U.S. Air Force Historical Study No. 119
(Formerly Army Air Forces Reference History No. 19)
(Short Title—AAFRH-19)

THE
Combined
BOMBER OFFENSIVE
APRIL THROUGH DECEMBER
1943

PREPARED BY
AAF HISTORICAL OFFICE
HEADQUARTERS, ARMY AIR FORCES

CLASSIFICATION CHANGED TO
CONFIDENTIAL
7 OCT 1953

CLASSIFICATION CANCELLED
By Authority of Director,
Research & Development
29 June 1945

SCANNED BY ISA

THIS PAGE Declassified IAW EO12958
CONFIDENTIAL

REFERENCE HISTORY

THE COMBINED BOMBER OFFENSIVE

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(Short Title: AAFRH-19)

AAF Historical Office
Headquarters, Army Air Forces
March 1946

SECURITY INFORMATION

THIS PAGE Declassified IAW EO12958
FOREWORD

This study was prepared during the summer of 1945 by Captain John W. Stormont, whose services were lost to the AAF Historical Office immediately after the study was completed. It does not incorporate, therefore, the results of such more recently released materials as the final over-all report of the U. S. Strategic Bombing Survey.

The present study is preceded by AAFRH-18: The Early Operations of the Eighth Air Force and the Origins of the Combined Bomber Offensive and will be followed by a study dealing with the CEO after December 1943. In order that the reader may understand without recourse to AAFRH-18 the developments narrated here, Captain Stormont has presented in Chapter I and part of Chapter II a summary analysis of materials which will be found treated in greater detail in the study covering the earlier period.

The study is subject to revision, and additional information or suggested corrections will be welcomed.
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Chapter I
SELECTION FOR THE COMBINED BOMBER OFFENSIVE

Early Planning: 1941-1942

The history of the combined bomber offensive (CBO) in Europe is, in the main, an account of strategic air warfare. In a letter written to the Commanding General of the Army Air Forces in January 1943, Maj. Gen. Ira C. Eaker, Commanding General of the United States component of the CBO forces, made a significant distinction between two of the most important military applications of air power. In the course of a comment on the enemy he said:

"The Germans never had an Air Force. They had a great Air Support Command. Goering designed and built their airframes to support ground action in continental conquest. They never had an Air Force of long-range bombers with a defensive fire power to carry destruction outside the continent... They had not the means, perhaps, to build the overpowering Air Force and the overpowering Air Support Command. Quite rightly, therefore, by their lights, they built the latter...

War Department doctrine on the employment of air power makes the same distinctions of mission and composition in more conventional terms. According to this doctrine the over-all mission of a strategic air force is the defeat of the enemy nation, the implication being that such a force can wage war on an enemy independent of the action of other forces. The strategic air force comprises bombardment, fighter, and photographic aviation, but heavy bombardment aircraft constitute its backbone. Its objectives are to be found in the vital centers of the enemy's communication lines and his economic system. The tactical
air force, on the other hand, lacks the emphasis on heavy bombardment aircraft and normally functions in a theater where ground forces are operating. Its missions are principally to gain air superiority within the theater, to prevent movement of hostile troops and supplies, and to participate with the ground forces in a combined effort to win objectives on the immediate front.\textsuperscript{2}

The joint and separate U. S. and British planning for the defeat of Germany contemplated from 1941 forward the strategic application of air power as one of the means of bringing that end about. The British-United States Staff Conversations held in the first quarter of 1941 and reported on 27 March of that year proposed "a sustained air offensive against the German homeland and all territories under her control" as one of the measures against Axis Europe.\textsuperscript{3} The War Department plan, A.H.C. 10. 5, which followed these staff conversations and provided for the defense of the western Hemisphere and action in the Pacific and European theaters, proposed the conduct of "offensive air operations from bases in the British Isles...against German military power at its source.\textsuperscript{4}

The A.D. plan A.D. 1, drafted in August 1941 in pursuance of a presidential directive dated 9 July and in consonance with the United States-British Staff Conversations of 1941 and F.A.A. 30. 5, stated clearly a strategic doctrine for the defeat of Germany in these words: "The center of the Axis system is Germany...The basic conception on which this plan is based lies in the application of air power for the breakdown of the industrial and economic structure of Germany.\textsuperscript{5}
The purpose was further elaborated in a "Plan for Initiation of U.S.
Army Bombardment Operations in the British Isles," 20 March 1943,
which stated that after our bombardment force had been built up
cosmestically it would conduct operations against the strategic ob-
jectives, facilities and establishments which support the operations
of enemy forces and the enemy national, economic, and industrial
structure."

