to have total air supremacy in the next war, or should not plan for such a scenario. The abundance of equipment present in the Army Air Force during the Second World War will also probably not be available. Therefore, it is these doctrinal precepts from America's World War II experience which offer the best lessons about how to fight and win a coordinated air-ground campaign. It is these combat lessons dealing with communications, tactical doctrine, and cooperation which demand our further study.

The most important characteristic of the air-ground team developed by Patton's Third Army and XIX TAC was a solid communications program. Patton and Weyland thoroughly integrated their staffs at every level. The exchange of officers to serve as TALOs and GLOs provided an invaluable linkage to both land and air forces during the war. They also held daily conferences to coordinate their priorities and to define the "commander's intent" for the next day and the remainder of the campaign. Both the pilot and the tank commander leading each armored spearhead knew their mission was to advance deep behind German lines and to attack the German homeland as soon as they could. Also, each pilot knew what his counterpart in the tank expected each aircraft to do during their ACC and armed reconnaissance missions. As such each ground officer and pilot understood and accepted their missions to support the objectives set forth by the ground commander. It was this unity of command which made Patton's air-ground team unusually effective and

successful. Without this characteristic, the Third Army could not have made its rapid advance through France in August and September 1944.

Electronic combat now creates communications problems for the air-ground team in contemporary warfare. It is unlikely that aircraft and tanks will be able to freely use the radio to coordinate their CAS efforts. The new jammers and radars permit ground forces to quickly identify and locate any force which relies heavily upon the radio. Through the use of their jammers, these men can destroy the close communications between the modern CAS team. They can also fix the position of any ground force so foolish as to rely upon radio contact between their aircraft and ground forces. In short, radio communication will not only not be available, but can either tip the enemy off to current operations or make our ground forces vulnerable to enemy air and artillery assaults. Neither situation would permit our ground forces to effectively integrate air and ground forces into an effective team or to destroy the front elements of an enemy assault. To overcome these weaknesses, the American military must now develop communications-out CAS procedures.

Employing modern technology, either microburst radio transmissions or laser technology, offers a unique opportunity for our forces to develop new quick communication and target identification procedures that efficiently integrate our air and ground forces into a modern CAS team. To fix your position, the enemy must be able to listen to at least ten seconds of radio communications. Employing a short message format which quickly permits the pilot to identify his front lines, microburst radio contacts would not give away friendly ground positions. When coupled with low power lasers, Allied ground forces could quickly identify enemy targets and avoid fratricide caused by improper identification in the battle area. Laser designation by ground forces could also reduce the vulnerability of aircraft operating along the front lines. Perhaps a stand off conventional cruise missile, with a range of 350 miles, or a drone could be used to fulfill lower priority CAS requests. Aircraft could then be used to hit only those targets which require immediate attention by air or ground fire support directed by the ground commander. These procedures need to be developed and practiced by every squadron and ground unit at either RED FLAG or the Military Training Center before the war begins. Only then will the AirLand Battle Doctrine have a chance to succeed.

The American military does not like to conduct joint operations. But if CAS by its very nature is a joint operation, then joint tactical CAS doctrines must be developed. Currently, the Air Force and the Army continue to use those tactical doctrines developed during World War II. It is time for pilots and ground officers to jointly develop a new tactical doctrine for the electronic battlefield which could effectively integrate our limited CAS resources. These officers should be encouraged to experiment with these tactics and procedures and to practice them in a realistic modern battlefield. Through indepth critique of each exercise, the American military can hone and perfect new CAS techniques which will work on the contemporary electronic battlefield. Also, these crew members should be encouraged to define ways to effectively disguise our CAS efforts. These new tactical doctrines would permit our ground commanders to more efficiently integrate air and land assets to conduct a successful AirLand Battle.

If these doctrines are to be successful, they must be practiced not just

by company level units, but also by corps level units. Only then will each pilot and gunner know his mission, have confidence in his tactical doctrines and equipment, and understand how they integrate into the combined fire support plan developed by the ground commander. When gunners and pilots have assimilated these new tactics, then chemical warfare training should be incorporated into future war exercise scenarios to prepare our ground forces and air crews for this contemporary threat as well. The complex nature of the modern battlefield demands that these doctrines be practiced prior to their use in combat. If exercises are not conducted, then the American military will risk repeating the disastrous North African Campaign. But this time, those irreplaceable air and ground assets will be destroyed and the war might be lost.

In short, if the Army expects to effectively employ its AirLand Battle Doctrine, it must practice those communications procedures, tactical doctrines, and CAS methods which it expects to use in battle. Through realistic joint exercises and critiques, the major problems present when conducting CAS can be eliminated. History has shown both the Air Force and the Army must pay more attention to CAS and its role on the modern battlefield. It may not be a glamorous mission, but it is essential to the modern AirLand Battle Doctrine.

CAS AND THE AIRLAND BATTLE

Tactical air power missions have not changed since WDFM 100-20 was published in July 1943, but the battle field and American doctrine have. The modern battlefield is a fast moving, fluid area where multi-echeloned forces are deployed in non-linear formations. Arrayed throughout this battlefield are artillery, electronic jammers, and surface-to-air missiles to intercept and destroy modern aircraft. This complexity differentiates the modern battlefield from the combat of the Second World War.

The Ninth Air Force had two major advantages in 1944 over the Germans -- total air supremacy, and unlimited resupply from a fully mobilized industrial base. It is highly unlikely either of these two advantageous factors will be present during the next war. With its air supremacy, IX and XIX TAC were able to maintain close radio contact with their ground forces. Further, American ground forces never had to spread out their resupply efforts or advancing armor columns to avoid enemy air attack. Yet, by comparing the two battlefields, officers can identify unique characteristics of the modern battlefield which will impede our CAS efforts during the next war.

Modern warfare is extremely mobile. Employing his modern tanks and mechanized forces, a modern general can immediately use his artillery and tanks to threaten his adversary and to destroy his will. This increased timing and tempo of the modern battlefield makes war very unpredictable. To disguise his efforts, the modern commander must not predeploy his forces, but must permit them to combine at the battlefield simultaneously to destroy an area or enemy threat. Once this mission is accomplished, these forces must quickly disperse to avoid the effects of enemy CAS and artillery. These forces also must be very flexible to meet any enemy counterattack. Modern aircraft and tanks are more technologically sophisticated than their World War II counterparts. Although aircraft can attain higher sortie rates, their systems are less reliable, less rugged, and incapable of duplicating the close intimacy of CAS forces which existed during the Second World War.

The increasing threat and mobile firepower in Soviet tank divisions causes a problem for the modern commander. Allied commanders must be able to impede the movement of these tanks into the battle area. These modern ground commanders must think about how to delay, disrupt, and destroy the second and follow on echelons of tanks before they can be effectively integrated into the enemy order of battle. Employing air power and his indigenous artillery fires, a ground commander will attempt to force their adversaries to deploy their forces early. This tactic will slow the enemy force, cause communications and coordination problems, and decrease the threat of this force upon current land operations. To pursue this strategy, the range of CAS aircraft and areas where CAS will be performed is deeper behind enemy lines than it was during the Second World War. Communications procedures and tactical doctrines must be developed, practiced, and perfected to assure the modern commander can effectively integrate all his support elements -- aircraft and artillery -- to effectively support his ground campaign.

Modern battles are no longer isolated events, but result from continuous operations along the forward edge of the battle area (FEBA). During the

Second World War, there were periods when a ground commander could rest his troops behind well defined geographical lines. The fluid nature of the AirLand Battle Doctrine where units now intermingle along the front lines almost assures these soldiers will be continually in contact with the enemy. On this battlefield, little pockets of friendly and enemy ground forces will intermingle throughout the whole theater in a haphazard fashion. The modern commander must be able to identify his forces, protect them from fratricidal fires, and destroy the enemy which threatens his forward infantry units. In an environment where his adversary is jamming his communications, attacking his headquarters, employing chemical and biological agents to degrade his capability, and destroying his supply depots, this commander may have a hard time maintaining control of his forces. Even if he can accurately pinpoint his adversary and direct aircraft to the area, how will these aircraft communicate with the ground forces and assure they are attacking the proper ground target?

The modern battlefield has a diverse array of high priority, high value assets deployed from the FEBA to the fire support control line (FSCL) (see Figure 50). Modern commanders must be able to prioritize these abundant CAS targets. They must also implement procedures to assure his limited CAS aircraft are not shot down by friendly artillery or ground forces. Clear precise procedures to integrate these air and ground fires into an effective air-ground team must be developed now. The complexity of the modern battlefield and capability of tactical equipment have made coordination and cooperation between all CAS forces more imperative. The modern commander who best integrates these fires will win the campaign. The decreasing of friendly vulnerability to fratricide and immediate ability to respond to battlefield opportunities should be the goal of each member of the air-ground CAS team. By identifying modern CAS tactics, practicing them in realistic exercises, and integrating friendly artillery and air power upon CAS targets, the AirLand Battle can be won. It should be towards this goal that future joint operations should be directed.

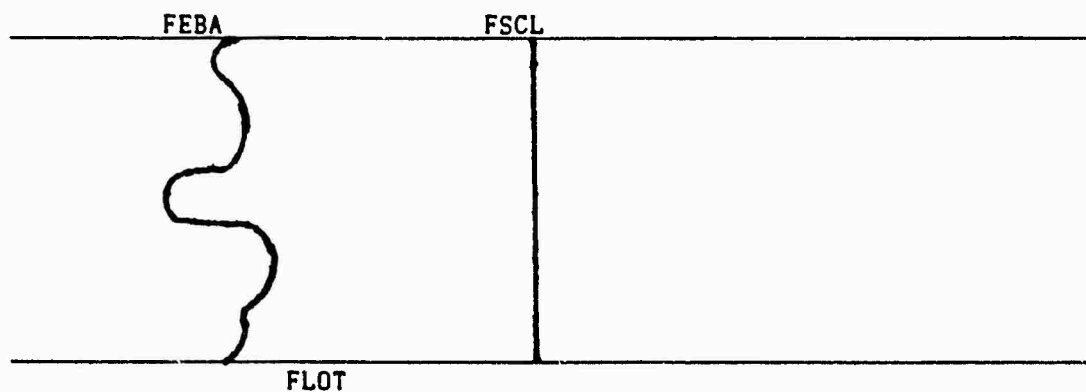


Figure 50: The Modern Battlefield

Finally, the non-linear nature of the battlefield causes problems for planners and support personnel. Where are we going to mass our efforts? On the counter air program? For CAS? Since forces move so quickly, how will we

be able to identify our forces? Can we assure all our fires are integrated into a cohesive program to destroy the enemy? These questions continually perplex the modern soldier and airman. It is these questions which must be resolved if modern CAS is to be effectively integrated into the ground campaign.

A RECONSIDERATION OF WORLD WAR TWO CAS DOCTRINE

Three crucial items assured the Ninth Air Force developed its CAS doctrine: superb leadership, thorough training, and innovative tactics. The use of these procedures after the Normandy invasion paid tremendous dividends for the American Army. From 6 June 1944 until 8 May 1945, Ninth Air Force crews flew 212,731 missions, 69,326 of these or 32.6% were close air support missions. In addition, these crews flew 94,770 missions to isolate the battlefield. To give the impression that air power won the war would be incorrect. However, the crucial support provided by the Ninth Air Force for Allied ground forces assured the ultimate victory. Only through the integrated effort of air, land, and sea forces was that victory attained.

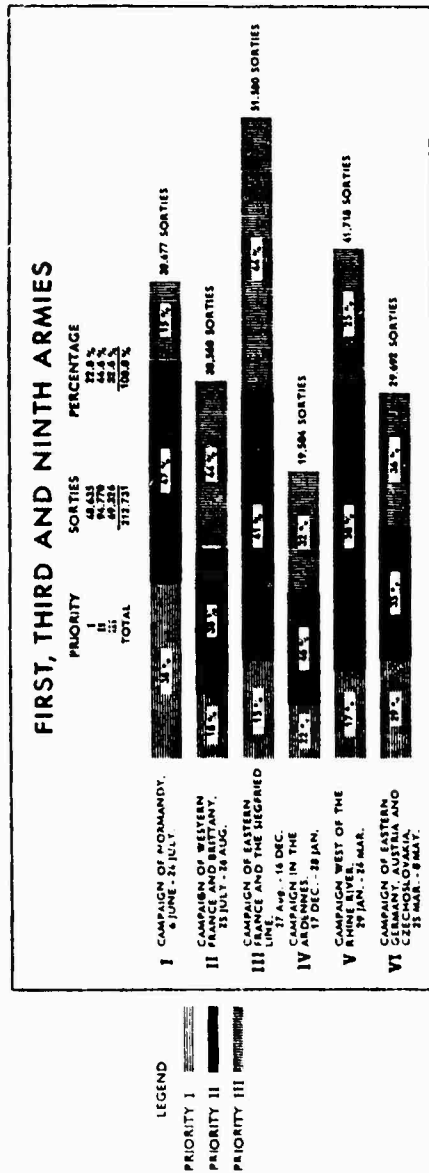
Much of the credit for the Allied air victory goes to Maj Gen Elwood R. "Pete" Quesada. He developed the aircrews, trained them, and effectively integrated his pilots into the air-ground team. At a time when most airmen were avoiding contact with Army units, Gen Quesada used his practical approach to war to develop the armored column cover tactics and to employ them during COBRA. Yet his lasting contribution to tactical air power was more subtle. He encouraged his subordinates and pilots to experiment with new tactics and procedures to destroy ground targets during the POINTBLANK and COBRA campaigns. This new crew force who learned their combat skills during the rugged Ninth Air Force training program and the interdiction campaigns was ready to accept their combat responsibilities. They assimilated the practical nature of their commander. Throughout the war, these pilots continually accepted joint responsibility for creating and executing new tactical doctrines. This same spirit continued in American tactical air forces after the war. It was this professionalism, a trademark of Gen Quesada, which became the legacy of tactical air power after the Second World War. Gen Omar Bradley best described Quesada and his contribution to air power in a letter to Gen Hap Arnold on 25 September 1944. He wrote:

I cannot say too much for the very close cooperation we have had between Air and Ground. In spite of the fact that we had no time for training together in England, it did not take long to work out a system of cooperation. Quesada was a peach to work with, because he was not only willing to try everything that would help us, but he inspired his whole command with this desire to help to such an extent that these youngsters now do almost the impossible whenever they think we need help. In my opinion, our close cooperation is better than the Germans ever had in their best days. (60:2)

If the American military is to develop new CAS procedures required to win the AirLand Battle, current military leaders in the Air Force and Army must show the same dedication to effective joint training and doctrine development. Only then will air and ground forces effectively and efficiently accomplish the goals of current Army doctrine.

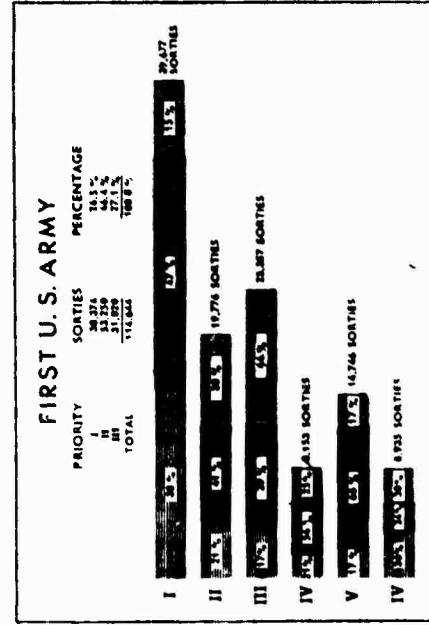
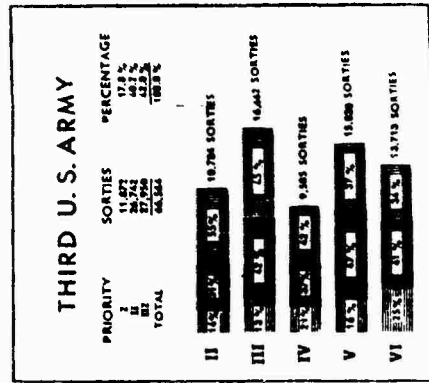
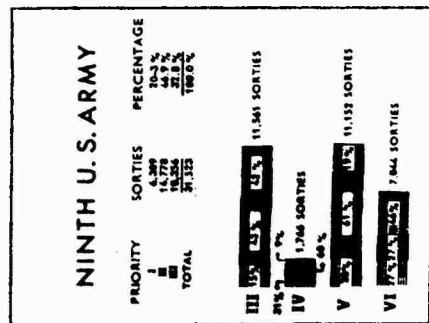
FIGHTER BOMBER COOPERATION

6 JUNE 1944 TO 8 MAY 1945 INCL.



LEGEND

- PRIORITY I
- PRIORITY II
- PRIORITY III



This priority distribution of fighter-bomber cooperation sorties is based on principal I and II only. It does not include the result of a study of Ninth Air Force Daily Summary Reports.

Figure 51: Summary of Fighter Bomber Cooperation for Twelfth Army Group from 6 June 1944 to 8 May 1945 (31:28)

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APPENDICES

- Appendix A: General Arnold's Air Force Mission Priorities
- Appendix B: Lord Tedder's Ten Principles of Air Power (1942)
- Appendix C: War Department Field Manual 100-20 "Command and Employment of Air Power" (21 July 1943)
- Appendix D: Statistical Summary of Ninth Air Force Operations

APPENDIX

APPENDIX A:

General Arnold's Air Force Mission Priorities

APPENDIX A: GENERAL ARNOLD'S FUNDAMENTAL PRINCIPLES OF AIR POWER

The following is extracted from Gen Arnold's Global Missions, pp. 290-1.

Throughout the war, I tried to have the Air Force operate under certain fundamental principles:

1. The main job of the Air Force is bombardment: large formations of bombardment planes must hit the enemy before the enemy hits us. In short, the best defense is attack.

2. Our planes must be able to function under all climatic conditions from the North Pole to the South Pole.

3. Daylight operations, including daylight bombing, are essential to success, for it is the only way to get precision bombing. We must operate with a precision bombsight--and by daylight--realizing full well that we will have to come to a decisive combat with the enemy Air Force.

4. We must have highly developed, highly trained crews working together as a team--on the ground for maintenance and in the air for combat.

5. In order to bring the war home to Germany and Japan, and deprive them of the things that are essential for their war operations, we must carry our strategic precision bombing to key targets, deep in the enemy territory, such as airplane factories, oil refineries, steel mills, aluminum plants, submarine pens, Navy yards, etc.

6. In addition to our strategic bombing, we must carry out tactical operations in cooperation with ground troops. For that purpose we must have fighters, dive bombers, and light bombers for attacking enemy airfields, communications centers, motor convoys, and troops.

7. All types of bombing operations must be protected by fighter airplanes. This was proved to be essential in the Battle of Britain and prior to that our own exercises with bombers and fighters indicated that bombers alone could not elude modern pursuit, no matter how fast the bombers traveled.

8. Our Air Force must be ready for combined operations with ground forces, and with the Navy.

9. We must maintain our research and development programs in order to have the latest equipment it was possible to get, as soon as it was possible to get it.

10. Air power is not made up of airplanes alone. Air power is a composite of airplanes, air crews, maintenance crews, air bases, air supply, and sufficient replacements in both planes and crews to maintain a constant fighting strength, regardless of what losses may be inflicted by the enemy. In addition to that, we must have the backing of a large aircraft industry in the United States to provide all kinds of equipment, and a large training establishment that can furnish the personnel when called upon.

APPENDIX

APPENDIX B:

Lord Tedder's Ten Principles of Air Power (1942)

SOURCE: "Notes on Air Operations Against Rommel in Egypt and Libya."
Command Informational Intelligence Series No. 43-7. Dated
6 May 1943. Washington: Office of the Assistant Chief of
Air Staff for Intelligence, pp. 1-6.

APPENDIX B: LORD TEDDER'S PRINCIPLES OF AIR WARFARE

In June 1942 after the British victory at El Alamein, Air Marshal Lord Tedder enunciated ten inviolable rules of air power. These principles became the foundation upon which Allied tactical air doctrine would evolve at the Casablanca Conference in January 1943. These ten principles were:

1. Air power must be independent of land and sea forces.
2. The Army Headquarters in the field and the Air Headquarters must be adjacent to each other. This close proximity will facilitate communication and cooperation between the two services.
3. Every night the air and ground commanders must hold a joint staff meeting to hash over problems and decide tomorrow's program. The close air support and air interdiction campaigns can then be integrated into the ground commander's overall concept of operations.
4. Radar is very important to air and land forces. It should be located on airfields so that fighters will not be caught on the ground and destroyed by a surprise enemy attack.
5. The fighter plane is the basic weapon of an air force. It should be used for the following missions in this priority:
 - a. Fighter sweeps to clear the enemy out of the sky
 - b. Escort for light and medium bombers
 - c. Interception of enemy aircraft
 - d. As a fighter bomber to provide CAS for ground forces
6. Always assure quick communications between the Air Headquarters and the Unit Commander. Air power is based on being at the right spot at the proper time to destroy the enemy air and land forces. Quick communications are essential to this flexible response by aircraft.
7. The entire air force should be commanded from an Advanced Headquarters located close to the front lines.
8. Air power must have a simplified chain of command. Commanders should restrict the number of people who report to them. These men should be directly responsible for air operations. During the North African campaigns, Lord Tedder had only six men report directly to him. This way his mind was not bothered by trivial matters. These responsibilities he delegated to his key staff members.
9. Intelligence is very important to an air or ground campaign. He had to have the information coming in constantly, right where he could see it. His Intelligence and Operations officers sat at adjoining desks and shared phone lines to the units. Since the A-2 and A-3 sat side by side, Lord Tedder could walk in and get any information he wanted, right on the spot.
10. Mobility is the key to successful air operations. He believed units should be broken down, even to the squadron level, in a 50/50 ratio --

each divided into two parts, with each part self-maintaining in all departments. If independent operations were needed, he employed a leap frog technique. The first element would deploy to the front; when the next deployment occurred the second unit would leap frog past the first unit to the front lines. The most forward element would then become the command element to control the battle. He also believed that units should be able to move within four hours and should deploy to support its operations in isolation for three to four days.

These principles were incorporated into the training and doctrine of each Ninth Air Force unit by Gens Brereton and Quesada. The British Army and Royal Air Force also incorporated these ideas into their doctrine after El Alamein in 1942. Much of the Allied tactical air force success sprang from Lord Tedder's ten crucial air power principles.

APPENDIX

APPENDIX C:

War Department Field Manual 100-20

"Command and Employment of Air Power"

COMMAND
AND EMPLOYMENT
OF AIR POWER



WAR DEPARTMENT • 2, JULY 1943

*United States Government Printing Office
Washington : 1944*

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WAR DEPARTMENT,

WASHINGTON 25, D. C., 21 July 1943.

FM 100-20, Field Service Regulations, Command and Employment of Air Power, is published for the information and guidance of all concerned.

[A. G. 300.7 (30 Jun 43).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,

Chief of Staff.

OFFICIAL:

J. A. ULIO,

Major General,

The Adjutant General.

DISTRIBUTION:

Bn and H 1 (8), 2-55 (5).

(For explanation of symbols see FM 21-6.)

FIELD SERVICE REGULATIONS

COMMAND AND EMPLOYMENT OF AIR POWER

(This manual supersedes FM 1-5, 18 January 1943. Pending revision of existing War Department publications which are affected by the publication of FM 100-20, whenever their contents are in conflict with the provisions of this manual, these instructions will govern.)

CHAPTER 1

GENERAL

SECTION I: Doctrine of command and employment.....	Paragraphs	1-3
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SECTION I

DOCTRINE OF COMMAND AND EMPLOYMENT

- 1. RELATIONSHIP OF FORCES.—LAND POWER AND AIR POWER ARE CO-EQUAL AND INTERDEPENDENT FORCES; NEITHER IS AN AUXILIARY OF THE OTHER.
- 2. DOCTRINE OF EMPLOYMENT.—THE GAINING OF AIR SUPERIORITY IS THE FIRST REQUIREMENT FOR THE SUCCESS OF ANY MAJOR LAND OPERATION. AIR FORCES MAY BE PROPERLY AND PROFITABLY EMPLOYED AGAINST ENEMY SEA POWER, LAND POWER, AND AIR POWER. HOWEVER, LAND FORCES OPERATING WITHOUT AIR SUPERIORITY MUST TAKE SUCH EXTENSIVE SECURITY MEASURES AGAINST HOSTILE AIR ATTACK THAT THEIR MOBILITY AND ABILITY TO DEFEAT THE ENEMY LAND FORCES ARE GREATLY REDUCED. THEREFORE, AIR FORCES MUST BE EMPLOYED PRIMARILY AGAINST THE ENEMY'S AIR FORCES UNTIL AIR SUPERIORITY IS OBTAINED. IN THIS WAY ONLY CAN DESTRUCTIVE AND DEMORALIZING AIR ATTACKS AGAINST LAND FORCES BE MINIMIZED AND THE INHERENT MOBILITY OF MODERN LAND AND AIR FORCES BE EXPLOITED TO THE FULLEST.

626363*—45

1

■ 3. COMMAND OF AIR POWER.—THE INHERENT FLEXIBILITY OF AIR POWER, IS ITS GREATEST ASSET. THIS FLEXIBILITY MAKES IT POSSIBLE TO EMPLOY THE WHOLE WEIGHT OF THE AVAILABLE AIR POWER AGAINST SELECTED AREAS IN TURN; SUCH CONCENTRATED USE OF THE AIR STRIKING FORCE IS A BATTLE WINNING FACTOR OF THE FIRST IMPORTANCE. CONTROL OF AVAILABLE AIR POWER MUST BE CENTRALIZED AND COMMAND MUST BE EXERCISED THROUGH THE AIR FORCE COMMANDER IF THIS INHERENT FLEXIBILITY AND ABILITY TO DELIVER A DECISIVE BLOW ARE TO BE FULLY EXPLOITED. THEREFORE, THE COMMAND OF AIR AND GROUND FORCES IN A THEATER OF OPERATIONS WILL BE VESTED IN THE SUPERIOR COMMANDER CHARGED WITH THE ACTUAL CONDUCT OF OPERATIONS IN THE THEATER, WHO WILL EXERCISE COMMAND OF AIR FORCES THROUGH THE AIR FORCE COMMANDER AND COMMAND OF GROUND FORCES THROUGH THE GROUND FORCE COMMANDER. THE SUPERIOR COMMANDER WILL NOT ATTACH ARMY AIR FORCES TO UNITS OF THE GROUND FORCES UNDER HIS COMMAND EXCEPT WHEN SUCH GROUND FORCE UNITS ARE OPERATING INDEPENDENTLY OR ARE ISOLATED BY DISTANCE OR LACK OF COMMUNICATION.

SECTION II

MILITARY AVIATION

■ 4. GENERAL CATEGORIES.—Aviation of the United States Army, referred to herein as military aviation, falls into two general categories as follows:

a. Aviation directly under command and control of the Commanding General, Army Air Forces. Included in this category are—

(1) All nontactical elements of the Army Air Forces such as those used for training, research, development, test, procurement, storage, issue, maintenance, and transport.

(2) All tactical units of the Army Air Forces not assigned to a theater or task force Commander.

b. Aviation directly under command and control of other commanders. (The Commanding General, Army Air Forces, has such technical command of this aviation as is necessary for the control and supervision of training and the supply and maintenance of equipment peculiar to the Army Air Forces.) This category consists of air forces assigned to theater or task force commanders.

■ 5. TYPES OF TACTICAL AVIATION.—In accordance with the purpose for which various types of aircraft are ordinarily employed, tactical aviation is organized, trained, and equipped to engage in offensive and defensive air operations. Corresponding to the means with which equipped, tactical aviation is divided into bombardment, fighter, reconnaissance, photographic, and troop-carrier aviation.

a. Bombardment aviation is the term applied to all aircraft designed for the air attack of surface objectives, and the organizations equipped with such aircraft.

b. Fighter aviation is the term applied to all aircraft designed for offensive air fighting, and the organizations equipped with such aircraft. (Fighter-bomber aircraft are fighters modified so that they may attack surface objectives.)

c. Reconnaissance aviation is the term applied to air units which perform the service of information for military commands. The function of reconnaissance aviation is to secure information by visual and photographic means and to return this information for exploitation.

d. Photographic aviation is the term applied to air units which perform photographic reconnaissance missions beyond the responsibilities or capabilities of reconnaissance aviation and special photogrammetric mapping missions for engineer topographic troops.

e. Troop carrier (including gliders) is the term applied to air units which carry parachute troops, airborne troops, and cargo.

f. The tactics and technique of performing the functions of air attack, air fighting, and air reconnaissance are set forth in FM 1-10, 1-15, and 1-20. Communication procedure essential to air force operations is contained in FM 31-35 and FM 1-45.

SECTION III

ORGANIZATION

■ 6. IN A THEATER OF OPERATIONS.—In a theater of operations, there will normally be one air force. This air force will be organized in accordance with the task it is required to perform in any particular theater and, therefore, no set organization of an air force can be prescribed. However, the normal composition of an air force includes a strategic air force, a tactical air force, an air defense command, and an air service command. An air force may also include troop carrier and photographic aviation.

■ 7. OF AVIATION UNITS.—a. Tactical air units of the Army Air Forces from the smallest to the largest are designated flight, squadron, group, wing, division, command, and air force. The method of assignment and employment of the air forces necessitates a highly flexible organization within tactical units.

b. (1) The flight is the basic tactical grouping or unit of the Army Air Forces and consists of two or more airplanes.

(2) The squadron is the basic administrative and tactical unit and consists of three or four flights, depending upon the type of aviation.

(3) The group, composed of three or more squadrons, is both tactical and administrative; it contains all the elements essential for its air operations.

(4) The wing is the next higher unit of the Army Air Forces and its functions are primarily tactical.

(5) Two or more wings may be combined to form an air division.

(6) An "air command" may include divisions, wings, groups, service and auxiliary units, and is both tactical and administrative.

(7) The air force is the largest tactical unit of the Army Air Forces. It may contain a strategic air force, a tactical air force, an air defense command, and an air service command. It requires aviation engineer units for the construction and maintenance of air bases.

c. Units are designated according to their primary functions; for example, reconnaissance squadron, fighter group, bomber wing, air service command.

d. Ordinarily the group is the largest unit of the Army Air Forces that will operate in the air as a tactical entity under the command of one individual. Many air operations are conducted by smaller units. Reconnaissance and photographic missions, and less frequently bombardment missions, may be carried out by single airplanes with the required fighter cover.

e. In addition to tactical units, units are organized for the purpose of maintenance and supply and for facilitating air operations. These units comprise personnel of the Army Air Forces and Army Service Forces who are trained for rendering service for the Army Air Forces. The maintenance and service units serving an air force are collectively designated the air service command.

CHAPTER 2

AIR OPERATIONS

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SECTION I

GENERAL

■ 8. **BASIC TASKS.**—The combat operations in which air force units are engaged are directed toward the accomplishment of the following basic tasks:

a. Destroy hostile air forces. This will be accomplished by attacks against aircraft in the air and on the ground, and against those enemy installations which he requires for the application of air power.

b. Deny the establishment and destroy existing hostile bases from which an enemy can conduct operations on land, sea, or in the air.

c. Operate against hostile land or sea forces, the location and strength of which are such as to threaten the vital interests of the United States or its Allies.

d. Wage offensive air warfare against the sources of strength, military and economic, of the enemies of the United States and its Allies, in the furtherance of approved war policies.

e. Operate as a part of the task forces in the conduct of military operations.

f. Operate in conjunction with or in lieu of naval forces.

■ 9. **BASIC DOCTRINE OF EMPLOYMENT.**—a. A knowledge of the powers and limitations of military aviation is a prerequisite to sound employment. Air operations almost invariably precede the contact of surface forces. The orderly mobilization and strategic concentration of the field forces and their

ability to advance from their concentration areas in accordance with the strategical plan of operations depend in large measure on the success of these early air operations.

b. Air operations in joint Army and Navy operations are undertaken in furtherance of the strategical and tactical plan. They include the air operations for which the Army is responsible under special regulations governing joint action of the Army and the Navy. The success of such air operations can be assured only by adequate joint training and careful joint planning.

c. Complete control of the air can be gained and maintained only by total destruction of the enemy's aviation. Since this is seldom practicable, counter air force operations in the theater must be carried on continuously and intensively to gain and maintain air supremacy and to provide security from hostile air operations.

d. The impracticability of gaining complete control of the air necessitates the constant maintenance of air defenses to limit the effectiveness of enemy air operations.

e. In order to obtain flexibility, the operations of the constituent units of a large air force must be closely coordinated. Flexibility enables air power to be switched quickly from one objective to another in the theater of operations. Control of available air power in the theater must be centralized and command must be exercised through the air force commander.

f. Experience in combat theaters has proved the requirement for centralized control, by the air commander, of reconnaissance aviation as well as other types of aviation. Reconnaissance missions must be closely coordinated with our own fighter activities and are directly influenced by hostile fighter action. The attachment of a reconnaissance unit to the corps or smaller ground unit would deprive that reconnaissance unit of essential operating information and fighter protection which are readily available to the air commander only. The information of hostile air activities gained by the aircraft warning service will be furnished by the air commander to missions prior to take-off; and when urgent, to the reconnaissance unit in the air. This central-

ized control improves operating efficiency of reconnaissance aviation and limits reconnaissance losses. The Army Air Forces is responsible for providing the reconnaissance and photographic missions essential to the success of the ground forces in each theater of operations. The absence of reconnaissance units specially trained and equipped for the performance of such missions does not alter this responsibility.

g. When task forces are formed because of isolation by distance or lack of communication, the doctrine of command still applies (sec. I, ch. 1). The task force commander will command his ground forces through a ground force commander and his air force through an air commander.

