

**INTERPRETING AIRPOWER:
AMERICAN OBSERVATION OF THE BATTLE OF BRITAIN**

BY

MAJOR JOSEPH L. SHEFFIELD

A THESIS PRESENTED TO THE FACULTY OF
THE SCHOOL OF ADVANCED AIR AND SPACE STUDIES
FOR COMPLETION OF GRADUATION REQUIREMENTS

SCHOOL OF ADVANCED AIR AND SPACE STUDIES

AIR UNIVERSITY

MAXWELL AIR FORCE BASE, ALABAMA

JUNE 2010

APPROVAL

The undersigned certify that this thesis meets master's-level standards of research, argumentation, and expression.

DR. THOMAS A. HUGHES (Date)

DR. RICHARD R. MULLER (Date)

DISCLAIMER

The conclusions and opinions expressed in this document are those of the author. They do not reflect the official position of the US Government, Department of Defense, the United States Air Force, or Air University.

ABOUT THE AUTHOR

Major Joseph L. Sheffield received his commission upon graduating from the United States Air Force Academy in 1997. After completing Specialized Undergraduate Pilot Training at Laughlin AFB, Texas in 1998, he went to fly B-1s at Dyess AFB, Texas. There he served as a B-1 instructor and evaluator pilot. After attending the United States Air Force Weapons School in 2004, he relocated to Ellsworth AFB, South Dakota and served as squadron assistant director of operations and wing weapons officer. Major Sheffield is a senior pilot with over 2200 flying hours and more than 300 combat hours. He has flown in Operations ENDURING FREEDOM and IRAQI FREEDOM. Major Sheffield received an MBA from the University of Nebraska-Lincoln and graduated from the United States Air Command and Staff College with a M.A. in Military Operational Arts and Sciences. Major Sheffield is married and has six children.

ACKNOWLEDGEMENTS

My first thanks go to my thesis advisor, Dr. Tom Hughes, who assisted me from topic creation to product completion. He helped refine the question I desired to answer and mentored me on research and writing. I appreciate his valuable insight and supportive guidance. I also want to acknowledge Dr. Rich Muller, my reader, for his meaningful assistance and helpful recommendations. These gentlemen not only enhanced the quality of the final product, but they were great to work with which made the project enjoyable.

I would like to thank the faculty, staff, and students of the School of Advanced Air and Space Studies Class XIX who facilitated my learning and made this year's experience truly rewarding.

Most importantly, I would like to express gratitude and appreciation for my wife and children. As always, they supported me with grace, encouragement, and extreme patience.

ABSTRACT

The battle between British and German air forces in the summer and early fall of 1940 was the first major campaign fought entirely by air. It engendered interest among airmen around the world, especially American observers who sought to learn what they could about war in the third dimension. Amidst an array of air activities and operations, the American observers identified pertinent airpower lessons, analyzed them in a meaningful way, and interpreted them for implementation within the Air Corps. In this task, they used the doctrine of strategic bombardment to filter and interpret the Battle of Britain. This doctrine conditioned how they ordered and categorized the vast amounts of battlefield data and information, and virtually ensured their view that the Battle of Britain was lost by Germany's failure to bomb well, and not won by the Royal Air Force's capacity for fighter defense. The observations and assessments of the American airmen reveal how doctrine has the potential to not only help, but also hinder how airmen interpret the battlefield. Ultimately, the observers' experience highlights the importance of thinking clearly and cleanly about military doctrine, to understand what it does for military organizations, and what it does to them.

CONTENTS

Chapter	Page
DISCLAIMER	ii
ABOUT THE AUTHOR	iii
ACKNOWLEDGMENTS	iv
ABSTRACT	v
INTRODUCTION	1
1 THE AIR BATTLE OVER BRITAIN	5
2 THE DISPOSITION OF AMERICAN AIRMEN	27
3 AMERICAN AIRMEN ASSESSMENT	42
4 CONCLUSION AND IMPLICATIONS.	68
BIBLIOGRAPHY	75

Introduction

U.S. observers had naturally watched the Battle of Britain with keen interest. They sensed, as did the British that the fate of the nation hung in the balance. They sought with intense interest to determine what lessons were to be learned from the first modern air war. All the elements were there: problems of target selection; the attempt, through varying objectives, to gain air supremacy; the countermeasures; the development of tactics for combat against fighters as well as bombers; the use of escort fighters, etc...

*-- Major General Haywood S. Hansell Jr.
The Air Plan That Defeated Hitler*

The battle between British and German air forces in the summer and early fall of 1940 was the first major campaign fought entirely by air. Ultimately, the British Royal Air Force (RAF) successfully retained control of the skies over its homeland against the vaunted German Luftwaffe, and staved off a potential German invasion. From June through September, the RAF countered Luftwaffe fighter and bomber attacks, protected critical coastal supply convoys and shipping activities, and disrupted German invasion and embarkation ports. In his famous ‘Battle of Britain’ Speech to the House of Commons on 18 June 1940, British Prime Minister Sir Winston Churchill said, “if the British Empire and its Commonwealth last for a thousand years, men will still say, ‘this was their finest hour.’”¹ The Battle of Britain was not only a significant moment in the history of Great Britain and World War II; it was also a seminal moment in the history of airpower. In fact, the air battle over the British Isles engendered interest among airmen around the world, especially American Airmen who were searching to learn what they could about war in the third dimension.

American Airmen were extremely interested in gathering useful insights and pertinent airpower lessons from both the RAF and the Luftwaffe. Not surprisingly, the Air Corps Chief of Staff, Major General Henry “Hap” Arnold, sent a series of operational and tactical airpower experts to England to observe and provide a firsthand report on the battle. He tasked the observers to obtain information to assist the Air Corps in “future

¹ Sir Winston Churchill Speech to the House of Commons, 18 June 1940, quoted in Stephen Bungay, *The Most Dangerous Enemy*, (London: Aurum, 2000), 24

organization, development of aircraft and aviation equipment, training of personnel, and possible revision of tactical doctrine and technique.”² Amidst an array of countless air activities and operations, the American observers identified pertinent airpower lessons, analyzed them in a meaningful way, and interpreted them for implementation within the Army Air Corps.

This thesis asks, in what ways and to what extent did the doctrinal predisposition of the American airmen impact their interpretation of airpower in the Battle of Britain. This inquiry requires a detailed account of the battle, a thorough understanding of Air Corps culture and doctrine, and a review of the observers’ activities and reported observations. A combination of these three facets reveals how the observers identified, analyzed, and interpreted airpower in order to provide meaningful recommendations to Air Corps leadership. Military doctrine is a filter by which to identify and prioritize activities during battle. It helps airmen sort through the massive amounts of data and information, but it has the potential to hinder full understanding. Ultimately, the goal of the observers was more than simply collecting information or generating data matrixes. Their goal was to create as accurate a picture as possible of the pertinent issues of the battle and effectively link them together to interpret how airpower was utilized and should be used in the future. Analyzing the experiences, observations, and recommendations of the various American airmen observer teams reveals how and where their belief in the doctrine of strategic bombardment conditioned what they saw.

The primary sources for this thesis include Military Intelligence Division reports, letters, personal journals, and internal War Department memoranda. The airmen sent to observe the battle over southern England never issued an official after action report or survey. Unlike General Christian Smuts’ airpower report following World War I or the post-World War II United States Strategic Bombing Survey, the American observations of the Battle of Britain were never consolidated into a single source document. Information about the different observer group activities, perspectives, interpretations, and recommendations may be found in a variety of sources – periodic update reports,

² Brigadier General B.K. Yount, Assistant Chief of the Air Corps, War Department, to Assistant Chief of Staff, G-2 Division, War Department General Staff, “Special Instructions for Lieutenant Colonel Grandison Gardner and Major Franklin O. Carroll, designated as Assistant Military Attachés for Air to England,” memorandum, 19 March 1940.

letters, journals, and memoranda. In fact, not until 28 January 1941, well after the climax of the battle, were the observers directed to submit a final report on their tour of duty in London.³ By this time, the observers who were active in the summer and early fall had moved onto other assignments and responsibilities. Most of them sent short replies to the Intelligence Division, referencing their periodic reports already submitted while on duty in Europe.⁴ In addition to the Army War Department General Staff Intelligence Division observer reports, some airmen, especially then-Colonel Carl A. “Tooe” Spaatz, sent letters directly to Arnold. Official Military Intelligence Division reports and professional letters are the two primary sources available. Other primary observation sources include Spaatz’s personal journal as well as available internal War Department memoranda. This thesis also utilizes secondary source literature available in seminal histories and biographies on the strategic context of the Battle of Britain and the operational and tactical airpower aspects of the RAF and Luftwaffe. It uses a mixture of primary Air Corps documentation and secondary scholarly studies to examine the cultural evolution of the Air Corps prior to World War II and the predisposition of the American airmen observers.

This thesis is divided into three substantive chapters followed by conclusions and implications. The first chapter provides a broad overarching account of the strategic, operational, and tactical components of the air battle over Britain. It traces the Luftwaffe and RAF strategy throughout the campaign and highlights the aircraft and organizations of both sides. In the end, there are two basic ways to interpret and assess the Battle of Britain – a German loss caused by a misapplication of offensive airpower based on poor air doctrine, strategy, and equipment; or a British victory due to a superb air defense doctrine, strategy, and equipment.

³ Smith, Lieutenant Colonel Ralph C. Military Intelligence Division, War Department General Staff to Chief, Intelligence Division Air Corps, War Department General Staff, memorandum. 29 January 1941.

⁴ For example, by February 1941 Carl A. Spaatz had been promoted to Brigadier General and began serving as Assistant Chief of the Air Corps. In compliance with the 28 January 1941 Final Report directive, he told the MID to reference the 29 update-reports he submitted while on observation duty in England. Brigadier General Carl Spaatz, War Plans Division, War Department General Staff to Assistant Chief of Staff, G-2 Division, War Department General Staff, “Submission of Final Report,” memorandum, 28 February 1941.

Chapter 2 examines the doctrinal prism through which American airmen viewed airpower at the time of the Battle of Britain. It outlines US airpower's evolution from the end of World War I to the beginning of World War II, highlighting the education, training, and organizational aspirations of American airmen during the interwar period. This chapter traces the development of US airpower ideas, concepts, and doctrine from the pursuit-fighter Air Service days to the dominant Air Corps perspective of daylight strategic bombardment when the observers were sent to England.

Chapter 3 provides a detailed account of the three primary Air Corps observation groups sent to England during the summer and early-fall of 1940. It recounts what the observers did, what they saw, and the assessments they made. It highlights what the observers perceived as the causes of the battle's outcome and what changes the Air Corps should implement in preparing for air operations in the future.

The final chapter explores how and where the observers' doctrinal predisposition influenced their observations and interpretations. It highlights why military doctrine is a filter in prioritizing and categorizing the vast amounts of data and information collected in today's complex battlefield. It then explores how doctrine not only helps airmen, but how it does things to them in terms of identifying, analyzing, and interpreting situations. It analyzes how the lens of strategic bombardment was a doctrinal filter that both helped and hindered the American observers' interpretation of events during the Battle of Britain. It concludes by warning today's airpower strategists and practitioners of the implications if they do not take the time to think clearly and cleanly about military doctrine.

Chapter 1

The Air Battle Over Britain

The situation as it presents itself for our Air Force for the decisive struggle against Britain is as favorable as it can be...What will happen when the German Air Force employs its whole strength against England? The game looks bad for England and her geographical and military isolation. We can face with confidence the great decision to come!

-- General Quade
Commandant Luftwaffe Staff College, July 1940

The strength of the British fighter defense, on which the German daylight attacks and the hopes of the coveted mastery of the air had come to grief, had perhaps been underrated...The enemy's power and resistance was stronger than the medium of attack.

-- Otto Bechtle
Berlin lecture, February 1944

On 24 May 1940, before Germany's victory over France was even complete, Hitler directed the Luftwaffe to begin independent air operations against the British Isles as soon as enough forces were available and ready.¹ The Luftwaffe was to gain control of the air over southern England in preparation for a potential invasion against England. The German intent to attack England was not unexpected or even without precedent. The Germans bombed Britain during the Great War, flying 52 air raids against Britain cities, dropping 73 tons of bombs, and killing 857 people and injuring 2,058.² Consequently, before Hitler attacked France, the British Chiefs of Staff ordered the RAF to bring civil defense, home forces, and coastal defense to the highest state of readiness in preparation for a potential German attack.³ Thus while the Luftwaffe began gradual offensive combat air operations over the British Isles, the RAF was readying its air defense.

¹ Richard Hough and Denis Richards, *The Battle of Britain*, (New York, NY: W. W. Norton & Co, 1989), 109.

² DeWitt S. Copp, *Forged in Fire: Strategy and Decisions in the Air War over Europe 1940-1945*, (Garden City, New York: Doubleday and Company, Inc, 1982), 92.

³ Hough and Richards, *Battle of Britain*, 101.

The Channel

Immediately following Germany's victory in France, the Luftwaffe established three Air Fleets, two across the Channel to the south and the other to the north. On 5 June 1940, the Luftwaffe began minor bombing attacks against the British homeland. They continued small, sporadic attacks until major operations began in the second week of August.⁴ Operations began slowly. This was partly because the Air Fleet commanders did not know what else to do. While awaiting strategic guidance from Hitler and the German High Command, Air Marshall Hermann Goering continued small random attacks to provide their pilots much needed fighter-bomber integration training. These operations also allowed them to probe British air defenses to discover their strengths and potential weaknesses. It also preserved their strength while additional aircraft and forces deployed to the forward operating bases.⁵

Germany entered the Battle of Britain with formidable and combat proven aircraft. The Luftwaffe's best fighter aircraft was the Messerschmitt Me 109. It was arguably the best all-round fighter in the world. Fortunately for Germany, 75% of the fighters available for the battle were Me 109s.⁶ It had a top speed of 354 mph at 16,500 feet and a ceiling of 34,000 feet. It was reinforced with armor for improved pilot protection and was armed with two 20mm wing cannons and two 7.9mm machine guns in the fuselage. It had excellent high altitude maneuverability and significantly outperformed British fighters at altitudes above 20,000 feet.⁷ At lower altitudes its maneuverability was matched by other fighters such as the Spitfire. The most significant deficiency of the Me 109 was its range limitation. Even flying out of bases in northern France it could barely reach certain areas of London, and heavy combat maneuvering reduced the range even more. The Luftwaffe tried to mitigate the problem by experimenting with a wooden drop-tank, but due to fuel leaks and other problems it was never used in combat.⁸

⁴ Richard Overy, *The Myth and the Reality: The Battle of Britain*, (New York, NY: W.W. Norton & Co, 2000), 67.

⁵ Stephen Bungay, *The Most Dangerous Enemy*, (London: Aurum, 2000), 122.

⁶ Bungay, *Most Dangerous Enemy*, 107.

⁷ Overy, *Myth and Reality: Battle of Britain*, 56-57.

⁸ Overy, *Myth and Reality: Battle of Britain*, 51.

The twin-engine Messerschmitt Me 110 Destroyer was the other Luftwaffe fighter used. It had an impressive armament capability; it could fly farther than the Me 109 (565 miles); and it had good speed (350 mph at 23,000 feet); but it lacked fighter-type maneuverability and acceleration. It was no match for the Hurricane or Spitfire and usually needed to be protected by the Me 109s to survive. Thus they were long-range escort failures.⁹ Thankfully for the Luftwaffe, they only comprised 25% of the fighter force.¹⁰ However, the Me 110s proved to be capable of fast attack bombing toward the latter half of the battle.¹¹ The Luftwaffe often used them to lure away British fighters, thereby allowing larger bombers to attack their targets unmolested and provide the Me 109s a chance to destroy the adversary in the air.¹²

Germany had four bomber aircraft – the Heinkel He 111, the Dornier Do 17, Junkers Ju 88, and the Junkers Ju 87 Stuka. The speed and maneuverability of these bombers was generally no match for enemy fighters. Their defensive armament was also weak. All of the Luftwaffe bombers were either single or twin-engine aircraft with relatively limited bomb capacity. The Luftwaffe decided not to pursue a heavy four-engine bomber force similar to US Army Air Corps or British RAF Bomber Command.¹³ In the mid-1930s, each of the major German aircraft manufacturers designed and built successful four-engine aircraft, but only a small number were ever produced; and they were used almost exclusively in transport roles for the Lufthansa.¹⁴ As the battle progressed, the two primary bombers were the He 111 and the Ju 88.

The Junkers Ju 87 Stuka was the Luftwaffe's only single-engine bomber. It carried a single 1,100 pound bomb and was equipped with a single rear-firing and two wing-mounted machine guns. The Stuka was originally designed as a precision dive-bomber for ground force support. It was very successful in previous battles on the

⁹ Hough and Richards, *Battle of Britain*, 45.

¹⁰ Bungay, *Most Dangerous Enemy*, 107.

¹¹ Bungay, *Most Dangerous Enemy*, 258.

¹² Overy, *Myth and Reality: Battle of Britain*, 57

¹³ There were three primary reasons the Luftwaffe did not pursue a four-engine bomber. First was due to the shortages of petroleum products, especially aviation fuel. Second was the lack of suitable engines to power a heavy bomber. Third, and most important, was that a strategic decision was made in 1937 to utilize the Luftwaffe as short-range tactical support to the German Army's blitzkrieg offensive to win continental battles. (Murray and Cooper)

¹⁴ Mathew Cooper, *The German Air Force 1933-1945, An Anatomy of Failure*, (New York, NY: Jane's Publishing Inc., 1981), 61.

continent and proved effective against ships in the English Channel. Its slow speed and poor maneuverability made it highly vulnerable. Due to heavy losses, it was eventually withdrawn from combat over England.¹⁵

The twin-engine Heinkel He 111 and Dornier Do 17 level-bombers were designed in the early to mid-1930s and by the spring of 1940 were nearly obsolete. In fact, a number of the Dornier's were converted into Luftwaffe reconnaissance aircraft. The Heinkel bomber had a bomb load of 4,400 pounds, but the Dornier only carried 2,200 pounds. Thus they extensively used the Heinkel while the Dornier only saw limited action. They were both short-range aircraft with limited defensive armament and top speeds just short of 250 mph.¹⁶ The Junkers Ju 88 was the third level-bomber, but it could also perform dive-bombing if required. It was the Luftwaffe's best and most effective bomber of the battle. It was the newest bomber and had the farthest range, higher top speeds, and carried 4,400 pounds of bombs. With speeds near 300 mph it was capable of outrunning British fighters, especially in a dive.¹⁷ The He 111 and the Ju 88 were the primary night bombers used during the climax of the battle.

By the end of June, the Luftwaffe had forward deployed sufficient fighter and bomber forces to begin regular operations. Therefore, they began flying standard routes with concentrated bomber and escort forces. The bombers would occasionally attack British ports and naval convoys in the English Channel as targets of opportunity. The strategic objective of these early operations was to seal off the Channel to British shipping and strategic resupply.¹⁸

British fighters flew regular area defense patrols to counter German port and shipping attacks. By the spring of 1940 the British bombers, fighters, and reconnaissance aircraft were few in number but efficient in operation. The two primary fighters for defending the British Isles were the Hawker Hurricane and the Vickers Supermarine Spitfire. The RAF had two other fighter aircraft, the Bristol Blenheim and Boulton-Paul Defiant, but they were not used until the end of the battle and only then for limited night-time defense. Since Spitfires were just becoming available in the early summer of 1940,

¹⁵ Hough and Richards, *Battle of Britain*, 47, 130.

¹⁶ Hough and Richards, *Battle of Britain*, 45-46, 150.

¹⁷ Hough and Richards, *Battle of Britain*, 46-47, 136.

¹⁸ Bungay, *Most Dangerous Enemy*, 147.

the bulk of RAF fighters were Hurricanes. Although the Spitfire was a new plane and structurally more advanced it was shot down at a faster rate.¹⁹

The Hurricane and the Spitfire were both at the cutting-edge of fighter technology for the day. The Hurricane, however, was the backbone of Fighter Command's defense fighter force and comprised roughly 55% of the fighters. Similar to the Luftwaffe's Me 109, it underwent a series of upgrades. The Hurricane Mark I had a maximum speed of 325 mph, eight .303 machine guns, and a maximum altitude of 34,000 feet. Although it was a little slow compared to the Spitfire or Me 109, it was a rugged and stable aircraft.²⁰ The Spitfire Mark I had a maximum speed of 362 mph at 18,500 feet, eight .303 machine, and a maximum altitude was also 32,000 feet.

The most significant British fighter capability was the industrial ability to rapidly produce them. The planned production for 1940 was 3,602. Despite the increasing severity of the air battle, aircraft production "rose very substantially from June onwards" and the British actually produced more fighters that year than they had programmed.²¹ This was significant because at the beginning of the battle, the Luftwaffe was basically twice as strong as the RAF.²²

During the latter part of May and early part of June, RAF fighters flew continuous patrols in an attempt to intercept German attacks against British ports and ships. Since the German airfields in France were so close to the Channel, there was not enough time for British radar operators to warn RAF fighters of approaching Luftwaffe aircraft or direct defensive intercepts. Despite periodic German attacks, the RAF had enough time to re-direct and even relocate its radar location and coverage toward France instead of toward the north where prewar assumptions initially dictated.²³ Similar to the Germans, they also used this time to sharpen pilot, radar, and command and control operations to

¹⁹ Although Spitfires were only 30% of the RAF operational fighter force yet they accounted for almost 40% of their combined losses. Overy, *Myth and Reality: Battle of Britain*, 38-39.

²⁰ Hough and Richards, *Battle of Britain*, 37, 71, 83.

²¹ Overy, *Myth and Reality: Battle of Britain*, 36. The British ultimately produced 4,283 fighters in 1940.