The air plan known as "ABD-22, dated 9 September 1943 and prepared
by the Army Air Forces in compliance with a letter directive from the
President to the Chief of Staff, declared that our air force must defeat
the German Air Force and undermine the economic structure that supported
the surface forces of the enemy. The accomplishment of these tasks was
to be through the combined efforts of the U.S.AAF and the British RAF.
The AAF would conduct precision bombing in daylight and the RAF would
make mass area attacks at night for the purpose of cutting down produc-
tion and weakening morale.

It is thus quite evident that the strategic air force mission was
understood and clearly stated well in advance of the drawing up of the
final Combined Bomber Offensive Plan.

Strategic warfare with heavy bombardment aviation involves three
phases: the preoperational or planning phase, operations and attack,
and the assessment of results. The planning phase is considerably differ-
ent from that for other types of warfare and even unlike that required
for other applications of air power. The strategic plan calls for two
essential steps—the selection of targets and the calculation of the

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force necessary to destroy these targets. It is primarily in the selection of targets that planning for strategic air war differs most from other types of war planning. Since the strategic force aims to destroy the economic sources of military power, the selection of target systems is of paramount importance. Their selection requires a kind of intelligence of the enemy and a type of personnel different from other military preparations.

The air planning for war against Germany that preceded the GSE Plan paid a great deal of attention to the matter of target selection. AIRD-1, mentioned above, selected a set of industrial systems for destruction and arranged them in order of priority. The plan called for:

a. disruption of the German electric power system
b. disruption of the German transportation system
c. destruction of German oil and petroleum supplies
d. undermining morale by attacks on centers of population

To aid in the accomplishment of these objectives it would be necessary to neutralize the German Air Force by attacks on

a. its bases
b. engine and airframe factories
c. aluminum and steel factories

The "Plan for Initiation of Air Force Bombardment Operations in the British Isles" selected as a list targets within four categories in the following order of priority:

a. Munitions industry
b. Electrical and water-power industry
c. Petroleum and fuel industry
d. Rail and water transportation

AIRD-19, mentioned above, went into considerable detail in selection of systems and individual targets, and in the calculation of the forces

UNITED STATES:
and munitions necessary for achieving the destruction of these targets. The size of the forces planned was based upon the consistent accuracy that had been observed in early Eighth Air Force operations. The plan provided seven target systems for the attention of the Eighth while the RAF bombers were to be engaged in mass area attacks. The systems for the Allied bombers included:

- First priority, facilities supporting the RAF — including eleven fighter factories, fifteen bomber factories, and seventeen engine plants.
- Second priority, twenty submarine building yards.
- Third priority, transportation system — individual targets (30) were to be found among building ships, repair works, repair yards, and camps.
- Fourth priority, electric power — including some thirty-seven major plants.
- Fifth priority, oil — which required destruction of twenty-three plants.
- Sixth priority, fourteen aluminum plants.
- Seventh priority, rubber — The destruction of the two principal plants was called for.

The whole plan required the destruction of 177 targets by 66,145 heavy bomber sorties dropping two tons per sortie.

Since during the course of 1943 the German submarine had become a serious threat to our successful driving of the war, the facilities supporting undersea craft were moved to top priority in a list of target categories given to the U.S. Eighth Air Force by the theater commander in October 1943:

- First priority, five submarine bases
- Second priority, aircraft factories and fields
- Third priority, twelve railroad marshaling yards

