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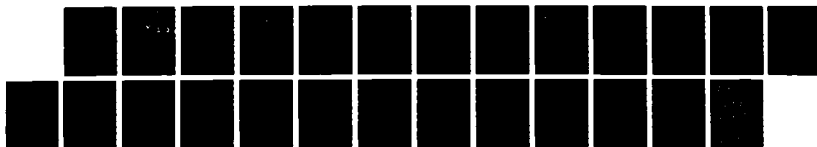
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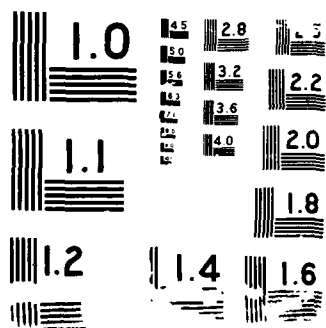
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STUDENT REPORT

THE EVOLUTION OF LONG-RANGE
ESCORT DOCTRINE IN WORLD WAR II
MAJOR LEE A. LESHER 88-1570
"insights into tomorrow"

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TITLE THE EVOLUTION OF LONG-RANGE ESCORT DOCTRINE IN WORLD WAR II

AUTHOR(S) MAJOR LEE A. LESHER, USAF

FACULTY ADVISOR MAJOR ALLAN W. HOWEY, ACSC/EDJ

SPONSOR MAJOR ALLAN W. HOWEY, ACSC/EDJ

Submitted to the faculty in partial fulfillment of
requirements for graduation.

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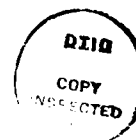
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The United States entered World War II with a doctrine of unescorted bombing because the Army Air Corps planners believed the B-17 was invincible. Early results proved the B-17 was not invincible and a new doctrine was needed. The deployment of the P-51 provided an aircraft that could effectively escort the bombers on long-range missions, and the doctrine was changed to escorted bombing. The study examines how the doctrine was developed initially, how and why it was changed, and the success that was achieved before and after the change.					
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-----PREFACE-----

During World War II, the United States developed a strategic bombing program that contributed greatly to the final outcome of the war. The program was the result of a lot of work by numerous airmen and it was not without it's faults. The initial doctrine of "unescorted" bombing proved disastrous and had to be changed. This paper is a case study in how that doctrine was developed, why it was changed, and how the new doctrine contributed to the success of the strategic bombing campaign during the war.

I would like to thank my faculty advisor, Major Allan W. Howey, for his encouragement and assistance. In addition, I'd like to thank my wife, Gloria, for many hours of typing and proofreading.



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-----ABOUT THE AUTHOR-----

Major Lee A. Lesher graduated from the University Of North Dakota, Grand Forks, North Dakota, in 1972 with a Bachelor of Science degree in Civil Engineering. He then attended Undergraduate Pilot Training (UPT) at Williams AFB, Arizona. After graduation in January 1973, he remained at Williams AFB as a T-37 instructor pilot. In 1978, he was assigned to the 1st Tactical Fighter Wing at Langley AFB, Virginia, and began flying the F-15. While at Langley he served as squadron training officer, flight commander and instructor pilot. He was transferred to Dhahran, Saudi Arabia, in 1982 where he served as Chief, Flight Test and Safety for Air Force Logistics Command, Logistics Support Group. Major Lesher's most recent assignment was at Headquarters, United States Air Forces in Europe. He was a current operations briefing officer for two years and then became the Chief of the Briefing Division. Major Lesher also holds a Master's in Business Administration from Arizona State University. His professional military education includes correspondence courses in Squadron Officer School, Air Command and Staff College, and National Security Management.