²² At the beginning of air hostilities over England German's had a total of 4,074 aircraft of which 75% were operationally capable compared to the British 1,963 aircraft with 72% operational capable. Of these the Luftwaffe had 1,464 fighters, 1,808 bombers, 569 reconnaissance, and 233 coastal aircraft. The British had 903 fighters, 560 bombers, and 500 coastal aircraft. Although Luftwaffe fighters outnumbered the British fighters 4 to 1, when comparing equally capable fighter aircraft – Me 109s to Hurricanes and Spitfires – the German's only enjoyed a 1 ½ to 1 advantage. Bungay, *Most Dangerous Enemy*, 107.

²³ Michal Korda, *With Wings Like Eagles*, (New York: NY, 2009), 129.

ensure defensive readiness. Early combat indications validated the RAF's concern regarding the height accuracy of their radar systems. Fighter Command usually operated with an accurate picture of the enemy's course and speed, and a fairly accurate estimate of its aircraft size, but their flight altitude was unreliable unless it was confirmed by a ground observer.²⁴ Although the RAF's defensive posture concentrated on Fighter Command's air defense operations, Coastal Command was given difficult, costly, yet important responsibilities.

In June, Coastal Command began flying regular reconnaissance missions twice every 24 hours. These intelligence gathering missions were usually conducted during the night in case the enemy launched a surprise invasion. In addition to anti-invasion intelligence patrols, the Command was occasionally tasked to bomb German shipping and storage areas. These operations cost the British significantly. Partly because the aircraft assigned to Coastal Command were less capable and partly because of the mission, they lost 600 airmen and 158 aircraft in six months.²⁵

Bomber Command was likewise assigned an important task and played a significant role during the battle. In fact, they conducted their first bombings on German territory soon after the Luftwaffe opened hostilities. Despite the RAF's acceptance of strategic bombing and the confidence within Bomber Command, the command was in far worse shape than Fighter Command at the beginning of the war.²⁶ Nonetheless, they had a large inventory of bombers. There were four main types, the Whitley, the Hampden, the Wellington, and the Blenheim. The first three were fairly equal in weapon capacity and capability. They carried 4,000 pounds of bombs, cruised at 160 mph, and had a range of approximately 1,200 miles. The Blenheim Mark IV was much lighter, but a little faster. It could only carry a 1,000 pound bombs but it could fly 1,460 miles at a speed of 198 mph. Bomber Command's first operation was launched one hour after England declared war.²⁷

²⁴ Korda, *Wings Like Eagles*, 143.

²⁵ Overy, *Myth and Reality: Battle of Britain*, 70.

²⁶ Hough and Richards, *Battle of Britain*, 59.

²⁷ Bungay, *Most Dangerous Enemy*, 88.

Bomber Command was tasked with limited attacks on German oil industry, aircraft production facilities, and communication nodes. After experiencing unacceptable losses during day attacks, they switched to night-time operations in June.²⁸ Overall, they did not release many weapons because of the limited ordnance their medium bombers could carry. They were also hindered by their bombers' modest range. In July the Air Ministry pushed the idea of developing a Bomber Striking Force that was capable of wearing down the Germans 'by carefully planned bombardments of vital objectives.'²⁹ However, British assaults against German power sources, industry, and communication nodes were unrealistic with the RAF's existing technology and aircraft. In the meantime, Bomber Command was directed to target ports along the coast, barges, and other enemy invasion areas, which they did with modest success.

In July the Luftwaffe began a pattern of operations that lasted until the beginning of August and the initiation of concentrated and coordinated air attacks.³⁰ Every morning the Luftwaffe would send an aircraft from each Air Fleet's meteorological unit to report the current and developing weather. Throughout the day general reconnaissance flights were also sent to photograph ports and airfields, to look for shipping convoys, and to report on battle damage if there were any attacks the previous evening. If a reconnaissance aircraft discovered an attractive target of opportunity, bombers were immediately launched and directed to attack. Then around dusk they would send a small bomber force supported by escort fighters to execute spurious attacks to keep the RAF defenses on edge. Night-time attacks along the coast were relatively uncontested since the British still did not have an effective night fighter. Typical Luftwaffe targets included docks, airfields, factories, railway stations, oil installations, and ships.³¹

The largest Luftwaffe raid since the beginning of operations occurred on the morning of 10 July, thus initiating the official beginning of the battle.³² It began when a reconnaissance Dornier Do 17P detected a British shipping convoy code-named "Bread." Six convoy-patrol RAF Spitfires intercepted the Dornier and the 20 escort Messerschmitt

²⁸ Bungay, *Most Dangerous Enemy*, 88.

²⁹ Overy, *Myth and Reality: Battle of Britain* 70.

³⁰ The operation was code-named Eagle Attack.

³¹ Bungay, *Most Dangerous Enemy*, 148-149.

³² David A. Johnson, *The Battle of Britain and the American Factor*, (Pennsylvania: Combined Publishing, 1998), 37.

Me 109s. The Spitfires successfully struck the reconnaissance plane which was damaged and caused to crash-land in France. During the fight two Spitfires were also hit and forced to land in nearby fields on the British coast.³³ A few hours later, Air Fleet 3 launched a 70-plus aircraft raid, including 48 medium bombers, to attack the convoy. Approximately 30 Hurricanes and 6 Spitfires intercepted them. A large and deadly dog-fight ensued; as a result one RAF aircraft was destroyed and eight were damaged while ten Luftwaffe aircraft were destroyed and six were damaged. In the end, the Luftwaffe successfully sank only one convoy ship.³⁴

In general, most of these early channel battles favored the Luftwaffe. The RAF defensive convoy patrols were extremely vulnerable. Not only did the consolidated German escort aircraft outnumber the RAF's smaller convoy patrols, but due to the short flight distance Luftwaffe pilots had a tactical advantage. There simply was not enough warning time for radar operators to give British pilots a good estimate on approaching enemy forces. Standing aircraft patrols also strained Fighter Command's limited resources. Exhausted pilots and rundown aircraft made the strategy of continual defensive patrols over the Channel unfeasible. Despite the Luftwaffe's relatively minimal success in damaging ships in the Channel, the Royal Navy had reached its limit and allowed only emergency convoys to traverse the Channel.³⁵

Both the RAF and the Luftwaffe learned lessons from these early operations over the Channel. The Luftwaffe confirmed what it already expected; the Me 109 was the only escort capable of effectively countering the British Hurricanes and Spitfires. They also learned that they needed to tie their escort fighters closer to their bombers than they had originally planned. The German bombers discovered the difficulty of effectively attacking a target and the importance of coordinating bomber defense with self-protection systems and fighter escorts.³⁶ The RAF learned the deadly price of being caught by surprise and unprepared. These skirmishes also highlighted the importance of applying continual well-coordinated defenses and the importance of well-timed intercepts. Until

³³ Bungay, *Most Dangerous Enemy*, 149.

³⁴ Bungay, *Most Dangerous Enemy*, 151.

³⁵ Bungay, *Most Dangerous Enemy*, 153.

³⁶ Overy, *Myth and Reality: Battle of Britain*, 75.

the initiation of the Luftwaffe concentrated air attack, the battle continued at a relatively moderate pace.

Before air operations accelerated, both air forces prepared their forces as best they could. The two sides were led and organized in very different ways. The contrast was personified by the personalities of the leaders for both forces.³⁷ The Luftwaffe commander-in-chief was Hermann Goering. He was already serving as Germany's air minister when Hitler officially announced the Luftwaffe's existence in 1935 and Goering was assigned to both positions.³⁸ He was vain and ruthless with unmatched political ambitions. Germany's massive remilitarization during the 1930s enabled him to expand his influence, and his reach continued to grow. As Luftwaffe commander he exuded great energy and interest, but he lacked the strategic judgment of a commander.³⁹

The German Air Force consisted of a highly trained and combat competent force. At the beginning of hostilities they had 1,450 experienced fighter pilots. The average age of their pilots was 26 years old and their average length of service was almost five years. The Luftwaffe's single-engine fighter force was fewer in number than RAF Fighter Command, but they had a higher rate of operational readiness and usually survived longer.⁴⁰

The Luftwaffe organized into territorial composite Air Fleets. Each Air Fleet was a balanced self-contained force comprised of fighters, bombers, cargo, reconnaissance, and weather aircraft. This structure was established to align an Air Fleet with an associated Army unit. At the beginning of combat over Britain the Luftwaffe forward deployed three fleets. They were located across the Channel on Britain's southern and northern flanks. Air Fleets 2 and 3 were located to the south in France and Air Fleet 5 was headquartered in Norway. Air Fleet 2 was responsible for southeast England and London. Air Fleet 3 focused on the west and northwest areas of England as well as the midlands region, while Air Fleet 5 was tasked with targets in north England and Scotland.⁴¹

³⁷ Overy, *Myth and Reality: Battle of Britain*, 30.

³⁸ Bungay, *Most Dangerous Enemy*, 37.

³⁹ Overy, *Myth and Reality: Battle of Britain*, 30-31.

⁴⁰ Overy, *Myth and Reality: Battle of Britain*, 59.

⁴¹ Bungay, *Most Dangerous Enemy*, 119.

The primary RAF leader during the battle was Fighter Command's commander-in-chief, Sir Hugh Dowding. He was near the end of his career when the air battle began; and was assigned to lead Fighter command in 1936, the same year the RAF reorganized into separate commands. He had a reputation as a stuffy, prickly, and independent-minded commander.⁴² As leader of Fighter Command, Dowding devoted himself to the creation of a defensive shield around the British Isles.

The RAF primarily consisted of inexperienced and untrained forces. By summertime they had over 9,000 pilots; unfortunately, only 30% were adequately trained and even less assigned to an operational squadron. Thus, 40% of the RAF pilots were either in initial training or some level of upgrade instruction and the remaining pilots were assigned to some type of staff position. Consequently, the RAF had fewer experienced pilots in the combat fighter squadrons than aircraft available. There were even fewer pilots who had the background and experience in air combat tactics and principles.⁴³

The RAF was organized very differently than the Luftwaffe. It was structured into Air Commands based on aircraft mission and function.⁴⁴ Thus, the responsibility for England's air defense rested on Dowding's Fighter Command. His command was divided into four operational groups. The front-line group, Group 11, was located in and responsible for southeast England. Group 12 had responsibility for the area north of London. Group 13 defended north England and Scotland while Group 10, which was comprised of only a few squadrons, defended the west and southwest.⁴⁵

The heart of England's air defense capability was neither the pilots nor the aircraft of Fighter Command, it was the command and control organization headquartered at Bentley Priory on the outskirts of London. The organization revolved around decentralized execution. At the Filter Room in Bentley Priory information regarding incoming Luftwaffe attacks was collected and relayed. Information was collected by radar stations located along the British coastline. These radars were capable of detecting the range and altitude of aircraft out to nearly 100 miles always. The information was then plotted on a large centralized map. Once it could be determined where the enemy

⁴² Overy, *Myth and Reality: Battle of Britain*, 32-33.

⁴³ Bungay, *Most Dangerous Enemy*, 260.

⁴⁴ The RAF consisted of Fighter Command, Bomber Command, Training Command, Coastal Command, Anti-Aircraft Command, and they eventually even established a Maintenance Command.

⁴⁵ Overy, *Myth and Reality: Battle of Britain*, 34.

aircraft were headed, that information was disseminated to the Group Headquarters and individual Sector Stations. Visual observers were also scattered along the coasts. They visually detected, plotted and relayed enemy aircraft tracks to the Observer Corps Center who consolidated this information and sent it directly to a Group Headquarter and Sector Stations. Group commanders selected which sector to activate and each Sector Station commander determined which squadrons to task for the mission. Once the aircraft were airborne they received intercept instructions via radio-telephony direction finding.⁴⁶ At the beginning of hostilities there were 30,000 observers, 1,000 observation posts, and 20 radar sites; they were manned both day and night.⁴⁷

Eagle Attack

On 1 August, Hitler issued strategic guidance in Directive No 17 to the Luftwaffe. The guidance stated that air attacks were to be directed ‘primarily against flying units, their ground installations and their supply organizations [sic], also against the aircraft industry, including manufacturing anti-aircraft equipment.’ It further stated that Hitler alone reserved the right to ‘decide on terror attacks as measures of reprisal.’⁴⁸ From this directive, Goering developed a broad operational plan; however, he did not outline any specific details. His plan consisted of a two-week sequential attack designed to assault British fighter forces on the ground and in the air.⁴⁹ Operation Eagle Attack begun. The operation was designed to secure air superiority over southern England through the destruction of British fighter aircraft and their airfields. The British coastal and satellite airfields used by Fighter Command were the primary target of the operation. The first five days of the operation targeted airfields within a 150-200 kilometers radius south of London; the next three days within a 100-50 kilometer radius; and finally a 50 kilometer radius on the last 5 days. The opening day – Eagle Day – was to begin as soon as plans were complete and the weather allowed. However, before the operation began Goering raided British radar stations and naval ports along the British coast.⁵⁰

⁴⁶ Hough and Richards, *Battle of Britain*, 51, 52, 58, 64.

⁴⁷ Overy, *Myth and Reality: Battle of Britain*, 45.

⁴⁸ Hough and Richards, *Battle of Britain*, 137.

⁴⁹ Bungay, *Most Dangerous Enemy*, 119.

⁵⁰ Hough and Richards, *Battle of Britain*, 138.

Luftwaffe operations generally followed Goering's plan, but the southern Air Fleet commanders had different opinions on the best strategy. General Hugo Sperrle, Air Fleet 3 Commander, argued the importance of first eliminating the RAF's air defense infrastructure while his counterpart, General Albert Kesselring the Air Fleet 2 Commander, advocated for attacks against London (either to draw RAF fighter command into a decisive battle or to bomb the British government into submission). Goering never fully committed to either of their strategies and did not clearly outline a strategy of his own; instead he implemented various aspects of all three.⁵¹

Eagle Day was eventually set for 13 August. Due to good weather and Goering's desire to pave the way for Eagle Attack's success, he began heavy attacks against radar stations and certain airfields a few days earlier. Expecting radar towers to topple, buildings to be damaged, and a disruption in communications, the Luftwaffe targeted every radar station in the south and south-east of England. However, their attacks had little impact on radar station operations, and none of the towers were more than superficially damaged.⁵² Not only were these targets difficult to hit, but when a radar station was bombed it was quickly repaired and returned to service. Additionally, back-up reserve stations were activated as soon as a primary station received any level of damage.⁵³ The Luftwaffe executed with precision; however, by tasking their small bombing forces against so many targets they did not have enough aircraft to achieve concentrated effects.⁵⁴ The Luftwaffe was nonetheless confident. They fully expected the radar stations and front-line airfields to be permanently inoperable after two days of bombing.

When the Luftwaffe launched three simultaneous raids in different target areas with twenty Dorniers each, they were surprised that radars detected them and RAF fighters intercepted them before they could reach their designated targets.⁵⁵ Nonetheless, multiple bombers reached their target because of the size, number, and concentration of the raids. Yet, in spite of the continuous Luftwaffe bombing, RAF radar sites and airfields were resilient to attacks and speedy to recover. Fighter Command was also

⁵¹ Bungay, *Most Dangerous Enemy*, 122.

⁵² Hough and Richards, *Battle of Britain*, 142-143.

⁵³ Hough and Richards, *Battle of Britain*, 145.

⁵⁴ Bungay, *Most Dangerous Enemy*, 204.

⁵⁵ Hough and Richards, *Battle of Britain*, 153.

successful in identifying, tracking, and tasking Group and Sector Station responses. On the other hand, pilots were exhausted. Most squadrons had scrambled two or even three times a day to provide over 500-plus defensive sorties against Luftwaffe attacks.⁵⁶

Eagle Attack arrived on 13 August 1940. Due to questionable weather, Goering decided to terminate the planned attacks and delay the operation for a better day. Since he did not make his decision until some aircraft were already airborne, not all the planes received the message. Although the escort fighters received the message that Eagle Day was delayed, they were unable to relay it to the bombers. Thus the bombers did not know that the operation was canceled and they proceeded toward England without any escort protection. British fighters could have enjoyed an easy victory if the radar operators had not missed the unescorted German bombers, most of which had turned around due to adverse weather.⁵⁷

As the afternoon cleared, Goering decided to commence Eagle Attack. The Luftwaffe opened the operation with a large 300 aircraft strike force. Two Hurricane fighter squadrons were tasked to intercept. The Luftwaffe outnumbered them ten to one. Although most of the bombers reached their targets, they only caused minimal damage because of the disruption and distraction caused by Hurricane pilots and anti-aircraft artillery. In an attempt to mitigate British aircraft defense, over the next few days the Luftwaffe began baiting RAF fighters into the air with an early fighter sweep in front of a concentrated formation of bombers. The strategy was designed to force RAF fighters to commit to takeoff and time the German strike force to arrive when the defense would require refueling.⁵⁸

The Luftwaffe surged with nearly 1,800 sorties on 18 August. It was the busiest and most deadly day of the entire battle. Their bombers targeted inland airfields and radar sites. Assuming that the RAF's defensive concentration and focus would only be toward the south, the Luftwaffe launched massive air strikes from Air Fleet 5 in the north as well as minor raids from Air Fleets 2 and 3. To their surprise the RAF was waiting in the north with significant resistance. The resistance stemmed from the ability to track enemy forces via radar and direct concentrated fighter intercepts. During the air battles,

⁵⁶ Hough and Richards, *Battle of Britain*, 153.

⁵⁷ Bungay, *Most Dangerous Enemy*, 207.

⁵⁸ Hough and Richards, *Battle of Britain*, 158.

the Luftwaffe had 69 aircraft destroyed and 31 significantly damaged, while Fighter Command had 34 aircraft destroyed and 39 damaged. The total aircraft lost was relatively equal since the RAF had another 29 aircraft destroyed and 23 damaged on the ground.⁵⁹ To date the Luftwaffe had lost 403 aircraft while the RAF had lost 253. On 19 August the Luftwaffe paused from their offensive operations due to exhaustion and weather, giving them an opportunity to reevaluate their strategy.⁶⁰ Goering gathered his Air Fleet leaders together to critically examine their strategy and operations.

The previous week of fighting had cost Germany nearly 300 aircraft compared to only 200 losses the previous month.⁶¹ The Luftwaffe leaders initially focused on escort tactics and then addressed bomber procedures. Due to the significant number of bomber losses, the bomber crews requested closer escort protection from the fighters. Goering agreed and ordered strict escort procedures. Instead of free-hunting sweeps, fighters had to remain near the bombers they were escorting. Bomber formations were also reduced in size while the escort fighter ration was increased in numbers. It was determined that at least two Me 109 groups were required to protect a single bomber unit. Additionally, any extra fighters available were given freedom of movement for airspace sweeps prior to attacks from the bomber strike forces. Although they expected the decision to weld Luftwaffe fighters to bombers to improve protection, pilot casualties actually increased. Goering and his commanders also addressed targeting. Since radar sites were difficult to strike and past attacks had proven unsuccessful, the Luftwaffe decided to abandon attacking radar stations.⁶² They were unaware of all the RAF Operation Rooms and Sector Stations and did not recognize the importance they played in commanding and controlling Fighter Command. Instead, they considered Fighter Command's airfields as the hub of the battle and they decided to concentrate their efforts on attacking them.⁶³

Airfields

Goering directed the Air Fleet Commanders to place British fighter airfields at the top of the target list. He directed five weeks of day and night 'ceaseless attacks' in

⁵⁹ Bungay, *Most Dangerous Enemy*, 231.

⁶⁰ Bungay, *Most Dangerous Enemy*,

⁶¹ Bungay, *Most Dangerous Enemy*, 232.

⁶² Hough and Richards, *Battle of Britain*, 220.

⁶³ Bungay, *Most Dangerous Enemy*, 232-234, 285.

preparation for the invasion now scheduled for 15 September.⁶⁴ Bomber Command airfields were only to be targeted if there was little risk of aircraft loss. Additionally, aircraft industries were only to be attacked with minimal forces during bad weather or night-time raids. The Luftwaffe's airfield strategy was designed to accomplish two things – force the RAF into the air and to render their bases unusable. The Luftwaffe did not discuss how the bombing of airfields would affect Fighter Command operations or how a bomber should effectively target these airfields.⁶⁵ Pilots did not know if they should concentrate their weapons on the grass landing strips or on the support equipment or the buildings associated with each airfield.⁶⁶ Over the next few weeks the Luftwaffe launched day and night heavy attacks without pause against fighter airfield targets. Between 12 August and 6 September, they executed a total of 53 main attacks on airfields.⁶⁷ A relatively small number of aircraft were destroyed on the ground and as the RAF began to camouflage and disperse their planes the numbers reduced significantly. In fact, only 56 aircraft were destroyed on the ground and 46 of them in the first week of airfield attacks.⁶⁸

The British established airfield repair units to ensure that damage was quickly fixed and operations resumed. Due to these repair operations, most of the bombed airfields experienced only limited interruptions to their flying operations. For example, after Manston Field was attacked approximately 350 men were able to return it to operational status by the end of the following day. It was later attacked five times in a 24 hour period and remained closed for only two days.⁶⁹ The Luftwaffe repeatedly attacked Eastchurch Field with the intention of destroying one of Fighter Command's central airfields; in reality it was only an emergency airfield for Coastal Command.⁷⁰ The airfields closest to the coast suffered the most severe bombing. By the end of August the Luftwaffe thought they had destroyed eight airfields and severely degraded most of the other ones. In reality, only 13 airfields experienced significant attacks and the RAF only lost operational use of three of them for a short duration.

⁶⁴ Overy, *Myth and Reality: Battle of Britain*, 75.

⁶⁵ Bungay, *Most Dangerous Enemy*, 234.

⁶⁶ Bungay, *Most Dangerous Enemy*, 236.

⁶⁷ Overy, *Myth and Reality: Battle of Britain*, 75.

⁶⁸ Overy, *Myth and Reality: Battle of Britain*, 76.

⁶⁹ Overy, *Myth and Reality: Battle of Britain*, 77.

⁷⁰ Hough and Richards, *Battle of Britain*, 226.