The Casablanca Conference

From the above it seems quite evident that definite progress had been made in the sphere of target selection in the planning prior to the
Drawing of the final blueprint for the combined bomber offensive in 1943. It was true, nevertheless, that certain things were lacking in the preparations for the air offensive against the Western Axis. No directive emanating from the top policy levels had been issued to control the combined operations of the two Allied air forces that were operating against Germany; no directive of sufficient clearness and definiteness had been given to the U. S. Eighth Air Force; and no unified analysis of enemy economy had been made that was sufficiently thorough to serve as a basis for the best target selection. 12

Two of these defects in strategic planning were eliminated by the work of the Casablanca Conference in January 1943: a directive was issued by the Combined Chiefs of Staff, and this directive proved to be quite clear and definite. There had apparently never been any disposition on the part of the Combined Chiefs to depart from the intention to use strategic air power as one of the primary offensive measures against Germany, but there had been some pressure exerted to have the U. S. Eighth abandon daylight precision bombing and join with the British in night bombing. 13

The Commanding General of the Eighth was called to Casablanca and given opportunity to defend the United States doctrine of day bombing. His defense emphasized the greater accuracy of this type of operation which permitted small targets like factories to be found, seen, and hit. Day bombing, he declared, was more economical in the employment of forces, for a smaller number of bombers could destroy a given target.
This meant reduced exposure to enemy action and consequent lower losses for a given result. Also, day attack was more economical because all forces could carry bombs, whereas at night large numbers of with找准ers and target illuminators were required. It was stated, in addition, that day bombing used in conjunction with British night bombing would heavily tax German defenses by allowing no rest during the daylight hours, and would prevent congestion and provide more economical use of English aircrews. The general's defense of precision bombing likewise stressed the fact that American training and equipment would require modification if successful night operation was to be possible, for American crews would need a long period of additional training to make them capable of coping with English weather at night and U.S. planners would have to be flaw corrected, thus reducing their range and range. Furthermore, the point was made that day bombing provided an excellent means of cooperation with the RAF night effort, in that the RAF bombers could find difficult targets and burn them by setting fires, whereupon the RAF could complete the job of destruction at night. Moreover, day bombing would permit the destruction of the enemy's day fighters, thus causing the greatest reduction of his air force. Finally, it would (as a complement to night bombing) result in the greatest havoc to the enemy's industrial system.14

General [illegible] spent an hour with the British Prime Minister at Casablanca and was assured by the latter that he would be given an opportunity to move his case.15

The Casablanca directive that was issued by the Combined Chiefs
of Staff on 31 January 1945 is noteworthy because it governed the operations of both U.S. and British bomber commands in the United Kingdom, because of its excellent statement of the mission of strategic bombardment, and because of the target systems that were selected for attack.

The mission of the bomber offensive from the United Kingdom was

"the progressive destruction and dislocation of the German military, industrial and economic system, and the undermining of the morale of the German people to the point where their capacity for armed resistance is fatally weakened."

The target systems to be attacked in the accomplishment of this mission were in five categories in the following order of priority:

a. German submarine construction yards
b. The German aircraft industry
c. Transportation
d. Oil plants
e. Other targets in enemy war industry

The directive stated that strategic developments might vary the order of the five categories and that there were other targets of military and political importance, such as submarine operating bases on the Biscay coast and the city of Berlin, which were worthy of attention. Attacks were to be made in the Mediterranean theater when the occasion demanded, and the units of the German fleet were to be hit when opportune. Daylight attacks were to be pressed against targets within Germany in order to maintain continuous pressure on German fighters, and to take enemy fighter pressure away from the Soviet and Mediterranean theaters.
The Report of the Committee of Operations Analysts

The target selection in the Casablanca directive was not, however, much different from nor perhaps any better than that in the earlier planning. The thing that had been lacking in all this planning was a thorough study of the enemy's economy by a single agency, such a unified analysis being necessary for the proper selection of strategic objectives. This phase of planning had developed its own principles and techniques, which involved a detailed knowledge of the enemy's productive system and a careful balancing of economic and military factors; but no agency had been created to apply these techniques in preparing a comprehensive report.

Not all of the intelligence of the enemy necessary for target selection can be obtained directly by an air force or a bomber command. Such intelligence is obtained by many regular and special governmental agencies and by a variety of individual experts. Its sources are as varied as its collectors. Aerial reconnaissance photographs, ground reports, captured weapons, interrogations of refugees and prisoners of war, current and recent enemy technical publications, the present experience of Allied technical experts abroad, our own production practices, and Allied data on bombing effectiveness are but some of the sources used in making a selection of targets for strategic bombing.