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REPORT NUMBER

88-1570

AUTHOR(S)

MAJOR LEE A. LESHER, USAF

TITLE

THE EVOLUTION OF LONG-RANGE ESCORT DOCTRINE IN WORLD WAR II

I. Purpose: To examine the changes that occurred in fighter escort doctrine during World War II.

II. Data: The United States entered World War II with a doctrine of unescorted, strategic bombing. That doctrine had been developed by the instructors at the Air Corps Tactical School. They based their concepts on the limited success of bombing during World War I, and on the ideas of Brig Gen Billy Mitchell and the Italian Giulio Douhet. They also based their doctrine on the theory that the B-17 was invincible. Early results proved that theory invalid when up to 30% of the attacking bombers were lost on some raids. The doctrine had to be changed, and the development of the P-51 provided an escort fighter that could accompany the fighters on the long-range missions. General Henry H. (Hap) Arnold changed the doctrine to escorted, strategic bombing and the bombers received fighter protection for the rest of the war.

III. Conclusion: The United States entered World War II with an invalid doctrine which nearly proved disastrous. Fortunately, there was enough time to change that doctrine in time to contribute to a successful strategic bombing campaign.

Chapter One

INTRODUCTION

On 14 October 1943, the Eighth Air Force launched a strategic bombing attack on ball bearing plants at Schweinfurt, Germany. A total of 291 bombers were launched on this mission and the losses were staggering. Sixty bombers, along with 1500 trained air crewmen, were lost while the Germans lost only 35 fighters. (8:172) Additionally, 17 of the bombers suffered major damage while 121 others had minor damage. (5:16) In contrast, on 18 March 1945, Eighth Air Force launched a strategic bombing attack on Berlin. This time only 24 of the 1250 bombers were lost during the raid. (18:1)

Why was there such a large difference in the number of bomber losses between these two attacks? The answer was simple: Fourteen groups of P-51 Mustangs provided long-range escort for the bombers on the Berlin raid. (18:1) The next question, of course, was: Why didn't any P-51's escort the October 14th attack? The simple answer was that they had not yet been fully developed and deployed.

The late arrival of a long-range escort for bombers resulted in unacceptable losses to the U.S. strategic bombing forces as demonstrated by the raid on Schweinfurt. The use of the long-range escort aircraft came about because of a change in the doctrine of unescorted bombing from the pre-World War II era.

The purpose of this paper is to analyze the evolution of fighter escort doctrine during World War II in the European theater. First, the pre-WWII doctrine will be reviewed. Then, it's effectiveness will be determined by looking at losses of bombers that occurred when this doctrine was in use. Next, the end-of-war doctrine will be reviewed along with it's effectiveness. Finally, the changes in doctrine will be analyzed by comparing the successes of pre-war and end-of-war doctrine. The analysis will yield lessons to be used when developing doctrine for the next war.

The result of this paper will not only be a historical review, but will also be an actual case study in the development of doctrine. The paper will show the process involved in developing new doctrine and what can happen if

that doctrine is invalid. The importance of developing valid doctrine prior to the beginning of a war will be vividly demonstrated by this historical example.

Chapter Two

PRE-WORLD WAR II DOCTRINE

The U.S. entered World War II with a "bomber invincibility" doctrine that had been developed and was firmly entrenched at the Air Corps Tactical School (ACTS). (14:120) The instructors at the school had arrived at this doctrine after much study of the prospective use of airpower. They believed that bombers had enough self-contained firepower to defend themselves on the way to their targets.

The ACTS instructors didn't have much history to study while developing this doctrine because airpower had not been used to any great extent previously. World War I had ended before any detailed lessons could be learned about the use of airpower. (14:14) However, during the Great War, the U.S. conducted a total of 150 bombing raids and dropped 275,000 pounds of bombs. Enough success occurred during these raids to prove that strategic bombing was feasible. (14:4)

Because of this lack of history, the primary ideas for strategic bombing doctrine were based mainly on theory. The ACTS instructors were the ones who developed these theories, but they were greatly influenced by airmen who had served before them. The ideas of Brig Gen Billy Mitchell and the Italian Giulio Douhet affected the theories developed at ACTS. (9:27)