The RAF also adapted its air defense to counter the Luftwaffe's evolving targeting strategy. Fighter Command moved a large number of aircraft from outer coastal airfields inland. Protection for these inland airfields was shared by fighters from 10 and 12 Groups, while 11 Group fought the attacking Germans in separate waves. Additionally, RAF fighters were ordered to only intercept German fighters over the land to avoid the high concentration of enemy fighters over the Channel.⁷¹ These defense measures were relatively successful; however, the Luftwaffe strategy of airfield attacks proved somewhat disruptive. The cumulative impact of the day and night bombing had 'a serious effect on the fighting efficiency of the fighter squadrons' and severely disrupted their defensive capabilities and operations.⁷²

The British faced nearly unsustainable pilot casualties. Replacement pilots were barely trained in time to keep pace with the losses. One in five squadron commanders and one in three flight commanders were either killed or wounded, and novices were being shot down at an alarming rate.⁷³ In fact, the RAF was better able to replace damaged or destroyed aircraft, due to a healthy aircraft production system, than pilots. The ability to train and replace a pilot was highly problematic and almost broke the RAF. The RAF could only endure another few weeks of airfield attacks before Fighter Command would have had to withdraw from southern England.⁷⁴

However, the Luftwaffe was also experiencing heavy losses. Although they lost significant pilot experience throughout the campaign, their loss of available combat aircraft was more critical.⁷⁵ By early September, they had already lost nearly 57% of their combat planes.⁷⁶ Their inability to gain control of the air over southern England and their high aircraft loss rate lead them to search for a new air strategy. They decided to shift targets from airfields to communication, industry, and cities. This change in strategy ultimately benefited the RAF and gave their pilots and airfields relief from constant Luftwaffe attack.

⁷¹ Overy, *Myth and Reality: Battle of Britain*, 78.

⁷² Overy, *Myth and Reality: Battle of Britain*, 85.

⁷³ Hough and Richards, *Battle of Britain*, 250.

⁷⁴ Hough and Richards, *Battle of Britain*, 248.

⁷⁵ Murray, *Luftwaffe Strategy for Defeat*, (Maxwell AFB, AL: Air University Press, 1983), 52. On 14 September the Luftwaffe had only 67% of its Me 109 crews operational; 46% for Me 110 crews; and 59% for bomber crews. A week later the numbers were 5% worse.

⁷⁶ Murray, *Luftwaffe Strategy for Defeat*, 54.

City Attacks

On the evening of 24 August, a small Luftwaffe bomber force attacked an oil terminal and missed. The bombs hit London and damaged St Giles church and other buildings.⁷⁷ In response, the British War Cabinet sanctioned Bomber Command to strike industrial targets in Berlin. Since May, Bomber Command had been trying to wage a strategic air offensive against Germany, but the new objectives were far beyond their normal reach and impact. Almost 24 hours after German bombs fell on the British capital 80 RAF bombers attacked Berlin. The RAF repeated these types of raids for the next three nights. Although the bombardment damages were relatively minimal, their moral effect was significant.⁷⁸ Hitler withdrew his ban of bombing London and ordered attacks on British cities, specifically London, in retaliation for RAF attacks on Berlin.⁷⁹ Goering ordered a shift in Luftwaffe strategy.⁸⁰

Massive Luftwaffe raids comprised of a couple hundred bombers and several hundred fighters were launched against London beginning on 7 September. Instead of breaking up to attack different Fighter Command airfields, the gorilla formations continued straight toward London. With forces from 11 Group awaiting airfield attacks and the amount of time it took 12 Group's Big Wing formation to get in position, the Luftwaffe successfully hit London's east side on their first couple of strikes on 7 September. They encountered little opposition. Opposition increased drastically in subsequent days. To increase bomber protection, the Luftwaffe fighters were ordered to fly in front and above the bombers and to weave in and out of their formations. These procedures increased fighter fuel consumption thus reducing their escort range and loiter time over London. Even before these procedures were implemented, the German fighters usually only had about 10 minutes of flight time over London before they had to return to base. Adding defensive scissor maneuvers at lower altitudes reduced their escort ranges and flight time even further.⁸¹

⁷⁷ Bungay, *Most Dangerous Enemy*, 305.

⁷⁸ Hough and Richards, *Battle of Britain*, 243.

⁷⁹ Hough and Richards, *Battle of Britain*, 244.

⁸⁰ Derek Wood and Derek Dempster, *The Narrow Margin: The Battle of Britain and the Rise of Air Power* 3rd Edition, 1990), 117. At the beginning of the battle, Goering issued a general order that limited targeting to 'destructive attacks against industry and air force targets' while a thorough study and effort was to be made 'to avoid unnecessary loss of life amongst the civilian population.'

⁸¹ Overy, *Myth and Reality: Battle of Britain*, 93.

Fighter Command adjusted their strategy to challenge the massive London bombing attacks. 11 Group typically launched six squadrons against the Luftwaffe's first wave of bombers, eight more squadrons against the second wave, and the remaining squadrons against the third wave. These defensive forces faced a heavily escorted German force in southern England, while 12 Group would mass in their big wing and intercept less defended German forces closer to London. To better protect the capital, all the fighters on the coast were relocated to airfields closer to London. These changes reduced Fighter Command's loss rate and improved their odds against Luftwaffe bombers. 15 September was an especially deadly day for the Luftwaffe. They sent approximately 200 bombers accompanied by a heavy fighter escort for an early raid followed by a 475 bomber force raid later in the day. Both of these raids were met with nearly every available British Hurricane and Spitfire. Although a majority of the bombers reached London in the morning, due to poor visibility and enemy pressure they scattered their bombs throughout the city. Since the majority of German fighters could not escort their assigned bombers to their targets before they had to turn around, the afternoon wave experienced higher bomber losses. At the end of the day, the German's lost 32 bombers and 24 fighters while the British lost 30 fighters.⁸²

The battle significantly turned when the Luftwaffe changed their air strategy from fighter airfields and industry to city attacks, specifically London. During the week of 7 to 15 September the German Air Force lost 298 aircraft, 99 fighters and 199 bombers; while the British Fighter Command lost 120 aircraft. On 18 September the German's launched their last major daylight raid when approximately 70 bombers attacked London and suffered significant losses. In the face of mounting losses in men and aircraft, the Luftwaffe bomber force switched from day to night-time bombing for the remainder of the conflict.⁸³ Nonetheless, they remained in the attack mode. They flew 24 attacks on London in September and at least one attack every night throughout the month of October. Although day missions produced unacceptable losses, night missions made the targets difficult to hit and the Luftwaffe had limited success.⁸⁴ To maintain pressure on London and to wear down Fighter Command by forcing it to engage in the air, the

⁸² Bungay, *Most Dangerous Enemy*, 319,333.

⁸³ Overy, *Myth and Reality: Battle of Britain*, 95-96.

⁸⁴ Hough and Richards, *Battle of Britain*, 292.

Luftwaffe executed day attacks with converted fighter-bombers for the remainder of the campaign. These aircraft were more maneuverable, had greater self-protection, and carried a single 500 pound bomb.⁸⁵

Fighter Command launched standing defensive patrols of high-flying Spitfires to counter the Luftwaffe's new approach. These patrols would bait German pre-strike fighter sweeps and fighter-bomber attacks. Once the enemy was located, Hurricanes from lower altitude would also perform an intercept, thereby presenting a high-low defense.⁸⁶ British anti-aircraft artillery became the primary method of night-time defense. They relocated guns from other positions to concentrate firepower in London. Bomber Command also increased its attack on German forces in the Channel during the month of September. In one month they flew over 1,600 bomber sorties against invasion ports; concentrating their attacks primarily on transports and barges during the last two weeks. In those two weeks they were successful in destroying 21 of 168 transports and 214 of 1,697 barges, eliminating 12% of the German transports and barges.⁸⁷

By the end of September it was clear that the Luftwaffe's ability to gain control of the air over southern England was severely diminished, if it ever existed. However, there was never any official recognition that the battle was over. The Luftwaffe kept flying and bombing; therefore, the RAF kept flying and defending. There were air activities and sporadic day bombings from October to December. The Luftwaffe turned to night bombings which highlighted weaknesses in the British night defense capability. In fact, the night attacks intensified which ultimately cost the lives of over 50,000 British civilians.⁸⁸ As the days passed and the winter approached, German barges and tugs began to disperse from the French ports and on 18 December 1940 Hitler issued Directive 2. The German invasion of England was postponed indefinitely. The RAF's fight against the Luftwaffe for control of the air over England finally dissipated.

The German Luftwaffe was virtually nonexistent six years before the Battle of Britain began, but by the spring of 1940 it boasted a force level of almost 500,000 troops

⁸⁵ Overy, *Myth and Reality: Battle of Britain*, 106.

⁸⁶ Overy, *Myth and Reality: Battle of Britain*, 107.

⁸⁷ Hough and Richards, *Battle of Britain*, 294.

⁸⁸ Korda, *Wings Like Eagles*, 283.

and an inventory of more than 4,000 combat aircraft.⁸⁹ At the start of hostilities they had already developed a reputation as a dominant air power, albeit a tactical one focused on supporting their army's *blitzkrieg* or 'lightning war' offensives, against western continental Europe. Luftwaffe records reveal that RAF fighter aircraft were regarded as the primary focus of the battle. They wanted to attract and destroy, or at least damage, as many British fighters at one time as possible. They wanted to make an impression of German fighter superiority and aircraft strength.⁹⁰ As the battle began, the Luftwaffe's goal was to destroy the British fighters by attacking their airfields and aircraft factories as well as destroying them in the air. Not long after operations began, the Luftwaffe even used its own bombers to bait RAF fighters into the air. According to post-war interrogations of German air leaders, "Whether the objectives were convoys in the Channel or airfields inland, or London, the object was always the same – to bring the defending [RAF fighter] squadrons to battle to weaken them."⁹¹ This was accomplished in a variety of ways.

A few times during the battle Hitler and Goering issued strategic guidance that was not necessarily consistent with their campaign objectives. For example, at the beginning of hostilities they instructed the Luftwaffe to attack ports and British convoys in the Channel after they provided strategic guidance to attack coastal defenses, radar sites, communications, troop concentrations, and naval installations. Even though the primary campaign objective was to mitigate RAF fighter command and gain air superiority over southern England, plans to accomplish this were not initially issued. The Luftwaffe received orders to attack the entire RAF structure and its supporting industries. Thus the plan to attack airfields near the coast and gradually work inland did not begin until the second week of August.⁹² When they did not immediately see desired results from attacking airfields, they placed a last gasp hope on attacks against England's capital city.

The British defense during the Battle of Britain has many facets. The first and most important part was their effective command and control structure. It was the center

⁸⁹ Bungay, *Most Dangerous Enemy*, 107.

⁹⁰ Derek Wood and Derek Dempster, *The Narrow Margin: The Battle of Britain and the Rise of Air Power 1930-1940*, (Westport: CN, 1961), 412.

⁹¹ Overy, *Myth and Reality: Battle of Britain*, 60.

⁹² Overy, *Myth and Reality: Battle of Britain*, 61-62.

of the RAF's defensive strength. In fact, the defense strategy was prepared and implemented through an effective integrated air defense system. It was designed to detect, collect, combine, and disseminate information enemy air information in addition to task from Fighter Command headquarters. It enabled RAF leadership to centrally command and control units across the entire British Isles with an overview of the air battle.

All of the RAF's operational Commands, including some aircraft and instructors from Training Command, were involved in defending against German air attacks. Fighter Command was tasked, with the support of ground defense forces, to prevent the Luftwaffe from obtaining control of the air over England while protecting RAF airfields and other vital military targets. Their priority of targets were first, enemy transport carrying men or supplies; second, bombers; third, high-flying reconnaissance aircraft; and fourth, enemy fighters attacking RAF bombers. British fighters were to concentrate on bombers because they were more expensive to produce and they carried a highly trained crew making it harder to replace than a single fighter pilot.⁹³ During the early weeks of the battle when the Luftwaffe targeted naval ships traversing the English Channel, British fighters armed with cannon and machine guns also provided defensive patrols for convoy protection.⁹⁴

The main weight of effort for Fighter Command's air defense strategy rested on 11 Group. Their defense strategy was designed around the basic tactical unit, the squadron. Instead of executing large, single defense formations, they launched squadron-size intercepts. It was a simple and responsive strategy. It also reduced the risk of suffering a major defeat while placing RAF fighters in a target rich environment. Perhaps most important of all, it disrupted the Luftwaffe's offensive operations because the enemy was exposed to continuous fighter attacks. Once Luftwaffe bombers crossed the coastline they were subject to attack and their escort fighters were forced to engage with the RAF. The intent was to inflict a series of small hits that would build into an unsustainable loss-rate that German bomber forces could not sustain.

⁹³ Michal Korda, *With Wings Like Eagles*, (New York: NY, 2009), 125.

⁹⁴ Overy, *Myth and Reality: Battle of Britain*, 48.

Fighter Command tried to disrupt German formations. Once enemy aircraft were stripped from their formations they were attacked one by one. This strategy made it difficult for bomber commanders to restore formation integrity and fly their planned attack routing and profiles.⁹⁵ If more than one British squadron scrambled and intercepted simultaneously, the Hurricanes engaged the bombers while the faster and more agile Spitfires tangled with the fighter escorts.⁹⁶ The strategy was to surprise and confuse the Luftwaffe, while hiding the fact that the British defense's most important aspects was the radar and ground control network.

Coastal Command and Bomber Commands also played critical roles in supporting RAF strategy. Coastal Command was primarily tasked to fly reconnaissance. It flew roughly 40 visual reconnaissance sorties. Bomber Command was assigned to degrade German invasion forces, German industry, and Luftwaffe air forces with long-range strikes. Coastal Command performed almost all of its reconnaissance over France in search of potential build-ups areas preparing for a possible German invasion operation. Coastal Command also protected British convoys in the Channel and attacked German shipping operations. They provided anti-ship patrols from Norway to the Channel ports.⁹⁷ Initially, Bomber Command supported the British strategy by striking oil and communication targets in the Ruhr area in accordance with strategic bombing doctrine. Due to heavy losses, they executed the majority of their missions at night. The Luftwaffe airfields in France and aircraft industries in Germany were next added to Bomber Command's target list. Bombers were also assigned to target industry in Berlin. As the possibility of a German invasion increased, they refocused their attacks on Channel assembly ports, ships, supply, and embarkation areas.⁹⁸

In the end, Britain won the battle. Whether this was because the Royal Air Force won, or the Luftwaffe lost, became a primary consideration for the American air observers dispatched to the Battle of Britain.

⁹⁵ Korda, *Wings Like Eagles*, 124.

⁹⁶ Bungay, *Most Dangerous Enemy*, 135.

⁹⁷ Bungay, *Most Dangerous Enemy*, 91.

⁹⁸ Hough and Richards, *Battle of Britain*, 112; Bungay, *Most Dangerous Enemy*, 92. Even though Bomber Command and Coastal Command only flew 9, 180 sorties from July to October, they were critical elements in RAF strategy.

Chapter 2

The Disposition of American Airmen

The creed of the bomber, the rallying cry on which our entire doctrine evolved, was phrased by Lt. Kenneth M. Walker, the bombardment instructor [at the Air Corps Tactical School]. It was carefully worded and was approved by the faculty of the school as accepted doctrine. It said – ‘A well planned and well organized air attack once launched cannot be stopped.’

*--Major General Haywood S. Hansell Jr.
The Air Plan That Defeated Hitler*

The observers that General Henry “Hap” Arnold sent to Europe to report on the 1940 air battle over the British Isles were products of US Army Air Corps culture. In common with most of their peers, they were airpower advocates who were involved in the development of the dynamic and evolving airpower doctrine in the US during the interwar years. Although many of the Air Corps’ airpower ideas and doctrines stemmed from past aerial experiences, the leading concepts grew from the academic logic and air-minded imaginations of airpower’s promise and potential in future wars. US airmen viewed airpower as one of the primary weapons in modern warfare. They also believed heavy, long-range strategic bomber was airpower’s primary instrument and warfare’s most decisive weapon. For them, the bomber was different from any other war instrument of the past. It provided the speed, mobility, range, and firepower to destroy an entire nation from the inside out rather than slowly defeating a nation from the outside in.¹ A myriad of incidents and aspects shaped the Army Air Corps culture during the interwar period, but three trends were paramount: the desire to establish an independent air force, the development of a strategic bombing doctrine, and the importance of a long-range heavy bomber aircraft.² While the desire for greater independence undergirded

¹ Lieutenant Colonel Peter R. Faber, “Interwar US Army Aviation and the Air Corps Tactical School: Incubators of American Airpower,” in *The Paths of Heaven: The Evolution of Air Power Theory*, ed. Col Phillip S. Meilinger (Maxwell AFB, AL: Air University Press, 1997), 184.

² Wesley Frank Craven and James Lea Cate, *The Army Air Forces in World War II: Plans and Early Operations, January 1939 to August 1942, Vol 1*, (Chicago, IL: The University of Chicago Press, 1948), 17.

organizational changes and aircraft acquisitions, it was the airmen's ideas, concepts, and theories of strategic bombing that had the greatest impact on the Air Corps' organizational culture and doctrinal teachings.

At the end of World War I, US Airmen had a different perspective of airpower than the Army's War Department General Staff. The General Staff viewed airpower as an auxiliary element of the ground forces. They saw it as an important enabler for successful land operations. According to them, close-observation and reconnaissance were airpower's most meaningful contributions. Airmen, however, thought airpower should be utilized as a major component in warfare. They considered control of the air and the potential of air bombardment as critical capabilities for future conflicts. Although not every airman argued that aviation should become a separate service with the same status as the land and sea services, nearly every airman agreed that the Air Service should be more than a mere auxiliary arm to the ground forces. A draft of the 1921 Air Services Field Officers School manual, considered by many to be the Air Force's first doctrinal manual, states, "In deriving the doctrine that must underlie all principles of employment of the air force, we must not be guided by conditions surrounding the use of ground troops, but must seek out our doctrine...in the element in which the air force operates."³ Although the Air Service and Air Corps were limited in their ability to issue official War Department doctrine, their dedication to improving and establishing effective airpower ideas, concepts, and theories was the source from which US air doctrine developed. When the observers departed for Europe the primacy of the bomber and the concept of strategic bombardment was the dominant feature of Air Corps culture.

However, immediately following World War I air operations centered on gaining and maintaining control of the air via pursuit aviation. Air superiority was readily accepted as an essential mission enabler for successful ground and air operations.⁴ Since pursuit aviation was the means air forces used to destroy enemy aircraft and achieve control of the air, it was viewed as the Air Service's primary element. Pursuit aviation

³ William Sherman quoted in Robert Frank Futrell, *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force 1907-1960*, (Maxwell AFB, AL: Air University Press, 1989), 4.

⁴ Thomas H. Greer, *The Development of Air Doctrine in the Army Air Arm 1917-1941*, (1955; reprint, Washington, D.C.: Office of the Air Force History, 1985), 8.

was at the center of airpower. Thus airpower theories and doctrines began to emerge regarding its execution. Pursuit aviators concluded that gaining air superiority through successful pursuit missions stemmed from offensive actions.⁵ Defensive pursuit operations, which consisted of close-escort protection and aerial barrage techniques, had proven lethal and unsound during air operations in World War I. Aviators argued that there were numerous advantages to offensive pursuit strategies over defensive ones. Offensive pursuit, such as detached escort and area sweep, maximized surprise, maneuverability, and mass against the enemy. Additionally, by advancing pursuit doctrine and tactics the Air Service gained a measure, however small, of independence from the land forces. This is because pursuit aviation was a mission outside the objectives of the ground forces, yet critical to their success. Since pursuit protected both the ground forces and other air force elements from hostile enemy attack, it was a main focus of the Air Service and was a priority class at the Air Service Tactical School.⁶ Although pursuit aviation remained the basic air focus during the Air Service era, its influence diminished and US airpower doctrine gradually shifted toward strategic bombing.

Although Brigadier General William “Billy” Mitchell recognized pursuit aviation’s leading role in the Air Service following World War I, by the early 1920’s he began pushing for the development of air bombardment.⁷ He believed that the primary value of airpower was in its potential to “hit an enemy’s great nerve centers at the beginning of the war so as to paralyze them to the greatest extent possible.”⁸ Mitchell also advanced the theory of strategic bombardment to demonstrate the need for an independent air service. He realized that if the Air Service were to mature into an independent military branch, airmen needed to either create new roles unique to airpower or seize responsibilities from the Army or Navy.⁹ In an attempt to display the effectiveness of airpower against naval vessels, Mitchell set up an exercise in 1921 to sink the battleship *Ostfriesland*. Although it demonstrated airpower’s bombing

⁵ Finney, *History of Air Corps Tactical School*, 29.

⁶ Colonel Wray R. Johnson, in Introduction William C. Sherman, *Air Warfare*, (1926; reprint, Maxwell AFB, AL: Air University Press, 2002), xv.

⁷ Greer, *Development of Air Doctrine*, 9.

⁸ William Mitchell quoted in Greer, *Development of Air Doctrine*, 9.

⁹ Faber, “Interwar US Army Aviation,” in *Paths of Heaven*, 191.

capability, it was not until the mid-1920s that strategic bombing gained significant momentum. However, Mitchell's demonstration did two critical things in advancing strategic bombing. First, it displayed the kinetic striking power of the bomber. Second, and more importantly, it lit the spark which eventually helped the Air Service acquire a national security mission, the mission of US coastal defense and long-range reconnaissance.