■ 10. AIR BASES.—Air bases, suitably located, are essential for the sustained operation of military aviation.

a. Much of the equipment pertaining to aircraft is of a complex and highly technical nature; its operation requires highly trained air crews; its maintenance and repair require mechanics with specialized skill. All aircraft need regular and frequent care and maintenance. They are vulnerable to air attack both in flight and on the ground. The fatigue of air crews and the repair and reservicing of equipment and material require all aviation units to operate from air bases where the necessary facilities are provided for security, rest, replacement, maintenance, and repair.

b. The essential requirements for base facilities are landing areas, facilities for tactical control and planning, administration, maintenance, repair and supply, and provisions for the security of personnel and equipment on the ground. Aviation engineers are essential for the construction and maintenance of air bases. Adequate communications for the control and direction of air operations and for liaison are required.

SECTION II

STRATEGIC AIR FORCE

■ 11. GENERAL.—Strategic air force operations are undertaken in furtherance of the strategic plans prepared by the War Department General Staff. The selection of strategic

objectives is a responsibility of the theater commander. Ordinarily, the theater commander will control these air operations by the assignment of a broad general mission to the air force commander. The air force commander executes the assignment by means of a directive to the strategic air force commander and general supervision of his forces.

■ 12. **MISSIONS.**—Generally, the aim of the strategic air force is the defeat of the enemy nation. Missions are selected which make a maximum contribution to this aim. Objectives may be found in the vital centers in the enemy's lines of communication and important establishments in the economic system of the hostile country. Objectives are selected in accordance with the ultimate purpose of the strategic plan. Counter air force operations necessary to neutralize or limit the power of the enemy's air forces are of continuing importance. Although normally employed against objectives listed above, when the action is vital and decisive, the strategic air force may be joined with the tactical air force and assigned tactical air force objectives.

■ 13. **COMPOSITION.**—The strategic air force is normally comprised of heavy bombardment, fighter, and photographic aviation. Heavy bombardment aviation is the backbone of the strategic air force. This class of aviation is characterized by its ability to carry heavy loads of destructive agents for great distances. It is also capable of conducting long-range strategic reconnaissance over land and sea. It relies upon speed, altitude, defensive fire power, and armor for security. Accompanying fighter aviation, where its radius of action permits, is also used to increase security. Fighter aviation furnishes air defense for bombardment bases. Photographic aviation performs long range high altitude photographic missions for the theater, air force, and strategic air force commanders.

SECTION III

TACTICAL AIR FORCE

■ 14. **GENERAL.**—*a.* In a theater of operations where ground forces are operating, normally there will be a tactical air force. Modern battle strategy and tactics derive success to

the degree that air power, sustained and in mass, is employed properly by the theater or task force commander.

b. The decision to launch a combined operation and to wage subsequent offensives is strongly influenced by the quantity and quality of air strength available.

c. Forces must be developed and committed to battle with overwhelming air components opposing estimated enemy air capabilities.

d. Tactical air force operations and ground force operations in the theater or task force will be coordinated by means of timely planning conferences of pertinent commanders and staffs, and through the exchange of liaison officers. Air and ground liaison officers will be officers who are well versed in air and ground tactics.

e. In modern battle operations, the fighting of land elements and the general air effort in the theater must be closely coordinated. The air battle should be won first whenever other considerations permit (par. 2).

■ 15. COMPOSITION.—a. The tactical air force may contain the following: reconnaissance aviation, light and medium bombardment units, fighter aviation and an aircraft warning service. This force does not serve the ground forces only; it serves the theater. Aviation units must not be parceled out as the advantage of massed air action and flexibility will be lost.

b. In a particularly opportune situation (offensive) or a critical situation (defensive), a part or a whole of the strategic air force may be diverted to tactical air force missions.

■ 16. MISSIONS.—a. The mission of the tactical air force consists of three phases of operations in the following order of priority:

(1) *First priority*.—To gain the necessary degree of air superiority. This will be accomplished by attacks against aircraft in the air and on the ground, and against those enemy installations which he requires for the application of air power.

(2) *Second priority*.—To prevent the movement of hostile troops and supplies into the theater of operations or within the theater.

(3) *Third priority.*—To participate in a combined effort of the air and ground forces, in the battle area, to gain objectives on the immediate front of the ground forces.

b. (1) *First priority.*—The primary aim of the tactical air force is to obtain and maintain air superiority in the theater. The first prerequisite for the attainment of air supremacy is the establishment of a fighter defense and offense, including RDF (radio direction finder), GCI (ground control interception), and other types of radar equipment essential for the detection of enemy aircraft and control of our own. While our air superiority is maintained, both the ground forces and the air force can fight the battle with little interference by the enemy air. Without this air supremacy, the initiative passes to the enemy. Air superiority is best obtained by the attack on hostile airdromes, the destruction of aircraft at rest, and by fighter action in the air. This is much more effective than any attempt to furnish an umbrella of fighter aviation over our own troops. At most an air umbrella is prohibitively expensive and could be provided only over a small area for a brief period of time.

(2) *Second priority.*—The disruption of hostile lines of communication (and at times lines of signal communication), the destruction of supply dumps, installations, and the attack on hostile troop concentrations in rear areas will cause the enemy great damage and may decide the battle. This accomplishes the "isolation of the battlefield." If the hostile force is denied food, ammunition, and reinforcements, aggressive action on the part of our ground forces will cause him to retire and the immediate objective will be gained. Massed air action on these targets with well-timed exploitation by ground forces should turn the retirement into rout.

(3) *Third priority.*—The destruction of selected objectives in the battle area in furtherance of the combined air-ground effort, teamwork, mutual understanding, and cooperation are essential for the success of the combined effort in the battle area. In order to obtain the necessary close teamwork the command posts of the Tactical Air Force and of the ground force concerned should be adjacent or common, at least during this phase of operations. Air and ground commanders

profit greatly from the other's successes. Airplanes destroyed on an enemy airdrome and in the air can never attack our troops. The advance of ground troops often makes available new airdromes needed by the air force. Massed air action on the immediate front will pave the way for an advance. However, in the zone of contact, missions against hostile units are most difficult to control, are most expensive, and are, in general, least effective. Targets are small, well-dispersed, and difficult to locate. In addition, there is always a considerable chance of striking friendly forces due to errors in target designation, errors in navigation, or to the fluidity of the situation. Such missions must be against targets readily identified from the air, and must be controlled by phase lines, or bomb safety lines which are set up and rigidly adhered to by both ground and air units. Only at critical times are contact zone missions profitable.

SECTION IV

AIR DEFENSE COMMAND

■ 17. GENERAL.—*a.* Air defense is the direct defense against hostile air operations as distinguished from the indirect defense afforded by counter air force operations. Air defense comprises all other methods designed to prevent, to interfere with, or to reduce the effectiveness of hostile air action.

b. Air defense is divided into active air defense and passive air defense.

(1) Active air defense comprises all measures aimed to destroy or to threaten destruction of hostile aircraft and their crews in the air. Active air defense is provided by fighter aircraft, antiaircraft artillery, and small arms fire; and by obstacles, principally barrage balloons

(2) Passive air defense is provided by dispersion, camouflage, blackouts, and other measures which minimize the effect of hostile air attack.

■ 18. COMPOSITION.—*a.* The active air defense means for any area may include fighter aviation, antiaircraft artillery, searchlights, barrage balloons and aircraft warning service.

Areas of responsibility for active air defense will be prescribed by the air force commander. Normally, the tactical air force will be responsible for the active air defense of the battle area utilizing fighter aircraft and the mobile aircraft warning service. This mobile aircraft warning service will include RDF (radio direction finder), GCI (ground control interception), and other types of radio equipment and warning facilities essential for the interception of enemy aircraft.

b. When antiaircraft artillery, searchlights, and barrage balloons operate in the air defense of the same area with aviation, the efficient exploitation of the special capabilities of each, and the avoidance of unnecessary losses to friendly aviation, demand that all be placed under the command of the air commander responsible for the area. This must be done.

c. Antiaircraft artillery attached or assigned to ground forces combat units remain under the command of the ground force unit commander, as distinguished from the antiaircraft units assigned to an air commander for the air defense of an area.

■ 19. TACTICS AND TECHNIQUE.—Tactics and technique of air operations in air defense are covered in FM 1-15.

SECTION V

AIR SERVICE COMMAND

■ 20. GENERAL.—The air service command in a theater provides the logistical framework of the air force. Its functions comprise such activities as procurement, supply, repair, reclamation, construction, transportation, salvage, and other services required by the tactical units of an air force. The air service command provides all repair and maintenance of equipment beyond the responsibility of first and second echelons of maintenance.

■ 21. ORGANIZATION.—a. All air force service organizations and installations are under the air service commander's direct control. These organizations and installations include air quartermaster, ordnance, signal, chemical, medical, and

engineer depots, and service centers. Where ground force depots supplying material *common to both ground and air forces* are adequate, suitably located, and can be used, such material should not be handled by an air force depot. Material peculiar to the Army Air Forces will normally be handled only by the Army Air Forces and not by ground or service force agencies.

b. The service center is a mobile organization provided to establish and operate the necessary third echelon maintenance, reclamation, and supply points within close supporting distance of the combat units. Service centers normally are set up on the basis of one for each two combat groups.

■ 22. REFERENCE.—The details of organization, functions, and method of operation of an air service command are contained in Army Air Forces Regulations 65-1.



APPENDIX

APPENDIX D:

Statistical Summary of Ninth Air Force Operations

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16 Oct 1943 -
8 May 1945

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STATISTICAL SUMMARY



NINTH AIR FORCE OPERATIONS

16 Oct 1943 - 8 May 1945

DECLASSIFIED

Prepared By 26th Statistical Control Unit



00123704

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8 May 1945

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Lieutenant General Hoyt S. Vandenberg
Commanding

FOREWORD

HEADQUARTERS NINTH AIR FORCE
Office of the Commanding General

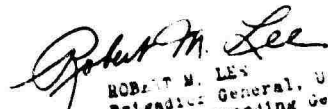
The combat operations of an air force are well adapted to statistical tabulation and analysis. The number of aircraft on hand, the number operational and the number of sorties are counted readily; the rates of loss, the comparative cost of different types of operations and the damage inflicted on the enemy can be computed with fair accuracy. What is more difficult to assess is how much the struggle helped the swift advance of earth-bound troops and armor, and how the battle would have fared without the air superiority that no present-day general would willingly be without.

The operations of the Ninth Air Force are bound up with the history of the campaigns through which it fought with the ground forces, and which culminated in the overwhelming defeat of the enemy opposing them. That the Ninth Air Force had a most vital part in the defeat of Germany is known to all; that, at every step of the way, it was in direct cooperation with the advancing troops on the ground is not always so well understood. Nor will this summary, in which are given the tabulations and charts that portray the total air force effort, make apparent, except by inference, the coordination involved in the operations of a tactical air force and the armies with which it worked. These matters will be covered elsewhere.

Within the air force a tremendous cooperative effort was also going on. The rapid advances of the armies necessitated many and frequent moves to forward bases; the construction and maintenance of airfields by the IX Engineer Command and their protection by antiaircraft artillery units of the IX Air Defense Command therefore became a major factor in keeping the sustained air offensive flexible. Likewise the mounting effort, averaging, despite many days of impossible flying weather, over 1000 sorties daily for each of the 337 days from D Day to V-E Day, entailed a problem in logistics of the first magnitude, which was successfully solved by the IX Air Force Service Command. In tactical operations each type of aircraft had its special role--in the rout of the Luftwaffe the medium and light bombers played their big part; in the choking and starving of the enemy by the interdiction of roads and bridges, railroads and marshalling yards, fighters, fighter-bombers and bombers became a fleet of airborne demolition crews whose targets were never out of range. In the disruption of the enemy's withdrawals the fighter-bomber achieved fame as one of the most potent and deadly weapons of modern war. In seeking out the enemy's dispositions and in assessing the damage already inflicted on his reconnaissance aircraft were the eyes both of the ground forces and of the air force, while liaison squadrons kept up an air-ground coordination of the most direct and immediate kind.

Some of the planning which went into the Ninth Air Force, its swift build-up to its D Day strength, the mission that was assigned to it, its accomplishment of that mission, the limitations imposed on its effort by European weather, are all reflected in the statistical presentation in this summary. What the air force achieved with what was allotted to it, and at what cost, are shown in the cold figures that do not depict the non-statistical side--the cumulative individual effort of the thousands who fought in the air and worked on the ground, of the many who perhaps knew little of the theory of tactical air power, but, finding themselves with a job to do, did it with the singleness of purpose that could only end in total victory.

FOR THE COMMANDING GENERAL:


ROBERT M. LEE
Brigadier General, USA
Deputy Commanding General
for Operations

AWARDS AND DECORATIONS

FROM 16 OCTOBER 1943




UNIT CITATION **41**
 **OAK LEAF CLUSTER** **10**



MEDAL OF HONOR **2**



DISTINGUISHED SERVICE CROSS **29**



DISTINGUISHED SERVICE MEDAL **5**



LEGION OF MERIT **96**



SILVER STAR **519**

 **OAK LEAF CLUSTER** **6**



DISTINGUISHED FLYING CROSS **6558**

 **OAK LEAF CLUSTER** **319**



SOLDIER'S MEDAL **509**

 **OAK LEAF CLUSTER** **3**



BRONZE STAR MEDAL **4111**

 **OAK LEAF CLUSTER** **18**



AIR MEDAL **17504**

 **OAK LEAF CLUSTER** **129577**

ORGANIZATION AND PERSONNEL

The Headquarters and Headquarters Squadron, Ninth Air Force, was a redesignation effected on 8 April 1942, at New Orleans, Louisiana, of the organization activated at Bowman Field, Kentucky, on 2 September 1941 as the V Air Support Command. The establishment of the Ninth Air Force as an operational air force, under the command of Major General (later Lieutenant General) Lewis H. Brereton, was accomplished at Cairo on 12 November 1942, by the assignment to it of all the U. S. Army Air Force units in the Middle East that had been known since 28 June 1942 as the Middle East Air Force. This air force, under Major General Brereton, had cooperated with the British Eighth Army in turning back the Afrika Korps at El Alamein and in the pursuit that ended on 13 May 1943, when all Africa was freed from Axis domination. The operations in the Middle East (tabulated on page 19) included attacks on Italian airdromes; on the coast of Sicily preparatory to, and during, the invasion of that island on 9 July, and attacks preceding and during the invasion of the Italian mainland on 23 July. They also included the famous, costly, but successful raid on the Ploesti oil fields by B-24's on 1 August 1943.

On 7 September 1943 it was decided in Washington to move the headquarters of the Ninth Air Force, IX Bomber Command, IX Fighter Command, and IX Air Service Command from the Middle East to Britain. All tactical units with the Ninth Air Force in Africa were transferred to the Twelfth Air Force for further service in the Italian campaign.

On 16 October 1943, Major General Brereton formally assumed command of the Ninth Air Force in the United Kingdom, with Brigadier General Victor H. Straha, who had occupied the same post in Africa, as Chief of Staff. In addition to the command headquarters that had been brought from the Middle East, or were enroute, the air force had under it at that time the commands and units that had been transferred to it from the Eighth Air Force--the VIII Air Support Command, the 3rd and 44th Bombardment Wings, the 322nd, 323rd, 386th, and 387th Bombardment Groups (M), the 434th Troop Carrier Group, the 67th Reconnaissance Group, the 21st Weather Squadron and the 40th Mobile Communications Squadron. As the nucleus of a service organization there was the VIII Tactical Air Service Command with six air depot groups. The assigned strength of the air force was 38,457 on 31 October.

The IX Bomber Command, commanded by Colonel (later Brigadier and Major General) Samuel E. Anderson, to which were assigned the four operational medium bombardment groups, continued to carry out attacks on enemy installations on the Continent. As new groups received from the U. S. reached the stage of training where they could be declared operational, there was a gradually accelerated effort, a large part of which was directed, beginning in January 1944, against flying bomb sites on the Continent.

On 12 November 1943, the 3rd and 44th Bombardment Wings were redesignated the 98th and 99th Combat Bombardment Wings, and shortly thereafter the 97th Combat Bombardment Wing was activated. When the air force attained full strength, the 98th and 99th each had four medium bomber and the 97th three light bomber groups.

The IX Fighter Command, commanded by Brigadier General (later Major General) Elwood R. Quesada, was, according to the original plan for a tactical air force, to have two air support divisions under it. However, these were activated not as divisions but as commands, the IX Air Support Command on 4 December 1943 (actually a redesignation of the VIII Air Support Command which was already operational under Brigadier General Quesada), and the XIX Air Support Command on 4 January 1944. The XII Air Support Command became operational on 18 April, under Brigadier General (later Major General) O. P. Weyland, and on the same day the commands were redesignated the IX and XII Tactical Air Commands. Personnel of the IX Fighter Command were used to augment the strength of the two commands. While the IX Fighter Command continued until after D Day to have some operational and training responsibility for the tactical air commands, they were more or less independent, and after the move to the Continent the IX Fighter Command, to all intents and purposes, went out of existence as an operating unit.

During the winter and spring, five fighter wings were assigned from the Eighth Air Force or arrived from the U. S., and fighter groups were arriving and being trained until, by D Day, 18 fighter groups were operational. During the preceding months groups, as they became operational, had been used in fighter escort of Eighth Air Force heavy bombers, and in fighter-bombing missions on the Continent, principally as a pre-invasion campaign to destroy the enemy air potential by concentrated attacks against enemy airfields and aircraft in northern France.

The IX and XII Tactical Air Commands moved with their groups to the Continent shortly after the invasion, and, at the beginning of the second phase of the campaign in France with the breakthrough at St. Lô, received their missions of cooperation with the First and Third Armies, respectively. With the arrival of the Ninth Army, the XIII Tactical Air Command (Provisional) was organized (13 September 1944), using the T/O's of the 84th and 303rd Fighter Wings. Under the command of Brigadier General Richard E. Nugent, the XIII Tactical Air Command (Provisional) provided air cooperation for the Ninth Army.

ORGANIZATION AND PERSONNEL

(CONTINUED)

The IX Air Service Command, commanded by Major General Henry J. F. Miller, was redesignated IX Air Force Service Command in January 1944. The VIII Air Service Area Command had been redesignated IX Air Force Advanced Air Depot Area Command on 17 November 1943, and a second Advanced Air Depot Area Command was activated on 4 January 1944. Under these two commands 13 air depot groups were divided among six provisional tactical air depots. The Base Air Depot Area was set up on 2 December 1943 and was under the Ninth Air Force until 15 May 1944, when it went under the command of U. S. Strategic Air Forces in Europe. In May 1944 Brigadier General Myron C. Wood succeeded Major General Miller as commanding general.

The growth of the IX Air Force Service Command kept pace with the increased needs of the air force, its assigned personnel just before D Day numbering 58,212. The command changed its organization as moves were made to the Continent, the tactical air depots being gradually discontinued and the air depot groups operating separately, directly under the advanced air depot areas. At maximum operating strength on 31 July 1944, the IX Air Force Service Command had 14 air depot groups and 23 service groups.

The IX Engineer Command was activated on 30 March 1944 under Brigadier General J. B. Newman. On D Day it had four regiments of aviation engineers and three airborne engineer battalions. Beginning with the emergency landing strip at Fougereville, which was operational at 2115 hours on D Day, these units had nine airfields operational, most of them with 5000-foot runways, by D+24 (30 June 1944), and another seven under construction.

The IX Engineer Command was relieved from its assignment to the Ninth Air Force and assigned to U. S. Strategic Air Forces in Europe on 20 February 1945. After V-E Day the command reverted to the control of the Ninth Air Force.

The IX Air Defense Command was activated on 30 March 1944, under Brigadier General W. L. Richardson, and was assigned two antiaircraft artillery brigades, which by D Day had 14 attached battalions. After D Day, two night fighter squadrons and the 71st Fighter Wing were assigned to this command, while the majority of the antiaircraft artillery units were relieved from attached in order to work directly with the armies in the early stages of the invasion. These units were later reattached to IX Air Defense Command, and many additional units were also attached for the defense of Antwerp and Liège against flying bombs, and Ninth Air Force forward airfields against enemy aircraft. With the decrease in enemy air offensive action by late summer, the night fighter squadrons and the fighter wing had been reassigned to the tactical air commands, and had changed from a defensive to an offensive role. After V-E Day the antiaircraft artillery units in the IX Air Defense Command were changed from attached to assigned status.

The IX Troop Carrier Command had been activated on 16 October 1943 under the command of Brigadier General Benjamin P. Giles. Under Brigadier General (later Major General) Paul L. Williams, who succeeded Brigadier General Giles on 25 February 1944, the command was built up to a strength of 14 groups, with the 50th, 52nd, and 53rd Troop Carrier Wings. On 24 August 1944 the IX Troop Carrier Command (with its service organizations from IX Air Force Service Command) was transferred to the First Allied Airborne Army. Lieutenant General Brereton had already relinquished command of the Ninth Air Force on 7 August to become commanding general of that army.

The new commanding general of the Ninth Air Force, Major General (later Lieutenant General) Hoyt S. Vandenberg, assumed command on 8 August 1944. He had previously been deputy commanding general of the Allied Expeditionary Air Force. The air force remained under his command until shortly after V-E Day, when Major General Teyland assumed command.

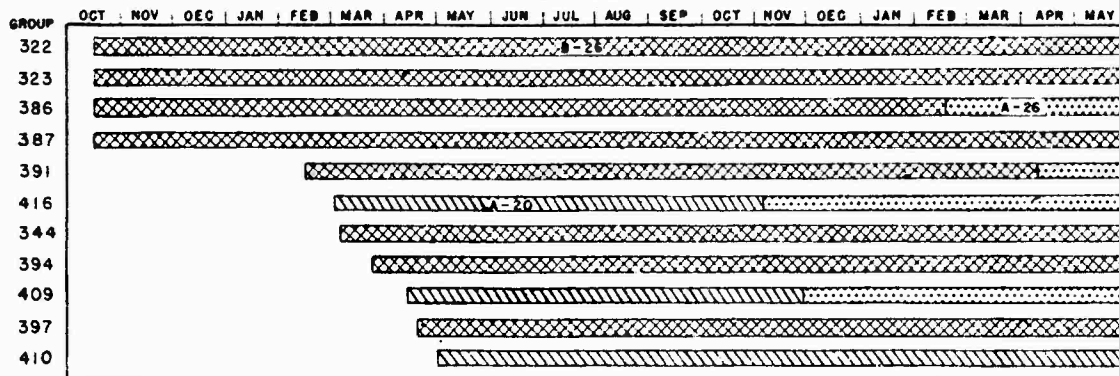
The assigned strength of the Ninth Air Force had grown swiftly during the build-up period, increasing from 52,724 on 6 December 1943 to an all-time high on 31 July 1944 of 179,851, by the following increments--December 1943, 17,752; January 1944, 30,845; February, 16,177; March, 26,793; April, 28,794; May, 1,051; June, 2,868 and July, 4,847. There were also attached personnel, chiefly in the antiaircraft artillery battalions of the IX Air Defense Command, which brought the operating strength of the air force in the early summer of 1944 to over 200,000.

With the division of effort in Europe between the Sixth and Twelfth Army Groups, the Ninth Air Force took over air cooperation with the latter, and the First Tactical Air Force (Provisional) was organized to cooperate with the former. On 12 October 1944 the XII Tactical Air Command of the Twelfth Air Force was assigned by U. S. Strategic Air Forces in Europe to the administrative control of the Ninth Air Force, and on 15 November this command, together with the 71st Fighter Wing, the 50th, 358th and 371st Fighter Groups, the 86th Air Depot Group and the 83rd and 312th Service Groups were assigned to the First Tactical Air Force (Provisional). With the cessation of hostilities the First Tactical Air Force (Provisional) was disbanded and its units were assigned to the Ninth Air Force.

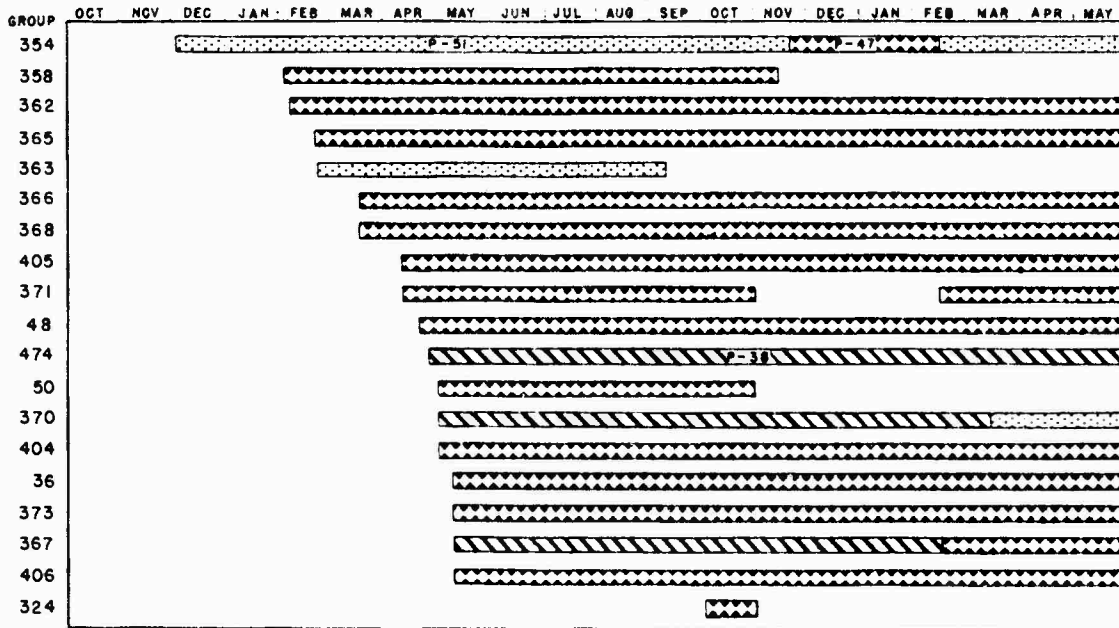
FLOW OF TACTICAL GROUPS

16 OCTOBER 1943 THRU 31 MAY 1945

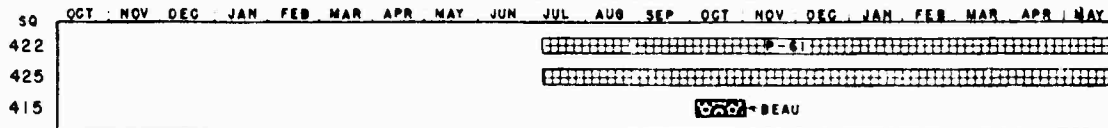
BOMBERS



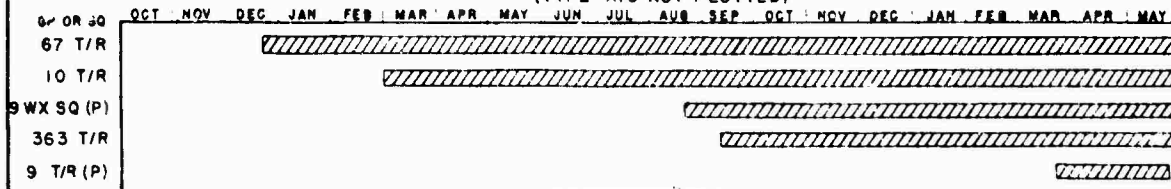
FIGHTERS



NIGHT FIGHTER SQUADRONS



RECONNAISSANCE (TYPE A/C NOT PLOTTED)



NOTE: TACTICAL GROUPS NEWLY ASSIGNED IN MAY 1945 NOT PLOTTED. INITIAL DATE FOR ALL GROUPS IS DATE OF FIRST TACTICAL MISSION.

PERSONNEL RECAPITULATION

DECEMBER 1943 THRU MAY 1945

	ASGD HQ. NINTH AF	ASGD IX TAC AIR COMD	ASGD IX BOMB DIVISION	ASGD IX AF SV COMD	ASGD IX KMO COMC	ASGD IX TRP CAR COMD	ASGD XIX TAC AIR COMD	ASGD IX AIR EMP COMD
31 January 1944	4110	22821	12736	43459	5994	8676		
29 February	4485	24005	14969	50782	5843	12414	1818	
31 March	5758	27093	18065	57475	9468	25041	3223	
30 April	7678	23993	21332	57042	17181	26591	11529	2174
31 May	8132	24022	21472	58212	17129	27570	11965	2600
30 June	6984	21932	22124	58558	16987	27727	13764	5183
31 July	7036	21725	22406	59673	17247	28685	13915	5209
31 August	7446	16920	21038	49454	17296		18400	4941
30 September	7568	15701	23757	49366	17468		16707	3823
31 October	6463	13158	23523	49397	17257		11955	3213
30 November	6350	13332	23531	48910	15386		11979	1385
31 December	6169	9801	23439	44544	15200		15889	1382
31 January 1945	7572	13014	23902	47658	15507		14403	1417
28 February	7304	12575	23905	45004			12736	1366
31 March	8391	12479	24166	47192			12707	1567
30 April	9522	10984	23508	46905			14826	33106
31 May	10141	11061	18307	70422			15416	29134

	ASGD XXIX TAC AIR COMD	ASGD XII TAC AIR COMD	CASUALS & COMD UNASSIGNED	TOTAL OFFICERS		TOTAL ENL. MEN		GRAND TOTAL	
				AUTH	ASGD	AUTH	ASGD	AUTH	ASGD
6 December 1943				6569	6336	52479	46388	53048	52724
31 December 1943				7677	7649	64128	60827	71805	68476
31 January 1944			1525	11215	10412	101532	88909	112747	99321
29 February			1182	14033	12629	108674	102869	121707	115498
31 March			208	17748	17129	130793	125162	148541	142291
30 April			3565	19979	20587	147681	150498	167660	171085
31 May			1034	21035	21643	150477	150493	173512	172136
30 June			1645	23241	22101	151333	152903	174574	175004
31 July			1955	23363	23036	151601	156815	174964	173851
31 August			2470	24715	15350	118379	124575	133054	139925
30 September	3192		2876	14581	15942	118203	124516	132764	140458
31 October	8925	1251	1789	14799	15717	118173	123214	132972	138931
30 November	8747	6852		14668	15426	115675	119046	130343	134472
31 December	8177			14616	14431	107747	110170	121363	124601
31 January 1945	8194			14835	14970	108813	110697	122668	125667
28 February	7390			14897	14901	98123	97379	112020	112280
31 March	7346			14933	15030	99375	101416	113308	116448
30 April	7007			14811	14733	100291	101175	105104	107958
31 May	5464	16023		20244	21149	157953	155909	178052	177568

SOURCE: AAF Form 127

AIRCRAFT AND COMBAT CREWS

The Ninth Air Force acquired on its arrival in England in October 1943 four under-strength medium bombardment groups from VIII Air Support Command and one troop carrier group. From then until June 1944 there was a gradually accelerated build-up until on D Day, the air force achieved its all-time maximum strength of eight medium and three light bombardment groups, 18 fighter groups, 14 troop carrier groups (lost in August to First Allied Airborne Army), and two reconnaissance groups consisting of four photo and four tactical reconnaissance squadrons. Aircraft numbered 7800, consisting of 4546 tactical, 2679 gliders and 575 utility types; and there were 5337 combat crews, including 990 bomber crews, 2032 fighter crews, 214 reconnaissance and 2101 troop carrier and glider crews. The overages of 663 tactical aircraft and the small overage in combat crews were quickly reduced when extensive operations were started. Combat losses immediately wiped out the excess fighter and reconnaissance aircraft, and insufficient replacements created a critical shortage which existed until V-E Day despite the fact that some groups were converted to aircraft models which had a larger replacement flow. An overage of bombers was maintained throughout the period of operations, however, mainly due to the flow of A-26 aircraft for the conversion of B-26 and A-20 groups. The air force aircraft authorization per group was increased in November 1944 to counteract the delayed deliveries from distant United Kingdom ports to airstrips. Combat crews created no problem as there was very generally an overage in all units.

On the completion of the combat mission of the air force, the aircraft authorization was decreased to unit equipment, with authority to retain all excess in the air force for the present.