Mitchell was an early proponent of the use of airpower, and he was one of the first to recognize the potential importance of bombardment aviation. He believed the enemy's power to make war must be destroyed in order to assure victory. He thought the targets should include factories, food, fuel, and even the places where people lived. According to a USAF Historical Study, History of the Air Corps Tactical School, "When instructors at the school began to graft the concept of the primacy of the bomber onto the concept of air warfare and strategic air operations, they were consciously or unconsciously providing the covering for the skeleton built by Mitchell." (9:27) However, the school did not agree with the importance Mitchell placed on pursuit aviation. He believed bombers would be the primary determinant of victory during war, but he thought pursuit aircraft would also play an important role. The instructors

at the school chose to believe in the invincibility of the bomber. (14:30)

The concepts of the Italian Giulio Douhet had somewhat less impact on ACTS. His idea of large formations of unescorted bombers was endorsed by the instructors at the school. However, they discarded his idea of mass area bombing at night and chose to support daylight bombing instead, because bombers were capable of more precision during daylight hours. (9:27) Additionally, the instructors heartily endorsed his idea that bombers were the most important type of aircraft and pursuit aircraft were not required, especially in the escort role. (14:49)

The ideas of Mitchell and Douhet were not accepted by all ACTS instructors. Several still believed that pursuit aircraft should play an important role. Claire Chennault was one of the most vocal advocates of pursuit aircraft. As a result of exercises he conducted at Fort Knox in 1933, he concluded pursuit aircraft could intercept bombardment aircraft. To prevent heavy losses, bombers would require escort when flying deep into enemy territory. However, the results of other exercises showed that pursuit was not effective against bomber forces. Chennault said of these other exercises that, "All sorts of fantastic and arbitrary restrictions were placed on fighters in maneuvers that were supposed to simulate (honestly) conditions of actual combat." (14:58-59) Claire Chennault lost the battle, however, and the idea of unescorted bomber invincibility continued at ACTS.

Technology was another factor that contributed to the primacy of the bomber, with the primary influence coming from the development of the B-17. The B-17 could outperform any pursuit aircraft at the time. Additionally, the development of the highly accurate Norden Mark XV bombsight was also important, because it greatly increased the bombing accuracy of the B-17. The combination of a bomber that could outperform pursuit and a highly effective bombsight added more impetus to the concept of unescorted bombing. (9:33)

In addition, technology is often stated as the reason a long-range escort fighter wasn't developed earlier. Maj Gen Grandison Gardner, who served as a research and development engineer prior to the war, stated, ". . . engineering problems held back the design of an effective long-range fighter." (14:85) However, a special study conducted by the USAF Historical Division concluded that, "those problems, while difficult, would seem no greater than the ones solved by the technical experts building the super-bomber [B-17]." The same study also stated, "The conclusion seems inescapable that, although financial and engineering factors exercised a contributing influence, the

lag in pursuit design resulted chiefly from doctrinal shortcomings." (14:85)

Doctrine affecting a strategic bombing campaign was contained in FM 1-10, Tactics and Techniques of Air Attack, 20 November 1940. It favored daylight attacks and indicated that escort support should be provided, when possible, wherever strong opposition was expected. However, even after this manual was published, ACTS still held to its belief that bombers had enough firepower to complete unescorted missions without sustaining heavy losses. (14:116)

The published doctrine and the theories of ACTS would soon be consolidated into a strategy for the use of U.S. airpower in WW II. The Air War Plans Division (AWPD) was formed in Washington in July 1941 and tasked with developing the "Air Annex" to the plan for the conduct of WWII. The plan would eventually be named AWPD-1, and its authors were Lt Col Harold L. George, Lt Col Kenneth Walker, Major Laurence Kuter and Major Haywood Hansell, Jr. All were previous ACTS instructors, and they all eventually became general officers. These air planners used their strategic background to develop AWPD-1 and after approval it became the established concept on which the American strategic air offensive was based. (4:67-98) According to Maj Gen Haywood Hansell, the primary objective of the plan was to "conduct an unremitting air offensive against Germany and Italy to destroy the will and capability to continue the war." (4:91) In other words, the plan was to use strategic bombing to break the will of the people and to destroy their capability to fight. There was no plan to use fighters to escort these bombers. The only time escorts were mentioned in AWPD-1 was when it stated escorts were not available. (5:17)