The Air Service looked to restructure its force to better fulfill the new coastal defense mission. Chief of the Air Service, Major General Mason M. Patrick, designed a plan to reduce the material and training emphasis on air auxiliary missions and recommended the Air Service focus its attention on the primary missions of pursuit and long-range bombardment.¹⁰ In March 1923, the War Department appointed a board to study the Air Service's plan. The Lassiter Board agreed with Patrick and formally recognized two distinct functions of airpower, the air service and the air force. These distinctions were important because it separated army auxiliary functions (air service) from other independent airpower operations (air force). The board also acknowledged that the Air Service needed its own Air Force to execute its independent air missions.¹¹ Furthermore, the Lassiter Board recommended the Air Service control its own annual budget and acquisition process to help the Air Service reverse its current aircraft shortage and budget shortfalls.¹²

Although the Lassiter Board's recommendations never became legislation, the Board had a significant impact on the Air Service. The Board's recommendations not only influenced the War Department, but swayed government officials to examine the current air organization. Consequently, in March 1924, the House of Representatives established the Lambert Committee to analyze the recommendations and review national air policy. The Lambert Committee agreed with the Lassiter findings and recommended a more independent air force. Committee members supported "the full use of aviation for

¹⁰ Futrell, *Ideas, Concepts, Doctrine*, 42.

¹¹ Greer, *Development of Air Doctrine*, 26.

¹² Futrell, *Ideas, Concepts, Doctrine*, 42.

the defense of the country” and concluded that the US “can have no adequate national defense without an adequate Air Force.”¹³

Before the congressional report was published, the Secretaries of War and Navy requested President Calvin Coolidge appoint another board to study the best methods of integrating airpower into national defense. The President agreed and convened the Morrow Board. For many airmen, the most significant part of the Morrow Report was the way in which it downplayed the necessity of an independent air force for national defense, though it did recommend the creation of an Air Corps. The Air Corps was designed to be an independent organization within the Army to unify aviation, provide special representation on the General Staff, and to recognize the function and missions of separate air force operations.¹⁴ Once the 1926 Air Corps Act passed, the evolution of air bombardment ideas and doctrine along with aircraft procurement and modernization began to flourish.¹⁵

There are a number of organizations that contributed to the culture of the Army Air Corps and its air theories and doctrines, but the Air Corps Tactical School (ACTS) had the greatest impact.¹⁶ The school, located first at Langley Field Virginia, and later at Maxwell Field, Alabama, was the hub of American airpower theory, doctrine, and tactics development. Although it was initially established to train officers for command and staff responsibilities, it provided a venue to develop and progress airpower ideas and concepts. There were a variety of airpower ideas circulating in the Air Corps during the interwar period. However, ACTS instructions and publications had the most significant influence. In fact, the 1932 Commandant, Lieutenant Colonel John F. Curry, maintained that ACTS was “a clearing-house into which tactical ideas can flow, where they can be tried and where the doctrine can go out to the service to be put into practice and be evaluated.” He believed the school occupied “a position of utmost importance in the development of the Air Corps because of its permanent effect upon our own officers and those of other branches.”¹⁷ Equally significant, a large number of ACTS instructors and

¹³ “Lampert Committee Report” quoted in Greer, *Development of Air Doctrine*, 26 and David E. Johnson, *Fast Tanks and Heavy Bombers*, (Ithaca, NY: Cornell University Press, 1998), 88.

¹⁴ Greer, *Development of Air Doctrine*, 29.

¹⁵ Johnson, *Fast Tanks and Heavy Bombers*, 90.

¹⁶ Faber, *Interwar US Army Aviation*, 211.

¹⁷ Lieutenant Colonel John F. Curry quoted in Johnson, *Fast Tanks and Heavy Bombers*, 155.

graduates served in key leadership and organizational positions within the Air Corps. Thus, ACTS teachings were not only an integral part of doctrinal development, but also in operational and tactical execution at multiple levels. In fact, at the end of World War II, 261 of the 320 general officers in the Army Air Force were ACTS graduates. Moreover, two thirds of the officers had graduated within five years of the beginning of the war, when strategic-bombing was the school's primary focus.¹⁸

Whereas ACTS closely followed the airpower opinions of the General Staff at the beginning of the 1920s, by the mid-to-late 1920s the emphasis turned to independent operations and bombardment aviation. Most airmen felt that the General Staff had repressed airpower's warfare potential and they were ready to show airpower's decisive role; they placed bombardment at the top of the list to prove it. Moreover, the Tactical School began to teach that it was futile to try and stop enemy air attacks through air to air combat. The ACTS text, *The Air Force* stated, "A strong hostile formation of bombardment or attack is likely to reach its objective before being intercepted and attacked by our pursuit. Even if attacked, unless by overwhelming numbers, it is likely to reach its objective."¹⁹ Since they did not believe that pursuit aviation could guarantee security from an enemy air attack, bombardment became the only way to gain and maintain air superiority. The Air Corps deduced that the only effective way to ensure control of the air was by destroying hostile aircraft before they could take off.²⁰ Moreover, bombing could also be used to attack important ground targets directly without having to engage with the enemy. Since airpower provided the characteristics of speed, flexibility, range, firepower, and independence of land or sea limitations, US airmen began to emphasize bombardment operations.

The Air Corps viewed bombardment as the optimum utilization of airpower. Aerial bombardment provided an unmatched warfare capability. In spring 1928, the ACTS commandant sent a paper to the General Staff for approval entitled, "The Doctrine of the Air Force." It stated, "The objective of war is to overcome the enemy's will to resist, and the defeat of his army, his fleet or the occupation of his territory is merely a

¹⁸ Finney, *History of Air Corps Tactical School*, 25.

¹⁹ Air Corps Tactical School, *The Air Force*, (Maxwell Field, AL: Air Corps Tactical School, 1930), 73, AFHRA 248.101-1.

²⁰ Finney, *History of Air Corps Tactical School*, 31.

means to this end and none of them is the true objective. If the true objective can be reached without the necessity of defeating or brushing aside the enemy force on the ground or water and the proper means furnished to subdue the enemy's will and bring the war to a close, the object of war can be obtained with less destruction and lasting after effects than has heretofore been the case. At present the Air Force provides the only means for such an accomplishment."²¹ This soon became the dominant theme of ACTS and the eventually the entire Air Corps. In fact, a 1931 ACTS manual stated, "victory is practically assured to the commander whose air force has gained and can maintain control of the air, even if his ground forces are merely equal or somewhat inferior to those of his enemy."²² *Bombardment Aviation*, another ACTS text from 1931, stated that bombardment aviation "forms the nucleus around which the Air Force is organized."²³ Bombardment had become the basic aspiration of the Air Corps, and when the Air Corps acquired the mission of national coast defense (that same year) the theory of long-range strategic bombing took hold and became a doctrinal reality.²⁴

The new mission of coastal defense and long-range reconnaissance provided the Air Corps with the rationale to design long-range aircraft and to explore and fully develop the doctrine of strategic bombardment.²⁵ To defend the national coasts, airpower advocates argued the importance of bomber aircraft intercepting and striking invading naval fleets. These advocates further expanded the mission of naval fleet destruction into offensive missions against an adversary's homeland via strategic bombing. Bombing advocates applied the mission of national coastal defense as an excuse to create an offensive airpower doctrine. Thus the Air Corps ideas and concepts of strategic bombardment became an integral component of national defense and the War Department began to produce larger planes including bomber prototypes.²⁶ Congress

²¹ Craven and Cate, *Army Air Forces in World War II*, 46.

²² Craven and Cate, *Army Air Forces in World War II*, 46.

²³ Air Corps Tactical School, *Bombardment Aviation*, (Maxwell Field, AL: Air Corps Tactical School, 1931), 17, AFHRA 248.101-8A.

²⁴ In January 1931 the Army and Navy agreed on the responsibilities of coastal defense; the Air Corps would "employ as an element of the army in carrying out its missions of defending the coasts, both in the homeland and in overseas possessions." quoted in Tami Davis Biddle, *Rhetoric and Reality in Air Warfare: The Evolution of British and American Ideas about Strategic Bombardment, 1914-1945*, (Princeton, NJ: Princeton University Press, 2002), 143.

²⁵ Biddle, *Rhetoric and Reality*, 144.

²⁶ Faber, *Interwar US Army Aviation*, 202-203.

also began to expand significantly Air Corps appropriations.²⁷ The long-range strategic bombers were viewed, not only within airpower circles, as the primary method of projecting power and defending US territory from enemy attacks.²⁸

Concurrent with developments in aircraft and missions, the Air Corps began advocating a warfare theory that differed from a traditional focus on fielded forces. Whereas past military doctrines focused mostly on an enemy's armed forces, airpower advocates proposed a theory that matched airpower's capabilities against an enemy's national structure. Before air power existed, an adversary's strategic targets were typically not considered realistic objectives because of the limited mobility and striking capability of ground forces. Consequently, ground armies were forced to fight an enemy's armed forces in decisive battle. The annihilation of enemy forces was designed to break the adversary's will to fight, thereby forcing surrender.²⁹ Airmen argued that the real purpose of war was to make the enemy submit to your will, and airpower provided the quickest and most efficient way of doing this. Airpower had the ability to disrupt national life. In fact, the Tactical School published an *Employment of Combined Air Force* manual in 1926 that asserted an adversary's capital, commerce, industrial centers, and resources should be considered proper military targets.³⁰ Airpower provided the speed, mobility, range, and firepower necessary to bypass armies and navies and strike national infrastructure targets. According to the Air Corps, the national morale and national industry was just as important, if not more important, than defeating an adversary's army. They viewed aerial bombardment's impact on enemy's population and production facilities as the easiest and cheapest way to win a war.³¹ Airpower could strike a nation's vital centers instead of conducting exhausting wars of attrition against its ground forces to achieve the same objective, adversary surrender.

Lieutenant Colonel Donald Wilson, director of the Air Tactics department at ACTS, wrote about this new kind of war in a letter to his colleague, Major Muir S. Fairchild, "Air warfare requires an entirely different approach. It requires thinking which can grasp the object of war and a realization that any nation's war potential is basically

²⁷ Biddle, *Rhetoric and Reality*, 145.

²⁸ Faber, *Interwar US Army Aviation*, 204.

²⁹ War Department, *1923 Field Service Regulations*, in Finney, *History of Air Corps Tactical School*, 30.

³⁰ Finney, *History of Air Corps Tactical School*, 30.

³¹ Greer, *Development of Air Doctrine*, 51.

rooted in the people in the nation's home territory. Any method which causes the people to prefer the terms for peace to continued suffering is effective. The airplane with the proper military intelligence provides a means which can reach these people immediately upon the outbreak of hostilities...Such action on the part of the enemy may cause such disruption that we have no other course except sue for peace."³² The Air Corps believed that airpower doctrine and force structure should be established on the basis of this kind of warfare. Bombers should be used in an offensive manner to strike a belligerent nation's national strategic targets. The Air Corps manuals stated that, "the specific objective for the offensive will be selected only as the result of a careful and complete scientific analysis that would evaluate the effects upon the [enemy's] economic system."³³ Although the new doctrine of strategic bombing was not founded on experience, it was based on air-minded expectations and seems academically logical. It took root and began to grow.

In 1933, Wilson established a bombing theory that claimed to disrupt the fabric of a nation's economy. He argued there were certain targets which should be designated strategic bombardment objectives. He believed the destruction of these targets would cripple an enemy's economy. As a civilian, Wilson worked with the railroads and understood the importance of vital links. The inoperability of a few vital links on a railroad would disrupt and potentially shut down the entire system. He applied this reasoning to an enemy's national industry. If bombers could destroy a few vital links within an enemy's economy, he believed the economic interdependence would cause the enemy to falter.³⁴ This idea resonated with airpower advocates, in part because airmen had recently experienced a disruption in the manufacture of a new aircraft: a newly acquired aircraft was inoperable because a manufacturer had not produced enough highly specialized springs for the controllable-pitch propellers, since the only factory manufacturing the springs had been affected by a flood. The theory of strategic node targeting along with the recent experience of the propeller-spring problem became the

³² Lieutenant Colonel Donald Wilson, quoted in Greer, *Development of Air Doctrine*, 78.

³³ Air Corps Tactical School, *The Air Force*, (Maxwell Field, AL: Air Corps Tactical School, 1934-1935), AFHRA 248.101-2.

³⁴ Finney, *History of Air Corps Tactical School*, 31.

foundation of strategic bombardment target selection.³⁵ Within the Air Corp the interruption of an enemy's industrial-web via strategic bombing was considered the primary objective of air warfare.

Even though the Air Corps' main emphasis was on dislocating an enemy's national structure, they also gave attention to targeting the adversary's air force. In fact, counter-air force attacks were almost as important as the national industrial-fabric objective.³⁶ Airmen perceived the destruction of "troops, supplies, lines of communication, and transport concentration centers" as the third objective for airpower.³⁷ Hence, the Tactical School continued to push the doctrine of strategic bombardment of an adversary's morale and national industrial infrastructure. A fundamental principle of the industrial fabric theory stated that an air force should continue to attack a specific node until it is completely destroyed before progressing on to another objective.³⁸

The industrial fabric theory and the national security requirements of airpower melded together with aeronautical technological developments to strengthen the doctrine of long-range strategic bombing. In fact, technology played a central role in the development of US airpower doctrine in the 1930s. The technological advancements and performance improvements of new aircraft stimulated the development of strategic bombardment theories. They also guided Air Corps aircraft procurement tendencies. Bombers not only had greater range than other aircraft, they were also faster, bigger, and armed with self-defense systems. With the operational capabilities of the Boeing B-9 and the Martin B-10 bombers, advocates began to believe that the speed, altitude, and armament of bombers would enable them to survive daylight operations without fighter escort.³⁹ Consequently, the Air Corps ordered relatively large quantities of both bomber types. The improved capability of these two bombers opened new vistas to airpower and bombardment advocates exploited these capabilities.⁴⁰ Airman continued searching for technological advances in bomber lethality and survivability. The introduction of the

³⁵ Major General Haywood S. Hansell, quoted in Finney, *History of Air Corps Tactical School*, 32.

³⁶ Greer, *Development of Air Doctrine in the Army Air Arm 1917-1941*, 78.

³⁷ Finney, *History of Air Corps Tactical School*, 31.

³⁸ Finney, *History of Air Corps Tactical School*, 30.

³⁹ The Martin B-10s reached top speeds of 215 miles per hour which was only slightly slower than the fastest pursuit aircraft, the Boeing P-26, whose top speed was roughly 15 miles per hour faster.

⁴⁰ Futrell, *Ideas, Concepts, Doctrine*, 64.

revolutionary four-engine Boeing B-17 incorporated all the best aircraft improvements and developments since the construction of the B-2.⁴¹

The impact of the B-17 on the theory and doctrine of airpower was profound. For strategic bombing to be successful, bombers had to reach the target and return in spite of adversary counter air operations. Even though the B-17 was not an intercontinental bomber, its ability to attack deep inside an enemy's homeland far exceeded that of any other aircraft.⁴² The B-17's range, payload capacity, armament, service ceiling, and speed were impressive, even compared to the world's most advanced pursuit aircraft. Consequently, the necessity of pursuit aircraft diminished and importance of pursuit doctrine diminished. In fact, in the inaugural flight of the B-17 from Seattle, Washington to Dayton, Ohio the new bomber averaged 252 miles per hour, 17 miles per hour faster than the fastest Air Corp fighter.⁴³ Most Air Corps officers conveniently assumed that any pursuit aircraft that tried to make modifications to keep pace with the technological advancements of the new B-17 bomber would lose its fundamental pursuit characteristics, thus making it essentially useless for aerial war fighting.⁴⁴

During this period the Air Corps doubted the ability of pursuit aircraft to adequately control the air. The new technological advancements of the bombers led bomber enthusiasts to declare that nothing could stop the bombers and that pursuit-escort was unnecessary; but this was in part a self-fulfilling prophecy because pursuit aircraft were not receiving upgrades along with the bombers. These advocates also argued that only bombardment could gain complete control of the air. They saw the destruction of the enemy's air forces on the ground as the only way to truly ensure control of the air. Hence, bombers not only provided long-range strategic strike capability, it also ensured air superiority, which was an important enabler for ground, sea, and air operations. Thus the Air Corps began focusing on developing long-range bombers and strategic bombing doctrine. The majority of airmen embraced the concept of bomber invincibility. A portion of this perception came from the belief in bomber self defense. The mutual

⁴¹ Greer, *Development of Air Doctrine*, 46.

⁴² Craven and Cate, *The Army Air Forces*, 65-66.

⁴³ Maurer Maurer, *Aviation in the U.S. Army, 1919-1939*, (Washington D.C.: Office of Air Force History, 1987), 354.

⁴⁴ Finney, *History of Air Corps Tactical School*, 33.

support of close formation machine guns, the speed of the bombers, and their high operating altitudes provided unparalleled self defense at the time.⁴⁵

Although the majority of Air Corps Airmen were convinced that the bomber was invincible, some still argued for the necessity of a strong pursuit force.⁴⁶ Pursuit advocates maintained the importance of fighter aircraft in securing air superiority. They argued that pursuit's ability to destroy aircraft in the air was an essential aspect of the air superiority mission. Claire L. Chennault was one of the leading voices of pursuit aviation. Even after teaching at ACTS for five years (1931-1936), Major Chennault continued to argue for pursuit aviation. He highlighted its importance within US air strategy. Chennault viewed pursuit as a weapon of opportunity that could be employed offensively or defensively.⁴⁷ Even bomber advocates, such as Lt Col Millard Harmon, lamented the disparaging attacks at ACTS against the importance and necessity of pursuit aviation.⁴⁸ Eighth Pursuit Group Commander, Lieutenant Colonel A. H. Gilkeson, bluntly argued that the "recent academic tendency to minimize, if not entirely dismiss, the consideration of the [pursuit] fighting force as a powerful and extremely necessary adjunct of the air force has led to the teaching of doctrines which have not been established as being true and might even be fatally dangerous to our aims in the event of armed conflict."⁴⁹ Most of the pursuit advocates were more measured in their opinions. They simply thought pursuit was as important an element of airpower as bombardment.

Ultimately, pursuit advocates acquiesced and acknowledged that bombardment was the centerpiece of Air Corps operations; yet they did not stop improving pursuit operations.⁵⁰ Even though a 1931 airpower exercise umpire stated that "due to increased speeds and limitless space it is impossible for fighters to intercept bombers and therefore it is inconsistent with the employment of [the] air force to develop fighters," the pursuit advocates did not fold.⁵¹ The Air Corps Tactical School agreed and continued to teach

⁴⁵ Air Corps Tactical School, *Bombardment Aviation*, (Maxwell Field, AL: Air Corps Tactical School, 1931), 70, AFHRA 248.101-8A.

⁴⁶ Pursuit proponents argued that experience revealed the bomber was not invincible. DeWitt S. Copp, *A Few Great Captains: The Men and Events that Shaped the Development of U.S. Air Power*, (McLean, VA: EPM Publications, Inc., 1980), 318.

⁴⁷ DeWitt S. Copp, *A Few Great Captains*, 322.

⁴⁸ Biddle, *Rhetoric and Reality*, 168.

⁴⁹ Lieutenant Colonel A. H. Gilkeson, quoted in Futrell, *Ideas, Concepts, Doctrine*, 82.

⁵⁰ Futrell, *Ideas, Concepts, Doctrine*, 82.

⁵¹ Greer, *Development of Air Doctrine*, 59.

pursuit aviation for both offensive and defensive missions until late 1933.⁵² However, subsequent airpower maneuvers and exercises, designed to highlight bomber capabilities, diminished pursuit aviation support even more. Following a 1934 exercise at March Field, California, Arnold concluded that, “Pursuit or fighter airplanes operating from front line airdromes will rarely intercept modern bombers except accidentally. Such being the case, they can normally operate solely against other Pursuits or Observation and it is doubtful whether such operations justify their existence.”⁵³ Chennault wrote an eight-page line-by-line criticism of Arnold’s statement. He also refuted the unrealistic structure of the exercises and the tactics employed in demonstrating bomber invincibility. Although he continued to argue for pursuit aviation, he stated that, “bombardment missions will be of the utmost importance and pursuit will cooperate to the limit of its range in executing these missions.”⁵⁴

In an effort to identify the future role and requirements of pursuit aviation, Vice Chief of the Air Corps and former ACTS Commandant, General Oscar M. Westover convened an Air Corps Board in 1935. The board reported that the most efficient means of neutralizing an enemy air offensive was with attack operations against the bases that supported enemy operations. The board also recommended that friendly air defenses were necessary against hostile aircraft.⁵⁵ Ultimately, the board recommended that pursuit missions change from gaining control of the air to defending against enemy air operations. Pursuit advocates yielded. Eventually, pursuit aviators were trained to wait for enemy bombers and intercept them instead of seeking them out and destroying them in offensive operations. In other words, pursuit aviation changed from an offensive mission to a mission defensive in nature.⁵⁶

Bombardment thus became the fundamental mission for the Air Corps’ offensive air operations. Bomber advocates were so committed to the offensive capability of the bombers that they discarded the need and support of other airpower elements. A section from the 1935 ACTS Bombardment Manual instructed that, “During the time devoted to

⁵² Finney, *History of Air Corp Tactical School*, 38.

⁵³ Lieutenant Colonel Henry Arnold, letter to the Chief of the Air Corps, subject: Employment of Tactical Units Equipped with Modern Pursuit and Bombardment, 26 November 1934, 18, ARHRA 248.282-27.

⁵⁴ Captain Claire L. Chennault, quoted in Martha Byrd, *Chennault: Giving Wings to the Tiger*, (Tuscaloosa, AL: The University of Alabama Press, 1987), 50.

⁵⁵ Futrell, *Ideas, Concepts, Doctrine*, 82.

⁵⁶ Air Corps Tactical School, *Pursuit Aviation*, 1937, in Finney, *History of Air Corps Tactical School*, 39.

the sighting operation and release of bombs, the bombing teams must disregard the hostile pursuit and concentrate entirely upon the task at hand.” It also stated, “A well-trained and well-disciplined unit having full confidence in its ability to defend itself...may be depended upon to perform effective and accurate bombing even under the most unfavorable circumstances.”⁵⁷ The foundation of bomber offensive lethality was based on the concept of precision targeting.