Before industrial systems can be ranked in target priority a number of economic and military criteria must be applied. Most important, perhaps, is the military use of the products of a system. Some of the economic factors which must be considered are the depth of an industry
(measured by the time required to get products from industry to the front line), the cushion (idle capacity that can be brought into production), the reserve stocks, the attrition rate, the existence of substitutes, the possibility of exercising economies, and the ability of an industry to recreate.

Military factors relating to the vulnerability of targets and the capabilities of the attacking air force must be studied. The structural characteristics and concentration of buildings, their susceptibility to various types of munitions, the dispersal of plants, and distances from bases all govern the possible destruction of a telling fraction of an industry by an air force.17

The appointment of a body to make the analysis of German economy that was necessary before further progress in target selection could be achieved was made on 9 December 1942 by the Commanding General of the Army Air Forces. This body, known as the Committee of Operations Analysts (COA) and placed under the direction of the Assistant Chief of the Air Staff, Operations Control, was instructed to submit a report which would show the rate of deterioration of the German war effort that would result from air operations and which would indicate an approximate date when invasion of the Continent would be possible.18

This was the body that filled the gap that had existed in the strategic planning before 1943 by making a thorough-going study of German economy upon which a dependable choice of target systems could rest.

The first meeting of the Committee of Operations Analysts was held on 10 December, and it immediately went to work with the appointment
of subcommittees to study enemy industrial systems. 19

Although it was desired that the committee submit a report before
the Casablanca Conference, this could not be accomplished in the time
available. An interim report was submitted on 23 December 1943 in which
the committee's methods and sources of intelligence were described and
in which the principle of concentration of effort was stated thus: "... it is better to cause a high degree of destruction in a few really
essential industries or services than to cause a small degree of destruc-
tion in many industries. 20"

The next few months were spent in the study of various target
systems. Assistance was given by A-2, C-2, the Board of Economic War-
fare, the Office of Strategic Services, the War Production Board, and
certain other government agencies and experts in private industry. Cer-
tain members of the committee went to England where methods and materials
were reviewed with the Eighth Air Force, the Royal Air Force, the Air
Ministry, and the Ministry of Economic Warfare.

The final report of the G-4 was submitted on 5 March 1945. The
over-all results of the researches of the various subcommittees were
presented in a bound volume which summarized data on 19 different German
industrial systems—all that appeared to have important significance.
Under a separate tab for each production unit in each system were
listed the distance of each unit from London and its percentage of
total axis production were set forth. For security reasons the committee
did not rank the 19 systems 21 in order of priority, but it did announce
a set of principles of strategic selection which apparently constitute
one of its chief contributions to the planning phase of this type of warfare.

Although the CJA did not recommend definite target priorities or find it possible at the time of the 6 March report to forecast a date on which invasion would be possible, it did arrive at two important conclusions:

1. The destruction and continued neutralization of some sixty targets would greatly impair and might paralyze the German Axis war effort.

2. In view of the ability of adequate and properly utilized air power to disrupt the industrial center of the enemy's military strength, only the most vital considerations should be permitted to delay or divert the application of an adequate striking force to this task.

The Combined Bomber Offensive Plan and Directive

The report of the CJA was taken to London, where a committee composed of Brig. Gen. Hoywood H. Lansell, Jr., Brig. Gen. Orvil A. Anderson, and plans personnel of U.S.A., the Royal Air Force, and the Eighth Air Force was set up under General Pincher for the purpose of drawing up an operating plan to accomplish the desired result. The committee had as its task the establishment of target priorities and the calculation of the size of U.S. forces necessary to accomplish the purpose of the CJA.