Chapter Three

EARLY SUCCESS

The U.S. began its strategic bombing effort on 17 August 1942, with B-17's from the 97th Bomb Group conducting an attack on targets in France. Attesting to the faith in the defensive power of the B-17 was the fact that the Commanding General of the VIII Bomber Command, Brig Gen Ira Eaker, was on board one of the aircraft. The mission was an unqualified success with about half of the bombs falling near the targets which were a locomotive workshop and some rolling stock repair shops in the city of Rouen. (3:12) This resulted in renewed faith in high-altitude, daylight, precision bombing. Additionally, none of the bombers were lost on the raid. However, because of the short range of the mission, the bombers had received fighter escort from four squadrons of RAF Spitfires. Therefore, the concept of unescorted bombing had yet to be tested. (3:12)

German fighters soon realized they could more effectively attack the bombers when there were no fighter escort aircraft accompanying the bomber formations. (3:23) Their chances occurred on longer range missions where fighters couldn't accompany the bombers all the way to the targets because of fuel restrictions. Results of these attacks began to prove that the B-17 was not truly invincible. (3:23) In fact, according to a history of the Eighth Air Force by Roger Freeman, "during November 1942, 3.7% of the attacking American bombers had fallen to enemy fighters and the figure had risen to 8.8% in December. The basic question was then - could the VIII Bomber Command's bombers make effective attacks without prohibitive losses?" (3:24) According to VIII Bomber Command, "A 10% loss was considered prohibitive whatever the results" (3:17).

The Americans continued their daylight bombing in spite of the losses, and according to Freeman's history:

obviously caused the Germans mounting concern during the first few months of 1943. There was evidence that the numbers of German fighters were being increased with units being transferred to the front. Tactics were being improved and new weapons tried out. Accurate precision bombing was being demonstrated but on 17 April the fiercest battle yet fought by the B-17's occurred. It was

a day of records; one giving ominous signs that the B-17's were more vulnerable to a determined fighter attack than their advocates were inclined to believe. (3:30)

More B-17's took part on this raid than on any previous mission. The Focke-Wulf aircraft factory at Bremen was the target and 115 aircraft took part with no fighter escort. Bombing results were good with approximately half of the factory destroyed. However, German fighters showed incredible tenacity and didn't even break off their attacks during barrages of flak. Their efforts resulted in the downing of 16 B-17's and damage to 48 additional aircraft. The loss of bombers was an increase of 50% over any previous mission for VIII Bomber Command. (3:30) The loss rate was 14% and was definitely considered to be prohibitive. (3:17)

Another shorter range mission to Antwerp on 4 May had significantly better results. This time 79 B-17's took part in a raid on the Ford and General Motors plants that had been taken over by the Germans. There were no losses because the bombers were accompanied by 12 squadrons of Allied fighters. Six of the squadrons were flying new P-47 Thunderbolts on their first combat escort mission. (3:31)

The P-47's provided somewhat longer range escort for the bombers during their raids. However, without external fuel tanks which were still being developed, the maximum range of the P-47 was only 300 miles. (18:20) This meant they were still unable to give any protection on bombing missions into Germany. On three raids into Germany in June and July 1943, a total of 72 of 386 attacking bombers were lost. (16:121) That translated into an unacceptable loss rate of 19%. (3:17)

The dire need for long-range escort became especially apparent on 17 August 1943 during the first attack against the ball bearing factory at Schweinfurt and an aircraft assembly plant at Regensburg, both in Germany. The raid consisted of 183 bombers with no fighter escort. The overwhelming success of the German fighters caused the loss of 60 bombers. (16:133)