The technological improvements to US bombsight equipment further validated the theory of precision bombing and the potential success of strategic air operations. Early ACTS manuals identify the bombsight as the most important part of the bomber fire control system. The text stated that every effort should be made to develop the most effective bombsight possible. These bombsights were so important and confidential that they were classified secret. The concept of precision bombing was further advanced when the bombsights were placed on the B-17. The 1935 B-17 Norden Mark XV bombsight testing proved that heavy bomb loads could be accurately dropped on small distant targets.⁵⁸ Operators soon learned that the effective use of the bombsight required daylight operations. Hence, the theory of high-level, daylight precision bombing against enemy industrial nodes was being taught at ACTS and throughout the Air Corps. The Air Corps claimed that if one of the social, economic, political, or military nodes was destroyed it would disrupt all the others and collapse a nation’s economic structure.

In the midst of Germany’s march through Europe, and just months before American airmen were assigned to Europe as Battle of Britain observers, the War Department Air Board completed a report that declared, “Air Power is indispensable to our national defense, especially in the early stages of war...Our aviation in peacetime, both its organization and its equipment, must be designed primarily for the application of Air Power in the early days of the war. *The basis of Air Power is the bombardment plane...a well led and determined air attack once launched may be interfered with, but it can rarely, if ever, be entirely stopped by local defense.*”⁵⁹

⁵⁷ Air Corps Tactical School, *Bombardment Aviation*, (Maxwell Field, AL: Air Corps Tactical School, 1935), 141, AFHRA 248.101-9.

⁵⁸ “Norden Mark XV Bombsight Testing” in Finney, *History of Air Corps Tactical School*, 33.

⁵⁹ War Department Air Board Report, quoted in Futrell, *Ideas, Concepts, Doctrine*, 95. Italic emphasis added.

By the time war came to Europe in 1939, American airmen were prone to believe that long-range, strategic, precision daylight bombardment was the primary way to employ airpower. They thought America's B-17 Flying Fortress provided the range and firepower to strike an enemy's key industrial infrastructure and cripple its society and war-making capability. According to them, airpower in the guise of this new bomber had the potential to create decisive results without the consequences of attrition warfare between opposing ground forces. They also downplayed pursuit aviation. They were prone to think that enemy pursuit fighters were unable to intercept and destroy self-defending heavy-bombers, and that escort fighters did not have the necessary range to protect friendly bombers. Thus, at the beginning of the war American airmen equated airpower's offensive capability to their long-range, strategic, heavy-bombardment doctrine.

Chapter 3

American Airmen Assessment

It is desired that you obtain all possible information...to serve as a guide for future organization, development of aircraft and aviation equipment, training of personnel and possible revision of tactical doctrine and technique...it is especially desired that you ascertain the doctrine of employment, tactical doctrines and technique, and personnel and material which existed prior to the commencement of hostilities, the extent to which each of these has been employed, and the changes made therein as a direct result of actual experience.

*-- Orders to First American Airmen Observation Team
Special Instructions, 19 March 1940*

From the beginning of World War II it became clear that air power was an integral part of modern warfare and would play a critical role in the war. The US Air Corps anticipated learning important air power insights and lessons from the war in Europe; especially, since it was the first time that large air forces from major powers were employed against one another in battle. Even though the War Department received reports from England and France during the winter of 1939 and 1940, General Arnold wanted to send tactical and operational air power experts to assess the air developments firsthand. He recognized the potential tactical and technical value obtained from personal firsthand observation. In fact, Arnold expected to implement pertinent lessons from the observers into Air Corps programs and force structure to increase American air combat preparedness and effectiveness. Consequently, he began sending a series of airmen in small groups to Europe as military air observers. Their official titles were Assistant Military Attachés for Air.¹ Although they had diplomatic status as Attachés, they were actually operational, tactical, and technical air power observers assigned by the Chief of the Air Corps. It appears that Arnold intended to send small observation groups of only a few airmen. After the climatic fighting over the Britain Isles concluded, however, he

¹ Brigadier General B.K. Yount, Assistant Chief of the Air Corps, War Department, to Assistant Chief of Staff, G-2 Division, War Department General Staff, "Special Instructions for Lieutenant Colonel Grandison Gardner and Major Franklin O. Carroll, designated as Assistant Military Attachés for Air to England," memorandum, 19 March 1940.

began dispatching larger observation groups.² Observer assignments were relatively brief. Short tours allowed them to observe and then return to the US to report their assessment.³ For almost two years, beginning in March 1940 until America entered World War II, Arnold sent airmen to England as air observers to access the most current combat developments.

During the height of the Battle of Britain, there were three main American observer groups. Two groups focused primarily on the operational, tactical, and technical details. They examined the air power operations and provided the Air Corps air power lessons and air strategy assessments. Their purpose was to obtain “technical and tactical information pertaining to the design, development, and tactical employment of aircraft,” and Arnold anticipated the information these groups brought home would be “vitally important to the immediate task of designing airplanes and equipment and the planning for future appropriations.”⁴ The third group was a high-level group that focused more on grand strategy and policy issues than simply air power operations. They were assigned by the Secretary of War to observe and learn about grand strategy issues as well as increase joint partnership relations with senior British military leaders. However, as airmen they naturally concentrated on operational and technical air power issues. In fact, four of this group’s first five lessons applied to Air Corps operations, programs, and procurement.

Gardner and Carroll Observations

On 19 March 1940, the first pair of observers, Lieutenant Colonel Grandison Gardner and Major Franklin Carroll, received orders from the Office of the Chief of the Air Corps designating them Assistant Military Attachés for Air in London. They were selected because Carroll was knowledgeable about aircraft engines and Gardner was an

² The first three observation groups originally consisted of two airmen. At the end of 1940, Arnold started sending a large number of observation specialist as he began to anticipate the probability of the US entering the war.

³ The 20 April 1940 memorandum from the Assistant Chief of the Air Corps to the Assistant Chief of G-2, states, “that the officers sent to Europe should return in not to exceed three months...in order that the information obtained by them may be presented in person.” It continues, “It is also believed advisable that visits overlap, in order that newly arrived officers may benefit by the contacts made available to them by their predecessors.” Brigadier General B. K. Yount, Assistant Chief of the Air Corps, War Department, to Assistant Chief of Staff, G-2 Division, War Department General Staff, memorandum, 20 April 1940.

⁴ Yount, memorandum, 20 April 1940

expert in ordnance, armaments, and bombing techniques.⁵ Their orders included a wide range of technical, tactical, and operational issues, but they were tasked to focus primarily on bombardment and its effectiveness. Their guidance was to examine and report on five specific areas of bombing: the ability of bombardment aircraft to penetrate anti-aircraft defenses without excessive losses; the effectiveness of dive and horizontal bombing; the effectiveness of active anti-aircraft defenses against aircraft; methods proposed to increase bomber aircraft effectiveness; and methods proposed to increase pursuit aircraft effectiveness.⁶ Their assessments were designed, “to serve as a guide for future organization, development of aircraft and aviation equipment, training of personnel, and possible revision of tactical doctrine and technique. [The orders continued,] it is especially desired that you ascertain the doctrines of employment, tactical doctrines and technique, and personnel and materiel which existed prior to the commencement of hostilities, the extent to which each of these has been employed, and the changes made therein as a direct result of actual experience.”⁷

Lieutenant Colonel Gardner and Major Carroll arrived in England at the beginning of April, just as Germany invaded Norway, and returned to America together at the end of May. During the second week of May, while Carroll continued his observation duties in England, Gardner visited Paris to observe RAF operations in France.⁸ Since they were representatives of the Air Corp on a special observation assignment, the RAF was willing to work with them and assist them in their duties. However, due to the timing and brevity of their tour they did not experience many firsthand operations or travel to many RAF bases or headquarters. Instead they spent the majority of their time reviewing reports already drafted from current attachés, and in conference with British Air Ministry counterparts and industry leaders.⁹ Thus, Gardner

⁵Richard G. Davis, *Carl A. Spaatz and the Air War in Europe*, (Washington D.C.: Smithsonian Institution Press, 1992), 42.

⁶Yount, “Special Instructions for Gardner and Carroll,” memorandum, 19 March 1940.

⁷Yount, “Special Instructions for Gardner and Carroll,” memorandum, 19 March 1940.

⁸Colonel Horace H. Fuller and Lieutenant Colonel Grandison Gardner, Military Attaché, Paris, France to Assistant Chief of Staff, G-2 Division, War Department General Staff, memorandum, 24 May 1940. When Gardner departed London for Paris on 11 May 1940 he and Carroll did not coordinate reports until they reunited at the end of May.

⁹Lieutenant Colonel Gardner and Major Carroll, Assistant Military Attaché to The Chief of the Air Corps, War Department, “Preliminary Report No. 1,” memorandum, 18 May 1940.

and Carroll's reports focused more on British Air Ministry preparation, Royal Aircraft Establishment manufacturers, and other civilian industries than on actual air operations.¹⁰

Gardner and Carroll's reports do not address Luftwaffe attacks on the British Isles. This is probably because attacks against England did not begin until 24 May 1940, only a short time before they departed for home. In fact, many of their findings and recommendations do not come from the air battles over Great Britain, rather they stemmed from the "the general consensus or opinion [which] seem so obvious in favor of certain lines of development."¹¹ This broad consensus focused primarily on aircraft equipment and development rather than air power strategy and operations. Nonetheless, they reported on RAF training programs as well as ideas for improving bomber and pursuit effectiveness. However, their recommendations focused primarily on improving armament and ordnance options since the majority of their time was spent in meetings and visits with industrial producers assessing aircraft, armament, and ordnance.¹²

Gardner and Carroll's observation reports may be categorized into three general categories: equipment, training, and bombardment. Once they arrived in England they spent the first two weeks reviewing files, establishing contracts, and getting oriented. After numerous visits and meetings with a variety of Air Ministry and RAF staff officers, their first observation tour was to equipment and material factories outside London. During the first two weeks of May they visited the RAF Production and Development Division Headquarters, the Spitfire factory, the Wellington factory, an aircraft armament factory, and the Rolls Royce engine factory.¹³ Aviation material and equipment was one of the observers' top priorities because of the lessons America learned from entering World War I without the proper types or quantity of aircraft.

¹⁰ Lieutenant Colonel Grandison Gardner and Major Franklin Carroll, Assistant Air Attaché, to The Chief of the Air Corps, War Department, "Report of Trip Abroad," memorandum, 9 July 1940

¹¹ Gardner and Carroll, "Preliminary Report No. 1," memorandum, 18 May 1940.

¹² Gardner and Carroll, "Preliminary Report No. 1," memorandum, 18 May 1940. and "Report of Gardner and Carroll on Trip Abroad," to Chief of the Air Corps, 9 July 1940.

According to their reports, they "spent practically their entire time in conference" with contacts and key personnel from the British Air Ministry and industry. However, these reports provide six pages of lessons and recommendations (received during meetings) for the US Air Corps to consider.

¹³ Lieutenant Colonel Grandison Gardner and Major Franklin Carroll, Assistant Air Attache, memorandum, "Partial Report of Visit of Lieutenant Colonel Grandison Gardner and Major Franklin O. Carroll to England."

On 17 May, Carroll visited the RAF bombing and gunnery leaders training center at Warmwell. This training center contained the single RAF gunnery leader school and all six bombardment schools.¹⁴ Interestingly, neither Carroll nor Gardner visited a fighter training center, the RAF's primary focus at the time. Perhaps this was due to the short duration of their observer tour in England. They did offer some observations the two received from the RAF regarding British pursuit operations over continental Europe. However, they remained focus on armament, protection, and bombardment. During Carroll's visit at Warmwell, he witnessed the RAF's dedication and focus on training. In fact, he sent three pages of detailed notes regarding gunnery leaders and bombardment training objectives, procedures, lessons. He also highlighted how each school successfully graduated 30 students every week trained as qualified bombardiers or gunnery leads.¹⁵

Given their pre-war orientation toward bombers, bombardment operations and procedures was another primary focus for both men. They reported that the RAF trained for bombardment of both land and sea targets.¹⁶ However, bombardment accuracy was relatively low and their ideas for improving effectiveness were somewhat limited. Similar to German views at the time, they believed dive bombing increased accuracy, but they wanted access to the American bomb sight. According to Gardner's observations, "It appears, at present, that the only thought for increasing the effectiveness of bombardment is to increase the number of bombardment airplanes."¹⁷ On the other hand, the observers reported, "It is believed that the Germans have been very much surprised at their low [bombing] efficiency and will find ways of improving as soon as the present job is finished" against France.¹⁸ Sure enough, to ensure support for their ground troops and to compensate for their ineffective bombing, the Luftwaffe implemented barrage bombing. They strived to create as much noise and confusion as possible to increase "the

¹⁴ Major Franklin O. Carroll, Air Attaché to Assistant Chief of Staff, G-2 Division, War Department General Staff, "Gunnery Leaders and Bombing Training Center, Warmwell, England," memorandum, 21 May 1940.

¹⁵ Carroll, "Gunnery Leaders and Bombing Training Center," memorandum, 21 May 1940.

¹⁶ Carroll, "Gunnery Leaders and Bombing Training Center," memorandum, 21 May 1940.

¹⁷ Lieutenant Colonel Grandison Gardner, Assistant Military Attaché, to Assistant Chief of Staff, G-2 Division, War Department General Staff, "Major Air Operations: Tactical Employment of Bombardment Units," memorandum, 24 May 1940.

¹⁸ Gardner, "Major Air Operations: Tactical Employment of Bombardment Units," 24 May 1940.

terrorizing effect and in reducing the ability of the defenders to think clearly, act quickly and exchange command and information effectively. It was reported that bombs and airplanes were also equipped with whistles to make their presence more obvious.”¹⁹

Regarding his observation of aerial bombing effectiveness, Gardner hand wrote a note that read, “Pretty low, but don’t draw conclusions too fast. We can do much better [than the RAF]. Accuracy [is] not vital in German type of warfare” either.²⁰

The recommendations of Gardner and Carroll’s reports focused almost exclusively on bomber aircraft. To address their assigned task they detailed the importance of bomber survivability and accuracy. Their remarks regarding survivability implied they believed the prewar notion that bombers can defend themselves via mutually supporting formation machine gun operations. However, they recommended numerous armament measures to improve their defense. They pointed out that every bomber should have two central fire-control stations, one for the rear hemisphere and the other for the forward hemisphere, and that power turrets with several gun combinations were a necessity.²¹ Nonetheless, they failed to recognize the potential and eventual necessity of fighter escorts. Gardner and Carroll’s report on bombing accuracy mirrored the general opinion of the Air Corps. They stated that low-altitude bombing provided better accuracy, but placed aircraft in higher danger. They also found that bombing accuracy was generally poor at all altitudes, but made worse because of European bomb sights and methods. They recommend that the Air Corps continue to protect and not release the highly sensitive Norden Mark XV Bomb Sight to Britain or any of its Allies.²²

Spatz, Kelsey, and Hunter Observations

Colonel Carl A. “Tooe” Spatz and Captain Benjamin S. Kelsey were the second set of observers sent to Britain. At the end of April, Spatz and Kelsey were

¹⁹ Lieutenant Colonel Grandison Gardner and Major Franklin Carroll, Assistant Military Attaché, to Assistant Chief of Staff, G-2 Division, War Department General Staff, “Tactical Employment of German Bombardment,” memorandum, 13 June 1940,

²⁰ “Special Instructions for Gardner and Carroll,” memorandum, 19 March 1940.

Hand written notes and responses to the Special Instruction Orders issued to Gardner and Carroll on 19 March 1940 in the Grandison Gardner Papers. It is presumed the notes and responses are from Gardner’s observations. Grandison Gardner Papers, AFHRC 168.7016-13.

²¹ Gardner and Carroll, “Preliminary Report No. 1,” memorandum, 18 May 1940.

²² Gardner and Carroll, “Preliminary Report No. 1,” memorandum, 18 May 1940.

recommended to replace Gardner and Carroll in London while Lieutenant Colonel Frank O'Dwyer "Monk" Hunter was dispatched to Paris for observer duty.²³ They did not carry written guidance. Their instructions were to observe and learn as much as possible and report recommendations for potential implementation. Like the first observer group, these observers were hand-selected by Arnold and each had a solid reputation with a long record of success and influence.²⁴ Moreover, the British viewed Spaatz, Kelsey, and Hunter as direct representatives of the Chief of the US Air Corps. The British were in an hour of need and they welcomed the Americans with an eager and willing attitude of cooperation.²⁵ Prior to the observers' arrival in England, visits were arranged for RAF Fighter, Bomber, and Coastal Command Headquarters as well as visits to specific air stations within each command. Visits were also scheduled to each type of RAF training school.²⁶ The British also opened the majority of their plans, programs, and materials to the Americans; however, they still were not ready to share their most prized secrets such as ULTRA (the breaking of the German military codes by duplicating the coding machines).²⁷ This observation group spent the next three months meeting with British senior military and civilian leaders, flying a variety of RAF aircraft, and sending observation reports back to Arnold and the Air Corps Staff, while enduring frequent Luftwaffe air raids.

Spaatz and Kelsey arrived in London on 31 May 1940. Within their first week they met with the Chief of the Air Staff, Air Chief Marshall Sir Cyril Newall, RAF Chief of Intelligence, Air Commodore Archibald Boyle, and Air Ministry Director of the Plans, Air Commodore Jack Slessor. During these meetings, the observers gathered a wide-range of lessons from RAF air operations over the continent. Even though the British had suffered significant aircraft losses during the air battles over Europe, specifically at

²³ The observers traveled together to France before Spaatz and Kelsey continued on to England. They "saw first-hand how appallingly prepared France was for war." Richard P. Hallion, *The Battle of Britain in American Context and Perspective*, (Bolling AFB, Washington DC: Air Force History and Museums Program, September 1998), 25.

²⁴ Spaatz was a World War I fighter pilot and current Air Corps Chief of Plans. Kelsey was a young, but exceptional test pilot, who had pioneered the technique of "blind flying." Hunter was the Air Corps leading fighter expert at the time and a World War I fighter ace.

²⁵ DeWitt S. Copp, *Forged in Fire: Strategy and Decisions in the Air War over Europe 1940-1945*, (Garden City, New York: Doubleday and Company, Inc, 1982), 40.

²⁶ Davis, *Spaatz and Air War*, 42.

²⁷ David R. Mets, *Masters of Airpower: General Carl A. Spaatz*, (California: Presidio Press, 1988), 110.

Dunkirk, their real bottleneck was beginning to become trained pilots and combat aircrew.²⁸ Spaatz and Kelsey discovered through conversations with the RAF that some of the captured Luftwaffe pilots had less than 100 hours, and one pilot was reported to only have 20 hours of flying experience; consequently, they assumed that the Germans were also beginning to face aircrew shortages.²⁹ During their meeting with Slessor, they inquired about the RAF's belief in deep strategic air operations against Germany and asked why the RAF had not executed strategic attacks against Germany while they still held air bases in France. Slessor expressed the RAF's confidence in deep strategic air operations, but responded that the German breakthrough interfered with any potential strategic air operation. Spaatz noted that the RAF "apparently thinks as we do [regarding the strategic bombing of Germany] but have been hindered by higher ups."³⁰

The observers initially focused on lessons from the continental air battles and how the Luftwaffe supported Germany's blitzkrieg operations. Despite German success, these talks with RAF leadership and staff members reinforced the observers' predisposition against tactical attack aviation and dive bombing. The British purported that dive bombing was ineffective and somewhat dangerous. According to them, dive bombing had more of an effect on morale than on actual destruction.³¹ First, dive bombers flew in the middle of the anti-aircraft zone and were more likely to get shot down, especially with the proliferation of anti-aircraft guns. Second, the RAF argued the accuracy of dive bombing did not exceed the accuracy of level deliveries. They discounted the Luftwaffe's successful dive bombing at Dunkirk since the British forces were assembling to evacuate and did not have adequate anti-aircraft artillery. Spaatz and Kelsey's first official cable to Arnold inferred that the Air Corps' tradition of level bombing had proven more successful in battle.³²

²⁸ "Diary of Brigadier General Carl Spaatz on Tour of Duty in England: 17 May to 1940 September 1940," 1 & 3 June 1940, Spaatz Papers, Box 7, Manuscripts Division, US Library of Congress, Washington D.C. Subsequent references to this diary will be "Spaatz England Diary."

²⁹ Spaatz England Diary, 2 June 1940.

³⁰ Spaatz England Diary, 3 June 1940.

³¹ Spaatz England Diary, 3 June 1940.

³² Colonel Carl A. Spaatz, Assistant Military Attaché, to Chief of the Air Corps, War Department. Major General Henry Arnold. Letter, 4 June 1940. and "Diary of Brigadier General Carl Spaatz on Tour of Duty in England: 17 May 1940 to 19 September 1940," Spaatz Papers, Manuscripts Division, US Library of Congress, Box 7. Subsequent references to these letters will be "Letter to Arnold."

During the second week of June, the situation in England changed. In addition to the sporadic Luftwaffe attacks, it became clear that once the German army drove through France it would turn toward the British Isles. The only question was how soon. Nonetheless, Spaatz and Kelsey continued to witness a sense of determination and defiance throughout the entire country. Citizens went about business as usual. Despite the sounding of air raid sirens and the building of bunkers, citizens went about their lives with gas masks and helmets in hand. The RAF heightened preparation and training in addition to increasing defensive patrol operations over the coast. Focused on aircrew training, the American observers began a series of meetings, tours, and inspections of training bases. They first visited the Headquarters of Training Command followed by inspections of Operational Requirements, Technical Training Command, and a variety of different training bases. Spaatz and Kelsey were very impressed with the RAF training system and programs. They considered it a potential strategic advantage.³³

The observers' then visited Bomber Command, Fighter Command, and Coastal Command Headquarters, followed by selected operational bases. They met with leaders both at the headquarters and the bases that had been stationed in France and who were combat veterans against the Luftwaffe. On 21 June, while inspecting Coastal Command, they witnessed an RAF strike against six German ships located in the English Channel. The bomber unit at Kings Lynn Base executed an attack with nine twin-engine Lockheed Hudsons and six Navy Gloster biplanes. The American's queried whether the RAF typically launched fighter escort in support of bomber missions. The Commanding Officer, Group Captain Primrose, responded, "When we send them [bombers] without fighters, they don't come back."³⁴

June was a busy month for Spaatz and Kelsey. By the end of the month they had visited and inspected 23 units, not including meetings with civilian and military leaders.³⁵ They had a better understanding of the air battles over the continent and had gained a wealth of knowledge and firsthand insight about the battle over Britain. They gained this

³³ Captain Benjamin S. Kelsey, Assistant Military Attaché, to Assistant Chief of Staff, G-2 Division, War Department General Staff, "Summary of Observations to Chief of the Air Corps," memorandum, June 1940.