COMBAT AIRCRAFT GAINS AND LOSSES 20 OCTOBER 1943 THRU 8 MAY 1945

	INVENTORY 20 OCT 1943	GAINS					LOSSES						INVENTORY 8 MAY 1945	
		NEW ORG UNIT EQUIP	REPL FOR CONV	OTHER REPL	OTHER	TOTAL GAINS	MIA	CAT E DAMAGE	NON-OP SAL- VAGE	TO 2ND LINE	TRANS TO OTHER AF	OTHER		TOTAL LOSSES
B-26	292	256		948	7	1211	305	254	239		106	4	908	595
A-20	15	192		423	2	617	78	78	79	7	273	8	523	109
A-26			320	183	31	534	35	25	28		11	1	100	434
TOTAL BOMBERS	307	448	320	1554	40	2362	418	357	346	7	390	13	1531	1138
P-38		225		471	33	729	301	77	158	22	37	6	601	128
P-47		975	75	2766	106	3922	1203	249	653	91	539	12	2747	1175
P-51	1	150	150	600	264	1164	262	19	110	8	501	55	955	210
P-61		26		36	8	68	5	9	10		9	3	36	32
TOTAL FIGHTERS	1	1376	225	3873	411	5883	1771	354	931	121	1086	76	4339	1545
P-3		10		25	6	41	8	8	5			2	23	18
P-5		80		109	2	191	19	2	33	10	49		113	78
P-6		81	54	121	75	331	67	18	51	3	31	3	173	158
TOTAL ENGINE		171	54	255	83	563	94	28	89	13	80	5	309	254
C-47/53	82	814		581	4	1399	48	4	29		1360		1441	40
GLIDERS		1792		905		2697	528	18	130		2020	1	2697	
GRAND TOTAL	390	4599	599	7168	538	12904	2859	761	1525	141	4936	95	10317	2977

SOURCE: Ninth AF Form 110-A

AIRCRAFT AND CREW STATUS

MONTHLY AVERAGES

AIRCRAFT

BOMBERS

COMBAT CREWS

	Avg. Ops. Oper.	Authorized			On Hand		Operational	
		In AF Per Op.	Total	In A.F.	In Tact Units	In Tact Units	% Oper.	
October 1943	4.05	85	344	292	292	230	78.8	
November	4.00	85	340	257	257	205	79.8	
December	4.00	85	340	249	249	230	92.4	
January 1944	4.00	85	340	353	243	208	85.6	
February	4.50	85	383	412	285	227	79.6	
March	7.00	85	595	692	434	358	82.5	
April	9.00	85	765	929	604	460	76.2	
May	11.00	85	935	1098	828	589	71.1	
June	11.00	85	935	1103	869	689	79.3	
July	11.00	85	935	1120	874	710	81.2	
August	11.00	85	935	1095	738	682	92.4	
September	11.00	85	935	1111	841	734	87.3	
October	11.00	85	936	907	739	626	84.7	
November	11.00	88	962	975	734	617	84.1	
December	11.00	88	968	967	723	583	80.6	
January 1945	11.00	88	968	1010	727	585	80.5	
February	11.00	88	968	1039	710	543	76.5	
March	11.00	88	968	1009	724	563	77.8	
April	11.00	88	968	1087	749	617	82.4	
May	11.70	64	784	1116	749	637	85.0	

	Authorized	Per Op.	Total	Asgd.	Available		Effect Str.
					In Tact Units	% Avail.	
October 1943	96	389	373	257	68.9	223	
November	96	384	363	240	66.1	205	
December	96	384	339	277	81.7	224	
January 1944	96	384	383	261	68.1	221	
February	96	432	510	306	60.0	227	
March	96	672	725	420	57.9	346	
April	96	864	835	505	60.5	423	
May	96	1056	948	672	70.9	545	
June	96	1056	1000	744	74.4	620	
July	96	1056	993	709	71.4	617	
August	96	1056	1044	764	75.3	610	
September	96	1056	1067	843	79.0	665	
October	96	1056	1216	910	74.8	615	
November	96	1056	1245	922	74.1	578	
December	96	1056	1197	940	78.5	572	
January 1945	96	1056	1193	981	82.2	584	
February	96	1056	1274	991	77.8	533	
March	96	1056	1400	1105	78.9	561	
April	96	1056	1353	1097	81.1	592	
May	96	1123	1390	1069	76.9	608	

FIGHTERS

	Avg. Ops. Oper.	Authorized			On Hand		Operational	
		In AF Per Op.	Total	In A.F.	In Tact Units	In Tact Units	% Oper.	
December 1943	4.40	96	38	66	66	62	93.9	
January 1944	1.00	96	96	144	92	62	67.4	
February	3.20	96	307	463	261	184	70.5	
March	6.20	96	595	760	528	371	70.3	
April	8.90	96	854	1428	681	546	80.2	
May	17.00	96	1536	1686	1349	995	73.8	
June	18.00	96	1642	1591	1385	1129	81.5	
July	18.60	96	1728	1462	1218	906	74.4	
August	18.67	96	1718	1524	1189	953	80.2	
September	17.67	96	1660	1502	1190	968	81.3	
October	18.70	96	1735	1515	1199	965	80.5	
November	15.17	100	1473	1351	996	830	83.4	
December	14.67	100	1436	1315	938	782	83.4	
January 1945	14.67	100	1436	1129	821	685	83.4	
February	15.17	100	1484	1207	922	785	87.1	
March	15.67	100	1536	1420	1086	969	87.2	
April	15.67	100	1536	1505	1137	1027	90.3	
May	17.67	75	1341	1694	1306	1150	88.1	

	Authorized	Per Op.	Total	Asgd.	Available		Effect Str.
					In Tact Units	% Avail.	
December 1943	108	43	255	104	40.8	50	
January 1944	108	108	610	86	14.1	58	
February	108	346	621	251	40.4	162	
March	108	670	816	398	48.8	320	
April	108	961	1295	562	43.4	487	
May	108	1776	1603	1213	75.7	955	
June	108	1838	1925	1595	82.9	1009	
July	108	1998	2057	1643	79.9	912	
August	108	1987	2130	1585	74.4	942	
September	108	2064	2322	1681	72.4	947	
October	108	2250	2364	1729	73.1	952	
November	126	1863	2147	1594	74.2	822	
December	126	1796	1967	1429	76.2	780	
January 1945	126	1796	1880	1405	74.7	683	
February	126	1856	1955	1391	74.9	781	
March	126	1922	2060	1488	72.2	960	
April	126	1922	2108	1575	74.7	1026	
May	126	2156	2363	1832	77.5	1144	

RECONNAISSANCE

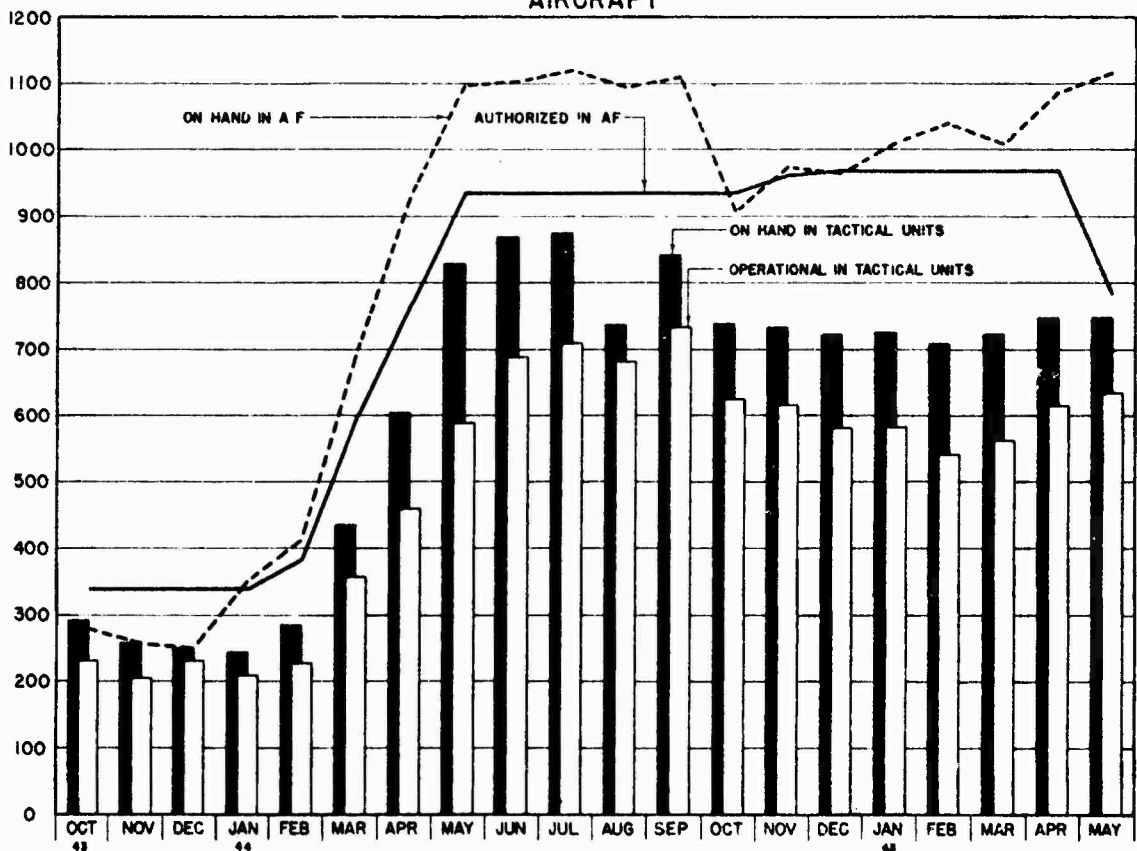
	Avg. Sq. Oper.	Authorized			On Hand		Operational	
		P-6 Per Sq.	Total	In A.F.	In Tact Units	In Tact Units	% Oper.	
December 1943	4.16	23	4	50	44	39	88.6	
January 1944	2.00	23	46	82	77	56	72.7	
February	2.00	23	46	104	78	60	76.9	
March	3.00	23	61	154	91	63	69.2	
April	5.00	23	119	129	88	41	46.6	
May	7.30	23	142	211	150	105	70.0	
June	8.00	23	186	202	170	161	94.7	
July	9.00	24	201	192	178	151	84.8	
August	9.40	24	201	195	179	156	87.2	
September	13.00	24	273	217	201	178	88.6	
October	13.70	24	289	250	226	191	83.8	
November	11.00	24	242	222	179	156	87.2	
December	11.00	24	265	292	204	163	79.9	
January 1945	11.00	30	290	290	212	170	80.2	
February	12.40	24	266	238	218	183	83.9	
March	12.40	24	275	278	228	196	86.0	
April	13.30	24	297	270	225	195	86.7	
May	17.60	18	273	292	255	211	82.7	

	Authorized	P-6 Per Sq.	Total	Asgd.	Available		Effect Str.
					In Tact Units	% Avail.	
December 1943	23	4	68	49	72.1	6	
January 1944	23	46	95	39	41.1	30	
February	23	46	117	49	41.9	49	
March	23	67	139	52	37.4	46	
April	23	112	193	42	21.8	55	
May	23	161	140	106	74.3	95	
June	23	189	243	184	75.7	137	
July	23	192	253	183	72.3	147	
August	23	192	310	218	70.3	156	
September	23	261	331	261	78.6	176	
October	23	276	388	295	76.0	179	
November	23	217	351	294	83.8	149	
December	23	217	313	251	80.2	162	
January 1945	23	217	316	244	77.2	168	
February	23	238	324	248	76.5	181	
March	23	247	356	259	72.8	192	
April	23	286	406	327	80.5	195	
May	23	336	485	386	79.6	209	

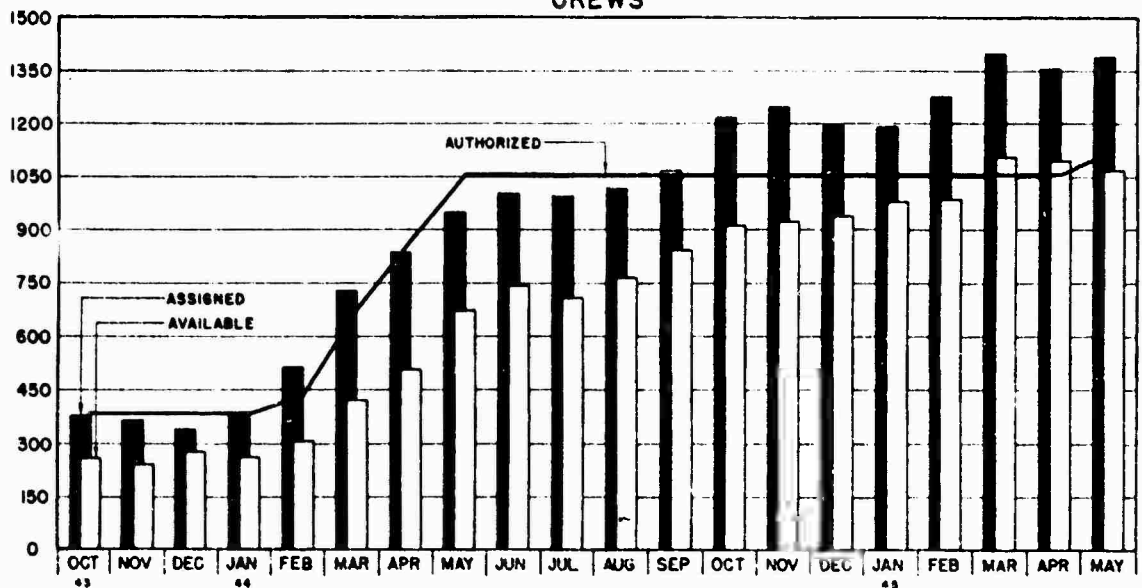
BOMBER AIRCRAFT AND CREW STATUS

OCTOBER 1943 THRU MAY 1945

AIRCRAFT



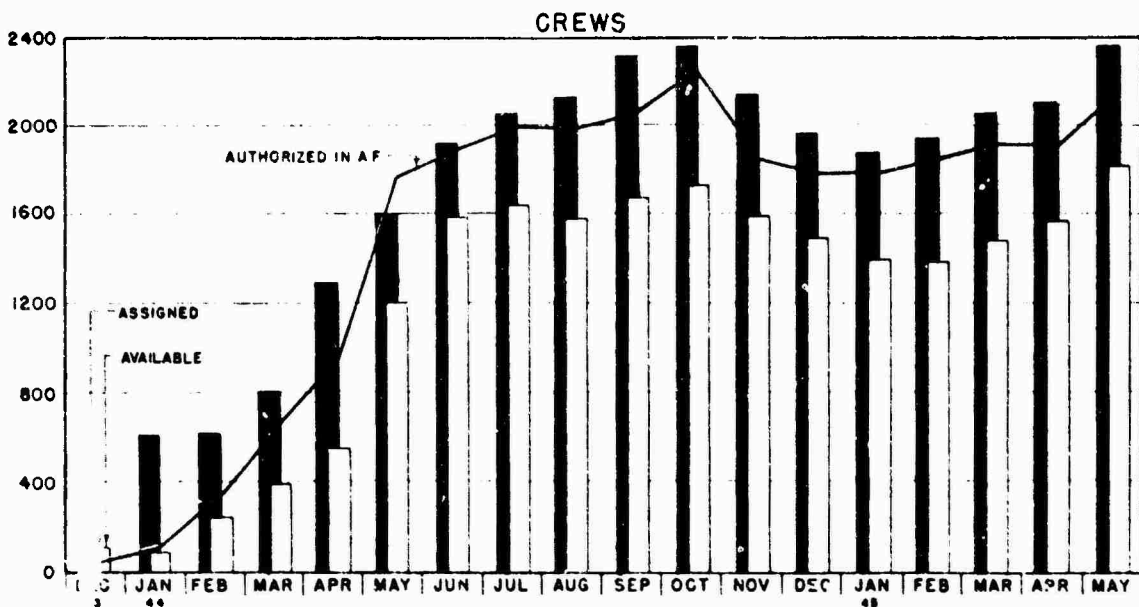
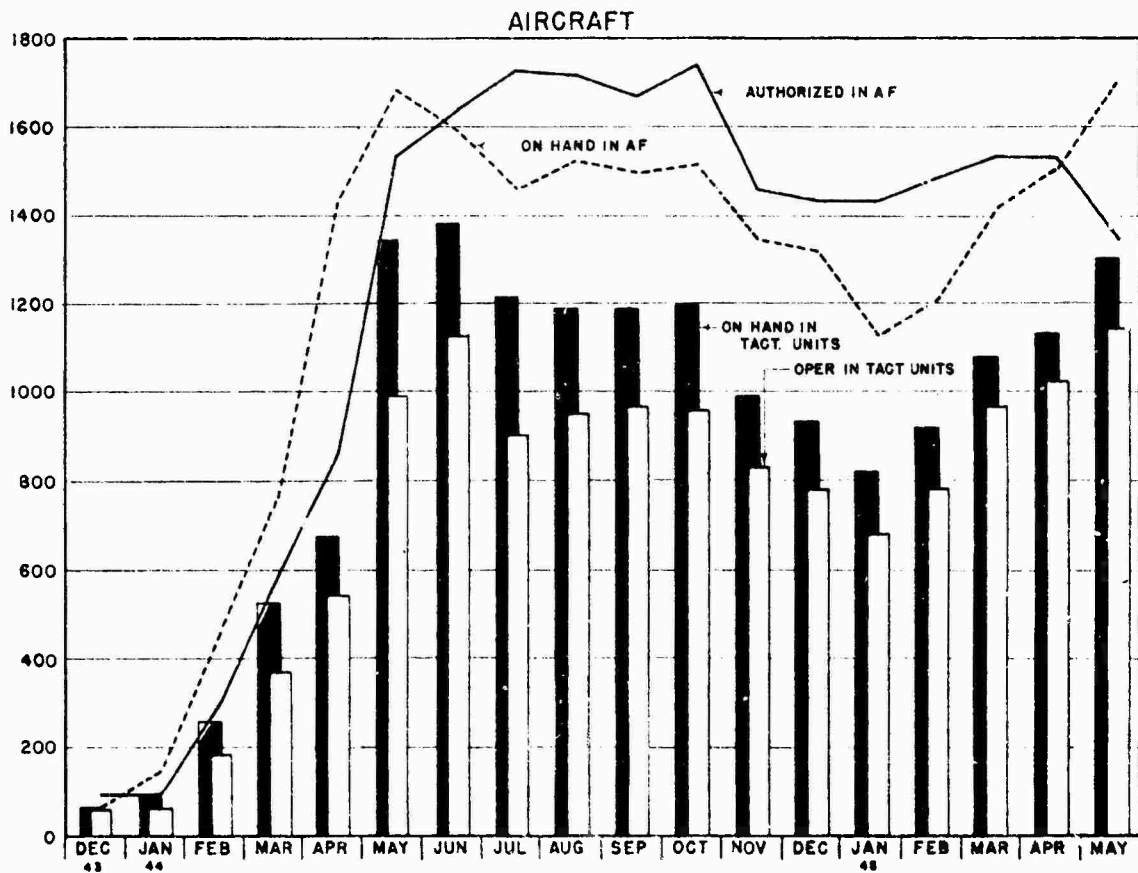
CREWS



SOURCE: AIRCRAFT STATUS REPORTS

FIGHTER AIRCRAFT AND CREW STATUS

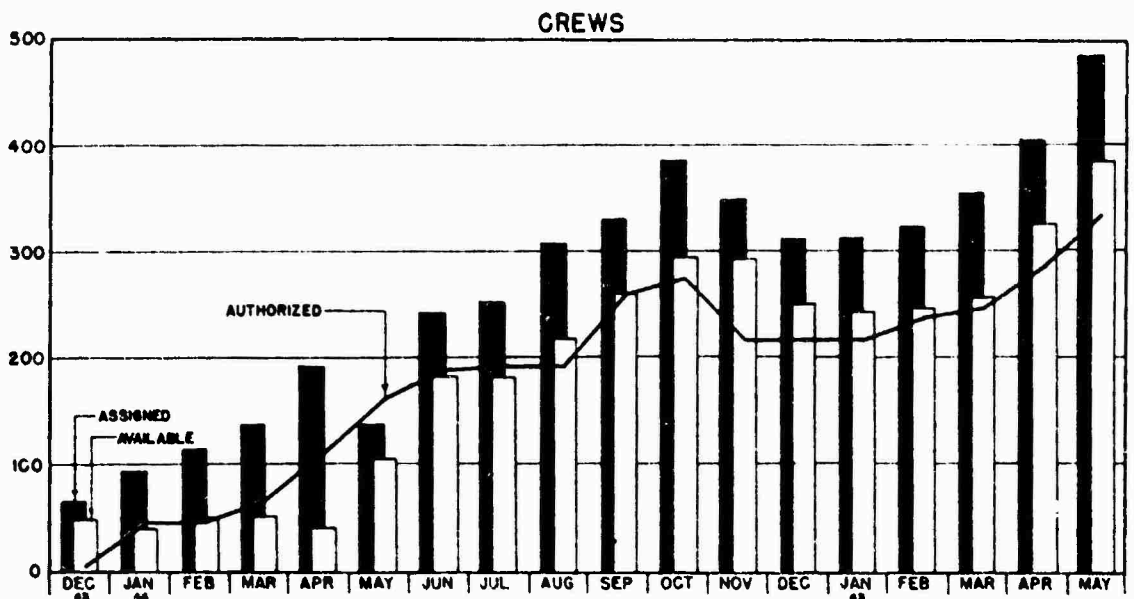
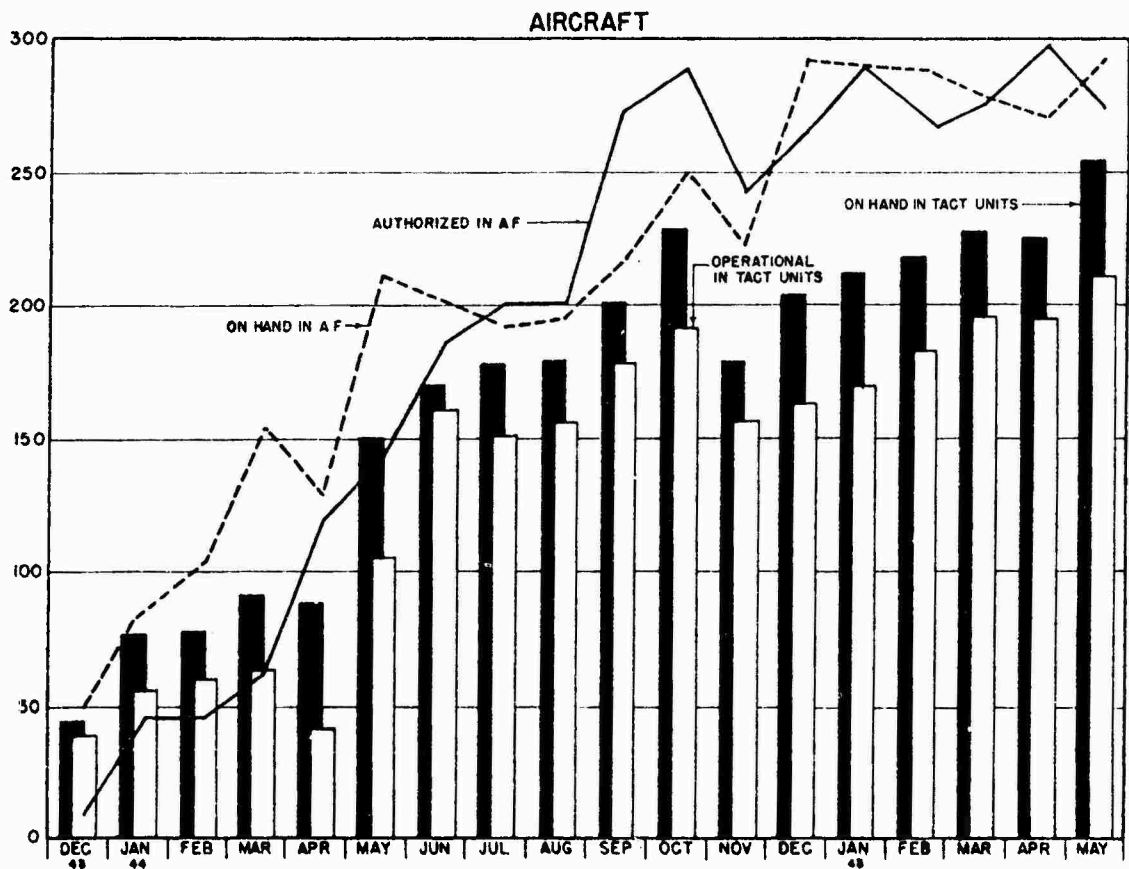
DECEMBER 1943 THRU MAY 1945



SOURCE: AIRCRAFT STATUS REPORTS

RECONNAISSANCE AIRCRAFT AND CREW STATUS

DECEMBER 1943 THRU MAY 1945



SOURCE: AIRCRAFT STATUS REPORTS

EFFORT

Effort previous to D Day, although sizeable, amounting to about 75,000 sorties, was still only 17.5 percent of the total effort from 16 October 1943 through V-E Day. It was sufficient, however, to attain the objective of softening up the northern coast of France, conducting important pre-invasion reconnaissance operations, running diversionary raids to keep the enemy guessing where the big blow was about to fall, and assuring air superiority during and after the invasion of the Continent. With the invasion the air force was therefore prepared to enter phase two of operations--isolation of the battlefield. On D Day bombers hit their all-time peak for one day with 1011 sorties, while fighters attained their highest number of sorties on D+1, with 2576, of which 1095 were assault area cover, 960 dive, glide and skip bombing, 361 troop carrier escort and 140 other escort. From D Day through D+9, with one day (9 June, D+3) completely non-operational, 6094 bomber and 14,444 fighter sorties were flown, and the enemy was already beginning to show signs of the disruption of his communications and the inability to bring up reinforcements that reached a climax after the St. Lô breakthrough on 25 July. Peaks in effort occurred thereafter whenever the ground situation became fluid, particularly during the battle of the Falaise Gap, the pursuit across France, the Metz offensive, the Ardennes counter-offensive, the siege of Aachen, and the battles west of the Rhine. A record ten-day effort was attained during the period 17 - 26 March, at the crossing of the Rhine, when 6754 bomber, 16,257 fighter and 2391 reconnaissance sorties were flown.

Weather was the great limiting factor in effort. Bombers operated at group strength or better on 343 out of the 571 days (60 percent) between 16 October 1943 and 8 May 1945, fighters on 397 out of 525 days (76 percent) from 1 December 1943 through 8 May 1945. The improvement of blind bombing equipment permitted bombers to operate a higher proportion of the days during later months. From 1 October 1944 through 8 May 1945 bombers operated on 139 days, on 56 of which only blind bombing techniques were used.

NINTH AIR FORCE OPERATIONS

16 OCTOBER 1943-8 MAY 1945

AIR FORCE TOTAL

	EFFORT			NON-EFFECTIVE EFFORT					BOMBING	LOSSES				AIR CLAIMS		
	Sorties	Credit Sorties	Effect. Sorties	% Non Eff.	No. Wea.	No. Para.	No. Mech.	No. Other	Tons On Target	MIA	Out. E	Total	% Rate	Dest.	Prob. Dest.	Dns.
October 1943	804	529	270	66.4	499	2	16	27	427.050					3	2	6
November	1568	1346	877	44.1	476	13	95	109	1571.650	6		6	4.5	10	5	6
December	2530	2294	1296	48.8	937	64	95	138	1674.580	9	5	14	6.1	9	2	13
Total 1943	4902	4169	2443	50.2	1900	79	206	274	3473.280	15	5	20	4.8	22	9	25
January 1944	2171	1819	1420	34.6	610	33	96	12	1986.000	7	3	10	5.5	48	20	44
February	6034	5470	4261	29.7	1301	149	258	85	3368.900	30	6	36	6.4	74	10	63
March	9499	7918	7918	16.7	862	176	371	192	5219.080	46	11	57	7.2	52	9	28
April	15769	14687	13011	17.5	1897	131	595	135	10213.180	83	18	101	6.9	98	10	62
May	34128	32353	28970	15.2	2292	516	1321	1053	17905.120	126	48	174	5.4	87	9	31
June	46871	44842	41081	10.6	2761	176	882	1191	23099.020	853	98	911	20.3	205	31	73
July	35326	33857	31003	12.2	2340	120	738	1125	15574.375	230	98	288	8.5	172	35	103
August	38386	37221	34210	10.9	1965	117	713	1381	15737.790	297	66	363	9.8	293	36	81
September	26879	25843	22721	15.5	3233	62	420	443	9605.440	112	45	157	6.1	114	11	40
October	22344	21120	18587	16.8	2805	70	449	433	7980.225	130	47	177	8.4	172	16	54
November	19987	18930	16721	16.3	2054	72	435	685	9338.062	133	42	175	9.3	62	8	26
December	24699	23576	21478	13.0	1201	102	436	1482	15785.747	262	83	325	13.8	405	62	193
Total 1944	282117	267336	242161	14.2	23281	1784	6734	8217	133332.899	2289	445	2774	10.4	1780	257	828
January 1945	16285	15580	14368	11.8	712	80	337	788	9433.461	112	57	169	10.8	42	3	12
February	27064	26409	25296	6.7	629	162	533	482	19716.817	143	68	211	7.9	46	9	58
March	51780	51288	49202	5.0	1075	142	895	466	33661.754	186	86	272	5.3	167	20	72
April	35387	34536	33655	7.7	1625	96	545	466	16694.516	124	39	163	4.7	319	20	119
May	2597	2376	2202	12.2	266	2	47	90	296.575	7	3	10	4.2	23	1	2
Total 1945	133023	130369	123685	7.0	4287	482	2357	2212	79803.143	572	232	824	6.3	997	53	263
Grand Total	420042	402074	368289	12.3	29468	2285	9297	10703	216609.322	2876	743	3619	9.0	2399	319	1116

Source: USAF Form 344

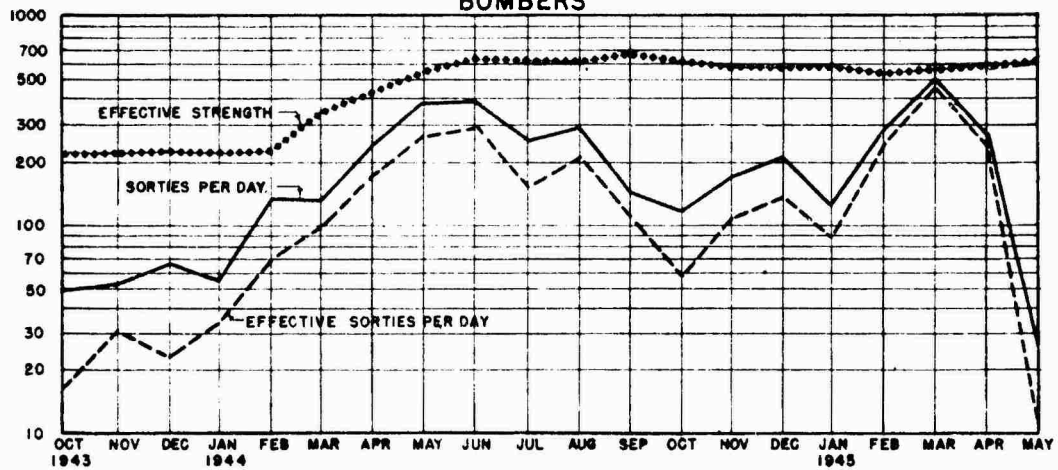
All loss rates are calculated on the basis of 1000 credit sorties.