This committee completed its work in April 1943. The finished plan restated the mission of the strategic air forces as defined in the Casablanca directive and recommended the destruction of 76 specific targets that were to be found in the following systems:

1. Submarine construction yards and bases
2. German aircraft industry
c. Ball bearings

d. Oil

e. Synthetic rubber and tires

f. Military transport vehicles

It further stated that the destruction of the selected individual targets within those systems would achieve the elimination of commanding fractions of enemy production within the affected industries:

a. Destruction of the selected submarine yards would reduce German construction by 35%.

b. German fighter capacity would be reduced by 45% and bomber capacity by 60%.

c. Ball-bearing capacity would be reduced by 70%.

d. Destruction of Ploesti refineries and German synthetic oil plants would reduce production by 45%.

e. Destruction of 50% of synthetic rubber production and nearly all of that for tires would be accomplished.

f. Destruction of seven plants producing motor vehicles would fatally weaken the capacity of the German people for armed resistance.

The German aircraft industry was placed second in the priority list of target systems, but the plan stated that German fighter strength was an intermediate objective of the bomber offensive second to none. That is to say that the German fighter force had to be destroyed before the combined bomber offensive, especially the American part of it, could be successful. It was pointed out in this connection that German fighter production had increased 44% and fighter strength on the Eastern front and nearly doubled since the entry of the United States into the war.

The plan emphasized the fact that the bomber offensive was an integrated P-1 and V-1 effort, and that the capabilities of the two forces were complementary.

A time schedule was worked out calling for all the B-17 missions against a certain number of targets within certain systems in each of
four three-month phases. The first phase was scheduled to run to 30 June, the second to 30 September, the third to the end of 1943, and the fourth to go into the early months of 1944. The specific targets for the Eighth during the first three phases were set forth in charts by category, and the distance from bases and the productive importance of each was shown. The RAFFWAR given a certain definite assignment of cities in each phase for attack. In general, these coincided with the location of the U.S. targets. The precision targets of the Eighth and the area targets of the RAFFWAR were shown on maps by different symbols.

The Eighth Air Force penetrations of enemy territory were to become deeper as the offensive progressed. First-phase operations were to be relatively shallow and were to be concentrated against the submarine yards and bases along the coast. Second-phase range was to increase to approximately 400 miles, and about three-quarters of the effort was to be concentrated against German fighter aircraft factories and other German Air Force facilities. The third phase was to see attacks against all the principal objectives with continued effort to neutralize those previously attacked but capable of repair. Fourth phase was to witness the continuation of these operations with provision made for attacks against installations associated with a cross-channel invasion.

The calculation of the size of U.S. forces needed was based upon the experience of the Eighth in operating in the theater. It was stated in the plan that this force had conducted about 25 missions in the three-month period from January to April 1943, and that approximately 12 of
there missions had been successful. It was stated also that the average number of aircraft dispatched by the Eighth was 86. It was assumed, therefore, that a force of about 100 bombers would be sufficient to destroy a target about 1,000 feet in radius, and that about two-thirds of the missions could be expected to reach and strike their objectives. It was further assumed on the basis of Eighth Air Force experience that about 37.5% of the airplanes in the theater could be dispatched on missions at any one time. In addition, some allowance for airplanes in reserve, in depot repair, and being modified. Contemplating about 18 important operations during each three-month phase, of which 12 were expected to be successful, the heavy bomber force build-up for the U. S. continent called for in the plan was:

- At the end of the first phase, 30 June 1943: 944
- At the end of the second phase, 30 September 1943: 1192
- At the end of third phase, 31 December 1943: 1746
- By 31 March 1944: 2702

The plan also called for the build-up of the U. S. forces in medium bombers which were to be used in attacks on German airfields and to aid in the heavy bomber raids by missions designed to divert enemy fighters. It was pointed out that medium bombers would also be required to support combined operations in 1944. The build-up progress for the medium was set at:

- By the end of the first phase: 300
- By end of second phase: 420
- By end of third phase: 600
- By 31 March 1944: 800

The plan did not provide a schedule for the build-up of fighter forces. It did, however, call attention to the need for extensive U. S.
fighter strength both to protect the bombers and to help reduce the German fighter strength. It also called attention to the necessity for the creation of a tactical air force in the European theater in order to be ready for combined operations in 1944.