³⁴ Spaatz England Diary, 21 June 1940.

³⁵ Spaatz England Diary, 1 July 1940. Spaatz diary entry lists the 15 official cables sent to the Chief of the Air Corps and 22 sights visited since arriving in England.

perspective from a variety of sources. They learned that pilots were becoming exhausted from flying day after day. The average bomber aircrew member was flying seven missions in six days and some aerial gunners were flying a mission on ten consecutive days.³⁶ Large bomber formations were proving difficult to manage and maneuver. Normal RAF bomber formations consisted of three heavy-bomber aircraft.³⁷ These formations were typically elements of a squadron formation of 12 bomber aircraft or more. The observers also learned about fighter operations and training considerations. They observed how new combat tactics, techniques, and capabilities were received and taught at the fighter developmental units. Training was often carried out in a combat atmosphere. The new film cameras on fighter gun sites assisted in teaching new fighter pilots how to employ guns as well as assist operational pilots debrief air defense missions.³⁸

As the German army approached Paris, Spaatz requested Hunter leave Paris and transfer to London to assist with the observation duties. His transfer was approved. Hunter arrived from Paris at the end of June as the newest Assistant Military Attaché for Air. Only three days later, a cable arrived from the US ordering Spaatz and Kelsey to return home. With the main air battle on the horizon and an imminent German knocking at the door, Spaatz requested an extension to his current observer assignment. His request to stay in England was authorized. Kelsey, however, was directed to return to America and report on his observations.³⁹

On 10 July, the Luftwaffe launched its largest raid since the beginning of its air operations against Britain. A concerted and lethal battle for control of the air began. The observers watched intently. They requested an opportunity to observe RAF operations for three to four days at different fighter or bomber stations and headquarters. The

³⁶ Captain Benjamin S. Kelsey, Assistant Military Attaché, to Assistant Chief of Staff, G-2 Division, War Department General Staff, "Morale in Royal Air Force – June Observation," memorandum, 20 July 1940.

³⁷ Colonel Carl Spaatz, Major George McDonald, and Captain Benjamin Kelsey, Assistant Military Attaché, to Assistant Chief of Staff, G-2 Division, War Department General Staff, "Bomber Command, Operational Training Units and Combat Squadrons – 16 and 17 June," memorandum, 3 July 1940.

³⁸ Colonel Carl Spaatz, Major George McDonald, and Captain Benjamin Kelsey, Assistant Military Attaché, to Assistant Chief of Staff, G-2 Division, War Department General Staff, "Fighter Command Headquarters, Fighter Station, and Air Fighting Development Units – 20 June," memorandum, 28 June 1940.

³⁹ Spaatz England Diary, 3 July 1940.

British Air Ministry approved Spaatz and Hunter's request.⁴⁰ This provided the observers a thorough examination of RAF fighter and bomber operations, procedures, and tactics. Interestingly, Spaatz, the senior American air observer, chose to tour and focus on bomber operations instead of the RAF's primary emphasis and strategy of the battle, fighter air defense. Consequently, Spaatz and Major George C. McDonald, the principal Assistant Attaché for Air, went to Bomber Command and associated units while Hunter and Colonel Martin F. Scanlon, the acting American Military Attaché in England, visited Fighter Command and its associated stations. The observers spent the last two weeks of July in the field gathering lessons from both commands.

During this period of observation, Hunter and Scanlon observed the operations and procedures Fighter Command implemented in maintaining control of the air and ensuring British homeland security. They were also the first American observers to learn about the specifics and complexities of the British radar-based air defense system. It was not until early July that the Air Ministry allowed the RAF to open their operation rooms and radars to the American observers.⁴¹ This gave Hunter and Scanlon the opportunity to get a firsthand look at the intricate command and control system as well as the early warning, ground intercept, and identification friend or foe radars. Interestingly, Hunter did not address the British integrated air defense in the observers' end of July letter to the Chief of Staff. He only addressed pursuit aircraft armament recommendations. In that letter, he offered a variety of armament recommendations from the development of aircraft cannon production facilities to the importance of adding more 50 caliber guns to fighter aircraft.⁴²

While Hunter and Scanlon were learning about British air defense and Luftwaffe fighter escort capabilities at Fighter Command, Spaatz and McDonald were focusing on British and German bombardment operations. Spaatz and McDonald developed strong opinions of German and British bombing operations during the last two weeks of July. The longer the bombing operations continued, the more they focused on target selection and bombing effects. Although the observers personally experienced an increase in Luftwaffe bombing raids, Spaatz reported to Arnold that the German bombing "has been

⁴⁰ Davis, *Spaatz and Air War*, 47.

⁴¹ Davis, *Spaatz and Air War*, 47

⁴² Lieutenant Frank O'D. Hunter quoted in Spaatz England Diary, Letter to Arnold, 31 July 1940.

particularly lousy.” He stated, “Juicy targets are available all over the islands and planes regularly make their appearance usually at night but the damage done scarcely warrants the effort. Whether they are holding back their mass of well-trained crews for an aerial blitzkrieg of whether they have no well-trained crews is not definitely apparent. However, I am beginning to believe that the German Air Force was too hastily constructed and is beginning to be mastered by the smaller but much better trained (apparently at least) RAF. The fights over the English Channel during the past few weeks indicate that smaller number of British fighters inflict serious losses on German bombers.”⁴³ By the end of July, the observers did not believe that the Luftwaffe had yet demonstrated the ability to mount a coordinated, concentrated, or decisive attack against British targets. They seriously questioned whether the German’s had the technological or operational capability to do so. The observers thought that the “British bombing [was] better than the German” bombing, yet they still had reservations.⁴⁴ Regarding RAF operations, they “believe[d] tactics of bombing can be improved.”⁴⁵

Spaatz also informed Arnold, “Losses in the aerial fighting recently have been in the neighborhood of 4 or 5 German planes for one RAF fighter.”⁴⁶ The actual kill ratio numbers, however, were significantly different. It is unclear where, how, and why the observers got these numbers. The inaccuracies may have come from the limitations of third party observation. The numbers possibly came from wishful thinking, or perhaps the RAF intentionally shaded the truth to secure American support for the British cause.⁴⁷ Whatever the reason, it is interesting that the observers do not appear to question the kill ratio information or attempt to validate it. They probably did not question the data because the RAF had been open and welcoming with most of their data. In fact, the British had invited the Americans into their highly classified operations centers. In any event, the observers accepted the kill ratio numbers on face value, although the

⁴³ Spaatz England Diary, Letter to Arnold, 31 July 1940.

⁴⁴ Spaatz England Diary, 22 July 1940.

⁴⁵ Spaatz England Diary, 16 July 1940.

⁴⁶ Spaatz England Diary, Letter to Arnold, 31 July 1940.

⁴⁷ Marshal of the RAF, Sir John Slessor, wrote a letter to Air Chief Marshal Charles A. Portal during this period stating, “I am sure the vital thing to get across to these [American] people, who are genuinely out to help us, is that, whereas their declared policy is to do everything short of war, actually on present they are doing about 25 per cent of what they could do short of war.” Marshal of the Royal Air Force Sir John Slessor, *The Central Blue: Recollections and Reflections*, (London: Cassell & Company Limited, 1956), 325.

information seems not to have called into question their assumptions of the inferiority of defensive air operations.

Spaatz and McDonald spent the majority of their two weeks with Bomber Command at a heavy bomber base housing two squadrons of 16 Wellington bombers. The bomber missions flown from this base provided the Americans personal insight on British bomber operations. They observed Bomber Command's operations and tactics in accomplishing the strategic objectives of diminishing German industrial and invasion port capabilities. The British flew the majority of their missions at night. The observers questioned the effectiveness of night-time bombardment. "Although night bombing has resulted in few losses, [I] believe [the] answer to bombardment is altitude, speed, and daylight attack, preceded by weather reconnaissance plane in uncertain weather."⁴⁸ According to Spaatz and his interaction with the RAF aircrew, "the more frank pilots [had] doubt as to [the] effectiveness of their night attacks."⁴⁹ In fact, Bomber Command had targeted the German aircraft industry for over a month with little or no results. Air Chief Marshal Charles A. Portal, Commander of Bomber Command, confirmed the American observers' interpretation of night-time bombardment effectiveness. He said that of the ten main aircraft industry targets "only three can be found with any certainty in moonlight by average crews. Expert crews may be expected to find the remainder on clear nights with a full moon, and average crews will sometimes find them after a good deal of time has been spent in searching."⁵⁰ Portal's statement combined with the observers' interpretation of RAF night bombing undoubtedly reinforced their perspective of the Air Corps' daylight bombing doctrine.

Spaatz and McDonald classified British bombing as "harassment over a large area rather than bombing for destruction."⁵¹ In other words, the RAF did not concentrate firepower against specific strategic targets according to Air Corps precision bombardment doctrine. The observers believed bombers should execute precision bombing to destroy specific targets in order to achieve strategic effects. During the nine days that Spaatz and McDonald spent with the two Wellington squadrons, they only

⁴⁸ Spaatz England Diary, 16 July 1940.

⁴⁹ Spaatz England Diary, 16 July 1940.

⁵⁰ Air Chief Marshal Charles A. Portal quoted in Davis, *Spaatz and Air War*, 48.

⁵¹ Spaatz England Diary, 22 July 1940.

witnessed a single raid where an entire squadron of 16 bombers was launched. Additionally, the bombers at the base only flew 15 missions in July because of questionable weather.⁵² According to the observers, the difficulty of night-time targeting had conspired with the lack of continuous bombardment pressure and relatively small bomber formations to produce the RAF's relatively ineffective bombing. However, it appears that the Americans considered the inability of British bombers to strike strategic objectives at far distances as the most significant limitation. In fact, Spaatz recorded, "the lack of a bomber sufficient to reach all parts of Germany and Italy from here is a serious handicap."⁵³

The observers were also critical of the British ability to conduct bombing raids without effective reconnaissance. The observers stated that the principal bombing objectives were German gas and oil supplies followed by aircraft factories, munitions factories, and airdromes. To execute effective bomber raids against these targets, reconnaissance missions both before and after the strike was of utmost importance. Thus, "whatever means are used it is evident that the most efficient long range bombing results cannot be accomplished without continuous reconnaissance of the target."⁵⁴ The RAF flew some trail reconnaissance missions over coastal targets using Spitfires. Despite their limited success, Spitfires could not provide the necessary reconnaissance over the majority of German strategic targets. The RAF needed an aircraft to fly reconnaissance over heavily defended targets located deep in Germany. Spaatz argued that the RAF lacked "an airplane of sufficient speed and firepower to carry out such missions during daylight."⁵⁵

At the end of July the observers returned together from their different inspections. They recorded that Bomber Command had already abandoned precision bombing for area bombing which consisted of dropping large amounts of bombs in target areas to ensure some destruction.⁵⁶ The Americans observed the different bomber ideas and techniques, but nothing that caused them to question the Air Corps' aspirations or plans. From their perspective, none of the British or German bombing operations or tactics directly

⁵² Letter to Arnold, 31 July 1940.

⁵³ Letter to Arnold, 31 July 1940.

⁵⁴ Letter to Arnold, 31 July 1940.

⁵⁵ Letter to Arnold, 31 July 1940.

⁵⁶ Spaatz England Diary, 27 August 1940.

challenged their views of long-range daylight precision bombardment. Although the climax of the battle over Britain was still weeks away, Spaatz wrote a letter to Arnold stating, “Unless the Germans have more up their sleeve than they have shown so far their chance of success in destroying the RAF is not particularly good.”⁵⁷ This implies that the American observation team realized that the destruction of RAF aircraft and airfields was one of the Luftwaffe’s primary objectives, and that the Luftwaffe was falling far short of the goal.

Attacking enemy air forces and airfields was not part of the current American air doctrine. It was an airpower strategy and intermediate objective that most American airmen would not have considered. Although they recognized the Luftwaffe’s air strategy of airfield and air force attacks, it did not cause the observers to pause and ask why, nor did it leave an imprint on their thinking. In fact, they did not report why they thought the Luftwaffe were attacking RAF airfields nor did they return to the US and evaluate the rationale of attacking enemy air forces and airfields instead of more lucrative strategic targets.

Emmons and Strong Observations

On 3 August the US Secretary of War ordered a high-level observation team to England to talk with British senior military and civilian leaders. Two of the officers assigned to the delegation were Major General Delos C. Emmons, the Commanding General of Headquarters Air Force and Brigadier General George V. Strong.⁵⁸ Since these observers were sent under the direction of the US War Secretary and were the highest ranking American military leaders in England, the British were hoping to make policy headway. The British wanted to work on important bilateral talks and joint strategy; however, the observers were assigned to simply observe and learn. They were given neither instructions nor authorization to engage in policy talks.⁵⁹ Despite British frustration, these observers were received warmly. During the team’s six week visit they met with the King, the Prime Minister, War Cabinet, and a variety of other leaders and

⁵⁷ Letter to Arnold, 31 July 1940.

⁵⁸ Rear Admiral Robert L. Ghormley, Assistant Chief of Naval Operations, was also a member of the delegation.

⁵⁹ Copp, *Forged in Fire*, 56.

organizations, both in and out of government.⁶⁰ They focused on how the British military strategy supported its grand strategy. Their report included observations on the British government's morale, their industrial situation, their shipping conditions, and the dubious financial outlook along with a number of other grand strategy issues. Although their level of observation differed from the level that the airmen Arnold sent, the majority of the Emmons and Strong report focused on air warfare operational issues. In their finalized report they separated their views into separate sections. One section addressed their perspective on the methods and means by which the British military strategy supported its grand strategy and the other detailed observations of the air battle.⁶¹ Ultimately they arrived at many of the same conclusions as the Arnold air observation teams.

Emmons and Strong reported that the British were in a difficult air battle, but capable of fending off the Luftwaffe. Their report was optimistic but measured. "Fighter command has done magnificent work but as yet has not faced more than 25 per cent of German air strength. The Bomber Command has, and is making, many profitable sorties into Germany and Italy."⁶² They reported that aircrew training was and would continue to be the biggest limitation for RAF operations. They observed with interest the effects of three flights a day for fighter pilots and four missions a week for bomber pilots.⁶³ In fact, some of the fighter squadrons were flying 50 to 60 hours per day.⁶⁴ They wrote, "The actual operating strength of the RAF is weak and losses have been very heavy, but quality of personnel and material...remains high."⁶⁵ In addition to observing personnel issues, Emmons and Strong inspected RAF and Luftwaffe aircraft. They saw RAF fighters receive firepower upgrades with new cannons. From their perspective, one of the main reasons for RAF fighter success was their superior firepower compared to the

⁶⁰ Major General Melos C. Emmons and Brigadier General Geo V. Strong, to Chief of Staff, War Department General Staff, "Observations in England, Memorandum for the Chief of Staff," memorandum, 15 September 1940. All subsequent references to this report will be "Emmons and Strong Report."

⁶¹ The Emmons Strong Report has sections on Air Material, Air Force Personnel, Supply, Air Raids, Air Tactics, Command Posts, Bombs, Anti-Aircraft Defenses, Training, Air Commands, etc.

⁶² Emmons and Strong Report, 3.

⁶³ J.E.F. "Executive Summary from Military Attache, London: Missions of British Air Force," Paraphrase of Code Radiogram received at War Department, 24 August 1940, US NARA, RG 165, WPD.

⁶⁴ Air Chief Marshal Sir Hugh C.T. Dowding, *Battle of Britain Despatch*, Arnold Papers, Official Military Reports 1940-1943, Manuscript Division, Reel #183, Library of Congress, Washington, D.C.

⁶⁵ Emmons and Strong Report, 3.

Luftwaffe fighters.⁶⁶ The American's concluded that fighter air to air success depended upon which aircraft had more firepower. Fighter Command's centralized control was another important aspect in Britain's successful air defense – it was “beautifully organized and operates most effectively.”⁶⁷

Emmons and Strong were impressed with the RAF bombers. They noted the British bomber's armor protection; the firepower of the power turrets; and the capacity of the large bomb bays.⁶⁸ In reporting on German bombers they wrote, “One is struck by the lack of defensive fire power, the small bomb capacity, and the lack of working space given to the crew. It is very evident that the Germans have sacrificed offensive firepower in order to secure speed.”⁶⁹ They concluded, “The damage done by the Germans in England has been very small considering the very large number of bombers used and the reason for it is that their bombers and the fuzing of their bombs are not satisfactory. They have done only a fraction of the damage that they could have done had they been equipped with the British types of bombardment airplanes.”⁷⁰

One of the primary differences between bomber capabilities was the bomb sights. The Germans used three types of Lotfe bomb sights, none of which were particularly impressive.⁷¹ The British, however, used a bomb sight that was particularly effective at night because it did not reduce light through periscope lenses like the Norden sight. The British incorporated the reflector principle and a non-glare round glass so that the bombardier did not lose the light from an object within the bomb sight. Although there is not any empirical evidence to support Emmons or Strong's assertion, they reported that the British had great success with night bombing.⁷² By August the RAF began executing their bombing raids almost exclusively at night. When they did fly day bombardment missions they employed as a six-ship formation. According to the report, a six-ship bomber formation provides “sufficient defensive guns and a reasonable amount of

⁶⁶ Emmons and Strong Report, 5.

⁶⁷ Emmons and Strong Report, 14.

⁶⁸ Emmons and Strong Report, 5.

⁶⁹ Emmons and Strong Report, 10.

⁷⁰ Emmons and Strong Report, 10.

⁷¹ Emmons and Strong Report, 9.

⁷² Emmons and Strong Report, 9.

protective armor, can reach its objectives during daylight hours without serious losses,” and still provide adequate bomb concentration.⁷³

At a departure meeting with Prime Minister Winston Churchill and Minister of Aircraft Production, Lord Beaverbrook, they requested specific aircraft parts and American aircraft. The most significant request was for B-17s. The US President had already received a request from the British for 32 B-17 Boeing bombers. The British were anxious to receive these planes so they could execute long-range strikes through the fall and winter.⁷⁴ Emmons and Strong forwarded the British requests. The request for B-17 bombers had a significant impact on the Air Corps’ preconceived disposition regarding the importance and necessity of long-range heavy bombers.

The Emmons and Strong delegation provided 11 lessons from their observations of the Battle of Britain. Although some of their lessons applied to the higher levels of strategy, the majority of them focused on the operational and tactical aspect of air power. For example, some lessons highlighted the importance of combined training exercises while others centered on aircraft survivability and improving observation aircraft specifications. They mentioned the importance of rapid coded-radio communications for all echelons. They also pointed out the necessity of increased fighter and bomber firepower in addition to bomber payload capacity.⁷⁵ Emmons and Strong ultimately concluded their report stating, “The lesson from this war, as far as we are concerned, is that we must build up the striking component of our Air Force as quickly as possible...A study should be initiated immediately as to how we best can build up our air striking force...It may mean a revision of our requirements and to this end it is recommended that the Air Board be reconvened to make this study and to make recommendations as to how to build up an adequate Air Force in the shortest possible time.”⁷⁶

Spaatz and Hunter Observations Continue

In August the Battle of Britain intensified and Arnold’s airmen continued to travel throughout England. During the Luftwaffe’s preparation and execution of full-scale air

⁷³ Emmons and Strong Report, 13.

⁷⁴ Emmons and Strong Report, 23.

⁷⁵ Emmons and Strong Report, 24-25.

⁷⁶ Emmons and Strong Report, 23.

attacks, Spaatz and Hunter were on the move visiting primarily Fighter Command units. They also spent time with Fighter Group Number 12 and Air Vice-Marshal Trafford Leigh-Mallory. They spent a day at the group operations center and saw parts of the group's air defense system. This inspection gave Spaatz an opportunity to see much of what Hunter already observed in July; he was impressed with the RAF's intricate command and control system.⁷⁷ The observers were amazed at how effectively and efficiently the British command and control system marshaled fighter aircraft to counter Luftwaffe attacks. Spaatz recommended a similar command and control structure be established in Panama and Hawaii. After visiting operational flying squadrons, the observers saw two new technologies that they recommended America procure: Identification Friend or Foe (IFF) signal boxes and gun cameras.⁷⁸ The IFF was an ultra high frequency device that enabled radars to identify friendly aircraft versus adversary aircraft. The movie gun cameras improved air to air training and assisted mission reporting accuracy. By the middle of August, the Luftwaffe initiated full-scale attacks. These massive raids "start[ed] off with a bang."⁷⁹

Spaatz and Hunter spent three days at the cliffs of Dover watching the German air offensive unfold. While the number of aircraft in the air and the altitudes they were flying at made it difficult for the Americans to follow the battles, they nonetheless learned the importance of fighter escort and witnessed the relatively inaccurate anti-aircraft artillery capability of the RAF. Meanwhile, the Luftwaffe focused their attacks against RAF airfields. According to the observers, "the net result of these operations seemed to be excessive losses compared to the damage done. Airdromes attacked were able to keep right on operating in spite of damage done to permanent buildings, etc."⁸⁰ The observers recognized how difficult it is to destroy an air force on the ground. It required unusual accuracy and precision to destroy these targets. Spaatz writes in his journal that the "old conception that [the] place to destroy [an] air force is on the ground has been thoroughly disproved. A well-dispersed air force is almost impossible to destroy on the ground, and bombs expended on such effort can be better used against oil

⁷⁷ Spaatz England Diary, 9 August 1940.