STRENGTH AND EFFORT

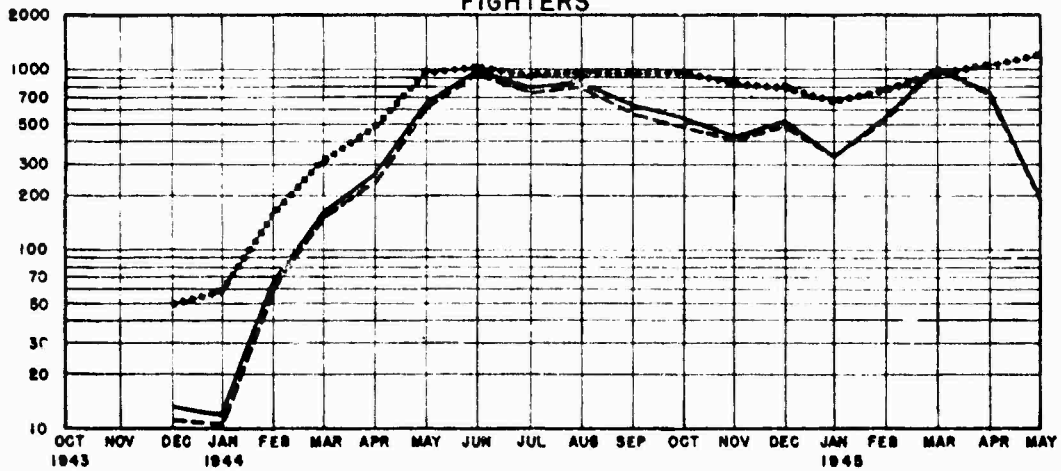
DAILY AVERAGE EFFECTIVE STRENGTH, SORTIES & EFFECTIVE SORTIES

16 OCTOBER 1943 THRU 8 MAY 1945

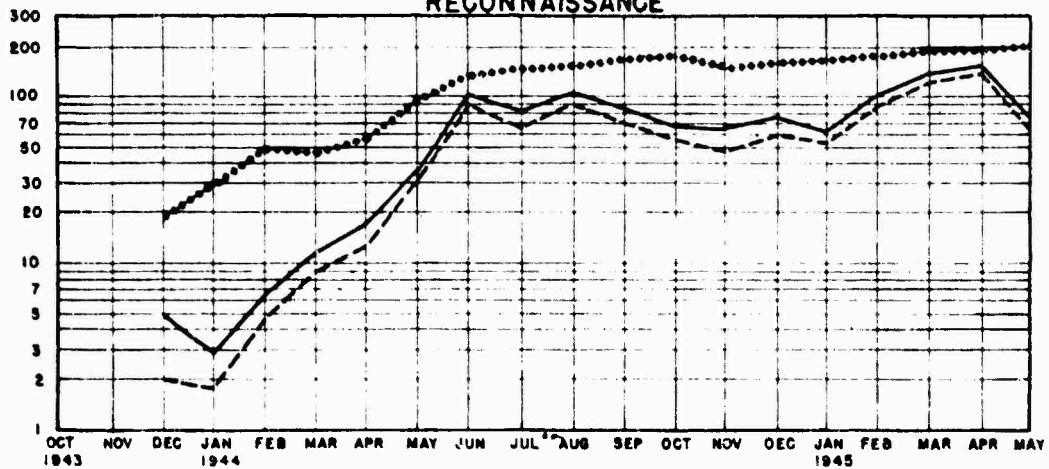
BOMBERS



FIGHTERS



RECONNAISSANCE



NINTH AIR FORCE OPERATIONS

(CONTINUED)

	EFFORT			NON-EFFECTIVE EFFORT				BOMBING	LOSSES				AIR CLAIMS			
	Sorties	Credit Sorties	Effect. Sorties	% Non Eff.	No. Wea.	No. Pers.	No. Mech.	No. Other	Tons on Target	MIA	Cat. B	Total	Rate	Dest.	Prob. Dest.	Dm.
TOTAL BOMBERS																
October 1943	804	520	270	66.4	489	2	16	27	427.050					3	2	6
November	1568	1346	877	44.0	474	13	95	109	1571.650	6		6	4.5	10	5	6
December	2067	1909	911	55.9	923	61	44	128	1474.580	2	5	7	3.7			
Total 1943	4439	3784	2058	53.6	1886	76	155	264	3473.280	8	5	13	3.4	13	7	12
January 1944	1711	1440	1041	39.2	584	32	49	5	1546.000	3	3	6	4.2	6	6	2
February	3081	3555	2328	40.0	1255	142	104	52	3368.900	14	6	20	5.6	2	1	3
March	4067	3012	3012	25.9	678	166	100	111	5116.330	10	8	18	6.0	2		10
April	7346	6560	5263	28.4	1691	92	261	79	9161.325	30	12	42	6.4			2
May	11947	11067	8520	28.7	2000	445	351	611	14664.450	43	27	70	6.3	2	1	
June	11687	10562	8893	23.9	1792	131	233	638	15300.775	46	20	66	6.2	2	1	2
July	8008	7144	5821	27.3	1322	68	172	625	9718.715	32	23	55	7.7	3	3	5
August	9192	8566	6602	28.2	1321	83	216	970	10439.995	39	38	77	9.0	2		
September	5431	5133	3379	37.8	1734	39	82	197	5593.125	13	12	25	4.9			
October	3672	3028	1799	51.0	1565	49	61	198	3112.125	16	15	31	10.2			1
November	5176	4384	3224	37.7	1344	38	103	467	5334.425	17	13	30	6.8			
December	6422	5657	4336	32.5	661	62	146	1217	7364.325	55	44	99	17.5	23	18	31
Total 1944	78940	70108	54218	31.0	19907	1367	1878	5170	90720.490	318	221	539	7.7	42	30	56
January 1945	3947	3382	2748	30.4	355	48	133	663	4558.125	18	36	54	15.7			
February	8146	7816	7074	13.2	235	131	301	405	11881.675	46	40	86	11.0	1	1	4
March	15526	15230	14326	7.9	283	92	530	325	23903.146	35	45	80	5.3	9	5	11
April	8309	7812	7176	13.6	555	57	189	332	12876.888	20	15	33	4.2	2	2	6
May	209	184	142	32.1	58		7	2	253.575							
Total 1945	36167	34424	31466	13.0	1486	328	1160	1727	53473.409	119	133	252	7.3	12	8	21
Grand Total	119146	108316	87742	26.4	19279	1771	3193	7161	147667.179	445	360	805	7.4	67	45	89
TOTAL FIGHTERS																
December 1943	415	361	361	13.0		1	40	10						9	2	13
January 1944	370	325	325	12.2		1	39	5						42	14	42
February	1964	1780	1778	9.6		7	150	31						69	9	60
March	5080	4627	4627	8.9	110	8	258	80	102.750	36	39	8.4		30	9	18
April	7914	7698	7369	6.9	151	37	301	56	1051.855	53	6	59	7.7	98	10	60
May	21074	20174	19479	7.6	217	39	923	416	3240.670	78	21	99	4.9	85	8	31
June	29990	29182	28192	6.0	737	37	603	421	7758.245	261	34	295	10.1	194	30	67
July	24773	24216	23110	6.7	671	41	500	451	5855.660	186	32	218	9.0	167	32	98
August	26037	25507	24779	4.8	429	23	439	367	5297.795	246	25	271	10.6	283	35	79
September	18879	18162	17210	8.8	1132	22	304	211	4012.315	91	32	123	6.8	114	11	39
October	16540	15987	15096	8.7	891	18	332	203	4268.100	107	30	137	8.6	168	16	80
November	12829	12479	12035	6.2	302	29	282	181	4001.637	109	28	137	11.0	57	6	24
December	15953	15618	15289	4.2	203	24	225	212	6421.422	175	37	212	13.6	365	41	157
Total 1944	181405	175715	169289	6.7	4843	286	4333	2634	42612.409	1362	248	1610	9.2	1693	221	755
January 1945	10392	10229	9990	3.9	143	17	153	89	4875.356	90	15	105	10.2	41	2	10
February	16070	15957	15675	2.5	127	27	186	55	7635.142	91	27	118	7.4	44	8	52
March	31863	31711	30969	2.8	469	38	287	100	9758.608	138	39	177	5.6	141	10	52
April	22280	21921	21225	4.7	641	31	280	103	3817.628	95	22	117	5.3	248	15	99
May	1694	1607	1519	10.3	136	2	32	5	43.000	4	3	7	4.4	15		1
Total 1945	82299	81455	79378	3.5	1516	115	938	352	26329.734	418	106	524	6.4	489	35	214
Grand Total	264119	257531	249028	5.7	6362	402	5331	2996	68942.143	1780	354	2141	8.3	2193	258	982
TOTAL TROOP CARRIER																
June 1944	2174	2118	2091	3.8				83			1	530	245.9			
August	37	37	37													
Grand Total	2211	2155	2128	3.8				83			1	530	245.9			

SOURCE: USAAF Form 34A

* All loss rates are calculated on the basis of 1000 credit sorties.

NINTH AIR FORCE OPERATIONS

(CONTINUED)

	EFFORT			NON-EFFECTIVE EFFORT					BOMBING	LOSSES				AIR CLAIMS				
	Sorties	Credit Sorties	Effect. Sorties	% Non Eff.	No. Wes.	No. Pers.	No. Mech.	No. Other	Tons On Target	MIA	Cat. E	Total	Ratd	Dest.	Prob. Dest.	Dma.		
TOTAL RECONNAISSANCE																		
December 1943	48	26	24	29.2	11	2	11											
January 1944	90	54	54	40.0	26		8	2										
February	187	135	135	27.8	46		4	2										
March	328	279	279	20.7	54	2	16	1										
April	509	469	379	25.5	95	2	33											
May	1131	1112	971	14.1	75	12	47	26		5	5	4.5						
June	3080	2980	2705	10.4	212	8	46	49		17	3	20	6.7		7	4		
July	2545	2497	2072	18.6	347	11	64	49		12	3	15	6.0		2			
August	3120	3111	2792	10.5	215	11	38	44		12	3	15	4.8		8	1		
September	2369	2348	2132	17.0	367	1	34	35		8	1	9	3.5			1		
October	2136	2105	1692	20.6	349	3	56	32		7	2	9	4.3		4	3		
November	1982	1967	1462	26.2	408	5	70	37		7	1	8	4.1		5	2		
December	2324	2301	1853	20.3	337	16	65	53		12	2	14	6.1		17	3		
Total 1944	19961	19958	16526	17.2	2531	71	503	330		80	15	95	4.9		43	6	17	
January 1945	1946	1939	1630	16.2	214	15	51	36		4	6	10	5.2		1	1	2	
February	2848	2836	2509	11.9	267	4	46	22		6	1	7	2.5		1	2		
March	4361	4347	3907	10.4	323	12	78	41		13	2	15	3.5		17	5	9	
April	4798	4783	4254	11.3	429	8	76	31		9	4	13	2.7		69	3	14	
May	604	585	541	10.4	52		8	3		3		3	5.1		8	1	1	
Total 1945	14557	14480	12841	10.9	1285	39	259	133		35	13	48	3.3		96	10	28	
Grand Total	34566	34072	29391	15.0	3827	112	773	463		115	28	143	4.2		139	16	45	
BY TYPE AND MODEL AIRCRAFT																		
A-20	October 1943	12	12	5	38.3	6		1	2,550									
	November	7			100.0	7												
	December																	
	Total 1943	19	12	5	73.7	13		1	2,550									
	January 1944																	
	February																	
	March	267	142	142	42.5	60	40	5	135,500		1	1	2	14.1				
	April	1489	1325	850	42.9	501	54	43	41	821,250		7	2	9	6.8			
	May	3299	2860	1963	40.5	766	155	98	317	1924,750	14	9	23	8.0			1	
	June	3405	2908	2430	28.6	685	52	63	156	3013,750	16	6	22	7.4				
	July	2385	2037	1708	32.8	515	36	45	187	1806,750	8	8	16	7.9				
	August	2885	2704	2015	30.2	583	19	55	213	2302,750	9	12	21	7.8				
	September	1473	1420	884	40.0	480	7	15	87	1134,500	9	4	13	9.2				
	October	1234	995	523	57.6	594	31	18	72	731,500	5	5	10	10.1				
	November	1147	944	786	31.5	214	9	18	120	1021,625	3	5	8	8.5				
	December	948	832	654	31.1	180	5	21	89	777,750	5	9	14	16.8				
	Total 1944	18913	16169	11849	36.0	4574	408	401	1281	13670,125	77	61	138	8.5		1		
	January 1945	657	643	547	16.7	66	4	13	27	634,750	4	7	11	15.6				
February	1155	1111	1051	9.0	51	7	21	25	1255,625	2	5	7	6.3					
March	1819	1802	1680	7.6	11	5	75	48	2139,050	6	4	10	5.9					
April	835	784	723	13.4	45	6	6	55	982,375	1	2	3	3.5					
May	1	1		100.0				1										
Total 1945	4467	4341	4001	10.4	173	22	115	156	5011,800	13	17	30	6.9					
Grand Total	22999	20522	15855	31.1	4740	430	517	1437	18684,675	90	79	169	8.2		1			
A-26	September 1944	77	75	73	5.2			3	133,375									
	October																	
	November	135	133	71	47.4	56		6	2	94,625	1		1	7.5				
	December	735	581	433	41.1	52	12	28	210	643,750	3		3	5.2				
	Total 1944	947	789	577	39.1	102	12	37	213	871,750	4		4	5.1				
	January 1945	647	627	551	14.8	14	6	17	58	1017,500	7	11	18	28.7				
	February	1534	1476	1376	10.4	24	13	78	45	2350,375	7	6	13	8.8				
	March	4069	3999	3895	4.3	84	15	47	28	6352,101	13	10	23	5.8		7	1	5
	April	3038	2939	2661	12.4	198	17	107	55	4654,822	4	1	5	1.7				
	May	204	179	141	30.9	55		7	1	253,375								
	Total 1945	9494	9220	8624	10.1	375	51	254	188	14629,173	31	28	39	6.4		7	1	5
Grand Total	10441	10009	9201	11.9	433	63	293	401	15499,923	35	28	63	6.3		7	1	5	

SOURCE: USAAF Form 34-A

All loss rates are calculated on the basis of 1000 credit sorties.

NINTH AIR FORCE OPERATIONS

(CONTINUED)

	EFFORT			NON-EFFECTIVE EFFORT					BOMBING		LOSS ¹			AIR CLAIMS			
	Sorties	Credit Sorties	Effect. Sorties	% Non Eff.	No. Wes.	No. Pers.	No. Mech.	No. Other	Tons On Target	MIA	Cat. B	Total	Rate	Dest.	Prob. Dest.	Dam.	
BY TYPE AND MODEL AIRCRAFT (CONTINUED)																	
B-26	October 1943	792	517	265	66.5	483	2	15	27	424,500	6			3	2	6	
	November	1561	1346	877	43.8	467	13	95	109	1571,650		6	4.5	10	5	6	
	December	2067	1909	911	55.9	923	61	44	128	1474,580	2	5	7	3.7			
	Total 1943	4420	3772	2053	53.6	1873	76	154	264	3470,730	8	5	13	3.4	13	7	12
	January 1944	1711	1440	1041	39.2	584	32	49	5	1546,000	3	3	6	4.2	6	6	2
	February	3881	3555	2328	40.0	1255	142	104	52	3368,900	14	6	20	5.7	2	1	3
	March	3820	2870	2870	24.9	618	126	95	111	4980,830	9	7	16	5.6	2		10
	April	5857	5235	4413	24.7	1150	38	218	38	8340,075	23	10	33	6.3			2
	May	8648	8199	6557	24.2	1234	310	253	294	12739,700	29	18	47	5.7	2		
	June	8282	7660	6463	22.0	1107	79	190	483	12287,025	30	14	44	5.7	2	1	2
	July	5623	5107	4219	25.0	807	32	127	438	7911,965	24	15	39	7.6	3	3	5
	August	6307	5862	4587	27.3	738	64	161	757	8137,245	30	26	56	9.6	2		
	September	3881	3638	2622	37.6	1254	32	64	109	4325,250	4	8	12	3.3			
	October	2438	2033	1276	47.7	975	18	43	126	2380,625	11	10	21	10.3			1
	November	3894	3307	2367	39.2	1074	89	79	345	4214,175	13	8	21	6.4			
	December	4738	4244	3249	31.4	429	45	97	918	5942,825	47	35	82	19.3	23	18	31
	Total 1944	59080	53150	41792	29.3	11225	947	1440	3476	76178,615	237	160	397	7.5	42	29	56
	January 1945	2643	2112	1650	37.6	275	38	103	577	2905,875	7	18	25	11.8			
February	5455	5229	4647	14.8	160	111	202	335	8275,675	37	29	66	12.6	1	1	4	
March	9668	9429	8791	9.5	188	72	408	249	15411,995	16	31	47	5.0	2	4	6	
April	4436	4089	3792	14.5	312	34	76	222	7239,691	15	10	25	6.1	2	2	6	
May	4	4	1	75.0	3				.200								
Total 1945	22206	20863	18841	15.2	938	255	789	1383	33833,436	75	88	163	7.8	5	7	16	
Grand Total	85706	77785	62886	26.9	14036	1278	2383	5323	113482,781	320	253	573	7.4	60	43	84	
P-38	April 1944	154	141	141	8.4		1	12									
	May	3094	2901	2750	11.1	2	12	206	124	148,500	13	11	24	8.3	1	1	1
	June	4629	4455	4363	5.7	97	13	120	34	1824,750	44	8	52	11.7	20	11	14
	July	3700	3565	3450	6.8	49	19	106	76	1253,250	36	11	47	13.2	21	13	33
	August	3951	3851	3733	5.5	51	7	88	72	1390,280	64	10	74	19.2	70	15	35
	September	3133	3022	2860	8.7	157	6	67	43	790,600	20	7	27	8.9	16	7	14
	October	2338	2271	2200	5.9	45	4	67	22	662,100	25	4	29	12.8	34	5	27
	November	2315	2224	2089	9.8	61	8	83	74	783,150	22	6	28	12.6	11	1	3
	December	2834	2740	2662	6.1	27	8	62	75	1284,500	43	5	48	17.5	67	11	44
	Total 1944	26148	25170	24268	7.3	489	78	811	528	8197,070	267	62	329	13.1	249	64	171
	January 1945	1511	1485	1422	5.9	28	9	34	18	588,600	13	2	15	10.1			
	February	1808	1783	1743	3.6	1	11	35	18	1038,350	16	9	25	14.0	4	1	8
	March	3015	2974	2940	2.5	25	8	40	2	765,000	13	13	44	4.4	5	3	7
	April	1440	1402	1395	3.1	3	4	35	3	411,550	8	4	12	8.6	5	2	2
	May	116	114	114	1.7			2							3		
	Total 1945	7890	7758	7614	3.5	57	32	146	41	2803,500	50	15	65	8.4	17	6	17
	Grand Total	34038	32928	31862	6.4	546	110	957	563	11000,570	317	77	394	12.0	266	70	188
	P-47	February 1944	1163	1098	1096	5.8		1	58	8							
March		3957	3694	3694	6.6	96	4	123	40	77,000	5	1	5	4.6	5	1	1
April		5605	5465	5307	5.3	109	23	150	16	902,105	14	5	19	3.5	18	2	13
May		15653	15079	14618	6.6	280	22	576	257	2974,545	44	8	52	3.4	5	1	2
June		22498	21994	21215	5.7	529	19	436	319	5168,890	186	24	210	9.5	124	16	30
July		17957	17594	16636	7.4	601	20	348	352	4579,410	134	20	154	8.8	97	13	39
August		19048	18688	18140	4.8	330	16	307	255	3897,910	149	12	161	8.6	134	13	30
September		14331	13771	12997	9.3	972	14	187	162	3163,340	65	25	90	6.5	62	4	23
October		23269	23223	22058	9.1	809	11	213	178	4065,750	69	23	92	7.2	107	8	42
November		9631	9431	9133	5.2	232	20	145	101	3062,487	74	18	92	9.8	39	4	18
December		12740	12507	12273	3.7	173	16	144	134	5118,422	128	26	154	12.3	272	27	110
Total 1944		135952	132144	127167	6.4	4030	166	2667	1822	33009,839	874	162	1036	7.8	833	90	311
January 1945		8739	8633	8438	3.4	114	7	109	71	4284,156	77	13	90	10.4	33	2	10
February		13593	13518	13286	2.3	125	15	131	34	6694,762	68	17	85	6.3	39	7	42
March		25069	24963	24307	3.0	444	28	196	94	8942,558	112	38	150	6.0	64	7	34
April		16926	16641	16052	5.2	570	26	193	85	3347,703	73	17	90	5.4	124	11	60
May		1367	1286	1200	12.2	135	2	26	4	43,000	4	2	6	4.7	12		1
Total 1945		65694	65047	63283	3.7	1388	78	656	290	23312,179	344	87	421	6.5	274	27	147
Grand Total	201646	197191	190450	5.5	5418	244	3322	2112	56322,038	1208	249	1457	7.4	1127	117	458	

SOURCE: USAAP Form 1-4

¹ All loss rates are calculated on the basis of 1000 credit sorties.

NINTH AIR FORCE OPERATIONS

(CONTINUED)

	EFFORT			NON-EFFECTIVE EFFORT					BOMBING	LOSSES				AIR CLAIMS				
	Sorties	Credit Sorties	Effect. Sorties	% Non Eff.	No. Waa.	No. Pers.	No. Mech.	No. Other	Tons on Target	MIA	Cat. I	Total	Rate*	Dest.	Prob. Dest.	Dam.		
BY TYPE AND MODEL AIRCRAFT (CONTINUED)																		
P-51	December 1944	415	361	361	13.0	3	1	40	10		7		7	19.4	9	2	13	
	January 1945	370	325	325	12.2		1	39	5		4		4	12.3	42	14	42	
	February	803	682	682	15.1		6	92	23		11		11	16.1	64	8	39	
	March	1123	933	933	16.9	14	4	132	40	25,750	30	2	32	34.4	41	8	15	
	April	2155	2052	1921	10.9	42	13	139	40	149,750	39	1	40	19.5	80	8	47	
	May	2327	2194	2111	9.3	35	5	141	35	117,625	21	2	23	10.5	79	6	28	
	June	2865	2735	2614	8.7	111	5	67	66	704,605	31	2	33	12.1	52	3	23	
	July	3025	2973	2944	2.7	21	2	35	23	23,000	16	1	17	5.7	49	6	26	
	August	2754	2691	2640	4.1	48		26	40	9,625	32	3	35	13.0	83	6	13	
	September	858	832	826	3.7		2	24	6	58,375	6		6	7.2	36		2	
	October	560	538	506	9.6	26	3	24	1	140,250	10	1	11	20.4	24	2	9	
	November	604	556	555	7.7	5	1	34	6	158,000	12	4	16	28.8	4	1	2	
	December	41	38	38	7.3			3		18,500	1		1	26.3	3			
	Total 1944	17480	16547	16095	7.9	302	42	756	285	1405,480	213	16	229	13.8	558	62	266	
	1945	January	491	479	474	3.5		1	15	1	96,750	7		7	14.6	7		2
February		3401	3391	3351	1.2		1	40	1	13,000	12	1	13	3.8	66		10	
March		3573	3544	3460	5.2	65	1	34	13	49,875	14	1	15	4.2	110	2	37	
April		186	183	183	3.2			3			1		1	5.5				
May																		
Total 1945	7651	7597	7476	2.3	65	3	92	15	159,625	33	3	36	4.7	183	2	49		
Grand Total	25546	24505	23932	6.3	370	46	888	310	1565,105	253	19	272	11.1	750	66	328		
P-61	July 1944	91	84	80	12.1			11										
	August	284	277	266	6.3			18			1		1	3.6	6	1	1	
	September	557	537	527	5.4	4		26										
	October	303	285	283	6.6	3		15	2		3	2	5	17.5	3	1		
	November	282	268	258	8.5	4		20			1		1	3.7	3		1	
	December	338	333	316	6.5	3		16	3		3	6	9	27.0	23	3	3	
	Total 1944	1855	1784	1730	6.7	14		106	5		8	8	16	9.0	35	5	5	
	1945	January	142	141	130	8.5	1	1	10		2,600				2			
		February	178	177	172	3.4	1		5		5,280	1	1	1	5.6			
		March	378	377	363	4.0		1	11	3	38,050	1	1	1	2.7	6		1
April		341	334	318	6.8	3		18	2	8,500					7			
May		25	24	22	1.2	1		1										
Total 1945	1064	1053	1005	5.5	6	2	45	6	54,430	1	1	2	1.9	15		1		
Grand Total	2919	2837	2735	6.3	20	2	151	11	54,430	9	9	18	6.6	50	5	6		
BEAU	October 1944	70	70	49	30.0	8		13									2	
C-47 /53	June 1944	1662	1606	1581	4.9				81		45	1	46	28.6				
	August	37	37	37														
Total 1944	1699	1643	1618	4.8					81		45	1	46	27.1				
GLID	June 1944	512	512	510	4.4				2		484		484	945.3				
F-3	June 1944	24	24	15	37.5	4		2	3		1		1	41.7				
	July	66	64	37	43.9	15	6	7	1		1		1	15.6				
	August	14	14	10	33.3			3	1									
	September	64	64	60	6.3	1		2	1		1	1	2	31.3				
	October	29	29	15	48.3	3		10	1						34.5			
	November	62	59	32	48.4	5	3	21	1		1				16.9			
	December	109	109	69	36.7	7	14	15	4						9.2			
	Total 1944	368	363	238	35.3	35	23	60	12		4	3	7	19.3				
	1945	January	67	66	32	52.2	12	8	10	5		4	4	6.1				
		February	70	70	35	50.0	12	3	17	3								
March		126	118	69	45.2	10	8	29	10		1			8.5				
April		10	10	7	30.0	1	1	1			1	1	1	100.0				
May																		
Total 1945	273	264	143	47.6	35	20	57	18		1	5	6	22.7					
Grand Total	641	627	381	40.6	70	43	117	30		5	8	13	20.7					

SOURCE: USAAF Form 344

* All loss rates are calculated on the basis of 1000 credit sorties.

NINTH AIR FORCE OPERATIONS

(CONTINUED)

		EFFORT			NON-EFFECTIVE EFFORT					BOMBING	LOSSES				AIR CLAIMS			
		Sorties	Credit Sorties	Effect. Sorties	% Non Eff.	No. Wa.	No. Pers.	No. Mech.	No. Other	Tons On Target	MIA	Cat. E	Total	Rate*	Dest.	Prob. Dest.	Dem.	
BY TYPE AND MODEL AIRCRAFT (CONTINUED)																		
F-5	February 44	1	1	1														
	March	40	36	36	10.0	1		3										
	April	170	163	123	27.6	31		14										
	May	303	292	213	29.7	54		25	8				13.7					
	June	611	586	430	29.6	111		38	27				5.1					
	July	574	554	360	37.3	161		28	21			2	7.2					
	August	702	696	521	25.8	139		20	13			3	4.3					
	September	602	599	423	29.7	153		14	12			1	1.7					
	October	466	465	326	30.0	118		17	4			1	2.2					
	November	361	361	218	39.6	135		4	4									
	December	530	530	393	25.9	109		11	17			4	7.5		1			
	Total 1944	4360	4283	3044	30.2	1012	24	174	106		18	2	20	4.7	1			
	F-5	January 45	402	400	321	20.1	61		6	13			2	5.0				
February		594	592	468	21.2	112		11	2									
March		928	927	767	17.3	128		3	9									
April		1160	1159	955	17.7	146		3	36	20		4	3.5		1			
May		86	86	69	19.8	14		2	1			2	23.3					
Total 1945		3170	3164	2580	18.6	461	8	76	45		8		8	2.5	1			
Grand Total	7530	7447	5624	25.3	1473	32	250	151		26	2	28	3.8	2				
F-6	December 43	48	24	24	50.0	11		11										
	January 44	90	54	54	40.0	26		8	2									
	February	186	134	134	28.0	46		4	2									
	March	312	263	243	22.1	53	2	13	1									
	April	339	306	256	24.5	64		19										
	May	888	880	758	8.5	21	9	22	18			1	1.2					
	June	2385	2370	2260	5.2	97	3	6	19			13	6.8		7		4	
	July	1905	1879	1675	12.1	171	1	31	27			9	5.3		2			
	August	2339	2336	2196	6.1	76	2	35	30			9	5.1		8	1	2	
	September	1771	1753	1517	14.3	213	1	18	22			6	3.4			1		
	October	1519	1493	1234	18.8	228	2	29	26			5	4.0		4		3	
	November	1392	1380	1045	26.9	268	2	45	32			6	5.1		5	2	2	
	December	1511	1489	1218	19.4	221	2	38	32			8	6.0		16	3	5	
Total 1944	14577	14257	12590	15.6	1484	24	268	211		57	10	67	4.7	42	6	17		
F-6	January 45	1324	1322	1132	14.5	140	6	30	15			1	2.3		1	1	2	
	February	1984	1983	1815	8.5	143		12	14			6	3.5		1		2	
	March	3030	3030	2801	7.6	185	1	21	22			12	4.6		17	5	9	
	April	3343	3337	3018	9.7	278	4	32	11			5	2.4		66	2	14	
	May	478	459	433	9.4	38		5	2			1	2.2		8	1	1	
	Total 1945	10159	10131	9199	9.4	784	11	100	65		25	8	33	3.3	93	9	28	
Grand Total	24784	24412	21813	12.0	2279	37	379	276		82	18	100	4.1	135	15	45		
P-51 RCN	August 44	65	65	65														
	September	132	132	132														
	October	118	118	117	.8				1			1	8.5					
	November	167	167	167														
	December	174	173	173	.6				1									
	Total 1944	656	655	654	.3				1	1		1	1.5					
	P-51 RCN	January 45	153	151	145	5.2	1		5	2			1	6.6				
		February	206	191	191	4.5			6	3								
		March	277	272	270	2.5			7							2	1	
		April	285	277	274	3.9	4		7									
May		40	40	39	2.5			1										
Total 1945	955	931	919	3.8	5		26	5		1		1	1.1	2	1			
Grand Total	1611	1586	1573	2.4	5		27	6		2		2	1.3	2	1			

SOURCE: USAAF Form 34A

* All loss rates are calculated on the basis of 1000 credit sorties.

MIDDLE EAST OPERATIONS

JUNE 1942 THRU SEPTEMBER 1943

B-24

	SORTIES	TONS ON TARGET	A/C LOST	CLAIMS		
				DEST.	PROB. DEST.	DML
June 1942	70	114.500	1	1	0	0
July	166	356.500	3			
August	180	361.000	1	0	1	3
September	217	431.250	1	1	0	3
October	280	424.250	1	8	4	2
November	244	352.500	1	3	2	5
December	213	307.250	1	3	1	0
January 1943	301	611.750	5	9	3	5
February	206	371.500	5	9	7	2
March	163	275.750	2	6	1	2
April	471	801.330	5	19	8	6
May	607	1083.430	5	17	14	6
June	470	1159.370	1	44	32	12
July	1180	2836.920	13	80	14	16
August	686	1165.680	61	185	18	21
September	509	925.090	7	100	17	4
TOTALS	5963	11598.010	112	485	122	81

B-25

	SORTIES	TONS ON TARGET	A/C LOST	CLAIMS		
				DEST.	PROB. DEST.	DML
June 1942						
July						
August	71	69.000	6			
September	73	70.500				
October	299	297.125	2	0	2	0
November	149	147.500				
December	42	26.875				
January 1943	110	100.187	2	2	0	1
February	70	59.750				
March	325	472.750	3	0	8	10
April	383	596.900	4			
May	279	350.200	4	0	11	0
June	363	425.450				
July	1223	1678.370	13	0	0	2
August	1222	1486.570	6			
September						
TOTALS	4609	5781.177	39	2	21	13

P-40

	SORTIES	TONS ON TARGET	A/C LOST	CLAIMS		
				DEST.	PROB. DEST.	DML
June 1942						
July						
August	4		1			
September	286			0	1	2
October	940	50.000	2	27	5	14
November	889	44.500	6	18	2	10
December	650	73.750	12	10	3	13
January 1943	539	39.580	2	10	2	7
February	120	5.810	2	1	0	0
March	1565	36.870	13	6	4	10
April	3058	168.860	25	98	4	37
May	2469	241.780	4	8	0	0
June	1201	23.750	1	29	3	4
July	1823	212.280	19	17	7	5
August	2664	488.750	11	5	6	1
September						
TOTALS	16908	1405.130	101	229	37	103

TOTALS

	SORTIES	TONS ON TARGET	A/C LOST	CLAIMS		
				DEST.	PROB. DEST.	DML
June 1942	70	114.500	1	1	0	0
July	166	356.500	3			
August	255	430.000	8	0	1	0
September	576	481.750	1	1	1	2
October	1519	771.375	5	35	11	16
November	1282	544.500	7	21	4	15
December	905	407.875	13	13	4	13
January 1943	1250	751.517	12	21	5	13
February	396	436.260	7	10	7	2
March	2053	805.370	17	12	13	22
April	3912	1567.090	34	117	12	43
May	3355	1675.090	13	25	25	6
June	2034	1608.570	2	73	35	16
July	4226	4727.570	45	97	21	23
August	4572	3141.000	78	190	24	22
September	509	925.090	7	100	17	4
TOTALS	27088	18744.317	252	716	180	197

ACTIVITY BY TYPE MISSION

16 OCTOBER 1943 THRU 8 MAY 1945

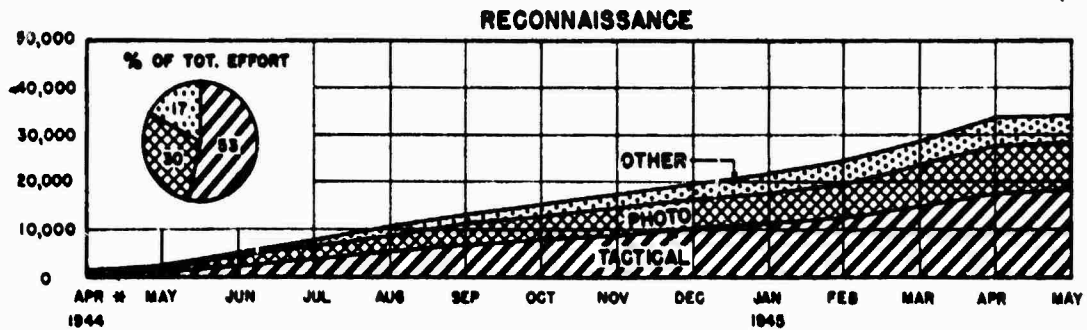
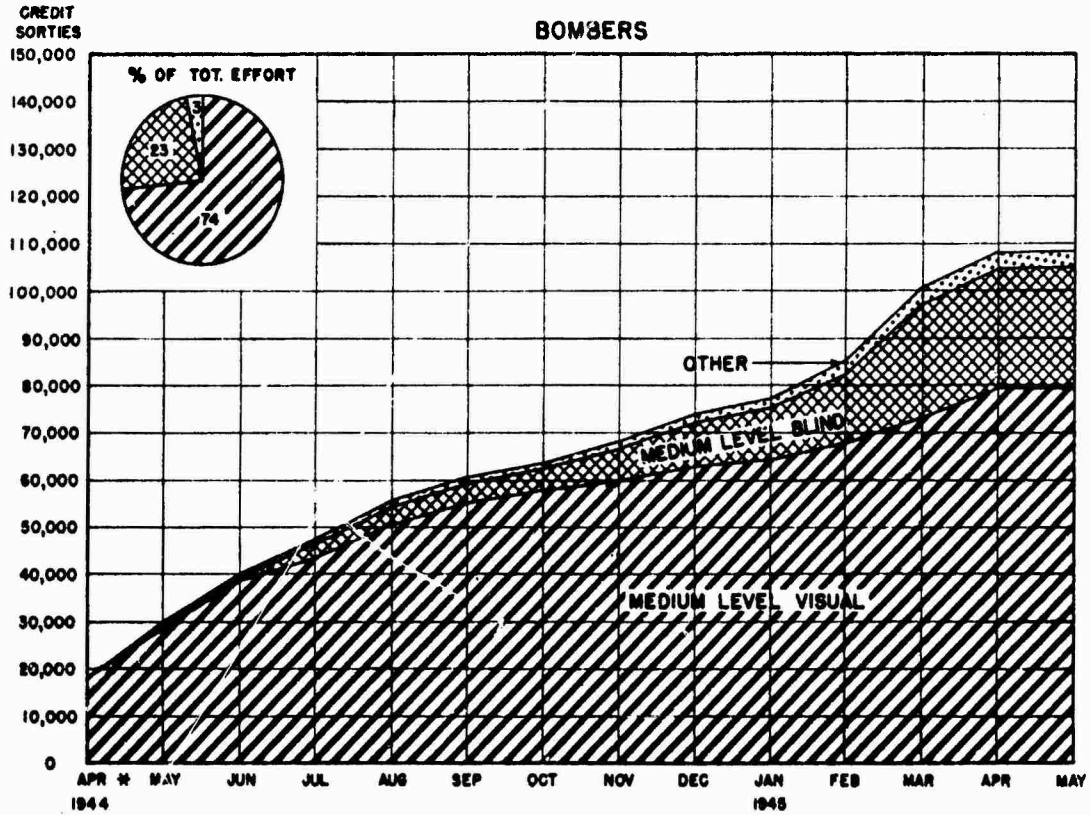
TYPE MISSION	SORTIES	CURRENT SORTIES	% OF TOT EFFORT	EFFECTIVE SORTIES	TONS ON TARGET	LOST & OAT	LOSS BY P/B LOSS BY 1000 ON SORT
BOMBING							
MEDIUM LEVEL VISUAL BOMBING	88528	79608	73.50	62686	108107.668	606	7.61
BLIND BOMBING							
Medium Level Blind Bombing	27169	25387	23.44	21961	38626.561	193	
Pathfinder Bombing	455	444	.41	412	469.625		
Medium Level Night Bombing	273	254	.23	235	243.125	1	
Search Bombing	32	32	.03	31	41.875		
Radar Bombing	16	16	.01	15	13.625		
Night Radar Bombing	20	20	.01	9	18.750		
TOTAL BLIND BOMBING	27955	26143	24.13	22663	39433.561	194	7.42
OTHER							
Window Dropping	2129	2048	1.89	1910	137.950	1	
Leaflet Dropping	481	445	.43	446		3	
Armed Reconnaissance	36	36	.03	23	7.500		
Night Reconnaissance	9	8	.01	8	1.000	1	
Close Escort - Medium Bombers	5	5	.01	5			
Night Artillery Adjustment	2	2		1			
Artillery Adjustment	1	1					
TOTAL OTHER	2663	2565	2.37	2393	145.950	5	1.95
TOTAL BOMBING	119146	108316	100.00	87742	147667.179	805	7.43