A second raid on Schweinfurt occurred on 14 October 1943, and proved to be the mission that ended the theory of bomber invincibility. Of 229 bombers on the raid, 60 were lost to enemy fighters. The losses were proving to be prohibitive and required a change in the doctrine of unescorted, daylight, precision bombing. (16:130)

Chapter Four

THE DOCTRINE CHANGES

Clearly after the second Schweinfurt raid it was time for a change in the doctrine of unescorted strategic bombing. The bomber forces could not continue to sustain such heavy losses. Therefore, many vital targets in Germany were out of effective range because there was no long-range escort. (15:9) Many senior leaders of the Army Air Force recognized this fact. Some leaders had foreseen the need for long-range escort even before the disaster at Schweinfurt.

Gen Ira Eaker was one of the first to recognize it when he became the Commanding General of VIII Bomber Command in late 1942. He stated, "As it was explained to me what my mission in England was to be, I began enthusiastically to reorient myself toward bombardment. I also, very early, became convinced that it would be greatly to our advantage and reduce our losses significantly if we could have fighters protect us" (7:173) Unfortunately, just the desire for long-range escort was not good enough. What was needed was a fighter that could carry out the mission.

Initial success with longer ranges occurred in March of 1943 when the P-47 began to be used. However, it was one year later when a combat-capable external fuel tank was perfected before the P-47's had enough range to reach Germany. Their effective range had increased to 470 miles, but they still could not accompany the bombers on deep penetrations into Germany. (18:19-23) What was needed was a fighter that could fly as far as Berlin, which was 550 miles away from London.

The answer to the problem of long-range escort deep into Germany came in December 1943 with the appearance of the P-51. (6:17) Production of the P-51 had actually begun in late 1941, but numerous technical difficulties had detracted from it's performance for almost two years. The addition of an 85 gallon internal fuel tank caused some problems initially, but added to the range of the aircraft when the problem was solved. The P-51 had a combat radius of over 800 miles when it arrived in Europe. (16:202)

These new P-51's were so successful that by March 1944

they were flying on escort missions all the way to Berlin. (2:12) It now became practical for the Army Air Forces to change their unescorted bombing doctrine and to provide fighter escort for all of the bombing missions.

During wartime it is difficult to formally change doctrine, so it is normally changed informally by the leaders. At this point in time the decision was up to Gen Henry H. (Hap) Arnold as the Commanding General of the Army Air Forces. He had desired to have long-range fighter escort for quite some time and now had the capability because of the P-51. According to Air Force historians, Wesley Frank Craven and James Lea Cates, "On October 30 General Arnold decided to stop any allocation of long-range P-51's from going to tactical reconnaissance units or to any theater other than the United Kingdom for the remainder of 1943 - this despite urgent requirements for those types in other quarters." (2:11) Additionally a directive on fighter allocation was released on October 31 that stated, "the primary role of all U.S. fighter units in the U.K. until further notice will be the support and protection of the heavy bombers engaged in the bombing missions for POINTBLANK." (16:144) POINTBLANK was the code name given to the attack against the German fighter forces and their supporting industries. (3:99) Gen Arnold had also set forth an ultimatum in June of 1943 which stated, "Get to work on this right away because by January 1944 I want a fighter escort for all our bombers from the U.K. into Germany." (16:124) The delivery of the P-51 allowed Gen Arnold to change the doctrine to escorted strategic bombing for the rest of the war.

Chapter Five

LATER SUCCESS

The new doctrine of strategic bombing with fighter escort protection was tested on a regular basis and proved to be very successful, primarily because of the P-51. According to an VIII Fighter Command report:

The P-51 met with tremendous success by being able to accompany the bombers over their deepest and final penetration where formerly they had little if any escort. In the encounters that followed the operational introduction of the P-51, the enemy suffered heavily and lapsed to a practice of only attacking the bombers when, for navigational, timing, or previous combat reasons, fighter escort was not in the immediate vicinity. (12:2)

Craven and Cates stated that, "The principal credit for the defeat of the German Air Force has rightly been given to the American long-range fighter force." (2:63)