⁷⁸ Spaatz England Diary, 10 August 1940.

⁷⁹ Letter to Arnold, 27 August 1940.

⁸⁰ Letter to Arnold, 27 August 1940.

tanks, factories, etc.”⁸¹ The observers did not associate the limited bombing success against airfields and aircrafts to the potential complexities and difficulties of bombing strategic targets.

During the August German offensive, the Luftwaffe launched air raids day and night to gain control of the air and prepare for a German invasion. RAF Fighter Command strived to attack the Luftwaffe bombers on every raid. The Americans observed that “large formations [of bombers] as used by the Germans are very unwieldy and susceptible to attacks by their tactics.”⁸² Moreover, the Luftwaffe bomber survival during daylight raids without proper fighter escort was very slim. RAF fighters focused on intercepting Luftwaffe bombers. In fact, they attempted to intercept German air raids whether there were Luftwaffe fighter escorts or not. Interestingly, the observers’ “general opinion [was] that German fighters will not attack a well-closed-in [British] day-bombing formation.”⁸³ It is not certain how the observers reached this conclusion. It appears contradictory. A well-flown RAF bomber formation can effectively defend itself against attacking Luftwaffe fighters, while a German bomber formation can expect to be broken up by dedicated English fighters. Perhaps this stemmed from the fact that the Luftwaffe did not launch many fighter attacks against RAF bombers; or because RAF bombers flew primarily at night; or possibly because the Americans did not fully consider the execution and success of British fighter escort. Whatever the reason, the observers ultimately perceived the air battle over England as evidence to why the Air Corps should continue pursuing its long-range heavy-bomber daylight precision bombing doctrine.⁸⁴

After witnessing bombing operations on both sides, the observers again rejected the technique of dive-bombing. They did not believe it was any more accurate than level-

⁸¹ Spaatz England Diary, 27 August 1940. In Spaatz letter to Arnold, 27 August 1940, he stated that “bombers can be used to better advantage against objectives more easily destroyed and of the utmost importance such as fuel storage tanks, factories, etc.”

⁸² Spaatz England Diary, 11 August 1940.

⁸³ Spaatz England Diary, 24 August 1940.

⁸⁴ In fact, a memorandum from Lieutenant General Ira Eaker to the Air Corps Chief of Plans Division identified lessons learned from 9 May 1940 to 24 June 1940 during air operations in Europe. This memorandum reveals the Air Corps belief regarding single seat pursuit aircraft capabilities. It states, “Heavy bombardment losses occurred regardless of the presence of accompanying single seater pursuit. Lesson: The defensive strength of bombardment formations must be augmented by means other than accompanying singles seater pursuit.” Lieutenant General Ira Eaker, Executive to Chief of the Air Corps, War Department, to Chief of Plans Division, War Department General Staff, memorandum, 10 August 1940.

bombing. Additionally, dive bombers were too vulnerable to use against defended targets.⁸⁵ The observers highlighted the importance of daylight raids to improve bombing accuracy and strengthen aircraft defense via mutual support. However, they did not mention the significant German losses caused by daylight bombing operations. In fact, the bomber attrition rates were so problematic that the Germans began launching four times the amount of escort fighters to bombers during daylight raids. Despite the escort support, German bombers remained susceptible to British air defense attack.

The American observers saw firsthand how the Luftwaffe fighters were unable to provide adequate protection to their bombers over England. Spaatz and Arnold were always a little concerned about the survivability and accuracy of unescorted bombers. Yet they did not know how to increase escort fighter range without reducing fighter maneuverability. The Germans had developed the Me 110, a twin-engine escort with greater range, but because it was not as fast or maneuverable as other fighters it was almost as vulnerable as the bombers. The plane could neither defend against enemy fighters nor effectively bomb enemy targets. The Luftwaffe made attempts, albeit meager, to increase the escort range of the Me 109 by adding external fuel tanks. The danger from continual fuel leaks forced the Luftwaffe to abandon external tanks as a solution.⁸⁶

Nevertheless, it was clear German bomber pilots were vulnerable and they did not want to fly outside the range of their escort partners. Hence, escorts were forced to fly in close formation with the bombers and the results were deadly for both the bombers and the escort fighters. RAF fighters began attacking the German bomber and escort formations at much higher altitudes and airspeeds than the German escorts, thereby leaving them at a significant disadvantage. Thus close fighter escort did “not ensure immunity from attack by hostile fighters on bombers. A comparatively few number of hostile fighters can, by determined effort, break up the large [bomber] formation.”⁸⁷ The Americans knew that bombardment aircraft had protection problems, but the solution was not clear. The observers witnessed that once fighters intercepted a bomber, the fighter

⁸⁵ Letter to Arnold, 27 August 1940.

⁸⁶ Richard Overy, *The Myth and the Reality: The Battle of Britain*, (New York, NY: W.W. Norton & Co., 2000), 8.

⁸⁷ Letter to Arnold, 27 August 1940.

had a decided advantage and that the defensive bomber typically needed more than extra firepower, improved armor, or mutual formation support to survive. However, the American observers did not fully understand, correctly interpret, or aggressively address the bomber protection problem within the US Air Corps, but their report stimulated an increased concern for bomber survivability prior to the US entry into war.

The concern for bomber survivability ultimately became a catalyst for a renewed emphasis in fighter aviation. In fact, in a letter Emmons wrote to Arnold, separate from his observation report, he claimed, “Aerial operations of the present European conflict confirm the results of the World War; that is that the present bombardment plane cannot defend itself adequately against pursuit attack.”⁸⁸ Thus, at the end of August an Air Corps Board convened at Maxwell Field ultimately agreed that there was a significant deficiency in fighter-pursuit capability that needed to be addressed. The board recommended that actions be implemented to improve pursuit aviation with a renewed emphasis on bomber escort.⁸⁹ Although the Air Corps identified the importance of bomber escort support, the service doctrine and mindset did not significantly change prior to US entry into World War II.

On 24 August, the same day Spaatz and Hunter returned from Dover, Luftwaffe bombers attacked London. The Americans were in the middle of the air raid while “bombs could be heard and fire of some intensity started to [the] East along [the] Thames. Later [the] raid passed over our apartment.”⁹⁰ The next day the British retaliated by sending a large bomber forces to attack the German capital of Berlin. Germany had shifted its air strategy and began launching bombing operations against cities in England, primarily London. In September the Luftwaffe began concentrating almost exclusively on London targets. While the Luftwaffe implemented this new

⁸⁸ Major General Delos Emmons, quoted in Thomas H. Greer, *The Development of Air Doctrine in the Army Air Arm 1917-1941*, (1955; reprint, Washington, D.C.: Office of the Air Force History, 1985), 117.

⁸⁹ “Study No. 54: Pursuit Training and Pursuit Plane and Tactical Development,” *Report of the Air Corps Board*, 27 August 1940, AFHRA 167.5-54. A memorandum from Major General Arnold to the Commanding General, GHQ Air Force, is in the study. In it Arnold states, “A doctrine which has been widely propounded in certain Air Corps circles for many years, to the effect that pursuit aircraft and fighter aviation can be minimized on the basis that fighter craft cannot shoot down large bombardment planes in formations, has now been proven wholly untenable.”

⁹⁰ Spaatz England Diary, 24 August 1940.

strategy, Spaatz wrote a letter to Arnold reporting on August observations. He concluded the letter with the following prediction:

“The Blitzkrieg seemed to start off with a bang two weeks ago and then petered out. After a lapse of several days renewed activities are in being but with slightly different tactics. Apparently the first effort was to determine the effect of large masses of bombers escorted by fighters on daylight missions, starting with action primarily against shipping in the channel and then extended to operations against airdromes most in the channel and London areas. The net result of these operations seemed to be excessive losses compared to the damage done... Whether the strategy of the Germans was to prepare the way for an invasion or to close the English Channel is a moot question. However, it would appear that the basic plan must be to close the channel and North Sea thus allowing a concentration of submarines and airplanes against the western approaches.”⁹¹

Although Spaatz and Hunter spent the majority of their remaining time in England focused on bomber operations, they identified and highlighted a change in Luftwaffe fighter escort procedures. On 18 September, Hunter visited Fighter Group 11 at Beggin Hill fighter station for a few days. He observed that the Luftwaffe stopped “using large quantities of [escort] fighters in direct protection of their bombers” because of the heavy losses they received.⁹² Instead, the Luftwaffe’s “new method of employment was to send large forces of fighters over [England] by themselves at high altitude...to dive on British fighters climbing up, deliver a burst and zoom back up to superior altitude, and repeat.”⁹³ This new technique allowed German fighters “to inflict heavier losses than they suffered.”⁹⁴ Since the Air Corps executed pursuit aviation defensively in the 1930s, Hunter recognized and assessed the Luftwaffe’s new emphasis on offensive pursuit operations as something significant to address.

Instead, the Air Corps prioritized bombardment observations and interpretations. Although pre-war air theorists believed that air raids on civilian populations would dissolve their will to resist and diminish morale, this did not occur in England. In fact, the opposite occurred. They noted the determination and strong resolve of British leaders and populace despite the indiscriminate bombing. The majority, if not all, the observers

⁹¹ Letter to Arnold, 27 August 1940.

⁹² Lieutenant Colonel Frank O’D Hunter, Assistant Air Attaché, to Assistant Chief of Staff, G-2 Division, War Department General Staff, “Visit to Fighter Station,” memorandum, 4 October 1940.

⁹³ Hunter, “Visit to Fighter Station,” memorandum, 4 October 1940.

⁹⁴ Hunter, “Visit to Fighter Station,” memorandum, 4 October 1940.

sent to England disagreed with the theory that heavy bombardment against a population would significantly reduce national morale eventually leading to a national collapse.⁹⁵ However, it was uncertain if this was because neither side had significant bombardment firepower to produce sufficient firepower for such a strategy. Spaatz commented, “Apparently indiscriminant bombing of London has started. Present strength of RAF heavy bomber inadequate to bring same firepower on Berlin. All air officers recommend immediate dispatch of all B-17’s with bombs sent by ships to add strength to RAF attack.”⁹⁶ Interestingly, the British bombardment air doctrine remained focused on attacking the civilian will and morale while the American bombardment air doctrine accelerated toward attacking the enemy’s industrial infrastructure. The experience and reports from the observers in England influenced the Air Corps’ focus on daylight precision bombing instead of attacking the population.

The American observers considered the RAF bombers better than the Luftwaffe bombers, but concluded that neither side had adequate war winning machines. They thought the bombers from both countries had similar problems – they were too small, too slow, too lightly armed, flew too low, and above all their payloads were too small. The Luftwaffe did not even have an up-to-date bomb sight and the RAF bomb sight did not compare to the Air Corps Norden Mark bomb sight. Furthermore, neither country employed bombers in proper formation thereby ensuring mutual defensive protection and mass precision firepower. The observers deduced that larger bombers must increase firepower in both the forward and the rear hemisphere to ensure proper protection. The observers recommended nothing less than 4-gun turrets for heavy bombers. They also advocated for improved armored plating to increase bomber survivability.⁹⁷ The day before Spaatz and Hunter returned to America, the Luftwaffe increased its bombing operations against London. According to the American’s, the RAF knew they did not have adequate bomber strength to retaliate sufficiently; their aircraft had neither the range nor the firepower to damage significant strategic German objectives. This perception,

⁹⁵ Every observer report that addresses British morale remarks it is high and that determination is resolute despite Luftwaffe bombing efforts. Captain Benjamin S. Kelsey, Assistant Military Attaché, to Assistant Chief of Staff, G-2 Division, War Department General Staff, “Summary of Observations to Chief of the Air Corps,” memorandum, June 1940.

⁹⁶ Spaatz England Diary, 24 August 1940.

⁹⁷ Letter to Arnold, 27 August 1940.

along with the RAF's request for B-17s, had a significant impression within the Air Corps about the importance of heavy four-engine bombers.

As fall approached, Spaatz and Hunter departed England and traveled with Emmons and Strong to the US. They arrived home toward the end of September. Spaatz and Hunter concluded that Germany never gained control of the air over Great Britain because they did not know how to use air power properly. Even though the RAF had a highly advanced air defense system and process with capable fighters, according to the observers, they still could not adequately stop the Luftwaffe from bombing. The Luftwaffe simply did not know how to bomb effectively. This was because the Luftwaffe leadership was not air-minded, their pilots were not properly trained, and they lacked proper bomber aircraft. They also did not have the correct aircraft in their inventory because they organized and employed too quickly, and allowed army objectives and ground operations to dictate air operations. As Spaatz pointedly put it to Arnold, "It takes close coordination with the Army to obtain maximum misuse of air power."⁹⁸

This perception generally followed American air beliefs, which held that the more an air force conformed to the army the less effective it is in maximizing its inherent strengths and unique capabilities. Although the observers questioned RAF bombing operations, they concluded "the English have developed real air power, whereas the Germans so far appear to have developed a mass of air geared to the Army and [are] lost when confronted with properly applied air effort."⁹⁹ The Luftwaffe could have shifted air strategies or begun ordering a series of strategic attacks, but since they did not have properly trained aircrew or adequate aircraft to perform long-range strategic missions they would be unable to successfully execute. According to the observers, the Luftwaffe lacked a strategic bombing doctrine and a long-range heavy bomber.¹⁰⁰

By the end of September it was clear the British had won the Battle of Britain and the Germans had lost. Unless the Luftwaffe generated and deployed more forces with a new offensive strategy, they were unable to significantly impact the British Isles let alone gain control of the air over England. Although Arnold continued to send more observer

⁹⁸ Letter to Arnold, 28 August 1940.

⁹⁹ Letter to Arnold, 12 September 1940.

¹⁰⁰ Letter to Arnold, 12 September 1940.

teams to England, their focus turned increasingly to other matters.¹⁰¹ What remained for the Air Corps, however, was to figure out why the battle concluded the way it did.

¹⁰¹ Arnold began sending a variety of different specialists to Great Britain. In fact, within a few months there were American observers for engineering, maintenance, aircraft development, medical, and aerial photography.

Chapter 4

Conclusion and Implications

“But for all its ferocity, the Battle of Britain could not duplicate the sort of air battle that the American air planners had in mind. As a result concrete ‘lessons’ simply did not materialize. True, both German and British bombers proved vulnerable to fighters, but then they were medium bombers, poorly armed and flying at relatively low altitude...the experience seemed inconclusive at the moment. American long range bombers were much better...”

*-- Major General Haywood S. Hansell Jr.
The Air Plan That Defeated Hitler*

The American observers assigned to the Battle of Britain in the summer and early fall of 1940 were selected because they were experienced officers and seasoned airmen. They were associated with the evolving US airpower doctrine of the interwar period and were products of the Army Air Corps culture. Each observer was an airpower advocate with high qualifications. They went to England to examine British and German air operations over the British Isles in the first major battle fought entirely by air. During the battle there was an abundance of information to collect and data to record. These observers, however, were responsible to accurately identify, analyze, and interpret key airpower elements to provide meaningful lessons and pertinent insights to Air Corps leadership. They did not have an easy task. Grandison Gardner believed “the immense amount of information that has become available” combined with the “stress and hurry under which a traveling observer must work” made it difficult to get “a much closer and better study of these problems.”¹

To help them filter all that they saw, these observers approached their task through the Air Corps’ doctrinal lens of long-range, strategic, precision bombardment. Military doctrine is what an armed force believe is the best way to conduct military affairs. It provides a conceptual basis for understanding the nature of war and the characteristics of different warfare. Doctrine serves as a guide for exercising professional

¹ Fuller, Colonel Horace H. and Lieutenant Colonel Grandison Gardner, Military Attaché, Paris, France to Assistant Chief of Staff, G-2 Division, War Department General Staff, memorandum, 24 May 1940.

judgment and a starting point for solving complex problems. Succinctly, airpower doctrine is what airmen believe is the best way to do things with airpower.² In 1940, American airmen believed that long-range, strategic, precision bombardment was the best way to effectively and efficiently employ airpower. Strategic bombardment was the focus of the US Army Air Corps. They believed that strategic bombardment exploited airpower's speed, mobility, range, and firepower to defeat a nation decisively from the inside out rather than slowly defeating a nation from the outside in with traditional land forces.³ This doctrine was the filter the American observers used to order data, categorize information, and identify pertinent lessons. Ultimately, this doctrine became the prism by which they interpreted airpower throughout the Battle of Britain.

Since precision bombing was fundamental to the doctrine of strategic bombardment, bombing accuracy was one of the observers' primary focus areas. They witnessed and reported a relatively low accuracy of bombing throughout the course of the battle. This did not significantly concern the observers. From their perspective, the inaccurate bombing operations of the Luftwaffe and RAF did not directly correlate to the Air Corps' bombing operations or capabilities. The Luftwaffe employed area bombing procedures and were only trained to support ground strategies and land objectives.⁴ Meanwhile, they attributed the RAF's inaccurate bombing to a low quality bomb sight and the difficulty of accurately targeting during night operations. Both sides focused more on general bombing for harassment purposes than on the accurate and decisive strategic bombardment operations of which the Air Corps advocated.⁵ In fact, the observers stated it appeared, "at present, that the only thought for increasing the

² Dennis M. Drew and Donald M. Snow, *Making Strategy: An Introduction to National Security Processes and Problems*, (Maxwell AFB, AL: Air University Press, 1988), 163.

³ Lieutenant Colonel Peter R. Faber, "Interwar US Army Aviation and the Air Corps Tactical School: Incubators of American Airpower," in *The Paths of Heaven: The Evolution of Air Power Theory*, ed. Col Phillip S. Meilinger (Maxwell AFB, AL: Air University Press, 1997), 184.

⁴ Grandison Gardner hand written responses to "Special Instructions for Lieutenant Colonel Grandison Gardner and Major Franklin O. Carroll, designated as Assistant Military Attachés for Air to England. Chief of the Air Corps, War Department, to Assistant Chief of Staff, G-2, War Department General Staff, "Special Instructions for Lieutenant Colonel Grandison Gardner and Major Franklin O. Carroll, designated as Assistant Military Attachés for Air to England," memorandum, 19 March 1940.

⁵ "Diary of Brigadier General Carl Spaatz on Tour of Duty in England," 22 July 1940, Spaatz Papers, Manuscripts Division, Box 7, US Library of Congress, Washington D.C. and "Report on Tactical Employment of German Bombardment," 13 June 1940, Grandison Gardner Papers, AFHRC 168.7016-13.

effectiveness of bombardment is to increase the number of bombardment airplanes.”⁶ For these reasons, the bombing inaccuracies of the Luftwaffe and RAF did not appear particularly relevant to the Air Corps method or doctrine of bombardment.

Consequently, the observers did not interpret the battle’s inaccurate bombing operations as lessons to consider or potential issues that the Air Corps should address. Moreover, they saw little reason to question their doctrine of precision bombardment.

In addition to interpreting the Luftwaffe and RAF inaccurate bombing operations as an example of poor equipment and training, the observers also perceived the air war as a contest between short-range, medium bombers. According to the Air Corps, an aircraft with speed, altitude, range, and payload was essential for strategic bombardment.⁷ To execute effective strategic bombardment operations, a heavy, long-range, four-engine aircraft like the B-17 was critical. Whereas Luftwaffe and RAF bombers were vulnerable to enemy fighters, they believed that a formation of four-engine heavy bombers was not. They concluded that with better armor, increased fire-power, and formation support four-engine bombers could fly during the day without any requirement for escort protection. This interpretation of heavy bomber defense was significant for the advancement of the Air Corps’ bombing doctrine because it neither jeopardized the accuracy of daylight precision bombardment nor placed the responsibility of bomber survivability on pursuit aircraft capabilities. The escort fighters at the time either did not have the capability to carry enough fuel to support long distant bomber missions, or they were too large to maneuver adequately and successfully protect the bombers they were assigned to defend.

The air forces with vulnerable medium bombers viewed escort fighter aircraft as essential. In fact, the German bombers did not want to fly outside the range of their escort partners even though the fighter protection repeatedly proved ineffective. The observers, however, noted issues with close escort operations. They reported that close fighter escorts did “not insure immunity from attack by hostile fighters on the bombers. A comparatively fewer number of hostile fighters can, by determined effort, break up the

⁶ Lieutenant Colonel Grandison Gardner, Assistant Military Attaché, to Assistant Chief of Staff, G-2 Division, War Department General Staff, “Major Air Operations: Tactical Employment of Bombardment Units,” memorandum, 24 May 1940.

⁷ Spaatz England Diary, 16 July 1940.

large [bomber] formation.”⁸ Although the American observers recognized and expressed an increased concern for bomber survivability, they did not interpret the necessity of aggressively advocating for pursuit aviation within the Air Corps.

It was not that the observer’s speculation regarding the need for a bigger and more heavily defended bomber was bad, or necessarily incorrect. Given how close the Battle of Britain was, a larger, more capable, German bomber may have made the difference. Nonetheless, the observers did not recognize or assess the importance of a capable fighter force. Due to their background, the observers neither inferred nor interpreted the RAF defensive fighters as a key to British victory or the misuse of escort fighters by the Luftwaffe as one of the reasons for German defeat. Amidst all the information and data that the observers could have collected regarding the importance of a quality fighter force, they focused only on the minimally-protected, medium-range bomber. Meanwhile, the Air Corps’ pursuit aviation was not adequately preparing, training, or equipping for the rapid fighter force advancements of the day.⁹ The observers’ interpretation was one of the many reasons the Air Corps was unprepared for the escort role of fighters at the outset of US involvement in World War II.