SOURCE: USAAP Form 34A

ACTIVITY BY TYPE MISSION TABULATION CONTINUED ON PAGE 22

CUMULATIVE CREDIT SORTIES BY TYPE MISSION

16 OCTOBER 1943 THRU 8 MAY 1945

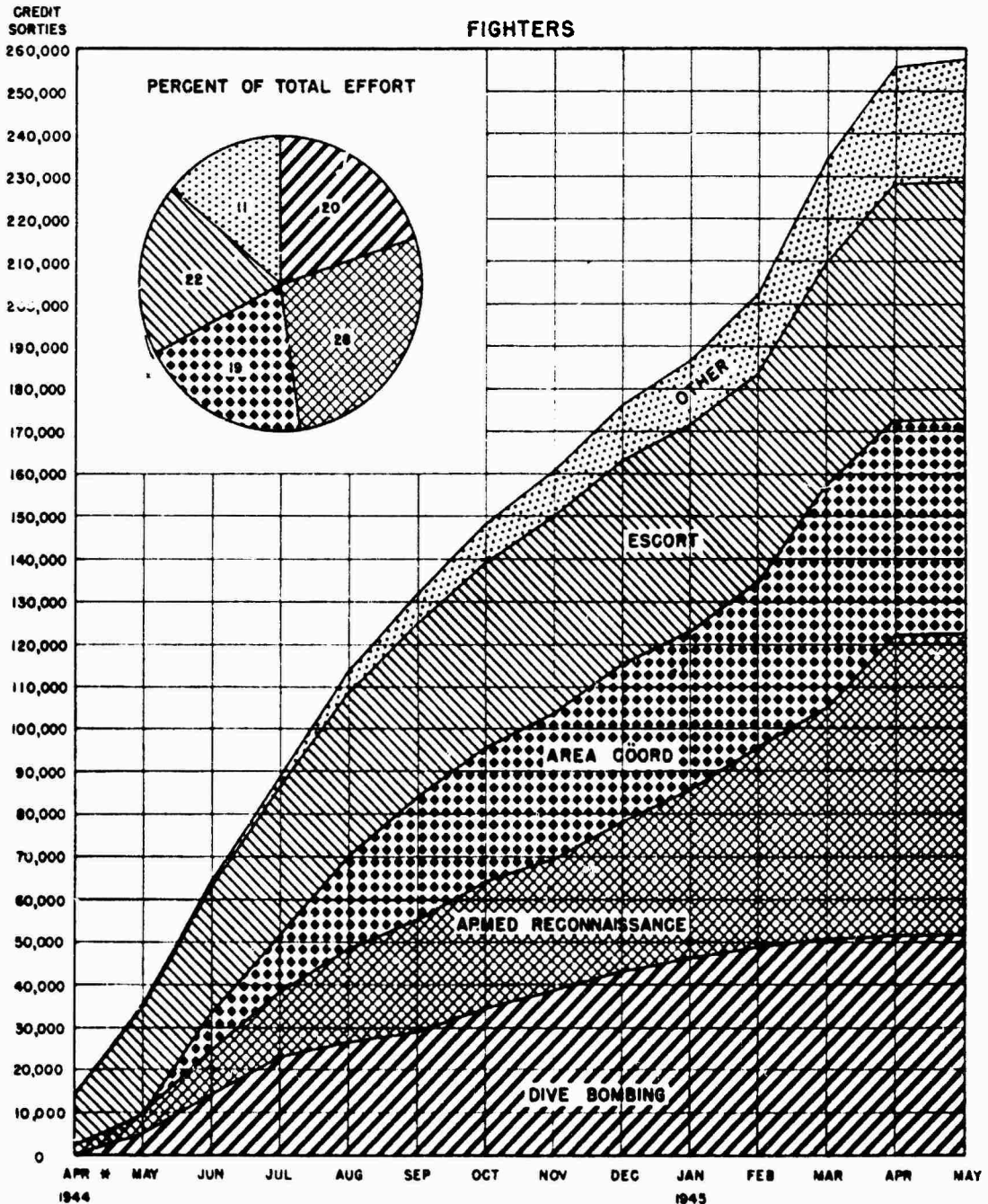


* CUMULATED 16 OCTOBER 1943 THRU 30 APRIL 1944.

SOURCE: GROUP OPREPS

CUMULATIVE CREDIT SORTIES BY TYPE MISSION

16 OCTOBER 1943 THRU 8 MAY 1945



* CUMULATED 16 OCTOBER 1943 THRU 30 APRIL 1944

SOURCE: GROUP OPREPS

ACTIVITY BY TYPE MISSION

(CONTINUED)

TYPE MISSION	SORTIES	CREDIT SORTIES	% OF TOT EFFORT	EFFECTIVE SORTIES	TONS ON TARGET	LOST & CAT B	LOSS RT PER 1000 CR SCR
<u>FIGHTERS</u>							
Armed Reconnaissance	73123	71606	27.81	69200	27468.267	771	
Dive Bombing	54177	52926	20.55	50476	26926.684	539	
Area Coordination	51625	50613	19.65	49107	12090.713	422	
Medium Level Radar Bombing	2481	2466	.96	2437	1413.606	7	
Rocket Projecting and Bombing	2806	1779	.69	1772	628.110	25	
Night Armed Reconnaissance	43	43	.02	42	8.000	1	
Low Level Bombing	100	100	.04	99	75.000	4	
Droop Shoot Bombing	31	19	.01	19	10.000		
Radar Bombing	16	15		15	11.250	2	
Night Dive Bombing	4	4		4	2.000		
TOTAL - BOMBING	183406	179571	69.73	173169	68633.930	1771	9.86
Close Escort - Fighter Bombers	17091	16862	6.55	16449	168.750	22	
Close Escort - Medium Bombers	23061	22061	8.57	21555	12.200	93	
Close Escort - Heavy Bombers	14305	13168	5.11	12590		102	
Close Escort - Troop Carrier	1723	1670	.65	1644	15.350	4	
Close Escort - Light Bombers	1658	1628	.63	1594	10.000	3	
Close Escort - Photo Recon	15	15		15			
TOTAL - ESCORT	57653	55404	21.51	53849	206.300	224	4.04
Area Patrol	11486	11300	4.39	11097	62.313	54	
Fighter Sweep	9017	8782	3.41	8550	30.250	73	
Weather Reconnaissance	885	872	.34	865	5.000	4	
Leaflet Dropping	981	979	.22	953	1.000	10	
Interception	336	329	.13	320			
Demonstration Patrol	190	189	.07	152		1	
Flying Bomb Interception	117	110	.04	106			
Radio Relay	86	86	.03	86		1	
Night Area Patrol	64	64	.03	43			
Night Intruder	56	55	.02	52	2.850	1	
Night Fighter Sweep	50	49	.02	47			
Photo Reconnaissance	49	23	.01	22		2	
Supply Dropping	45	23	.01	23			
Night Interception	40	40	.02	40	.500		
Night Weather Reconnaissance	22	19	.01	18			
Tactical Reconnaissance	19	19	.01	19			
Radar Calibration	7	7		7			
Flare Dropping for Artillery	6	6		6			
Miscellaneous	4	4		4			
TOTAL - OTHER	23060	22556	8.74	22010	101.913	146	6.47
TOTAL FIGHTERS	264119	257531	100.00	243028	68942.143	2141	8.31
<u>RECONNAISSANCE</u>							
TACTICAL RECONNAISSANCE							
Medium Level Tactical Reconnaissance	12149	11927	35.01	10756		43	
Tactical Reconnaissance	4224	4164	12.22	3703		28	
Low Level Tactical Reconnaissance	2043	2039	5.98	1841		10	
High Level Tactical Reconnaissance	16	16	.05	12			
TOTAL - TACTICAL RECONNAISSANCE	18438	18146	53.26	16312		81	4.46
PHOTO RECONNAISSANCE							
Photo Reconnaissance	4232	4093	12.01	2642		21	
High Level Photo Reconnaissance	3086	3077	9.03	2765		6	
Medium Level Photo Reconnaissance	2986	2579	7.57	2207		6	
Night Photo Reconnaissance	371	345	1.07	200		9	
Low Level Photo Reconnaissance	349	347	1.02	295		4	
TOTAL - PHOTO RECONNAISSANCE	10624	10461	30.70	8109		46	4.42
OTHER							
Weather Reconnaissance	3085	3059	8.98	3030		3	
Artillery Adjustment	2330	2317	6.90	1863		10	
Radio Relay	19	19	.06	19			
Armed Reconnaissance	18	18	.05	16			
Close Escort - Photo Reconnaissance	14	14	.04	11			
Area Patrol	12	12	.04	12			
Photo Mapping	11	11	.03	8		1	
I. F. F. Check	4	4	.01	2			
Close Escort - Light Bombers	4	4	.01	4			
Night Weather Reconnaissance	4	4	.01	4			
Courier	3	3	.01	1		2	
TOTAL - OTHER	5504	5465	16.04	4970		16	
TOTAL RECONNAISSANCE	34566	34072	100.00	29391		143	4.20
GRAND TOTAL	420082	402074		360289	214609.322	2619	9.00

SOURCE: USAAF Form 34A

BOMBING

Bombers dropped about 25 percent of their total tonnage on targets (147,667 tons) before D Day, having as their main targets airfields, marshalling yards, V-weapon sites and military installations in northern France, with some raids being made on targets in Belgium. Fighters, however, dropped only six percent of their total tonnage on targets (68,942 tons) before D Day, and did not hit their bombing stride until they were running close tactical coordination missions in Normandy. Bombers averaged 431 tons per day operated at group strength or better throughout the entire period and fighters averaged 174 tons. Both bombers and fighters reached their bombing peak in March 1945, when bombers dropped 23,903 tons and fighters 9759 tons for an average per day operated of 854 tons for bombers and 375 tons for fighters.

The weight of fighter activity devoted to close tactical coordination is shown by the fact that about 40 percent of their tonnage fell on troops, armor and motor transport. Marshalling yards and rail cutting were their second and third objectives. The main targets for bombers were marshalling yards (18 percent), bridges (16 percent), and troops, armor and motor transport (15 percent).

Bomb types consumed numbered 19 high explosive types, 15 fragmentation types and 17 incendiary types; the tonnage percentages being 92 percent high explosive, five percent fragmentation and three percent incendiary. Fighters expended 14,056 rockets, 93 percent of them in the last six months of operations.

BOMBING EFFORT BY TYPE TARGET

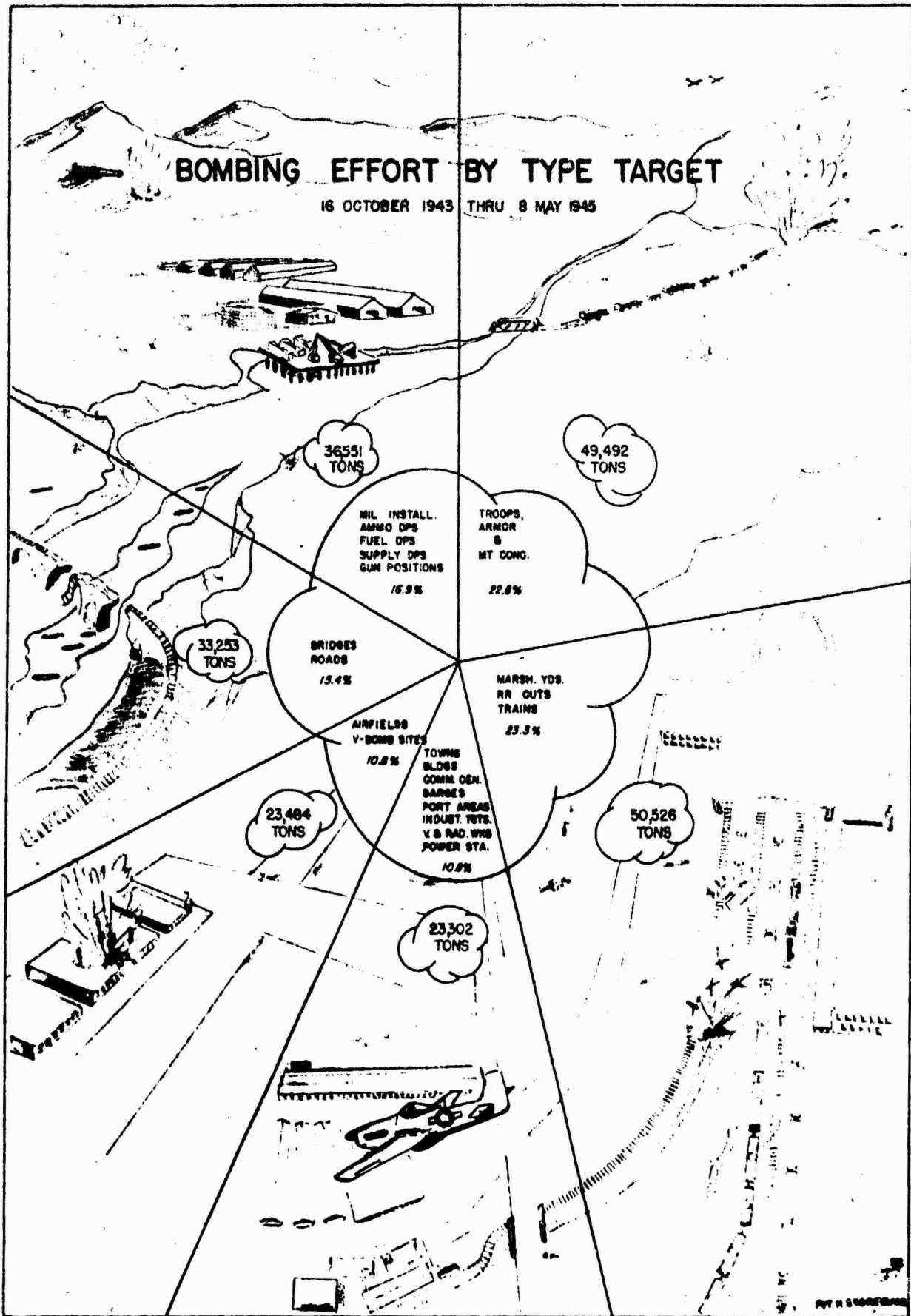
16 OCTOBER 1943 THRU 8 MAY 1945

TYPE OF TARGET	BOMBERS		FIGHTERS		TOTAL	
	TONS OF TONNAGE	PERCENT	TONS OF TONNAGE	PERCENT	TONS OF TONNAGE	PERCENT
Troops, Armor and Motor Transport	22491.206	15.23	27001.267	39.17	49492.473	22.80
Marshalling Yards	26653.733	18.05	10765.011	15.62	37418.744	17.30
Bridges	23316.884	15.79	5490.590	7.96	28807.474	13.30
Towns and Buildings	8540.143	5.78	5026.620	7.29	13566.763	6.30
Railroad Cutting	3289.025	2.23	957.160	1.39	4246.185	1.98
Airfields	9802.919	6.64	2168.075	3.15	11970.994	5.50
V-Weapon Sites	11270.462	7.63	242.469	.35	11512.931	5.30
Military Installations	9871.209	6.69	1515.992	2.19	11386.801	5.30
Ammunition Dumps	6686.865	4.53	1123.637	1.63	7810.502	3.60
Fuel Dumps	5173.226	3.51	620.943	.90	5800.169	2.70
Supply Dumps	5102.131	3.46	690.799	1.00	5792.930	2.70
Gun Positions	2734.687	1.85	3026.166	4.39	5760.853	2.60
Communication Centers	4816.449	3.26	95.000	.08	4911.449	2.20
Roads	4072.972	2.76	366.319	.53	4439.291	2.10
Port Areas	2856.537	1.93	533.715	.77	3390.252	1.60
Industrial Targets	477.162	.32	298.839	.43	776.001	.37
Trains			451.358	.66	451.358	.22
Valve and Radio Works	354.057	.24	46.513	.07	400.570	.18
Power Stations	126.575	.09	8.964	.01	135.539	.06
Barges			126.096	.18	126.096	.05
Miscellaneous	18.937	.01	17.010	.03	35.947	.02
TOTALS	147667.179	100.00	68942.143	100.00	216609.322	100.00

SOURCE: USAAF Form 3-4

BOMBING EFFORT BY TYPE TARGET

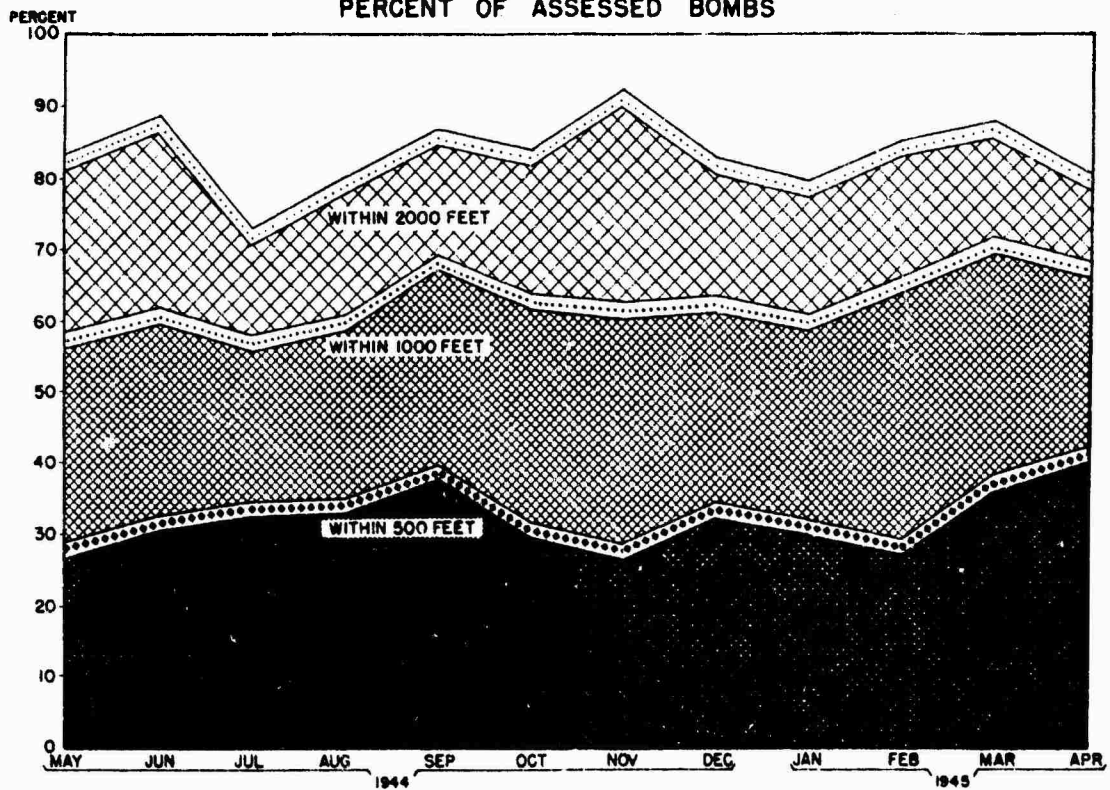
16 OCTOBER 1943 THRU 8 MAY 1945



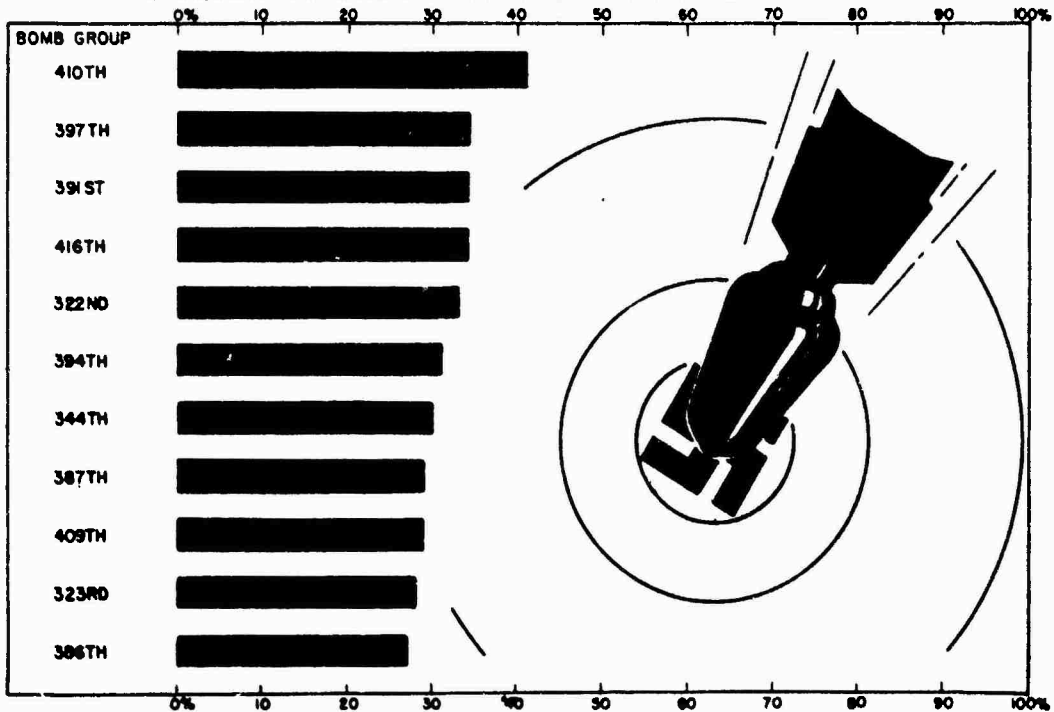
BOMBING ACCURACY

1 MAY 1944 THRU 30 APRIL 1945

PERCENT OF ASSESSED BOMBS



12-MONTH AVERAGE WITHIN 500 FEET—BY GROUP



SOURCE: OPERATIONAL RESEARCH SECTION, 9TH BOMB DIV

BOMB AND AMMUNITION EXPENDITURES

16 OCTOBER 1943 THRU 8 MAY 1945

HIGH EXPLOSIVE

	2000 GP		1600 GP		1100 GP		1100 DEMO		1000 GP		1000 COMP B		1000 SAP	
	NO	TONS	NO	TONS	NO	TONS	NO	TONS	NO	TONS	NO	TONS	NO	TONS
On Target	21931	21931.000	98	78.400	399	197.450	72	39.600	97988	48994.000	2048	1024.000	2698	1349.000
Jett & Lost	876	876.000			34	18.700			3200	1600.000	114	57.000	58	29.000
Total	22807	22807.000	98	78.400	393	216.150	72	39.600	101188	50594.000	2162	1081.000	2756	1378.000

	600 GP		500 GP		500 COMP B		500 SAP		300 GP		250 GP	
	NO	TONS	NO	TONS	NO	TONS	NO	TONS	NO	TONS	NO	TONS
On Target	1355	406.500	373373	93343.250	12670	3167.500	2476	619.000	4605	690.750	161393	20174.125
Jett & Lost	35	10.500	16404	4101.000	396	99.000	25	6.250	184	27.600	4734	591.750
Total	1390	417.000	389777	97444.250	13066	3266.500	2501	625.250	4789	718.350	166127	20765.875

	250 DEMO		200 GP		150 GP		100 GP		100 DEMO		100 D/A	
	NO	TONS	NO	TONS	NO	TONS	NO	TONS	NO	TONS	NO	TONS
On Target	422	52.750	73	7.300	12995	974.625	105368	5268.400	686	34.300	56	1.800
Jett & Lost			7	.700	238	17.850	3985	199.250			5	.250
Total	422	52.750	80	8.000	13233	992.475	109353	5467.650	686	34.300	61	3.050

FRAGMENTATION

	500		500 GL		400		360		280		265		260		250	
	NO	TONS	NO	TONS	NO	TONS	NO	TONS	NO	TONS	NO	TONS	NO	TONS	NO	TONS
On Target	3168	792.000	395	98.750	128	25.600	44	8.280	20	2.800	77	9.625	62201	7775.218	89	11.125
Jett & Lost	111	27.750	4	1.000	16	3.200	24	4.320			4	.500	2537	317.220		
Total	3279	819.750	399	99.750	144	28.800	70	12.600	20	2.800	81	10.125	64738	8092.438	89	11.125

	120		6 X 20		100		90		80		60		20	
	NO	TONS	NO	TONS	NO	TONS	NO	TONS	NO	TONS	NO	TONS	NO	TONS
On Target	9131	537.149	1931	96.550	12775	638.790	704	31.680	8	.320	54	1.620	12966	129.660
Jett & Lost	708	41.595	86	4.300	1023	51.150	6	.270			18	.540	1498	14.980
Total	9839	578.744	2017	100.850	13798	689.900	710	31.950	8	.320	72	2.160	14464	144.640

INCENDIARY

	1100 FB		1000 FB		750 FB		500 FB		500 IC		500 IB		500 WP		350 FB	
	NO	TONS	NO	TONS	NO	TONS	NO	TONS	NO	TONS	NO	TONS	NO	TONS	NO	TONS
On Target	2369	1302.950	24	12.000	560	210.000	4669	1167.250	9165	2291.250	10512	2628.000	121	30.250	20	3.300
Jett & Lost	130	71.500			26	9.750	154	38.500	114	28.500	286	71.500			1	.175
Total	2499	1374.450	24	12.000	586	219.750	4823	1205.750	9279	2319.750	10798	2699.500	121	30.250	21	3.675

	300 WP		300 FB		280 FB		250 IB		250 TI		125 WP		100 WP		100 IB		100 SM	
	NO	TONS	NO	TONS	NO	TONS	NO	TONS	NO	TONS	NO	TONS	NO	TONS	NO	TONS	NO	TONS
On Target	62	9.300	31	4.650	143	20.020	2	.250	179	22.375	20	1.250	125	62.250	6568	328.400	35	1.750
Jett & Lost	8	1.200	14	2.100	23	3.220					10	.500	182	9.100				
Total	70	10.500	45	6.750	166	23.240	2	.250	179	22.375	20	1.250	1255	62.750	6790	337.500	35	1.750

TOT NO ON TGT	940084	NO JETT & LOST	37278	GR TOT	977362	TOT TONS ON TGT	216609.322	TOT TONS JETT & LOST	8337.720	GR TOT	224947.048
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AMMUNITION AND MISCELLANEOUS EXPENDITURES

TYPE AIRCRAFT	ROCKET ON TGT	ROCK JETT	TOTAL ROCKETS	.50 CAL EXP - OP	.50 CAL LOST	.50 CAL TOT EXP	20 MM EXP-OP	20 MM LOST	20 MM TOT-EXP	LEAF BOMBS	PHOTO BOMBS
A-20				158294	219594	377888					
A-26				268182	109000	377182					
B-26				2122510	1498430	3616940				2619	
P-38				3225436	409037	3634473	497730	44233	541963	214	
P-47	13783	344	14127	55487264	2767109	58254375				2191	
P-51				2587779	225332	2753111				26	
P-61	273	2	275				167933	8805	176738		
P-3				1667	1700	3367					2361
P-5											
P-6				253362	67040	320402					60
P-51 Rem				16290	1260	17550					
Totals	14036	346	14402	64060769	5290522	69351291	665663	53038	718701	5090	2421

BOMB AND AMMUNITION EXPENDITURE

16 OCTOBER 1943 THRU 8 MAY 1945

BY TYPE AIRCRAFT AND TYPE BOMB

A-20

TYPE BOMB	NO. ON TARGET	NO JET & LOST	TONS ON TARGET	TONS JET & LOST
300 GP	72767	1978	18191.750	494.500
300 GP	17		2.550	
250 GP	724	52	90.500	6.500
150 GP	24		1.800	
500 SAP	528	10	132.000	
500 FR	520		130.000	
260 FR	61	4	7.625	.500
500 FR G1	395	4	98.750	1.000
500 IB	118	4	29.500	1.000
TOTAL	75154	2032	18684.475	506.000

P-30

TYPE BOMB	NO. ON TARGET	NO JET & LOST	TONS ON TARGET	TONS JET & LOST
2000 GP	57	1	57.000	1.000
1000 GP	13660	1045	6830.000	522.500
500 GP	10618	815	2654.500	203.750
1000 SAP	1239	11	419.500	.500
1100 FB	1147	55	630.850	30.250
900 FB	478	47	119.500	11.750
350 FB	20	1	3.500	.175
750 FB	6		2.250	
500 IB	182	1	45.500	.250
260 FR	242	12	30.250	1.560
100 FR	153	48	7.650	2.400
TOTAL	27802	2036	11000.570	779.138

TOTAL BOMBERS

TYPE BOMB	NO. ON TARGET	NO JET & LOST	TONS ON TARGET	TONS JET & LOST
2000 GP	21874	875	21874.000	875.000
1600 GP	98		78.400	
1100 GP	359	34	197.450	18.700
1000 GP	75335	1592	37667.500	796.000
600 GP	1341	33	402.300	9.900
500 GP	189418	9523	47354.500	1380.750
300 GP	4540	184	681.000	27.660
250 GP	158233	4505	19779.125	563.125
150 GP	12995	238	974.625	17.850
100 GP	105293	3984	5264.650	199.200
1000 GB	2048	111	1024.000	97.000
500 GB	7958	141	1989.500	35.250
1000 SAP	1199	11	599.500	.500
500 SAP	528	10	132.000	2.500
1100 FB	72		39.600	
250 FR	422		52.750	
100 FR	686		34.300	
500 FR G1	395	4	98.750	1.000
500 FR	544		136.000	
260 FR	36915	1190	4614.335	148.790
120 FR	4913	319	285.019	18.734
100 FR	3417	203	170.850	10.150
6x20 FR	1900	86	95.000	4.300
500 IB	6527	131	1631.750	32.750
100 IB	6568	182	328.400	9.100
100 WP	24		1.800	
100 W/A	56	5	2.800	.230
250 TI	179		22.375	
500 I G1	8526	106	2131.500	26.500
TOTAL	882363	6472	147887.178	4239.849

A-26

TYPE BOMB	NO. ON TARGET	NO JET & LOST	TONS ON TARGET	TONS JET & LOST
1000 GP	14175	254	7087.500	127.000
500 GP	10438	211	2609.500	53.500
250 GP	8731	499	1091.375	62.375
150 GP	3087	96	291.525	7.200
100 GP	10625	191	531.250	9.550
1000 GB	2003	110	1004.000	95.000
500 GB	4086	109	1021.500	27.250
1000 SAP	54	2	27.000	1.000
260 FR	3822	206	477.750	25.750
120 FR	1284	56	75.525	3.294
500 IB	1450	18	362.500	4.500
500 I G1	3682	30	920.500	9.500
TOTAL	64242	1793	15499.923	385.918

P-47

TYPE BOMB	NO. ON TARGET	NO JET & LOST	TONS ON TARGET	TONS JET & LOST
1000 GP	8987	563	4493.500	281.500
600 GP	14	2	4.200	.600
500 GP	167981	9630	41995.250	2407.500
300 GP	65		9.750	
250 GP	2268	145	283.500	20.625
200 GP	73	7	7.500	.700
100 GP	75	1	3.750	.050
500 GB	4712	255	1178.000	63.750
1000 SAP	260	36	130.000	18.000
500 SAP	1840	15	460.000	3.750
500 FR	2624	111	656.000	87.750
400 FR	128	16	25.600	3.200
360 FR	46	24	8.280	6.320
280 FR	77		2.800	
265 FR	20	4	9.625	.900
260 FR	2447	1281	3098.438	160.120
250 FR	89		11.125	
120 FR	4218	389	214.130	22.861
6x20 FR	31		1.550	
100 FR	9205	772	460.250	38.600
90 FR	704	6	31.680	.270
80 FR	8		.300	
60 FR	54	18	1.680	.540
20 FR	11068	1498	110.680	14.980
500 IB	3724	152	931.000	38.000
500 I G1	639	8	159.750	2.000
1100 FB	1209	74	644.920	40.700
1000 FB	24		12.200	
750 FB	510	26	191.250	9.750
500 FB	4175	105	1043.750	26.250
300 FB	31	14	4.650	.200
280 FB	143	23	19.740	3.220
500 WP	121		30.250	
300 WP	6	8	9.500	1.200
100 WP	1224	10	61.050	.500
125 WP	20		1.250	
100 W/A	35		1.750	
TOTAL	210924	18213	86324.038	3193.338