This rather complete air plan, which restated the strategic air mission with respect to Germany, listed target priorities, contained a detailed schedule of operations by phases, and provided for the buildup of United States heavy and medium bombers, received the approval of the U. S. Army Commanding General of the European Theater of Operations and of the Chief of the British Air Staff. The plan was taken to Washington by the Commanding General of the Eighth Air Force and presented to the Combined Chiefs of Staff, who granted approval in May. The Combined Bomber Offensive directive based upon it was issued through the British Air Staff to the Eighth Air Force and to RCAF Bomber Command and Fighter Command on 10 June 1943. The directive reaffirmed the strategic air mission as it had been given in the Casablanca directive; it listed target priorities in the light of the then existing strategic situation; it assigned tasks to the British Fighter Command and to the American fighter forces, and provided for coordination of British and U. S. efforts.

Target priorities were assigned to the Eighth under three heads: intermediate, primary, and secondary objectives. The intermediate objective was stated to be the German fighter strength. Calling this an intermediate objective implies that it was something that had to be accomplished before the rest of the offensive could be effectively concluded. It was pointed out that any delay in the attack on German fighters
would make the prosecution of the rest of the task progressively more
difficult. Enemy fighter strength was to be cut down by attacks on air-
frames, engines, components, and ball-bearing factories; by area disorganiza-
tion attacks; by strikes against repair desots and storage works; and by
the destruction of fighters in the air and on the ground.

Primary objectives of the heavy bombers were to be:

a. German submarine yards and bases
b. Facilities supporting the German air forces other than fighters
c. Ball bearing

d. Oil

It was directed that the German submarine yards and bases receive maxi-
mum effort whenever tactical and weather conditions precluded attacks on
German fighter objectives. The offensive against oil was stated to be
contingent upon attacks against Ploesti from the Mediterranean.

Secondary objectives of the bomber offensive were to be:

a. Synthetic rubber and tires
b. Military transport vehicles

The directive called for the British Bomber Command to be employed
in the general disorganization of German industry, with all action designed
as far as practicable to be complementary to that of the Army.

Judgments Concerning the Selection of Targets

Before proceeding with the account of operations in pursuance of
the Combined Bomber Offensive directive, it might be well to examine
tentatively, in the light of the strategic situation and the intelligence
of the enemy available in 1943, some of the questions that have been raised
concerning the choice of the target selection in that plan.
Facing a judgment upon subsequent events, the giving of high priority to submarine yards and bases as primary objectives might be questioned. We now have the testimony of Grand Admiral Doenitz to the effect that the bombing of these facilities was not very damaging. He declared that the U-boat assembly places were never hit until 1945 and that the turn-around time in the pens was not increased by bombing. Eighth Air Force studies made in late 1942 and early 1943 concerning the effectiveness of bombing submarine installations had already indicated that such action was none too effective. There was great doubt about the vulnerability of submarine pens; in fact a study made by VIII Bomber Command on 3 December 1942 expressed the opinion that none of the U.S. bombs available at the time were capable of penetrating the roofs of the pens from any practical bomb- ing height. Another study on the target value of submarines concluded that because of the cushion of excess productive capacity an attack on components would have at best only a very long-term effect. Submarine yards, moreover, were not considered profitable targets unless the then current sinking rate by air and surface craft could be doubled. Even total destruction of all yards would produce no decrease in the number of submarines operating in the Atlantic for the 12 months succeeding the destruction. The 6th report of 8 March 1945 evidenced this lag in military results with the statement that the number of submarines undergoing trials and nearing completion was sufficient to make good the sinking rate at the time. This report also said that there was no conclusive evidence that the bombing of bases would substantially reduce the number of submarines operating at any one time.
It seems, therefore, that neither submarine yards nor bases are the tests of a good target for strategic bombing. One must conclude, however, that the U-boat was such a menace in early 1943 that any method that offered any promise at all should have been used. Fortunately, the strategic bombardment of yards and bases was but one of the methods employed against this enemy weapon.