The German Air Force quickly became aware of the effectiveness of the long-range fighter escort. After the war, General Adolph Galland of the German Air Force said:

When escort fighters appeared, a new tactic had to be devised. Orders were issued that fighters were to ignore the escorts and attack the bombers. The results were disastrous to the German fighters who were pounced on by the escort fighters. Only the best German units maintained battle discipline and even some of the most experienced fighter units became victims of fear of fighters. (4:130)

One ratio that began to change and showed the effectiveness of the fighter escort was the percentage of German fighters destroyed by Allied bombers and fighters. The bombers accounted for 90% of enemy losses in the summer of 1943. By fall, that percentage had dropped to 70-80%. However, by May of 1944 that percentage had dropped to 10%, which meant the fighter escort was destroying the enemy fighters before they attacked the American bombers. (13:79)

More important than the percentage of German fighters destroyed by fighters, however, was the percentage of

American bombers downed by enemy aircraft on bombing raids. An evaluation conducted by the Operational Research Section of Eighth Air Force indicated the overall success of the escort operation. From August to December 1942, 4% of the attacking American bombers were downed by enemy fighters. Throughout 1943 that percentage had risen to 5.1%. In 1944 the improvement began. During the first four months it was 3.5%, but from May through September the percentage had dropped drastically to only 1.4%. (11:49) The decrease in losses is credited to the escort fighters by the VIII Air Force Evaluation. It stated:

Since enemy fighter forces available to oppose day bombers increased in size during this period, and since individual enemy fighter attacks have been shown to have more than doubled in effectiveness, the loss rate would probably have increased rather than decreased without the protection of long-range escort. Accordingly, our fighters may be credited with averting the loss of thousands of bombers. (11:50)

The change in doctrine from unescorted to escorted bombing had proven to be a great success.

Chapter Six

CONCLUSION

Doctrine is defined in the ACSC Making Strategy volume as "what we believe about the best way to conduct military affairs." (10:141) The U.S. entered WWII with a doctrine of unescorted strategic bombing. However, by the end of the war that doctrine had changed to escorted strategic bombing. Results of the initial doctrine proved to be disastrous and had to be changed. Technological advances, which resulted in the refinement of the P-51, allowed the Air Corps leaders to deal with a pre-war constraint of limited range fighters that had made long-range escort impossible. The doctrinal evolution that took place had a significant impact on WWII.

The change in doctrine greatly reduced bomber losses on deep penetrations into Germany and contributed significantly to the success of the strategic bombing campaign. General Spaatz said, "The strategic offensive would not have been possible without long-range fighter escort." (17:3) Gen Claire Chennault agreed with him and stated, "Without the long-range escort fighters the daylight bombing of Germany would have ended in a bloody failure" (1:24)

The development of the initial strategic bombing doctrine for WWII had been a difficult task. Lack of any detailed, recent history required planners to rely totally on theory. After the war Gen Hansell said, "Our doctrine . . . was based on hope and not on existing fact" (5:10) Many others agreed with Gen Hansell but felt that the planners should have done better. A USAF historical study entitled History of the Air Corps Tactical School concluded: "Possibly had the planners insisted that the strategic air war would be dependent on fighter escort for the bombers, the engineering difficulties in producing such a plane would have been overcome sooner." The study also said, "it can only be concluded that there was some sketchy thinking." (9:39) Craven and Cates pronounced that, "The failure to have developed such a plane was the most serious flaw in the program, and it is difficult to account for." (7:280)

Craven and Cates were probably a little harsh in their criticism. The air planners did their best in a very demanding situation. Luckily, the U.S. was able to react in time with a new aircraft and a new doctrine which resulted

in success in WWII. The evolution from unescorted to escorted strategic bombing contributed greatly to that success.

There is a valuable lesson to be learned from the mistakes the Air Corps planners made prior to World War II. That is, doctrine must be developed that will ensure success during war. Technological problems which detract from that doctrine must be overcome. During the next war there may not be enough time to recover from an invalid doctrine.

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