TOTAL FIGHTERS

TYPE BOMB	NO. ON TARGET	NO JET & LOST	TONS ON TARGET	TONS JET & LOST
2000 GP	57	1	57.000	1.000
1000 GP	22652	1608	11326.000	804.000
600 GP	14	2	4.200	.600
500 GP	183995	10081	45980.750	2720.250
300 GP	65		9.750	
250 GP	3160	229	395.000	28.625
200 GP	73	7	7.500	.700
100 GP	75	1	3.750	.050
500 GB	4712	255	1178.000	63.750
1000 SAP	1499	47	749.500	23.500
500 SAP	1948	15	497.000	3.750
1000 FB	1		.500	
500 FR	2624	111	656.000	27.750
400 FR	128	16	25.600	3.200
360 FR	46	24	8.280	6.320
280 FR	77		2.800	
265 FR	20	4	9.625	.900
260 FR	25286	1347	3160.883	168.430
250 FR	89		11.125	
120 FR	4210	389	214.130	22.861
6x20 FR	31		1.550	
100 FR	9398	820	467.900	43.000
90 FR	704	6	31.680	.270
80 FR	8		.300	
60 FR	54	18	1.620	.540
20 FR	12964	1498	129.660	14.980
500 IB	3954	155	994.250	38.750
250 IB	2		.250	
500 I G1	639	8	159.750	2.000
1100 FB	2109	130	2109.950	71.500
1000 FB	24		12.000	
750 FB	510	26	210.000	9.750
500 FB	4669	154	1167.250	38.500
350 FB	20	1	3.500	.175
300 FB	31	14	4.650	2.100
280 FR	143	23	20.020	3.220
500 WP	121		30.250	
300 WP	6	8	9.500	1.200
125 WP	20		1.250	
100 W/A	35		1.750	
TOTAL	287721	17808	88842.143	4087.771

B-26

TYPE BOMB	NO. ON TARGET	NO JET & LOST	TONS ON TARGET	TONS JET & LOST
2000 GP	21874	875	21874.000	875.000
1600 GP	98		78.400	
1100 GP	359	34	197.450	18.700
1000 GP	61160	1338	30580.000	669.000
600 GP	1341	33	402.300	9.900
500 GP	106213	3331	26553.250	832.750
300 GP	4523	184	678.450	27.600
250 GP	148778	3954	18597.250	494.250
150 GP	9084	142	681.300	10.650
100 GP	94668	3793	4733.400	189.650
1000 GB	40	4	20.000	2.000
500 GB	3872	32	968.000	8.000
1000 SAP	1145	9	572.500	4.500
1100 FB	72		39.600	
250 FR	422		52.750	
100 FR	686		34.300	
500 FR	24		6.000	
260 FR	33032	980	4128.960	122.540
120 FR	1489	253	213.450	15.440
100 FR	3417	203	170.850	10.150
6x20 FR	1900	86	95.000	4.300
500 IB	4959	107	1239.750	27.250
100 IB	6568	182	328.400	9.100
100 WP	24		1.800	
250 TI	179		22.375	
100 W/A	56	5	2.800	.250
500 I G1	8544	68	1211.000	17.000
TOTAL	912987	19825	113482.781	3348.080

P-51

TYPE BOMB	NO. ON TARGET	NO JET & LOST	TONS ON TARGET	TONS JET & LOST
1000 GP	6		3.000	
500 GP	14		3.500	
1100 FB	13	1	7.150	.550
750 FB	44		16.500	
500 FB	16	2	4.000	.500
280 FB	2		.280	
500 IB	79	2	19.750	.500
250 IB	2		.250	
TOTAL	178	5	54.430	1.550

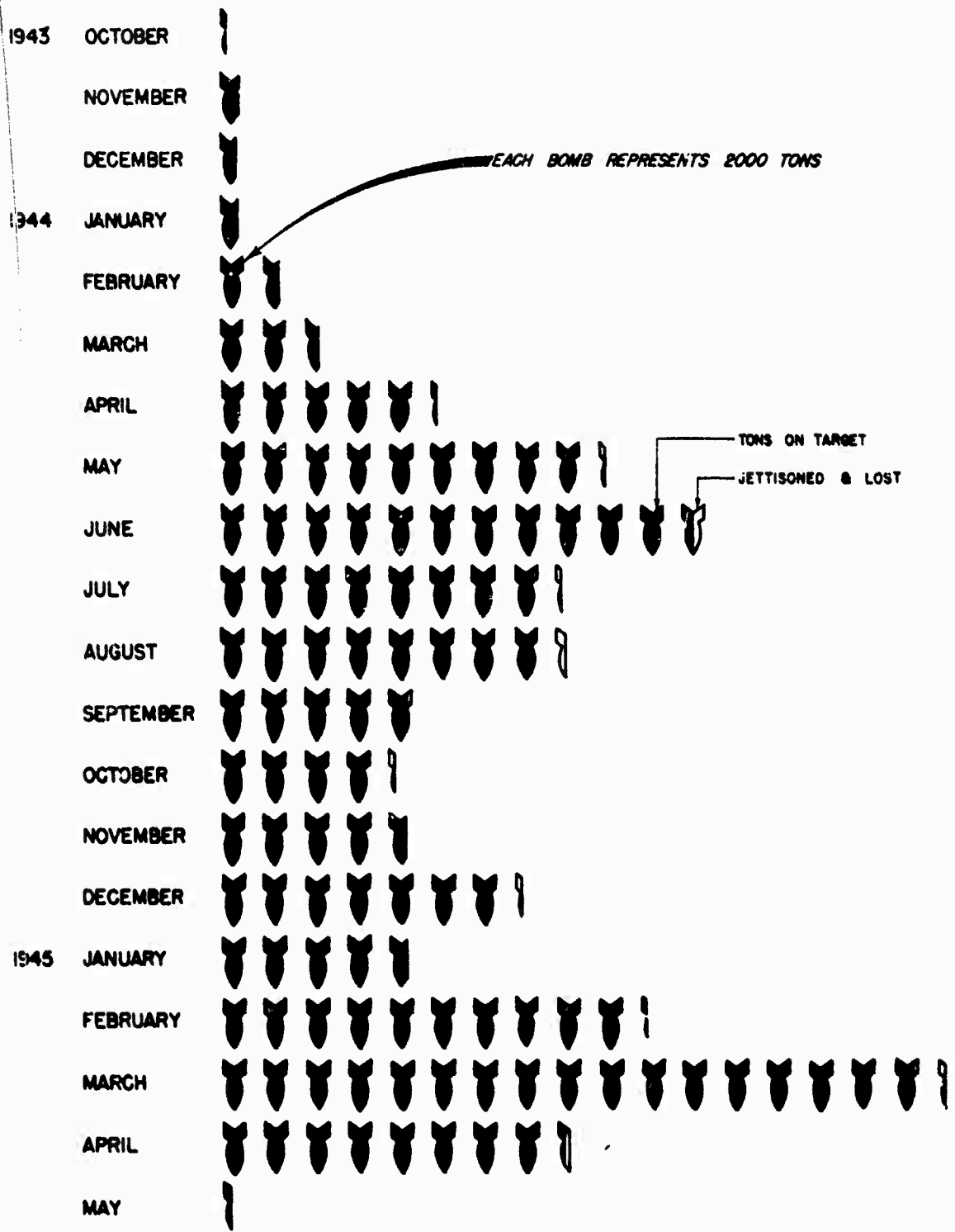
P-51

TYPE BOMB	NO. ON TARGET	NO JET & LOST	TONS ON TARGET	TONS JET & LOST
300 GP	534	436	1335.500	109.000
250 GP	892	64	111.500	8.000
500 SAP	108		27.000	
260 FR	377	54	72.125	6.750
20 FR	1898		18.980	
TOTAL	8817	554	1565.105	123.750

SOURCE: USAAF Form 34A

BOMB EXPENDITURES

16 OCTOBER 1943 THRU 8 MAY 1945



SOURCE: GROUP OPREPS

AIRCRAFT AND CREW LOSSES

The air force lost 2347 tactical aircraft, and 742 were written off as a result of battle damage (Category E) in the full period of operations. Of every 1000 aircraft entering enemy territory, 7.7 were lost or received damage resulting in salvage. Of every 100 aircraft losses or write-offs for battle damage, 47 were charged to flak, 13 to enemy aircraft and 40 to crash landings, accidents the result of enemy action, combinations of flak and enemy aircraft or losses with reason unknown. Bombers had a slightly lower, reconnaissance a considerably lower, and fighters a slightly higher loss rate than the air force average.

For every aircraft lost or salvaged for battle damage, six received battle damage requiring major or minor repairs or replacements. The ratio of flak loss to flak damage was one to 12.

The trend of loss rates, charted on the following page, shows a decided peak for both bombers and fighters in December 1944 and January 1945, resulting from the enemy's abortive attempt to regain air superiority in the Ardennes. Only in December was a considerable proportion of bomber losses due directly to enemy aircraft action. Loss rate for bombers and fighters declined steadily from January 1945 to V-E Day, and were below the 20-month average in March 1945 through May for bombers and in February through May for fighters.

Air crew initial casualties totaled 5383, of whom 622 were originally reported killed in action, 3713 missing in action, 400 seriously wounded and 646 slightly wounded.

AIRCRAFT LOST AND DAMAGED

16 OCTOBER 1943 THRU 8 MAY 1945

BATTLE LOSSES

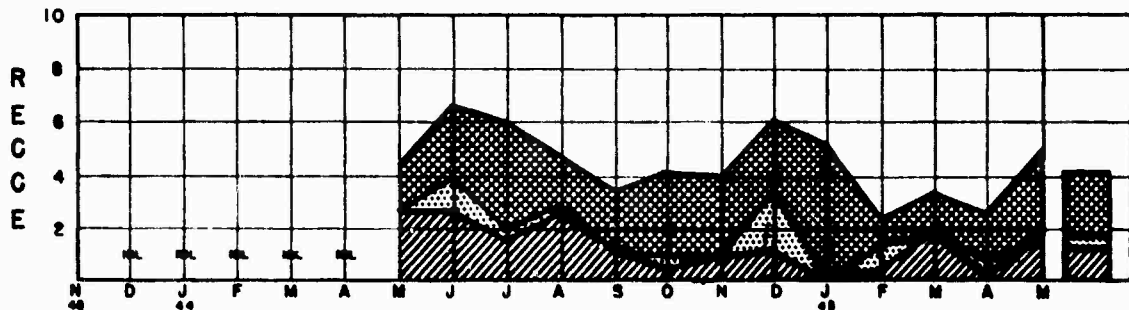
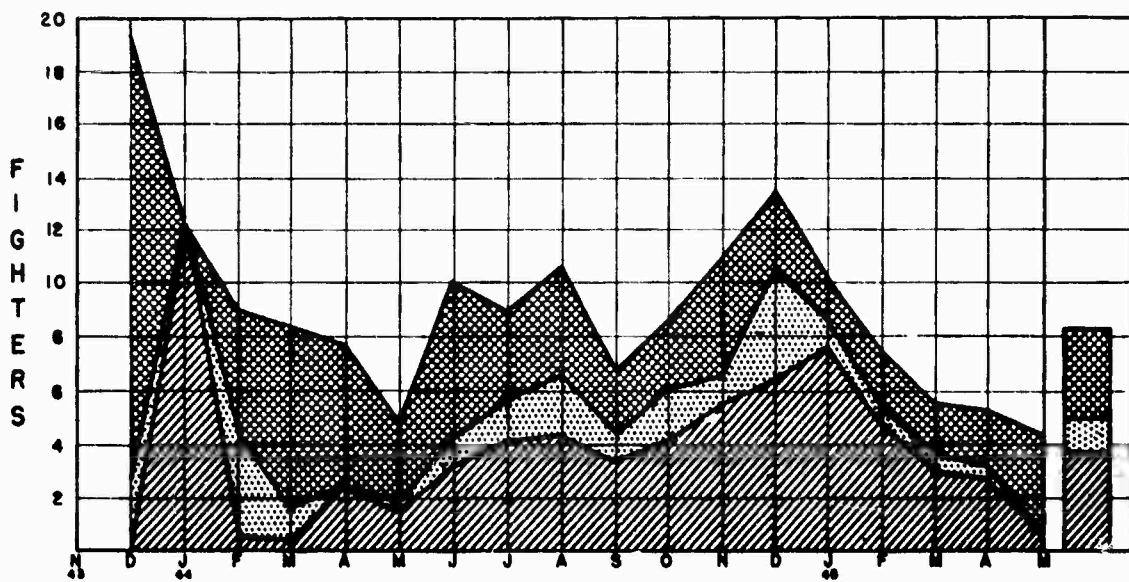
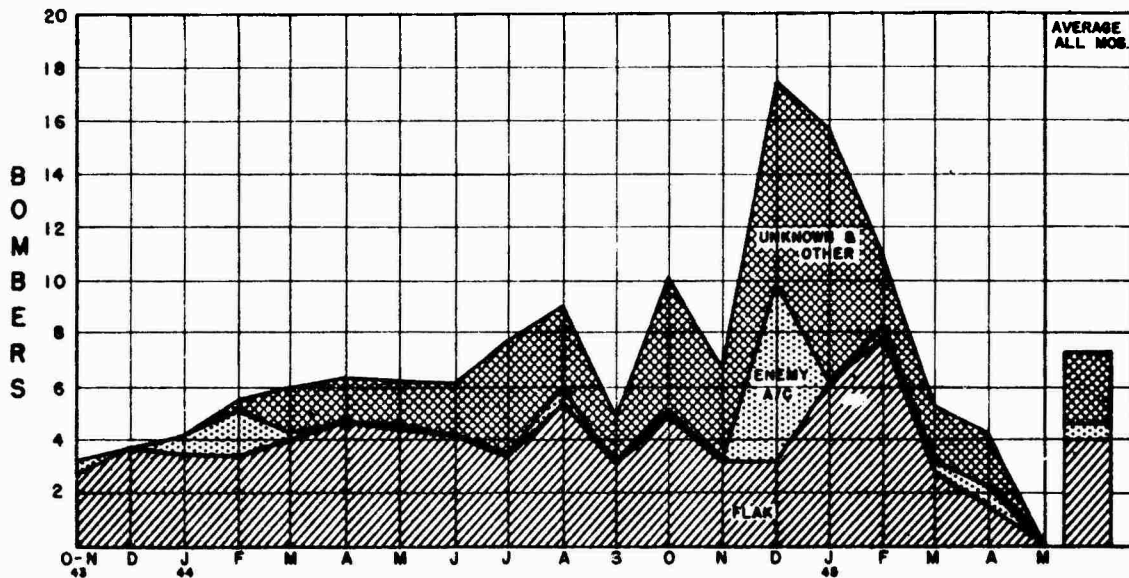
TYPE AIRCRAFT	FLAK				ENEMY AIRCRAFT				OTHER				TOTAL			
	LOST	CAT E	TOTAL	RT PER 1000 CR SORTIES	LOST	CAT E	TOTAL	RT PER 1000 CR SORTIES	LOST	CAT E	TOTAL	RT PER 1000 CR SORTIES	LOST	CAT E	TOTAL	RT PER 1000 CR SORTIES
A-20	56	36	92	4.4					34	43	77	3.8	90	79	169	8.2
A-26	20	10	30	3.0	2	2	4	0.4	13	16	29	2.9	35	28	63	6.3
B-26	204	116	320	4.1	47	13	60	0.8	69	124	193	2.5	320	253	573	7.4
TOTAL BOMBERS	280	162	442	4.0	49	15	64	0.6	116	183	299	2.8	445	360	805	7.4
P-38	115	32	147	4.5	81	6	87	2.6	121	39	160	4.9	317	77	394	12.0
P-47	612	131	743	3.8	176	19	195	1.0	420	99	519	2.6	1208	249	1457	7.4
P-51	76	7	83	3.4	41		41	1.7	136	12	148	6.0	253	19	272	11.1
P-61	2	2	4	1.4		2	2	0.7	7	5	12	4.2	9	9	18	6.3
TOTAL FIGHTERS	805	172	977	3.8	298	27	325	1.3	684	155	839	3.2	1787	354	2141	8.3
P-3		1	1	1.6					5	7	12	19.1	5	8	13	20.7
P-5	2	1	3	0.4	4		4	0.5	20	1	21	2.8	26	2	28	3.7
P-6	32	6	38	1.6	15		15	0.6	35	12	47	1.9	82	18	100	4.1
P-51 Bom									2		2	1.3	2		2	1.3
TOTAL ENGINE	34	8	42	1.2	19		19	0.6	62	20	82	2.4	115	28	143	4.2
GRAND TOTAL	1119	342	1461	3.7	366	42	408	1.0	862	358	1220	3.0	2347	742	3089	7.7

BATTLE DAMAGE

TYPE AIRCRAFT	FLAK				ENEMY AIRCRAFT				OTHER				TOTAL			
	CAT A	CAT AC	CAT B	TOTAL	CAT A	CAT AC	CAT B	TOTAL	CAT A	CAT AC	CAT B	TOTAL	CAT A	CAT AC	CAT B	TOTAL
A-20	2317	249	156	2722		2	2	4	24	6	18	48	2341	257	176	2774
A-26	608	64	113	785					14	2	13	29	622	64	126	814
B-26	8505	642	51	9198	77	22	2	101	100	43	10	153	8682	707	63	9452
TOTAL BOMBERS	11430	955	320	12705	77	24	4	105	138	51	41	230	11645	1030	365	13040
P-38	590	94	20	706	13	15	2	30	42	22	7	71	645	133	29	807
P-47	3130	1653	81	4864	50	110	7	167	179	195	21	395	3359	1958	109	5426
P-51	212	52	11	275	11	8	1	20	11	17	4	32	234	77	16	327
P-61	7	2	1	10		1		1	6	4	2	12	13	7	3	23
TOTAL FIGHTERS	3939	1803	113	5855	74	134	10	218	238	238	34	510	4251	2175	157	6583
P-3	3			3							1	1	3		1	4
P-5	8	5	1	14	1			1		1		1	9	6	1	16
P-6	71	53	1	125	3	3	2	8	8	1	4	13	82	57	7	146
TOTAL ENGINE	82	58	2	142	4	3	2	9	8	2	5	15	94	63	9	166
GRAND TOTAL	15451	2816	435	18702	155	161	16	332	386	291	80	755	15990	3268	531	19789

SOURCE: USAAF Form 344

LOSSES PER 1000 CREDIT SORTIES BY CAUSE (INCLUDING MIA & GATE) OCTOBER 1944 THRU MAY 1945



SOURCE: GROUP OPREPS

AIRCRAFT AND CREW ATTRITION

OPERATIONAL AND NON-OPERATIONAL LOSSES AS PERCENT OF UNIT EQUIPMENT

	A-20	A-26	B-26	Total Bombers	P-38	P-47	P-51	P-61	Total Ftrs	P-3	P-5	P-6	Total Rem
October 1943													
November			5.9	5.9									
December			2.7	2.7									
January 1944			3.9	3.9			30.0		30.0				
February			9.0	9.0		9.3	17.8		12.5			3.3	3.3
March	3.4		5.1	4.9		6.3	28.0		15.3				
April	10.8		9.1	9.4	86.7	7.6	34.0		15.3			1.7	2.3
May	14.6		11.1	12.1	16.7	9.3	31.3		13.1		16.0		7.3
June	16.7		10.9	12.5	27.6	25.0	26.7		25.1		6.3	20.8	14.0
July	10.9		10.4	10.5	24.0	24.9	22.7		24.3	6.3	6.3	16.7	11.2
August	14.6		14.5	14.5	41.8	24.2	24.0		25.7		7.8	15.3	10.5
September	5.2		6.6	6.3	18.2	12.2	17.3		13.3	12.5	4.7	5.6	5.8
October	10.9		5.5	7.0	18.3	17.8	21.3	16.7	18.1	6.3	1.6	7.3	5.5
November	12.7	1.7	8.4	8.7	20.0	24.2	30.9	7.1	23.2	6.3	18.8	11.5	12.9
December	37.5	4.7	22.0	20.3	26.8	26.1		35.7	26.6	12.5	8.3	11.5	10.8
January 1945	18.8	11.7	8.2	9.8	11.5	18.1		10.7	16.5	37.5	12.5	7.4	11.6
February	17.2	10.4	16.0	14.9	18.1	14.1	42.1	8.3	15.6		3.1	11.1	7.4
March	21.9	13.0	12.1	13.2	12.3	21.8	12.5	4.2	19.5	18.8	12.5	14.8	14.4
April and May	12.5	8.5	8.9	9.1	27.7	14.9	20.0	8.3	16.3	25.0	14.1	11.7	15.8
Average	13.6	9.3	9.8	10.3	22.8	18.5	24.5	10.0	19.6	12.5	8.6	9.7	9.5

SOURCE: Ninth AF Form 110-A

INITIAL COMBAT PERSONNEL CASUALTIES

	BOMBER GROUPS					FIGHTER GROUPS					RECONNAISSANCE GROUPS				
	KIA	MIA	SWA	LWA	Total	KIA	MIA	SWA	LWA	Total	KIA	MIA	SWA	LWA	Total
October 1943	3			5	8										
November		39	2	16	57										
December		14	3	22	39		7			7					
January 1944	7	19	2	9	37		5		1	6					
February	2	87	3	16	108	2	16		1	19					
March	20	62	3	13	98	20				20		15			15
April	97	155	12	51	235	5	34	1		40	2	19	1		22
May	24	214	41	61	340	4	34	6	2	66		18	1		19
June	49	157	37	53	296	17	187	9	7	220	1	30	1	2	34
July	24	163	22	37	246	19	147	20	20	206		21	1	1	23
August	31	186	28	34	279	19	177	11	16	223	8	11		2	21
September	17	51	8	10	86	13	65	4	7	89		7			7
October	29	60	7	23	119	9	86	5	6	106	2	3	1		6
November	27	61	7	13	108	9	91	5	2	107	3	8			11
December	35	310	25	43	413	16	164	10	19	209	2	11	2	1	16
January 1945	39	65	34	28	166	6	75	8	25	114		3	4	2	9
February	43	268	25	41	377	6	84	2	7	99		5		1	6
March	58	150	23	20	251	10	118	2	6	136	4	12	2		18
April	12	93	17	14	136	6	81	4	7	98		5			5
May			1		1	1	2		1	4	1			1	2
Total	437	2134	300	509	3400	162	1393	87	127	1769	23	168	13	10	214

SOURCE: AG Casualty Section, Ninth AF

AIRCRAFT USAGE

The number of sorties per month per unit equipment aircraft is computed on the basis of authorized or attained unit equipment, whichever is less, with the figure for attained unit equipment being arrived at as follows:

$$\frac{\text{Authorized Group Unit Equipment}}{\text{Authorized per Group Strength in Air Force}} \times \text{Total A/C on Hand in Air Force} = \text{U/E Attained}$$

As the air force was usually under strength in all models of fighter aircraft during the period of operations on the Continent, their usage rates were generally computed on the basis of attained equipment.

Bombers had an average usage rate for the entire period of 11.5 sorties per aircraft, A-20's leading with 13.1; fighters averaged 18.4, P-47's leading with 18.9; and reconnaissance aircraft attained 16.2, P-51 weather recon leading with 21.7, followed closely by P-6's with 19.4.

Usage rates were naturally highly influenced by weather, as will be noted from the chart on the opposite page, where the correlation between the usage rate and the number of operational days¹, as well as days operated², is very strong. Bombers had only five fully operational days in October 1944, lowest of any month of full scale operations, and their usage rate reached its lowest point of 5.5. Fighters had six fully operational and 11 partially operational days in January, their lowest month, when the usage rate dropped to its lowest point of 12.4. Usage rates were also affected by the tactical situation, and rose as operations became more intense, climbing steadily from January 1945 and reaching their highest peaks in March, with 22.1 sorties per aircraft for bombers, 30.8 for fighters and 21.6 for reconnaissance.

SORTIES PER UNIT EQUIPMENT AIRCRAFT

OCTOBER 1943 THRU APRIL-MAY 1945

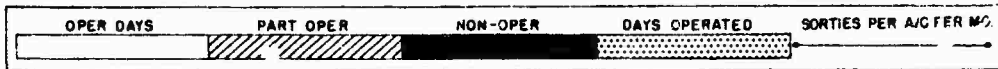
	A-20	A-26	B-26	TOTAL BOMB.	P-38	P-47	P-51	P-61	TOTAL FIGHT.	P-3	P-5	P-6	P-51 Recon.	TOTAL RECON.
October 1943			4.3	4.3										
November			8.0	8.0										
December			11.1	11.1			13.8		13.8			20.0		20.0
January 1944			6.7	6.7			4.9		4.9			3.5		3.5
February			13.5	13.5		7.8	8.9		8.2			6.2		6.2
March	5.3		9.8	9.1		12.6	7.5		10.9		2.7	10.4		9.5
April	14.6		12.3	12.8	10.3	11.1	14.4		11.9		6.3	7.9		7.6
May	17.2		16.9	17.0	15.3	17.3	15.5		16.5		6.1	13.8		9.9
June	17.7		16.2	16.6	24.5	24.8	20.6		24.3	4.0	13.3	33.1		24.6
July	12.4		11.0	11.4	22.6	22.3	23.8	7.6	22.3	6.6	11.7	26.5		19.4
August	15.0		12.3	13.1	19.8	23.9	22.4	11.8	22.8	1.0	14.0	33.4		23.3
September	7.7		7.6	7.7	18.2	18.0	11.4	25.3	17.7	4.6	12.0	19.0		15.7
October	6.4		5.1	5.5	13.2	14.7	7.9	12.6	14.1	2.1	8.8	13.6		11.3
November	8.6	2.9	7.9	7.7	11.8	13.1	10.9	10.8	12.6	4.8	8.8	17.5		13.9
December	14.8	8.4	9.4	9.9	15.6	17.0		14.7	16.7	7.3	11.3	13.8		12.6
January 1945	10.3	5.1	5.5	5.8	10.2	13.0		7.1	12.4	5.2	8.4	12.5	10.9	10.8
February	18.0	10.0	11.8	12.0	14.2	19.1	12.9	8.1	17.9	5.0	9.3	18.4	15.4	14.3
March	28.4	21.2	21.6	22.1	26.4	30.8	32.1	18.0	30.2	8.4	14.5	26.3	24.6	21.6
April - May	13.1	13.8	11.0	11.8	18.7	21.4	26.9	17.4	20.2	.7	19.8	33.8	24.1	24.0
AVG, ALL MONTHS	13.1	12.4	11.0	11.5	17.3	18.9	16.8	13.6	18.4	4.6	11.3	19.4	21.7	16.2

¹See Weather Definitions, page 48.

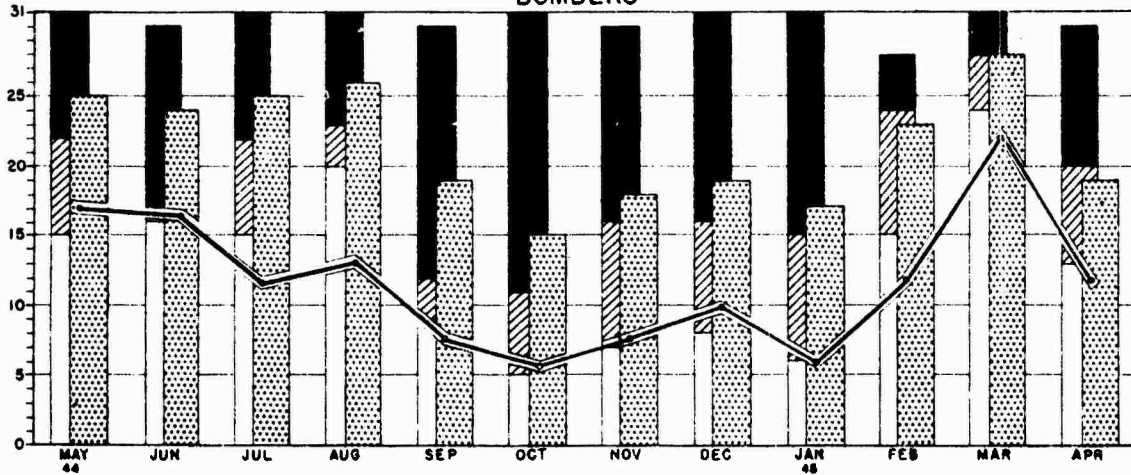
²"Days operated" refers to operations of one group mission or better and is computed from operations reports without reference to weather conditions.

SOURCE: Ninth AF Form 110-A and USAAF Form 344

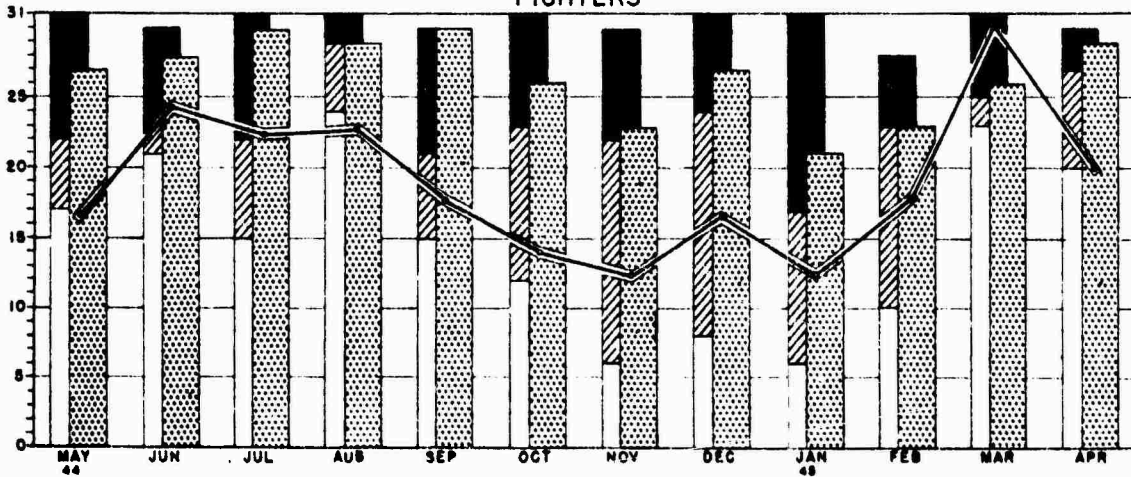
OPERATIONAL DAYS AND SORTIES PER AIRCRAFT



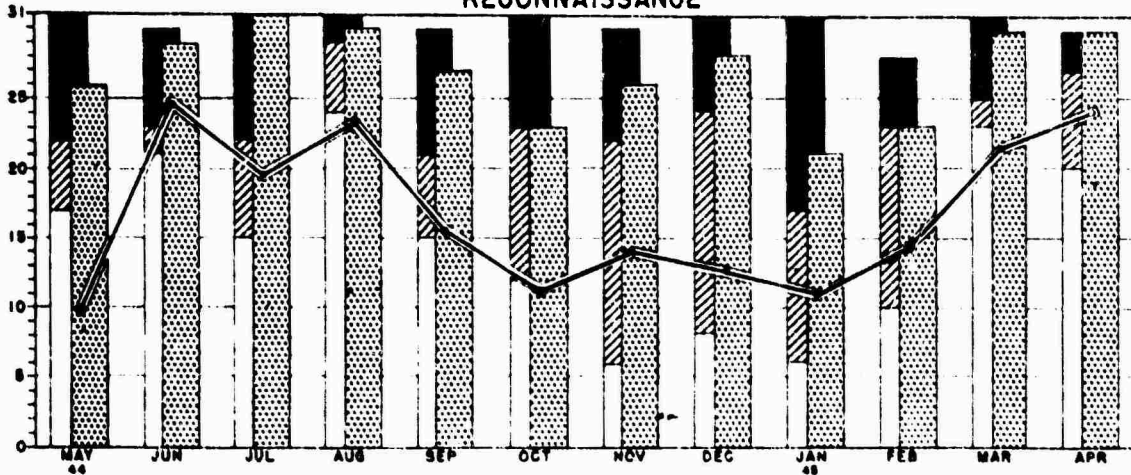
BOMBERS



FIGHTERS



RECONNAISSANCE



SOURCE: GROUP OPERS, A/C STATUS REPORTS AND STAFF WEATHER OFFICER, NINTH AF

EFFORT RELATED TO WEATHER DURING SIX CAMPAIGNS¹

Of the 337 days covered in this study, bombers had fully operational flying weather on 142 and fighters on 161. During some campaigns, notably for bombers in the Normandy campaign and for fighters in the Northern France campaign, it was necessary to put up considerable effort on non-operational days. For the over-all total from D Day to V-E Day the effort put forth on fully operational days accounted for 75.7 percent of the total bomber, 73.3 percent of the total fighter, and 73.9 percent of the total reconnaissance effort. Effort on non-operational days accounted for 10.2 percent of total bomber, 7.1 percent of total fighter and 6.9 percent of total reconnaissance effort; and the balance was accounted for by operations on days when the weather minima prevailed only partially throughout the air force. Sorties per group per fully operational day were at their highest in the West of Rhine campaign, with secondary peaks during the Normandy and Ardennes campaigns.