If fighter advocate and champion of pursuit aviation, Major General Claire L. Chennault, had been a member of an Air Corps observation team, he may have identified other lessons and interpreted the battle differently. Although Chennault did not question the importance of bombardment, he was a dedicated and vocal proponent of pursuit aviation. In fact, after the end of the war, he wrote about an experience he had at Air Corps headquarters in 1941. He recorded, “I detected no evidence that [the headquarters] top planners had absorbed any of the lessons of the Battle of Britain where the eight-gunned Spitfire and Hurricane fighters proved more than a match for German bombers unescorted or with fighter escort stretched beyond effective range.”¹⁰ Whatever his interpretation of the battle may have been, it is certain he would have categorized and prioritized the importance of pursuit aviation in his observation. With his doctrinal

⁸ Colonel Carl A. Spaatz, Assistant Military Attaché, to Chief of the Air Corps, War Department. Major General Henry Arnold. Letter, 27 August 1940.

⁹ Thomas H. Greer, *The Development of Air Doctrine in the Army Air Arm 1917-1941*, (1955; reprint, Washington, D.C.: Office of the Air Force History, 1985), 120.

¹⁰ Claire L. Chennault, *Way of a Fighter: The Memoirs of Claire Lee Chennault, Major General, U.S. Army (Ret)*, ed. Robert Hotz (New York, NY: G. P. Putnam’s Sons, 1949), 94.

background in pursuit aviation, it is likely he would have interpreted the battle more as a victory for RAF airpower strategy than an ineffective bombing strategy by the Luftwaffe. Whereas the assigned observers quickly identified the Luftwaffe's inability to execute effective bombardment operations, they were slow, even unable, to recognize the RAF's unprecedented integrated air defense system and impressive pursuit-fighter operations.

American airmen never fully credited the RAF air defense operations in the victory over the Luftwaffe. In fact, they viewed the ability of the Germans' ill-equipped, untrained, and flawed bomber force to penetrate British air defenses; despite the resources, preparation, and training the RAF placed in bolstering it, as support for their bombardment predisposition. If the Luftwaffe, with all its flaws, could achieve limited success against such a strong defensive effort by the RAF; an air force with trained aircrew, a heavy four-engine bomber, and the correct bombardment doctrine could certainly be decisive in strategic bombardment operations. In fact, the observers considered the inability of the Battle of Britain's bombers to strike strategic objectives at far distances with mass firepower as one of the most significant limitation of the two air forces. From their perspective, the inadequate range of the Luftwaffe bombers and the inability of the RAF bombers to reach all parts of Germany and Italy was one of the most significant handicaps.¹¹ This interpretation, again, stemmed in part from their doctrinal filter of strategic bombardment.

Although Air Corps doctrinal filter did not specifically mention the importance of training, the observers immediately recognized it as a critical element in successful air operations. In fact, the observers did a good job addressing and emphasizing the significance of training in the majority of their reports to the General Staff. They toured multiple British training bases and analyzed ways to implement a variety of effective training programs into the Air Corps. During the height of the battle they correctly interpreted aircrew training as the biggest limitation facing RAF operations and potential success.¹² The observers realized that you cannot simply ask aviators to change operational missions or tactics; aviators require proper training and qualification to do it

¹¹ Spaatz Letter to Arnold, 31 July 1940.

¹² Major General Melos C. Emmons and Brigadier General Geo V. Strong, to Chief of Staff, War Department General Staff, "Observations in England, Memorandum for the Chief of Staff, " memorandum, 15 September 1940. (Unedited Copy).

successfully. Their observations and assessments were immediately implemented. Arnold noted, “It was just as essential to have a balanced production of trained combat and maintenance crews as it was to have planes.”¹³ This was especially critical since the Army Air Corps expanded from 51,000 personnel in 1940 to over 2,280,000 personnel in 1945.¹⁴ The observers’ interpretation regarding the importance of training played a significant role in ensuring American airmen readiness when the US finally entered the war.

Although the observers accurately interpreted the importance of training, they never recognized that the battle they witnessed was one of attrition. Since World War I, airmen believed airpower would avoid the carnage of attrition warfare. They expected air operations to bypass armed ground forces and directly strike critical targets to decisively, and swiftly, decide a conflict’s outcome. Additionally, American airmen believed Giulio Douhet. The ideal way to gain control of the air was to destroy an enemy’s air force on the ground by attacking airfields, supply bases, and industrial rather than combating it in the air.¹⁵ The observers were conditioned to see these two elements of air warfare; however, neither occurred. The main air battle occurred in the skies over England and eventually turned into a war of attrition. The fighter-pursuit battles proved deadly for aviators and extremely costly for the RAF and Luftwaffe’s ability to continue operations. The observers remarked that the lack of British combat aviators was “the neck of the bottle” in RAF operations.¹⁶ However, they did not acknowledge the Battle of Britain as an air battle of attrition without a clear or decisive conclusion.¹⁷

It is clear that doctrine significantly influenced the way the observers identified, analyzed, and interpreted airpower during the Battle of Britain. The data points the observers used were prioritized and categorized through the prism of strategic

¹³ General Henry “Hap” Arnold, *Global Mission*, (New York, NY: Hutchinson & Co., 1951), 136.

¹⁴ The United States Army Air Forces in World War II, “Army Air Force Statistical Digest, World War II,” <http://www.usaaf.net/digest/t3.htm> (accessed on 7 May 2010).

¹⁵ Giulio Douhet, *The Command of the Air*, trans. Dino Ferrari (Tuscaloosa, AL: The University of Alabama Press, 1998), 34.

¹⁶ Spaatz Letter to Arnold, 27 August 1940. In this same letter, the observers mentioned the difficulty of targeting and destroying an air force on the ground because of dispersion and camouflage.

¹⁷ Once Hitler cancelled plans for invasion and turned east it was clear the Britain won and Germany lost. Nonetheless, there never was a recognizable ending with a decisive blow or a definite defeat of one protagonist or the other. Richard Overy, *The Myth and the Reality: The Battle of Britain*, (New York, NY: W.W. Norton & Co, 2000), xi, 67.

bombardment to create a picture of the air activities and lessons from both sides. Ultimately, the observers perceived the battle as an inaccurate, short-range, medium-bomber offensive air battle instead of a precise, effective fighter defensive battle because of their doctrinal filter. Consequently, there are specific lessons that the observers either missed, or ignored, or did not pursue. Since doctrine is a fundamental aspect of the US Air Force, the American observation and interpretation of the Battle of Britain provides a warning to today's airpower strategists and practitioners.

It is not easy to accurately comprehend the battlefield or effectively implement the appropriate airpower strategy. This is especially true in today's air environment where there is an abundance of data collection and information matching. Military doctrine can help organize and prioritize information. It conditions airmen where to focus and what to prioritize to accurately picture and understand the situation. Ironically, the conditioning of doctrine has the potential to hinder as well as help. This is because doctrine not only helps airmen, but affects them in terms of identifying, analyzing, and interpreting situations. For example, when the Luftwaffe began its indiscriminate bombing of London, RAF airmen interpreted it very differently from airmen in the Air Corps. The Air Corps considered civilian bombing ineffective and accelerated their doctrine emphasis toward a nation's industrial web complex. However, the RAF recommitted itself to civilian and morale bombing by advocating the necessity of a larger, more capable bomber. Although doctrine is a primary filter to determine 'correct' data or to connect 'real' lessons, caution is required. It is essential to take time to think clearly and cleanly about military doctrine. As the environment changes airpower strategists must combine established doctrine with past experience, knowledge, and seasoning for success.¹⁸

¹⁸ Two examples of changes in the environment that may require doctrinal modifications are when new evidence arises or technology significantly evolves.

Bibliography

Primary Sources

- Air Corps Tactical School. *The Air Force*. Maxwell Field, AL: Air Corps Tactical School, 1930, Air Force Historical Research Agency (AFHRA) 248.101-1.
- Air Corps Tactical School. *The Air Force*. Maxwell Field, AL: Air Corps Tactical School, 1933-1935, AFHRA 248.101-2.
- Air Corps Tactical School. *Bombardment Aviation*. Maxwell Field, AL: Air Corps Tactical School, 1931, AFHRA 248.101-8A.
- Air Corps Tactical School. *Bombardment Aviation*. Maxwell Field, AL: Air Corps Tactical School, 1935, AFHRA 248.101-9.
- Arnold, General Henry H. *Global Mission*. New York, NY: Hutchinson & Company, 1951.
- Arnold, Lieutenant Colonel Henry H. To The Chief of the Air Corps. Letter. Subject: "Employment of Tactical Units Equipped with Modern Pursuit and Bombardment Airplanes," 26 November 1934, AFHRA 248.282-27.
- Assistant Chief of the Air Corps To Assistant Chief of Staff, G-2. Memorandum, 20 April 1940, United States National Archives Research Agency Record Group 165, War Department General Staff, E65 Military Intelligence Division (US NARA RG165, WDGS, E65 MID) 1917-1941, 2345-872.1.
- Carroll, Major Franklin O. Assistant Military Attaché. To Assistant Chief of Staff, G-2 Division, War Department General Staff. Memorandum. Subject: "Gunnery Leaders and Bombing Training Center, Warmwell, England," 21 May 1940, AFHRC 168.7016-13.
- Chennault, Claire L. *Way of a Fighter: The Memoirs of Clair Lee Chennault, Major General, U.S. Army*. Edited by Robert Hotz. New York, NY: G. P. Putnam's Sons, 1949.
- Chief of the Air Corps. War Department. To Assistant Chief of Staff, G-2 Division, War Department General Staff. Memorandum. Subject: "Special Instructions for Lieutenant Colonel Grandison Gardner and Major Franklin O. Carroll, designated as Assistant Military Attachés for Air to England," 19 March 1940, US NARA RG165, WDGS, E65 MID 1917-1941, 2610-191.2.
- Douhet, Giulio. *The Command of the Air*, translated by Dino Ferrari. Tuscaloosa, AL: The University of Alabama Press, 1998.

- Dowding, Air Chief Marshal Sir Hugh C. T. *Battle of Britain Despatch*. Arnold Papers, Official Military Reports 1940-1943, Manuscript Division, Reel 183, Library of Congress, Washington, D.C.
- Eaker, Lieutenant General Ira, Executive, Chief of the Air Corps. To Chief of Plans Division, War Department General Staff. Memorandum, 10 August 1940, US NARA RG165, War Plans Department (WPD).
- Eaker, Lieutenant General Ira, Executive, Chief of the Air Corp. To Chief of Plans Division, War Department General Staff. Memorandum. Subject: "Evaluation of Air Information for the Various Divisions – Re: Great Britain Report," 15 August 1940, US NARA RG165, WPD.
- Emmons, Major General Melos C. and Brigadier General Geo V. Strong. To Chief of Staff, War Department General Staff. Memorandum. Subject: "Observations in England, Memorandum for the Chief of Staff, " 15 September 1940, US NARA, RG 165, War Plans Department (WPD), 4366/4 to 4374/10
- Fuller, Colonel Horace H. and Lieutenant Colonel Grandison Gardner. Military Attaché, Paris, France. To Assistant Chief of Staff, G-2 Division, War Department General Staff. Memorandum. 24 May 1940, AFHRC 168.7016-13.
- Gardner, Lieutenant Colonel Grandison, Assistant Military Attaché. To Assistant Chief of Staff, G-2. Memorandum. Subject: "Tactical Employment of Pursuit Aircraft: Increased Effectiveness of Pursuit," 24 May 1940, AFHRC 168.7016-13.
- Gardner, Lieutenant Colonel Grandison, Assistant Military Attaché. To Assistant Chief of Staff, G-2. Memorandum. Subject: "Major Air Operations: Tactical Employment of Bombardment Units," 24 May 1940, AFHRC 168.7016-13.
- Gardner, Lieutenant Colonel Grandison and Major Franklin Carroll. Assistant Military Attaché. Memorandum. Subject: "Partial Report of Visit of Lieutenant Colonel Grandison Gardner and Major Franklin O. Carroll to England," AFHRC 168.7016-13.
- Gardner, Lieutenant Colonel and Major Carroll. Assistant Military Attaché. To The Chief of the Air Corps, War Department. Memorandum. Subject: "Preliminary Report No. 1," Memorandum, 18 May 1940, US NARA RG165, WDGS, E65 MID 1917-1941, 2083-1627.6.
- Gardner, Lieutenant Colonel Grandison and Major Franklin Carroll. Assistant Military Attaché. To The Chief of the Air Corps, War Department. Memorandum. Subject: "Report of Trip Abroad," Memorandum, 9 July 1940, US NARA RG165, WDGS, E65 MID 1917-1941.

- Gardner, Lieutenant Colonel Grandison and Major Franklin Carroll. Assistant Military Attaché. To Assistant Chief of Staff, G-2 Division, War Department General Staff. Memorandum. Subject: "Tactical Employment of German Bombardment," 13 June 1940, AFHRC 168.7016-13.
- Hansell, Haywood S. Jr. *The Air Plan That Defeated Hitler*. Atlanta, GA: Higgins-McArthur, 1972.
- Hunter, Lieutenant Colonel. Assistant Military Attaché. To Assistant Chief of Staff, G-2 Division, War Department General Staff. Memorandum. Subject: "Visit to Fighter Station," 4 October 1940, US NARA RG165, WDGS, E65 MID 1917-1941, 2083-937.16.
- J.E.F. "Executive Summary from Military Attache, London: Missions of British Air Force," Paraphrase of Code Radiogram received at War Department, 24 August 1940, US NARA, RG 165, WPD.
- Kelsey, Captain Benjamin S. Assistant Military Attaché. To Assistant Chief of Staff, G-2 Division, War Department General Staff. Memorandum. Subject: "Morale in Royal Air Force – June Observation," 20 July 1940, US NARA RG165, WDGS, E65 MID 1917-1941, 2083-1644.64.
- Kelsey, Captain Benjamin S. Assistant Military Attaché. To Assistant Chief of Staff, G-2 Division, War Department General Staff. Memorandum. Subject: "Notes on Royal Air Force Training," 20 July 1940, US NARA RG165, WDGS, E65 MID 1917-1941, 2083-1628.17.
- Kelsey, Captain Benjamin S. Assistant Military Attaché. To Assistant Chief of Staff, G-2 Division, War Department General Staff. Memorandum. Subject: "Summary of Observations to Chief of the Air Corps," June 1940. US NARA RG165, WDGS, E65 MID 1917-1941, 2083-1668.3.
- Mitchell, William. *Winged Defense: The Development and Possibilities of Modern Air Power-Economic and Military*. 1925. Reprint, Tuscaloosa, AL: The University of Alabama Press, 2009.
- Report of the Air Corps Board. "Study No. 54: Pursuit Training and Pursuit Plane and Tactical Development." Maxwell Field, AL: 27 August 1940, AFHRA 167.5-54.
- Slessor, Marshal of the Royal Air Force Sir John. *The Central Blue: Recollections and Reflections*. London: Cassell and Company Limited, 1956.
- Smith, Lieutenant Colonel Ralph C. Military Intelligence Division. To Chief, Intelligence Division Air Corps. Memorandum. 29 January 1941. US NARA RG165, WDGS, E65 MID 1917-1941, 2341-145.243

- Spaatz, Colonel Carl A. "Diary of Spaatz on Tour of Duty in England," 17 May 1940 to 19 September 1940, Spaatz Papers, Box 7, Manuscript Division, Library of Congress, Washington, D.C.
- Spaatz, Colonel Carl A. Assistant Military Attaché. To Chief of the Air Corps, War Department. Major General Henry Arnold. Letter, 4 June 1940. US NARA, RG 165, WPD, 4366-4 to 4374-10.
- Spaatz, Colonel Carl A. Assistant Military Attaché. To Chief of the Air Corps, War Department. Major General Henry Arnold. Letter, 31 July 1940. US NARA, RG 165, WPD, 4366-4 to 4374-10.
- Spaatz, Colonel Carl A. Assistant Military Attaché. To Chief of the Air Corps, War Department. Major General Henry Arnold. Letter, 27 August 1940. US NARA, RG 165, WPD, 4366-4 to 4374-10.
- Spaatz, Brigadier General Carl A. Plans Division, War Department General Staff. To Assistant Chief of Staff, G-2 Division. Memorandum. Subject: "Submission of Final Report," 28 February 1941, NARA, RG 165 WDGS, E65 MID Correspondence, 2341-158.1.
- Spaatz, Colonel Carl, Major George McDonald, and Captain Benjamin Kelsey. Assistant Military Attaché. To Assistant Chief of Staff, G-2 Division, War Department General Staff. Memorandum. Subject: "Bomber Command, Operational Training Units and Combat Squadrons – 16 and 17 June," 3 July 1940, US NARA RG165, WDGS, E65 MID 1917-1941, 2083-937.12.
- Spaatz, Colonel Carl and Captain Benjamin Kelsey. Assistant Military Attaché. To Assistant Chief of Staff, G-2 Division, War Department General Staff. Memorandum. Subject: "Coastal Command Operational Training Unit," 2 July 1940, US NARA RG165, WDGS, E65 MID 1917-1941, 2083-945.18.
- Spaatz, Colonel Carl, Major George McDonald, and Captain Benjamin Kelsey. Assistant Military Attaché. To Assistant Chief of Staff, G-2 Division, War Department General Staff. Memorandum. Subject: "Fighter Command Headquarters, Fighter Station, and Air Fighting Development Units – 20 June," 28 June 1940, US NARA RG165, WDGS, E65 MID 1917-1941, 2083-1628.23.
- Spaatz, Colonel Carl, Major George McDonald, and Captain Benjamin Kelsey. Assistant Military Attaché. To Assistant Chief of Staff, G-2 Division, War Department General Staff. Memorandum. Subject: "R.A.F. Training Program," 23 June 1940, US NARA RG165, WDGS, E65 MID 1917-1941, 2083-1628.16.

Yount, Brigadier General B.K. Assistant Chief of the Air Corps, War Department. To Assistant Chief of Staff, G-2 Division, War Department General Staff. Memorandum. Subject: "Special Instructions for Lieutenant Colonel Grandison Gardner and Major Franklin O. Carroll, designated as Assistant Military Attachés for Air to England," 19 March 1940, US NARA RG165, WDGS, E65 MID 1917-1941, 2610-191.2.

Yount, Brigadier General B.K. Assistant Chief of the Air Corps, War Department. To Assistant Chief of Staff, G-2 Division, War Department General Staff. Memorandum. 20 April 1940. US NARA, RG 165 WDGS, E65 MID 1917-1941, 2345-872.1.

Secondary Sources

Biddle, Tammi Davis. *Rhetoric and Reality in Air Warfare: The Evolution of British and American Ideas about Strategic Bombardment, 1914-1945*. Princeton, NJ: Princeton University Press, 2002.

Bungay, Stephen. *The Most Dangerous Enemy: A History of the Battle of Britain*. London: Aurum Press, 2001.

Byrd, Martha. *Chennault: Giving Wings to the Tiger*. Tuscaloosa, AL: The University of Alabama Press, 1987.

Craven, Wesley Frank and James Lea Cate, eds. *The Army Air Force in World War II. Vol. 1, Plans and Early Operations: January 1939 to August 1942*. Chicago, IL: The University of Chicago Press, 1948.

Cooper, Mathew. *The German Air Force 1933-1945, An Anatomy of Failure*, New York: Jane's Publishing Inc., 1981.

Copp, Dewitt S. *A Few Great Captains.: The Men that Shaped the Development of the U.S. Air Force*. McLean, VA: EPM Publications, Inc., 1980.

Copp, DeWitt S. *Forged in Fire: Strategy and Decisions in the Air War over Europe 1940-1945*. Garden City, New York: Doubleday and Company, Inc, 1982.

Davis, Richard G. *Carl A. Spaatz and the Air War in Europe*. Washington D.C.: Smithsonian Institution Press, 1992.

Drew, Dennis M., and Donald M. Snow. *Making Strategy: An Introduction to National Security Processes and Problems*. Maxwell AFB, AL: Air University Press, 1988.

- Faber, Lieutenant Colonel Peter R. "Interwar US Army Aviation and the Air Corps Tactical School: Incubators of American Airpower." In *The Paths of Heaven: The Evolution of Air Power Theory*. Edited by Colonel Phillip S. Meilinger. Maxwell AFB, AL: Air University Press, 1997.
- Finney, Robert T. *History of the Air Corps Tactical School 1920-1940*. 1955. Reprint Maxwell AFB, AL: Air Force History and Museums Program, 1998.
- Futrell, Robert Frank. *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force 1907-1960*. Maxwell AFB, AL: Air University Press, 1989.
- Greer, Thomas H. *The Development of Air Doctrine in the Army Air Arm 1917-1941*. 1955. Reprint, Washington, D.C.: Office of Air Force History, 1985.
- Hallion, Richard P. *The Battle of Britain in American Context and Perspective*, Bolling AFB, Washington DC: Air Force History and Museums Program, September 1998.
- Hough, Richard and Denis Richards. *The Battle of Britain: The Greatest Air Battle of World War II*. New York: Norton, 1989.
- Johnson, David Alan. *The Battle of Britain*. Pennsylvania: Combining Publishing, 1998.
- Johnson, David E. *Fast Tanks and Heavy Bombers*. Ithica, NY: Cornell University Press, 1998.
- Johnson, Colonel Wray R. Introduction to William C. Sherman, *Air Warfare*. 1926. Reprint, Maxwell AFB, AL: Air University Press, 2002.
- Korda, Michael. *With Wings Like Eagles: A History of the Battle of Britain*. New York: Harper Collins Publishers, 2009.
- Maurer, Maurer, *Aviation in the U.S. Army, 1919-1939*. Washington, D.C.: Office of Air Force History, 1987.
- Mets, David R. *Masters of Airpower: General Carl A. Spaatz*. California: Presidio Press, 1988.
- Murray, Williamson. *Strategy for Defeat: The Luftwaffe*. Maxwell AFB, Alabama: Air University Press, 1983.
- Overy, Richard. *The Myth and the Reality of the Battle of Britain*. New York: W.W. Norton & Company, 2000.
- Wood, Derek and Derek Dempster. *The Narrow Margin: The Battle of Britain and the Rise of Air Power 1930-1940*, Connecticut: Greenwood Press, 1961.