BOMBERS

	NORMANDY	S. FRANCE	SIB. LINE	ARDENNES	V. RHINE	WEST. RHINE	TOT. & AVG.
TOTAL DAYS	50	32	112	43	55	45	337
Fully Operational Days ²	26	23	26	9	36	22	142
Partially Operational Days	7	3	24	11	12	8	65
Non-operational Days	17	6	62	23	7	15	130
TOTAL SORTIES (ALL DAYS)	16031	10474	18512	6480	21894	10879	84270
Sorties, Fully Op. Days	10933	9528	10556	4187	19617	8957	63778
Sorties, Partially Op. Days	685	222	4825	1853	2255	1283	11863
Sorties, Non-op. Days	4213	724	3131	440	22	99	8629
PERCENT EFFORT (ALL DAYS)	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Percent Effort, Fully Op. Days	68.2	91.0	57.1	64.6	89.6	82.3	75.7
Percent Effort, Partially Op. Days	5.5	2.1	26.0	28.6	10.3	16.8	14.1
Percent Effort, Non-op. Days	26.3	6.9	16.9	6.8	.1	.9	10.2
Average Groups Operational	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Sorties per Group per Fully Op. Day	34.23	37.70	36.91	42.29	49.53	37.01	40.83
Group Missions per Group per Fully Op. Day	1.06	1.09	1.03	1.18	1.38	1.03	1.13

FIGHTERS

	NORMANDY	S. FRANCE	SIB. LINE	ARDENNES	V. RHINE	WEST. RHINE	TOT. & AVG.
TOTAL DAYS	50	32	112	43	55	45	337
Fully Operational Days	29	25	38	11	28	29	161
Partially Operational Days	9	4	46	15	19	10	98
Non-operational Days	12	4	27	17	12	6	78
TOTAL SORTIES (ALL DAYS)	45289	31192	57996	18398	42104	30636	225195
Sorties, Fully Op. Days	34317	25354	33801	10109	35088	26427	165096
Sorties, Partially Op. Days	5801	1392	20505	6468	6531	3447	44164
Sorties, Non-op. Days	5171	4446	3690	1761	465	762	19935
PERCENT EFFORT (ALL DAYS)	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Percent Effort, Fully Op. Days	75.8	81.3	58.7	55.1	83.3	86.3	73.3
Percent Effort, Partially Op. Days	12.8	4.5	35.6	35.3	15.5	11.2	19.6
Percent Effort, Non-op. Days	11.4	14.2	5.7	9.6	1.2	2.5	7.1
Average Groups Operational	18.30	18.67	17.07	14.67	13.54	15.67	16.63
Sorties per Group per Fully Op. Day	64.66	94.32	90.77	62.64	81.69	58.15	61.70
Group Missions per Group per Fully Op. Day	1.35	1.13	1.06	1.30	1.70	1.21	1.29

DAY RECONNAISSANCE³

	NORMANDY	S. FRANCE	SIB. LINE	ARDENNES	V. RHINE	WEST. RHINE	TOT. & AVG.
TOTAL SORTIES (ALL DAYS)	4728	3294	7734	3100	6249	6300	31413
Sorties, Fully Op. Days	3634	2733	4906	1622	5101	5207	23803
Sorties, Partially Op. Days	524	196	2410	1154	1013	778	6039
Sorties, Non-op. Days	570	405	418	320	135	315	2171
PERCENT EFFORT (ALL DAYS)	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Percent Effort, Fully Op. Days	76.9	83.0	63.4	52.3	81.6	82.5	73.9
Percent Effort, Partially Op. Days	11.1	4.7	31.2	37.4	16.2	12.3	19.2
Percent Effort, Non-op. Days	12.0	12.3	5.4	10.3	2.2	5.1	6.9
Average Squadrons Operational	8.00	8.22	11.11	10.00	11.02	12.38	10.39
Sorties per Sqdn per Fully Op. Day	15.66	13.30	11.32	14.75	16.53	14.50	13.67
Sqdn Missions per Sqdn per Fully Op. Day	1.31	1.11	.94	1.23	1.38	1.21	1.16

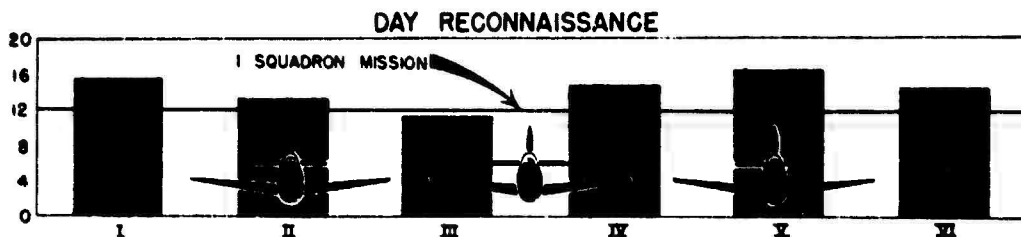
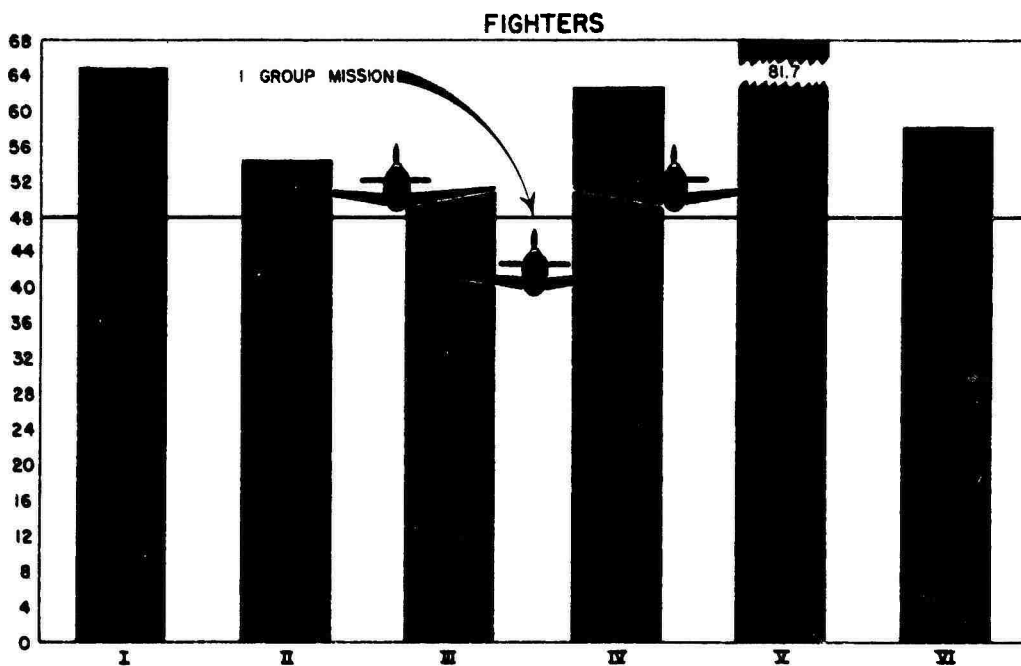
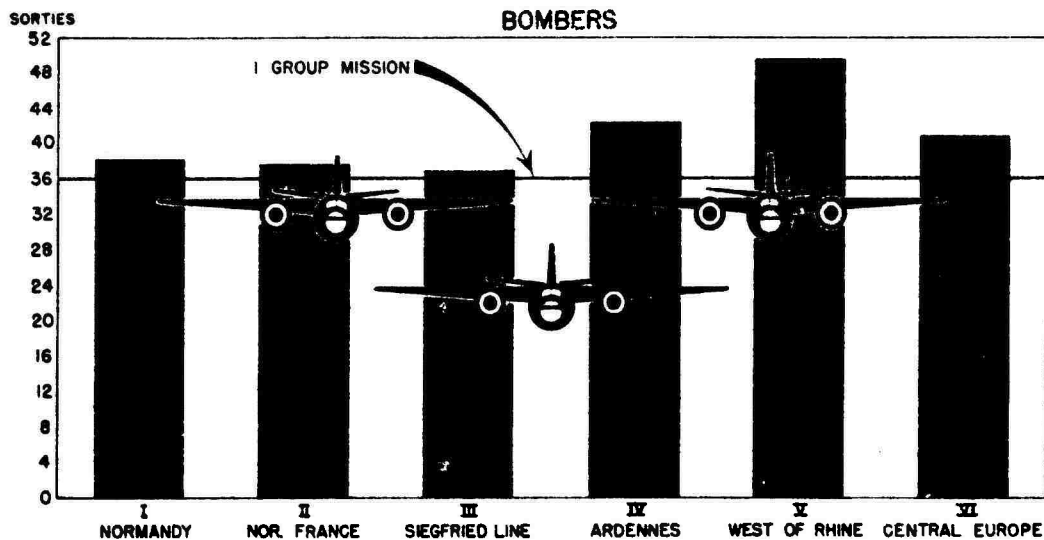
¹ See page 39 for inclusive dates of campaigns.

² See page 48 for weather definitions. ³ Operational for blind bombing days for bombers included is fully or partially operational as appropriate. ⁴ Based on same operational day breakdown as for fighters.

SOURCE: USAAF Form 344 and Staff Weather Officer, Sixth AF

SORTIES PER GROUP PER OPERATIONAL DAY DURING SIX CAMPAIGNS

6 JUNE 1944 THRU 8 MAY 1945



SOURCE: GROUP OPREPS & WEATHER SECTION 9TH AF

LOCATION AND USAGE OF AIRFIELDS ON THE CONTINENT

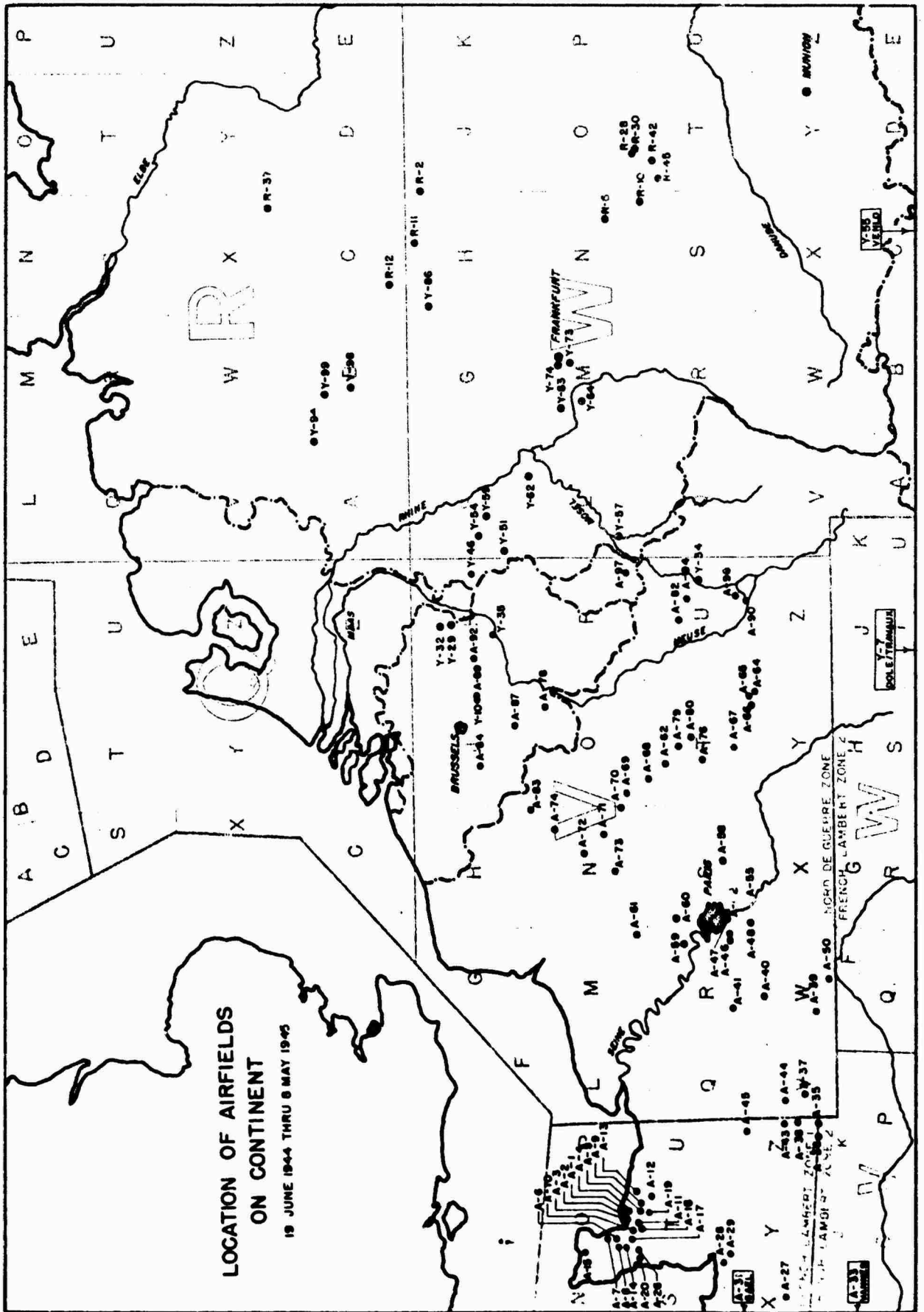
19 JUNE 1944 THRU 8 MAY 1945

AIR FIELD	LOCATION	MAP CO-ORDINATES	NO. UNITS	SORTIES	FROM	TO
A-1	St. Pierre Du Mont	R-433933	1	2098	25 Jun 44	24 Aug 44
A-2	Criquerelle	R-571905	2	4028	22 Jun 44	27 Aug 44
A-3	Carderville	R-573890	2	2393	19 Jun 44	25 Aug 44
A-4	Douv Jumeaux	R-591684	1	4634	27 Jul 44	30 Aug 44
A-5	Chappelle	R-591767	2	2427	2 Jul 44	28 Aug 44
A-6	Bomerville	R-564976	2	4180	27 Jun 44	16 Sep 44
A-7	Averille	R-573046	2	3231	1 Jul 44	29 Aug 44
A-8	Picardville	R-569187	1	3017	1 Jul 44	28 Aug 44
A-9	Le Molin	R-569187	1	3762	1 Jul 44	28 Aug 44
A-10	Carment	R-562818	1	2440	24 Jun 44	20 Aug 44
A-11	St. Lambert	R-562818	1	592	24 Jun 44	1 Sep 44
A-12	Ligneville	R-562818	1	2051	19 Jul 44	28 Aug 44
A-13	St. Jean Des Bois	R-571885	2	2175	30 Jul 44	28 Aug 44
A-14	Cretterville	R-571885	3	3374	7 Jul 44	27 Aug 44
A-15	Montparnos	R-571885	3	3478	5 Aug 44	28 Aug 44
A-16	Brucherville	R-571885	1	1169	21 Aug 44	5 Sep 44
A-17	Montville	R-571885	1	669	21 Aug 44	5 Sep 44
A-18	St. Jean De Rays	R-571885	1	766	20 Aug 44	6 Sep 44
A-19	Le Vieille	R-564675	1	636	20 Aug 44	6 Sep 44
A-20	Lozeay	R-571741	1	411	27 Aug 44	21 Sep 44
A-21	Gregoy	R-571741	1	149	29 Aug 44	25 Sep 44
A-22	Rennes	R-564694	3	2855	21 Aug 44	23 Sep 44
A-23	Panterson	R-564694	1	1391	21 Aug 44	23 Sep 44
A-24	St. James	R-564694	1	1136	21 Aug 44	23 Sep 44
A-25	St. James	R-564694	1	1235	16 Aug 44	17 Sep 44
A-26	St. James	R-564694	2	207	16 Aug 44	17 Sep 44
A-27	Yamou	R-564694	1	695	27 Aug 44	24 Sep 44
A-28	St. Laurent	R-564694	1	592	20 Aug 44	23 Sep 44
A-29	St. Laurent	R-564694	1	379	20 Aug 44	23 Sep 44
A-30	Montreuil	R-564694	1	612	12 Sep 44	3 Oct 44
A-31	Chateaux	R-564694	3	1542	26 Aug 44	14 Oct 44
A-32	Dreux	R-564694	2	1312	26 Aug 44	7 Oct 44
A-33	Villa Conchay	R-564694	1	496	1 Sep 44	18 Sep 44
A-34	St. Marcou	R-564694	1	406	2 Sep 44	10 Sep 44
A-35	Paray	R-564694	1	406	6 Sep 44	10 Sep 44
A-36	Lezay	R-564694	1	118	29 Aug 44	20 Sep 44
A-37	Orly	R-564694	1	782	29 Aug 44	20 Sep 44
A-38	Brétigny	R-564694	1	434	26 Aug 44	11 Oct 44
A-39	Brétigny	R-564694	3	3973	26 Aug 44	11 Oct 44
A-40	Malin	R-564694	1	345	26 Aug 44	11 Oct 44
A-41	Malin	R-564694	1	1357	26 Aug 44	12 Feb 45
A-42	Caumont	R-564694	2	2817	18 Sep 44	4 Apr 45
A-43	Caumont	R-564694	1	3704	2 Oct 44	5 Apr 45
A-44	Caumont	R-564694	2	3425	2 Oct 44	6 Apr 45
A-45	Caumont	R-564694	1	3752	2 Oct 44	6 Apr 45
A-46	Caumont	R-564694	1	1123	23 Sep 44	17 Oct 44
A-47	Caumont	R-564694	3	8066	23 Sep 44	3 Oct 45
A-48	Caumont	R-564694	1	574	18 Sep 44	5 Oct 44
A-49	Caumont	R-564694	1	124	18 Sep 44	24 Nov 44
A-50	Caumont	R-564694	1	925	19 Sep 44	18 Oct 44

TOTAL AIRFIELDS -- 102 TOTAL SORTIES -- 267608

FIELDS A-1 THRU A-31, A-36, A-43 AND A-45 ARE PLOTTED IN LAMBERT ZONE 1, A-35 AND A-36 IN LAMBERT ZONE 2, ALL OTHERS IN NORD DE GUERRE ZONE

SOURCE: I. ENGBERG



**LOCATION OF AIRFIELDS
ON CONTINENT**

19 JUNE 1944 THRU 8 MAY 1945

CLAIMS AGAINST ENEMY AIRCRAFT

16 OCTOBER 1943 THRU 8 MAY 1945
AIR CLAIMS

ENEMY A/C	A-20	A-26	B-26	TOT BOMBERS
PV 190	0-1-0	6-1-4	29-24-25	35-26-29
PV 200				
Ju 52		1-0-1	29-17-54	30-17-55
ME 109			2-2-4	2-2-4
ME 262			0-0-1	0-0-1
Nise U/I				
TOTAL	0-1-0	7-1-5	60-43-84	67-45-89

ENEMY A/C	P-38	P-47	P-51	P-61	F-5	F-6	P-51 RCN	GRAND TOTAL**
DO 217		2-1-0	4-1-3	5-0-0		1-0-0		12-2-3
PV 44			1-0-0					1-0-0
PV 56			1-0-0					1-0-0
PV 190	144-46-118	493-51-193	271 2/3-19-117	3-0-0	1-0-0	55-7-19	0-1-0	1006 2/3-150-476
PV 200								0-0-2
ME 111		3-1-0	4-0-1	4-0-1		3-0-2		14-1-4
ME 126						1-0-0		1-0-0
ME 129			3-0-0					3-0-0
ME 177				1-0-0				1-0-0
ME 260						1-0-0		1-0-0
Ju 52		3-0-1		5-0-0		2-0-0	1-0-0	11-0-1
Ju 87		0-1-0	2-0-0	3-0-0		14-1-0		19-2-0
Ju 88		7-0-0	9-1-12	9-2-1		9-0-1		26-3-14
Ju 186			1-0-0	12-2-1		1-0-0		14-2-1
Ju 288						1-0-0		1-0-0
ME 108		6-0-0						6-0-0
ME 109	112-24-65	581-61-235	374 5/6-29-129		1-0-0	40-5-16	1-0-0	1140 1/3-136-500
ME 110	2-0-0	8-1-5	444-6-32	7-1-3		3-0-2		68-10-42
ME 209			2-1-2					2-1-2
ME 210	1-0-0	1-0-0	2-4-0			0-0-1		4-4-1
ME 262	0-0-5	9-1-20	7-2-12			0-2-2		18-7-43
ME 410		4-0-2	22-1-20	1-0-0				27-1-22
AM96		1-0-0						1-0-0
AR 234		0-0-1						0-0-1
Storch	2-0-0	2-0-0				2-0-0		6-0-0
Cap P-47		1-0-0				1-0-0		2-0-0
Cap Messg		1-0-0						1-0-0
Nise U/I	1-0-0	5-0-1	1-0-0			5-0-2		12-0-4
TOTAL	266-70-188	1127-117-458	750-66-328	50-5-6	2-0-0	135-15-45	2-1-0	2399-319-1116

*By Bombers

**Includes totals from "Total Bombers" tabulation.

GROUND CLAIMS

ENEMY A/C	P-38	P-47	P-51	GRAND TOTAL	ENEMY A/C	P-38	P-47	P-51	GRAND TOTAL
Do 20			3-0-0	3-0-0	ME 163		2-0-0	6-0-2	8-0-2
Do 217	3-0-1	46-2-25	1-0-1	50-2-27	ME 209			0-0-2	0-0-2
PV 56		3-0-0		3-0-0	ME 210	0-0-4	42-1-37	3-0-0	47-1-41
PV 58		0-0-1		0-0-1	ME 262	1-0-0	29-3-19	1-0-1	31-3-20
PV 187	0-0-1			0-0-1	ME 410	2-1-3	47-9-34	2-0-4	51-10-41
PV 189		3-0-4		3-0-4	ME 129		2-0-3		2-0-3
PV 190	20-0-24	287-12-179	57-0-26	365-12-229	AR 196		1-0-0		1-0-0
PV 200	4-0-2	1-0-3		5-0-5	Storch		6-0-1	1-0-0	7-0-1
Ju 52	30-0-4	70-2-31	2-0-3	102-2-38	Oe 242		7-0-4		7-0-4
Ju 87		53-3-30	3-0-11	56-3-61	Oe 244		0-0-1		0-0-1
Ju 88	37-0-44	277-25-248	42-2-26	356-27-318	Capitro P-47		1-0-0		1-0-0
Ju 90			1-0-0	1-0-0	Capt. Hurricane	2-0-2			2-0-2
Ju 186		22-1-17	1-0-0	23-1-17	S/S A/C	9-0-11	15-0-31		24-0-42
Ju 352		2-0-0		2-0-0	F/S A/C	5-0-14	43-6-42		48-6-56
ME 111	8-1-30	177-15-105	37-0-20	222-16-155	4/S A/C		0-1-2		0-1-2
ME 113		1-0-0		1-0-0	Transport		1-0-6	5-0-4	6-0-10
ME 115			0-1-1	0-1-1	Glider	2-0-0	8-0-10	4-0-1	14-0-11
ME 126	0-0-1	1-0-1	1-0-0	2-0-2	Liaison		9-0-4		9-0-4
ME 129		1-0-3	0-0-6	1-0-9	Pinkback		2-0-5		2-0-5
ME 177	5-1-3	4-0-6	2-1-3	11-7-12	Trainer		14-1-5	1-0-5	15-2-10
ME 189		1-0-0		1-0-0	U/I A/C	1-0-1	128-14-164	28-1-56	158-15-241
ME 280		3-0-4		3-0-4	Biplane		2-0-3		2-0-3
ME 108		12-0-12		12-0-12					
ME 109	6-2-10	451-33-435	49-1-17	504-36-462	TOTALS	133-3-199	1821-135-1904	257-7-191	2216-147-1894
ME 110	2-0-4	49-2-29	9-1-2	59-3-35					

Note: Totals include 1-0-0 PV 190, 2-0-0 ME 109, 1-0-0 ME 110 and 1-0-0 U/I A/C, by P-6's.

SOURCE: USAAF Form 344

CLAIMS AGAINST MISCELLANEOUS GROUND TARGETS

DURING SIX CAMPAIGNS

5 JUNE 1944 THRU 8 MAY 1945

CAMPAIGNS

<i>I</i>	<i>NORMANDY</i>	<i>5 JUN - 25 JUL</i>
<i>II</i>	<i>NORTHERN FRANCE</i>	<i>26 JUL - 26 AUG</i>
<i>III</i>	<i>SIEGFRIED LINE</i>	<i>27 AUG - 16 DEC</i>
<i>IV</i>	<i>ARDENNES</i>	<i>17 DEC - 28 JAN</i>
<i>V</i>	<i>WEST OF RHINE</i>	<i>29 JAN - 24 MAR</i>
<i>VI</i>	<i>CENTRAL EUROPE</i>	<i>25 MAR - 8 MAY</i>

MOTOR TRANSPORTS



CAM	I	II	III	IV	V	VI
DES	1948	8743	8382	10284	10188	13782
DAM	774	2879	2181	2609	4153	694

TOTAL DES - 53811 TOTAL DAM - 22546

DUMPS



CAM	I	II	III	IV	V	VI
DES	4	16	98	138	148	180
DAM	1	3	85	27	106	98

TOTAL DES - 582 TOTAL DAM - 320

ARMORED VEHICLES & TANKS



CAM	I	II	III	IV	V	VI
DES	158	1030	888	1141	770	723
DAM	94	889	496	1080	808	673

TOTAL DES - 4509 TOTAL DAM - 3751

HANGARS



CAM	I	II	III	IV	V	VI
DES	-	9	24	12	19	72
DAM	-	2	22	6	27	81

TOTAL DES - 135 TOTAL DAM - 118

LOCOMOTIVES



CAM	I	II	III	IV	V	VI
DES	184	189	2188	211	1288	1606
DAM	183	-31	658	65	768	891

TOTAL DES - 5753 TOTAL DAM - 2677

FACTORIES & MISCELLANEOUS BUILDINGS



CAM	I	II	III	IV	V	VI
DES	42	39	1302	1785	4973	2930
DAM	16	9	687	657	3171	160

TOTAL DES - 11073 TOTAL DAM - 6341

RAILROAD CARS



CAM	I	II	III	IV	V	VI
DES	2117	2881	7288	4423	18088	2904
DAM	3449	2283	7480	4848	28883	10808

TOTAL DES - 43317 TOTAL DAM - 51269

RAILROADS CUT



CAM	I	II	III	IV	V	VI
DES	107	49	1086	916	3238	684
DAM						

TOTAL CUT - 6072

BRIDGES



CAM	I	II	III	IV	V	VI
DES	38	24	68	34	188	12
DAM	12	17	118	81	182	8

TOTAL DES - 360 TOTAL DAM - 328

VESSELS & BARGES



CAM	I	II	III	IV	V	VI
DES	3	197	288	10	210	68
DAM	4	168	308	5	273	197

TOTAL DES - 770 TOTAL DAM - 955

GUN EMPLACEMENTS



CAM	I	II	III	IV	V	VI
DES	34	288	1187	588	671	638
DAM	8	98	683	230	378	24

TOTAL DES - 3361 TOTAL DAM - 1649

HORSE DRAWN VEHICLES

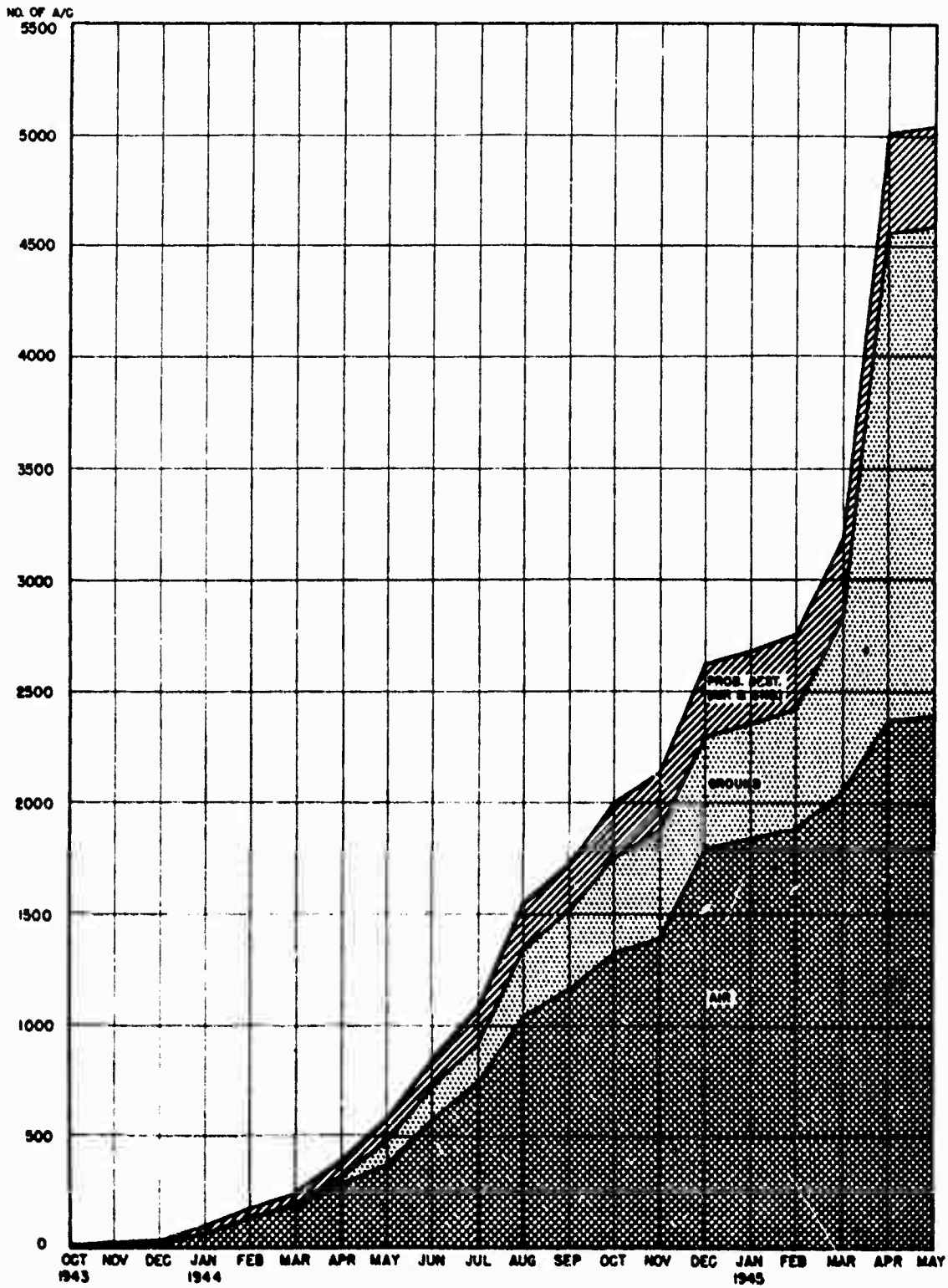


CAM	I	II	III	IV	V	VI
DES	388	449	2488	274	1542	224
DAM	88	78	188	117	483	488

TOTAL DES - 6312 TOTAL DAM - 1362

CUMULATIVE ENEMY AIRCRAFT CLAIMS, AIR & GROUND (DESTROYED AND PROBABLY DESTROYED)

16 OCTOBER 1943 THRU 8 MAY 1945



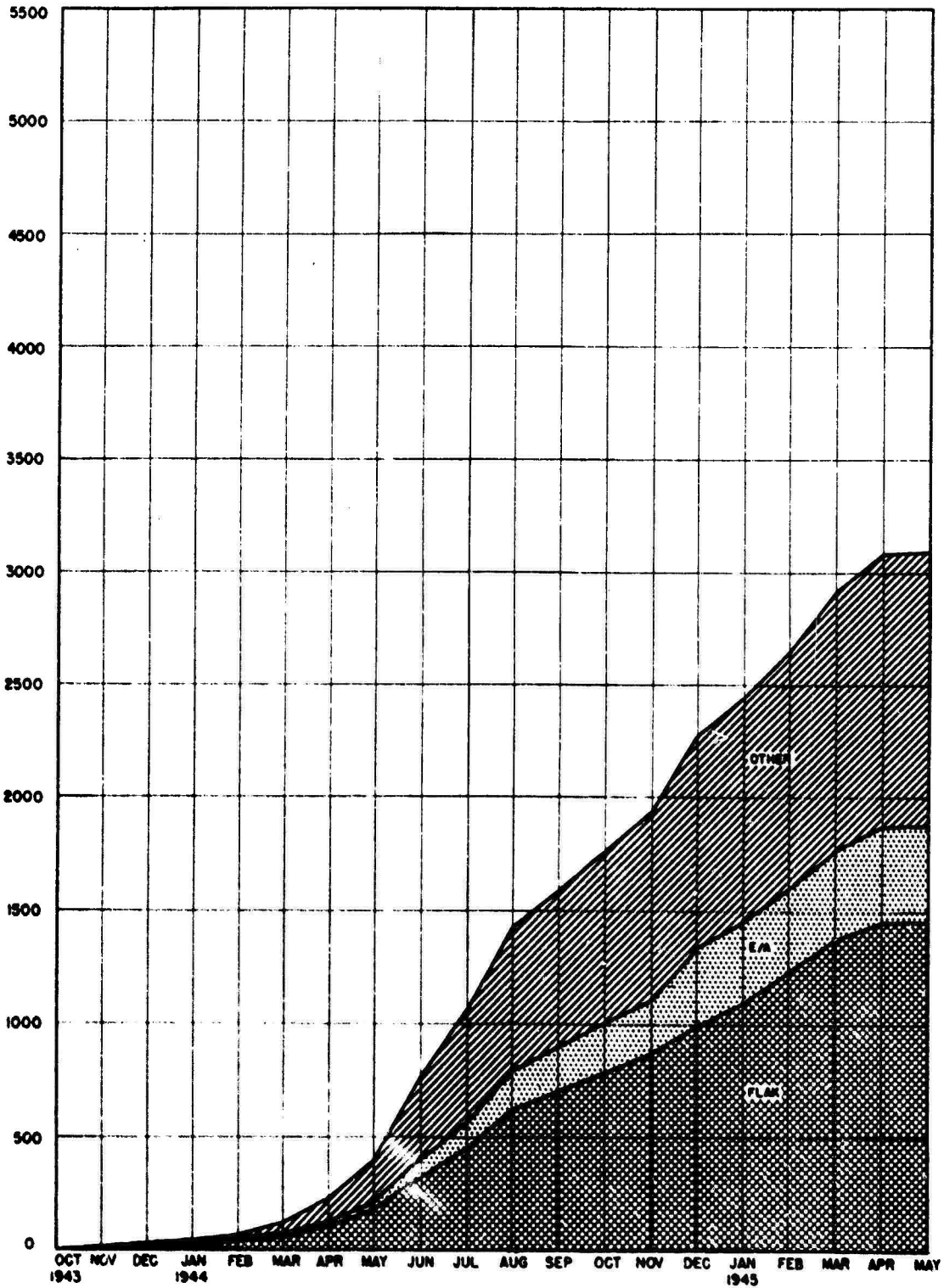
SOURCE: GROUP OPREPS

CUMULATIVE COMBAT LOSSES OF AIRCRAFT BY CAUSE

(INCLUDES MIA & CATEGORY E)

16 OCTOBER 1943 THRU 8 MAY 1945

NO. OF A/C



SOURCE GROUP OPREPS

NON-EFFECTIVE SORTIES

Out of every 1000 sorties flown from 16 October 1943 through 8 May 1945, 124 were non-effective, 71 due to weather, five to personnel failure, 22 to mechanical failures and 25 to other reasons. Bombers exceeded these figures, flying 764 non-effective sorties out of every 1000, of which 61 percent were caused by weather. The trend chart on the opposite page shows how the weather non-effective rate was brought down in the months when a substantial part of bomber activity was devoted to blind bombing. Fighters had the lowest non-effective rates, going above 10 percent only in the first two months and in the final month of operations, and averaging 5.7 percent. Reconnaissance non-effectives varied widely between different models, and averaged 15.0 percent, more than half due to weather. All non-effective rates were high in the early months of operations, moderated during the summer months of 1944, climbed during September and October (and November for reconnaissance), and then declined steadily to reach all-time lows in March 1945.

Mechanical non-effectives, in order of number of occurrences (apart from the miscellaneous classification), were caused primarily in bombers by failure of engine, armament, navigational or electrical equipment, fuel and oil; in fighters by failure of engine, fuel, radio, oil, electrical or hydraulic equipment, and propeller; and in reconnaissance by failure of radio, engine, camera and navigational equipment.

NON-EFFECTIVE SORTIE ANALYSIS

16 OCTOBER 1943 THRU 8 MAY 1945

	A-20	A-26	B-26	TOTAL BOMB.	P-38	P-47	P-51	P-61	BRAD	TOTAL FMS.	P-3	P-5	P-6	P-51 Recon.	TOTAL RECON.	GRAND TOTAL
Sorties	22999	10441	85706	119146	34038	201546	25546	2919	70	264119	641	7530	26784	16211	34566	417831
Effective Sorties	15855	9201	62686	87742	11862	190450	23932	2755	49	269028	381	5624	21813	1573	29391	36161
Total Non-Effective	7144	1240	23020	31404	2176	110996	1614	134	21	15091	260	1906	2971	38	5175	51670
Weather Non-Eff.	4760	483	14034	19279	546	5418	370	20	8	6362	70	1473	2279	5	1027	29468
Personnel Non-Eff.	430	63	1278	1771	110	244	46	2		402	43	32	37		112	2285
Mechanical Non-Eff.	517	293	2383	3193	957	3322	888	151	13	5331	117	250	379	27	773	9297
Other Non-Effective	1437	401	5323	7161	563	2112	310	11		2996	30	151	276	6	463	10620
Total % Non-Effective	31.1	11.9	26.9	26.4	6.4	5.5	6.3	6.3	30.0	5.7	40.6	25.3	12.0	2.4	15.0	12.4
% Non-Eff. Weather	20.7	4.6	16.4	16.2	1.6	2.7	1.4	.7	11.4	2.4	10.9	19.6	9.2	.3	11.1	7.1
% Non-Eff. Pers.	1.9	.6	1.5	1.5	.3	.1	.2	.1		.2	6.7	.4	.1		.3	.5
% Non-Eff. Mech.	2.2	2.3	2.8	2.7	2.8	1.6	3.5	5.2	18.6	3.0	18.3	3.3	1.5	1.7	2.2	2.2
% Non-Eff. Other	6.7	3.8	6.2	6.0	1.7	1.0	1.2	.4		1.1	4.7	2.0	1.1	.4	1.3	2.5

MECHANICAL NON-EFFECTIVES

Fuel	40	18	141	199	81	539	108	1		729		23	4		27	955
Oil	24	9	130	163	64	254	31	1		350		7	1		8	521
Electrical	75	45	92	212	112	147	38	6		303	6	6	10	1	23	538
Propeller	5		101	106	47	191	29	6		273			2		3	381
Hydraulic	22	46	80	148	87	183	14	1		287	1	4	9	2	16	451
Armament	74	26	218	318	8	68	9	3		88					406	406
Oxygen					11	53	49	1		114		9	3		12	126
Generator	7		16	43	15	34	17	2		68	1	4			5	116
Carburetor	3	2	15	20	57	47	2	1		107		3		1	4	131
Radio	25	9	30	64	97	369	60	67	6	599	16	12	156	1	185	848
Switch		4	1	5	2	13	8			23			10		10	38
Heat	4		6	10	11	13	19			43			1		1	54
Instruments	9	3	58	70	15	15	4			19		1			1	90
Coolant			1	1	12		3			15			4		4	20
Supercharger			7	7	23	12	5			40		3	1		4	51
Navigational Equip.	27	21	204	252							32		4		36	288
Internal Leaks					2	167				169					1	110
Camera											30	23	19		72	72
Engine	33	27	574	684	144	432	201	10	1	778	5	81	32	7	143	1407
Miscellaneous	119	83	689	891	184	855	289	52	6	1384	26	73	103	15	217	2634
TOTAL MECH. NON-EFF.	517	293	2383	3193	957	3322	888	151	13	5331	117	250	379	27	773	9297

OTHER NON-EFFECTIVES

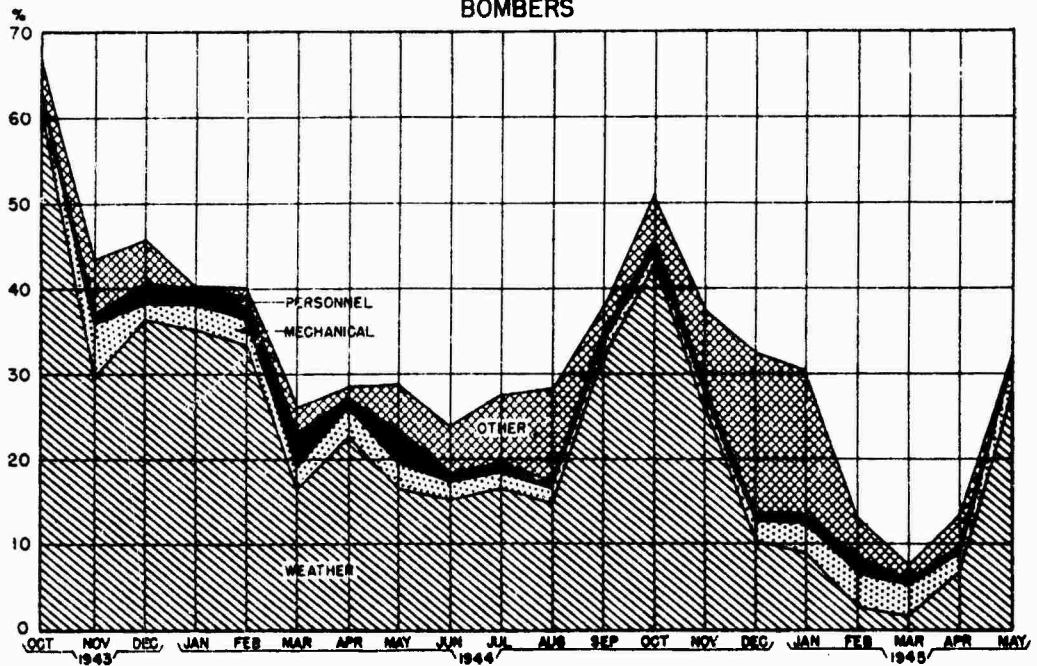
Abort	406		1051	1457	199	434	156			789		6	35	3	44	2290
Empty Action	34	5	226	265	60	264	15			321	3	64	82		151	737
Pathfinder Equipment	50	8	76	134												134
Miscellaneous	947	388	3970	5305	304	1432	139	11		1886	27	79	199	3	268	7639
TOTAL OTHER NON-EFF.	1437	401	5323	7161	563	2112	310	11		2996	30	151	276	6	463	10620

SOURCE: USAAF Form 344

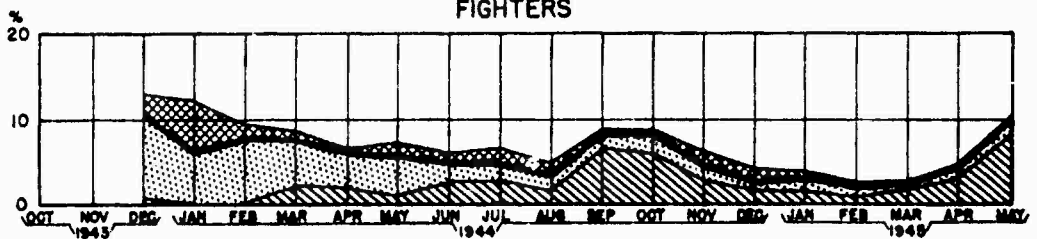
PERCENT OF SORTIES NON-EFFECTIVE

OCTOBER 1943 THRU MAY 1945

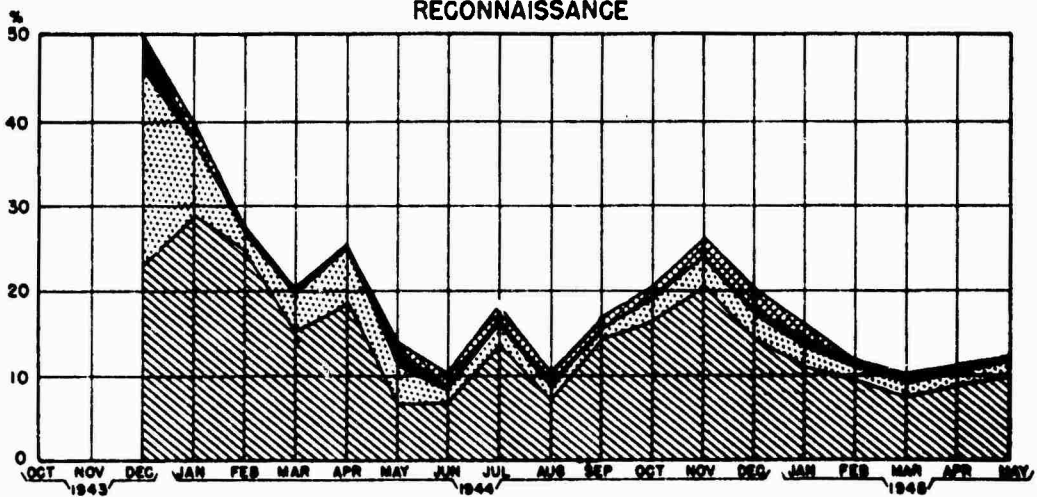
BOMBERS



FIGHTERS



RECONNAISSANCE



SOURCE GACUP OPREPS

FLYING TIME AND GASOLINE CONSUMPTION

16 OCTOBER 1943 THRU 31 MAY 1945

OPERATIONAL HOURS

	A-20	A-26	B-26	TOTAL BCMB.	P-38	P-47	P-51	P-61	BAU	TOTAL PTRS.	P-3	P-5	P-6	P-51R	TOTAL RSCGN	O/47 /53	GRAND TOTAL
Oct	12		1824	1836													1836
Nov			3725	3725													3725
Dec			5689	5689			961			961			39		39		6689
TOT 1943	12		11238	11250			961			961			39		39		12250
Jan			4616	4616			1333			1333			86		86		6035
Feb	61		10000	10061		3538	2553			5891		8	319		327		16279
Mar	571		11996	12567		9399	477			13716		87	111		498		26781
Apr	3870		16320	20190	1284	14150	711			22555		340	588		928		43673
May	8790		26046	32836	6324	44961	709			58404		430	1623		2053		93293
Jun	8779		25115	33894	12442	52119	802			73363	83	365	2761		3709	12997	123963
Jul	7001		17524	24529	9801	36746	58	202		53207	176	1087	1310		2573		80305
Aug	10027		21081	31108	8944	42711	326	586		58767	38	1538	4784	110	6500	148	96523
Sep	5391	335	13308	19034	8621	39497	3102	1200		52420	136	1243	2740	351	4468		75922
Oct	3519		7792	11311	5703	31181	1533	687	221	39325	56	790	2471	272	3589		54225
Nov	3284	532	11734	15530	5408	19792	1367	512		27079	104	551	2116	319	3090		45699
Dec	2695		14438	19217	6048	25753	89	792		32682	179	711	2408	230	3578		55477
TOT 1944	53888	2951	177930	234889	64575	319847	50120	3979	221	438742	772	7648	21617	1362	31399	13145	718175
Jan	2033	2153	7808	11994	3482	17765		266		21513	103	562	2245	238	3148		36655
Feb	3098	4999	18142	26239	3492	27730		329		32895	96	887	3570	362	4915		64049
Mar	5605	13032	33642	52279	7826	53286		8785		70817	297	1367	5840	495	7999		131095
Apr	3178	11550	19146	33874	2883	52043		10851		64634	12	2174	8442	693	11321		111829
May	3	828	15	846	323	4581		60		5312		671	2973	194	3838		9996
TOT 1945	13917	32562	78753	125732	18006	155205	21528	2432		197171	508	5661	23070	1982	31221		353624
GR TOTAL	67917	35513	267941	371371	82581	475052	72609	6411	221	636874	1280	13309	44726	3344	62659	13145	1084049

NON-OPERATIONAL HOURS

	A-20	A-26	B-26	P-38	P-47	P-51	P-61	BAU	P-3	P-5	P-6	P-51 R	O-47 /53	L-4	L-5	MISC	GRAND TOTAL	
Oct	33		973			22							683	380	557		2648	
Nov	107		824		14	766							864	816	1118		4509	
Dec	232		914		8	952					170		2759	770	1306		7111	
TOTAL 1943	372		2711		22	1740					170		4306	1966	2981		14268	
Jan	116		4561		1020	1756					466		6708	526	129	1379	13661	
Feb	712		1763	328	3173	1224				233	517		7848	248	236	1514	17796	
Mar	720		3808	749	5402	1193				236	438		6605	150	310	448	20054	
Apr	2537		7359	3011	18430	1583				463	1267		40075	97	1306	2484	78612	
May	4663		8737	3307	14154	1743	54			119	554	2050	50743	684	1654	11463	99523	
Jun	3661		4962	1241	6623	1432	844			298	523		28770	380	5525	7247	61909	
Jul	4982		5423	1033	5739	680	1223			384	689		43960	290	3367	8866	75244	
Aug	4978	418	7412	834	5834	973	578			279	336	702	46199	1113	6747	7874	86318	
Sep	3491	128	7990	1066	6317	1039	667			90	246	420	164	206	362	7761	34457	
Oct	1935	772	6587	804	4814	667	468	124		152	362	816	107	2361	296	5389	28595	
Nov	2087	1589	6804	687	4663	227	321			113	217	444	83	1121	434	3333	23647	
Dec	1000	1550	4580	542	4782	73	298			415	289	396	121	1148	446	2992	19744	
TOTAL 1944	30302	4461	67180	13604	80951	12590	4453	124	1850	4348	8365	514	231744	4986	40751	49561	557764	
Jan	1148	952	4976	455	3101	34	183			135	227	399	60	882	497	2403	899	16312
Feb	646	1907	4319	629	5063	505	301			131	328	442	70	1328	545	4488	1547	23049
Mar	1751	4643	7971	708	6949	1480	375			303	417	687	114	3227	1162	9736	3407	42930
Apr	2211	9272	13843	869	9214	1547	429			185	640	951	71	4020	1532	14686	4780	64250
May	920	19961	12975	2640	27884	4037	609			515	1692	2909	87	4758	823	16315	5754	101479
TOTAL 1945	6677	36335	44084	5301	33056	7603	1897			1269	3304	5348	402	14215	4599	47628	16387	240065
GRAND TOTAL	37351	40796	113975	18905	134029	21933	6350	124	3119	7652	13483	916	252265	11511	91360	65948	820117	

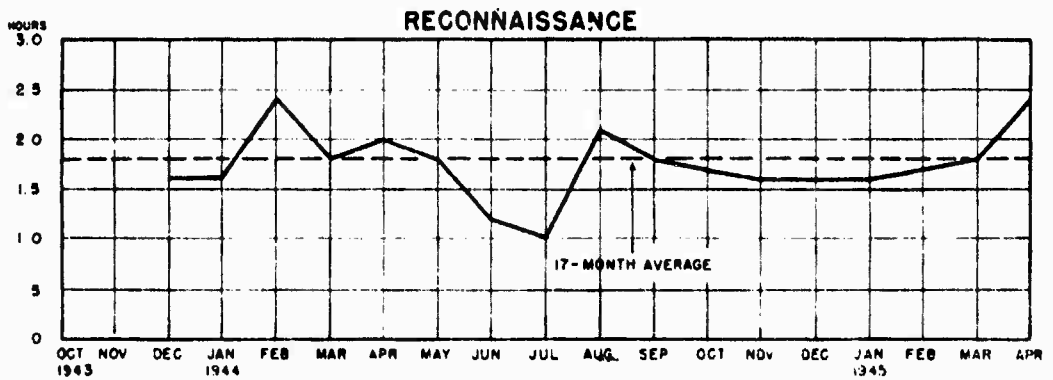
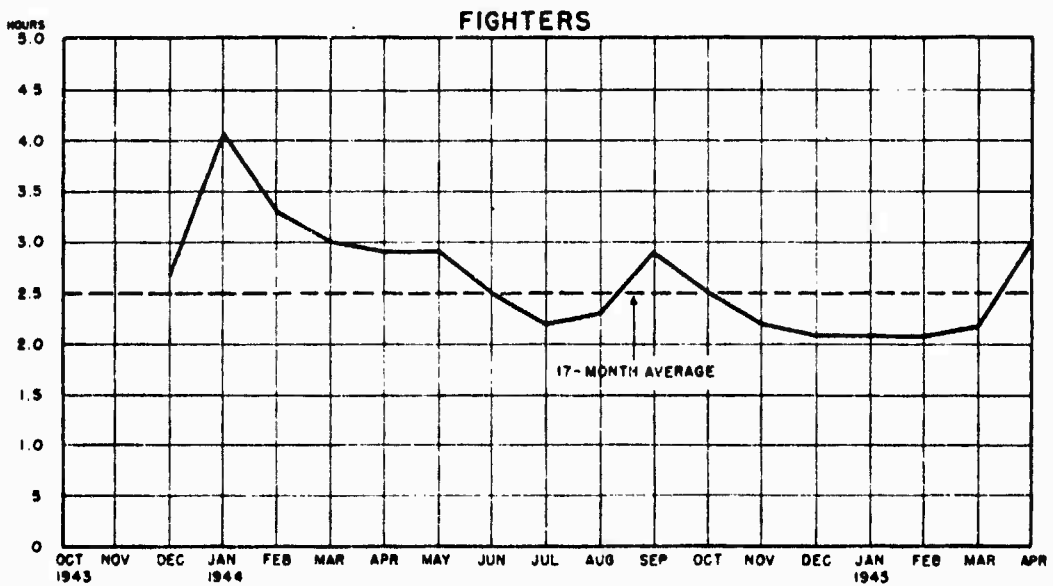
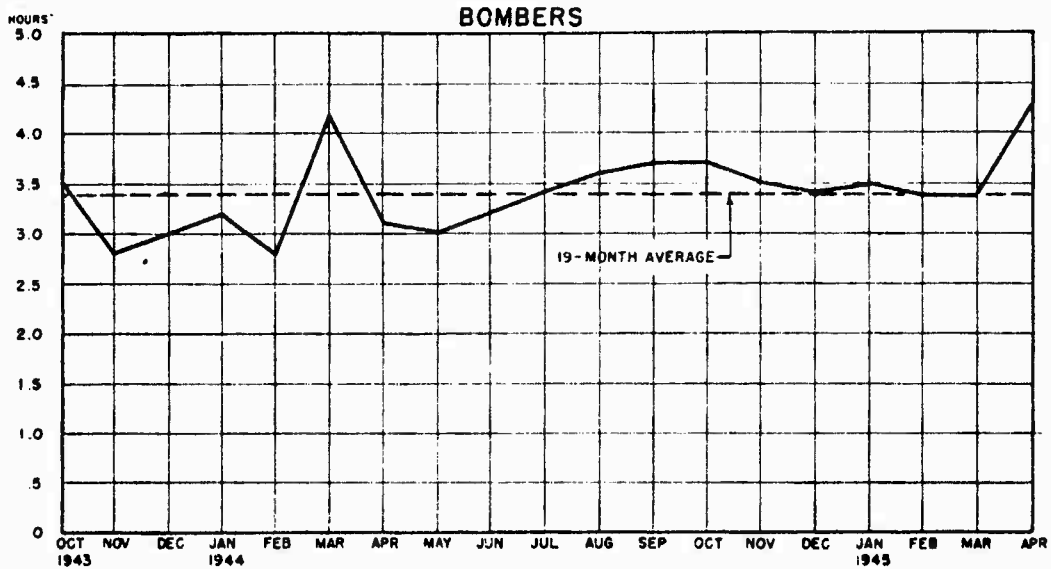
GASOLINE CONSUMPTION

MONTH	U. S. GALS.	MONTH	U. S. GALS.	MONTH	U. S. GALS.	MONTH	U. S. GALS.
October 1943	541,912	March 1944	5,462,420	November 1944	7,693,632	April 1945	18,372,304
November	589,302	April	5,946,081	December	8,794,768	May	20,674,213
December	1,489,174	May	14,647,717				
		June	16,814,843	TOTAL 1944	120,612,879	TOTAL 1945	66,809,744
TOTAL 1943	2,960,388	July	14,674,332				
		August	17,544,148	January 1944	1,403,370		
		September	11,276,403	February	3,889,597		
		October	8,445,280	March	20,777,346	GRAND TOTAL	190,383,213

SOURCE: Flying Time & Gasoline Consumption Reports

FLYING HOURS PER CREDIT SORTIE

OCTOBER 1943 THRU APRIL 1945



SOURCE: GROUP OPREPS & FLYING TIME REPORTS

AIRCRAFT ACCIDENTS

RATES PER 1000 FLYING HOURS

MARCH 1944 THRU MAY 1945

TOTAL AIR FORCE

	OVERALL		OPERATIONAL		NON-OPER.	
	NO. ACC.	RATE	NO. ACC.	RATE	NO. ACC.	RATE
Mar 1944	91	1.94	24	.90	67	3.34
Apr	132	1.08	43	.98	89	1.43
May	148	.77	62	.66	86	.86
Jun	148	.80	93	.75	55	.89
Jul	122	.80	74	.91	48	.67
Aug	134	.73	78	.81	56	.64
Sep	136	1.26	80	1.05	56	1.75
Oct	156	1.89	70	1.30	86	3.02
Nov	164	2.34	86	1.88	78	3.18
Dec	158	2.10	88	1.59	70	3.55
Jan 1945	214	4.04	118	3.22	96	5.89
Feb	176	2.02	94	1.47	82	3.56
Mar	207	1.19	133	1.01	74	1.72
Apr	195	1.11	109	.97	86	1.34
May	166	1.26	24	1.68	142	1.21
TOTAL	2347	1.27	1176	1.12	1171	1.48

TOTAL BOMBERS

	OVERALL		OPERATIONAL		NON-OPER.	
	NO. ACC.	RATE	NO. ACC.	RATE	NO. ACC.	RATE
Mar 1944	14	.82	8	.64	6	1.33
Apr	17	.57	9	.45	8	.81
May	23	.50	14	.43	9	.70
Jun	27	.64	17	.50	10	1.10
Jul	24	.76	15	.61	9	1.29
Aug	21	.47	15	.48	6	.46
Sep	19	.62	10	.52	9	.78
Oct	27	1.31	10	.88	17	2.90
Nov	44	1.69	24	1.55	20	1.91
Dec	60	2.28	36	1.87	24	3.37
Jan 1945	84	4.40	60	5.00	24	3.39
Feb	52	1.57	39	1.49	13	1.89
Mar	56	.84	37	.71	19	1.32
Apr	42	.70	30	.89	12	.46
May	30	.76	2	1.71	28	.73
TOTAL	540	1.01	326	.94	214	1.14

TOTAL FIGHTERS

	OVERALL		OPERATIONAL		NON-OPER.	
	NO. ACC.	RATE	NO. ACC.	RATE	NO. ACC.	RATE
Mar 1944	63	2.99	15	1.14	48	6.54
Apr	90	1.96	34	1.51	56	2.40
May	92	1.18	48	.82	44	2.28
Jun	90	1.10	70	.97	20	2.01
Jul	77	1.25	59	1.12	18	2.07
Aug	85	1.27	60	1.02	25	3.04
Sep	92	1.48	65	1.23	27	2.92
Oct	93	2.01	56	1.42	37	5.39
Nov	82	2.46	56	2.04	26	4.35
Dec	75	1.93	47	1.43	28	4.81
Jan 1945	82	3.21	45	2.07	37	9.65
Feb	91	2.24	45	1.35	46	6.24
Mar	113	1.40	83	1.16	30	3.12
Apr	100	1.27	64	.99	36	2.83
May	92	1.76	15	1.75	77	1.77
TOTAL	1317	1.62	764	1.21	553	3.07

TOTAL RECONNAISSANCE

	OVERALL		OPERATIONAL		NON-OPER.	
	NO. ACC.	RATE	NO. ACC.	RATE	NO. ACC.	RATE
Mar 1944	1	.85	1	2.01	-	.00
Apr	2	.75	-	.00	2	1.16
May	1	.21	-	.00	1	.37
Jun	-	.00	-	.00	-	.00
Jul	1	.21	-	.00	1	.87
Aug	4	.50	3	.46	1	.64
Sep	8	1.64	5	1.21	3	3.97
Oct	7	1.51	4	1.21	3	2.26
Nov	13	3.67	6	2.17	7	9.04
Dec	10	2.27	5	1.52	5	4.55
Jan 1945	22	6.06	13	4.47	9	12.48
Feb	15	2.75	10	2.20	5	3.55
Mar	13	1.46	13	1.73	0	0.00
Apr	19	1.44	13	1.15	6	3.25
May	17	1.59	7	1.55	10	1.68
TOTAL	133	1.54	80	1.28	53	2.19

TOTAL NON-TACTICAL

	OVERALL		OPERATIONAL*		NON-OPER.	
	NO. ACC.	RATE	NO. ACC.	RATE	NO. ACC.	RATE
Mar 1944	13	1.73			13	1.73
Apr	23	.52			23	.52
May	32	.43			32	.43
Jun	31	.56	6	.46	25	.60
Jul	20	.57			20	.57
Aug	24	.38			24	.38
Sep	17	1.64			17	1.64
Oct	29	2.64			29	2.64
Nov	25	3.43			25	3.43
Dec	13	2.28			13	2.28
Jan 1945	26	5.55			26	5.55
Feb	18	2.28			18	2.28
Mar	25	1.43			25	1.43
Apr	34	1.41			34	1.41
May	27	.91			27	.91
TOTAL	357	.87	6	.46	351	.88

15 MONTH AVG RATES BY TYPE A/C

	OVERALL		OPERATIONAL		NON-OPER.	
	NO. ACC.	RATE	NO. ACC.	RATE	NO. ACC.	RATE
A-20	131	1.26	70	1.03	61	1.68
A-26	76	1.00	38	1.07	38	.93
B-26	333	.94	218	.90	115	1.03
F-38	219	2.17	123	1.49	96	5.17
F-47	912	1.49	554	1.17	358	2.39
F-51	130	1.76	67	.99	63	4.82
F-61	34	2.59	20	3.09	14	2.10
F-3	10	2.27	5	3.91	5	1.60
F-5	38	1.77	16	1.18	22	2.80
F-6	85	1.46	59	1.32	26	1.93
L-4	59	6.56	-	-	59	6.96
L-5	103	1.15	-	-	103	1.15
O-47/53	69	.85	6	.46	63	.84
Misc.	128	2.03	-	-	128	2.03
TOTAL	2347	1.27	1176	1.12	1171	1.48

* Applies to troop carrier operations.

SOURCE: Extract AAF Form 14 and Flying Time reports.

OPERATIONS DEFINITIONS

Sortie: A sortie is an aircraft airborne on a mission against the enemy (synonymous with terms "aircraft dispatched", "aircraft airborne", and "aircraft taking off", previously used).

Aircraft Credit Sortie: An aircraft credit sortie is deemed to have taken place when an airplane, ordered on an operational mission and in the performance of that mission, has entered an area where enemy anti-aircraft fire may be effective, or where usual enemy fighter patrols occur, or when the airplane is in any way subjected to enemy attack. (Definition previously used for "sortie" in the ETO)

Non-Effective Sortie: A non-effective sortie is a sortie which for any reason fails to carry out the purpose of the mission. (Synonymous with the term "abortive".)

Damaged: U. S. aircraft damaged are classified as follows:

- (a) Category "A" describes aircraft repairable by the nearest convenient combat unit.
- (b) Category "AC" describes aircraft repairable on site by an Air Service Command unit or equivalent.
- (c) Category "B" describes aircraft to be collected by a salvage organization and dispatched for repair to an Air Service Command unit or equivalent.
- (d) Category "E" describes aircraft damaged beyond economical repair. Aircraft which crash in friendly territory are considered to be damaged Category "E", not lost, as defined below.

Lost: U. S. aircraft will be considered lost when (a) seen to crash or land in enemy territory or at sea, (b) pilot and entire crew seen to bail out over enemy territory or at sea, (c) seen to disintegrate or be enveloped in flames, or (d) failing to return from a mission after a reasonable length of time and not known to have landed in friendly territory.

Enemy Aircraft Casualties: (a) Destroyed in the Air -- Aircraft in flight shall be considered destroyed when (1) seen to crash, (2) seen to disintegrate in the air or be enveloped in flames, (3) seen to descend on friendly territory and be captured, or (4) pilot and entire crew seen to bail out.

(b) Destroyed on the Ground -- Aircraft not in flight shall be considered destroyed when (1) seen or confirmed by photographs to have been blown apart or burned out, (2) seen by strike photograph to have been within unobstructed lethal radius of a fragmentation bomb, (3) seen to sink in deep water, or (4) known to have been aboard carrier or other ship at time of confirmed sinking.

(c) Probably Destroyed -- Aircraft shall be considered probably destroyed when (1) while in flight seen to be so badly damaged as to have less than an even chance of reaching its own territory safely, or (2) seen to be so damaged by bombing or strafing as to have less than an even chance of being repaired.

(d) Damaged -- Aircraft shall be considered damaged when (1) seen while in flight to be so damaged as to require repair before beginning another mission, but having a better than even chance of reaching its own territory safely, or (2) seen to be so damaged by bombing or strafing as to require repair before becoming operational.

SOURCE: Ninth Air Force Memo 55-9, 24 April 1945

WEATHER DEFINITIONS

1. Operational Day. The following weather minima have been considered:

a. Bombers.

(1) Bases.

(a) Take off.

1. Visibility greater than 1 1/4 miles.
2. Ceiling greater than 1000 feet.
3. Low cloud less than 1000 feet thick unless amount of low cloud is 8/10 or less.

(b) Landing.

1. Visibility greater than 2 1/2 miles.
2. Ceiling greater than 1000 feet.

(2) Targets.

(a) Route.

1. No sharp fronts.
2. Visibility greater than 2 1/2 miles.
3. No icing.

(b) Visual target.

1. Visibility greater than 2 1/2 miles.
2. Total cloud at low and medium level less than 6/10, cloud at medium level less than 4/10.

(c) Blind target.

1. Greater than 6/10 total low and medium cloud, less than 4/10 medium cloud.
2. If blind bombing missions are successfully carried out, the day is listed as operational for blind bombing.

b. Fighters.

(1) Bases. As for bombers.

(2) Targets.

(a) Route. As for bombers.

(b) Target.

1. Visibility greater than 2 1/2 miles.
2. Ceiling greater than 3000 feet.

2. Non-operational Day.

a. Bombers. When weather minima as listed above do not exist at any bomber base, or when no groups have targets meeting the minima for targets, or when both situations prevail; or any combination resulting in conditions below the minima for either bases or targets which affect all groups.

b. Fighters. When weather minima as listed above do not exist at any fighter base, or when no groups have targets meeting the minima for targets, or when both situations prevail; or any combination resulting in conditions below the minima for either bases or targets which effect all groups.

3. Partially Operational Day. (Bombers and fighters to be considered separately, as above.)

a. At least one base operational, and with the group at that base having operational targets.

b. Subject to the above condition, a day is partially operational if one or more groups have non-operational targets, although all groups may be at bases where operational conditions prevail.

4. Sources of Information. Weather summaries submitted by staff weather officers, daily A-2 mission reports and hourly synoptic charts.

SOURCE: Staff Weather Officer, Ninth AF.

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