The inclusion of the aircraft industry in high-priority target position is not even to be such questioning. It is true that testimony of German prisoners of war has indicated that our bombing was not nearly so damaging as we believed it would be or thought it was at the time. The reason seems to have been found in the ability of the enemy to effect dispersal of the industry. Of course, the degree of effectiveness of the bombing as it developed did not to any great extent invalidate the wisdom of selecting the aircraft industry as a target system in 1943. One of the fundamental tasks of an air force is the destruction of hostile air forces by attacks in the air, on the ground, and against all installations which support air power. The aircraft industry, not the economic and military criteria for a target system in 1943 and it would have been a violation of fundamental principles of air warfare not to have given it high priority. Moreover, the effects were by no means negligible.

The oil-bearing industry was accorded third priority among primary objectives of the bomber offensive, immediately after submarines and aircraft. Some of the testimony by German prisoners of war seems to minimize the effectiveness of the bombing of this industry also, but its effect was not more marked than due to several factors: the dispersal that was
achieved, the ability of the crew to cut down on the delivery time of the finished product from the factory to the consumer, the fact that in the aircraft industry ball bearings could be replaced by other consumables, and that the German army had accumulated in the vicinity of Magdeburg several months' supply for emergency purposes. Allied information on the ball-bearing industry rated it an excellent target system from both the economic and military standpoints. On the basis of American and British knowledge and practice it was believed inpracticable for the Germans to have accumulated any great stock of bearings. Nearly half the German supply was turned out in three plants around the one city of Schweinfurt, and 10% of the product came from two plants near Karls. The bombing of the ball-bearing industry would be crippling to all other industry which used high-speed moving parts. The bearing industry was too valuable to the German war effort not to have accorded it high priority in 1943.

An indication concerning the effect of Allied strategic bombing in Europe that has been obtained from German prisoners of war indicates that attacks on oil and transportation did more damage to German effort than any other bombing. The target priority list which according to Hermann Göring would have been most effective reads as follows:

a. Synthetic oil
b. Communications
c. Aero-engine factories
d. Airframe factories
e. Ball-bearing factories
f. Airfields

Albert Speer, former German Minister of Armaments and War Production, ranked
objectives in order of relative importance from the point of view of current production. His first two categories were:

1. Key points in the basic industries or supplies.
2. Transportation and communications, although the effect of attacks on these war long delayed because of the density of the transportation network.

Sorge said that the attacks on the chemical industry were the most difficult to deal with, and he included synthetic oil production in the chemical industry. The former Minister of Armaments even went so far as to say that the attack on the chemical industry, without the impact of other military events, would have rendered Germany defenseless.\(^{26}\)

Field Marshal Wilhelm Keitel rated the destruction of transportation as the most decisive influence in the defeat of Germany, and the demoralization of the Wehrmacht and the nation as of second greatest influence.\(^{27}\)

General Galland rated the bombing of transportation facilities and oil targets in first and second places in his scale of effectiveness. He ranked transportation facilities first because of their direct importance to military operations and war production, oil targets second because of their relation to the function of air and armored forces and military and industrial transport.\(^{28}\)

There is little point in introducing further evidence concerning German opinion on the ranking of target systems. Oil and transportation run like a chorus through a considerable portion of their testimony. This raises two questions: why oil was not given higher priority, and why transportation was not included among primary or secondary objectives of the Combined Jumper Offensive Plan. As far as oil is concerned, this amounts
to asking why it was not raised above ball bearings. The oil industry  
(synthetic and natural) aside newer than Klopitti was much more dispersed than  
was the bearing industry. Synthetic production, which accounted for  
about 31 per cent of output, was scattered among some 12 plants. Only two  
of these plants were estimated to turn out as much as b each of the  
total Axis product. One was at Louna (E), 570 miles from London, and  
the other at Poleitz (E), which was 340 miles from London. It was recog-  
ized in 1943 that the German oil position was serious, but it was also  
known that such a large portion of the Axis requirement was supplied by  
the refineries located about Klopitti that an attack on this complex  
would be necessary before attacks on the dispersed synthetic producers  
would show telling results.

The question of the exclusion of transportation targets from the  
early phases of the combined bomber offensive is relatively simple. It  
will be recalled that AIR-1 (Plan for Bomber and Constituent Units to  
Arrive in the United Kingdom in 1943), AIR-43 (the target directive given  
to the Eighth Air Force in October 1943), and the Casablanca directive  
all placed transportation in relatively high priority. Transportation  
had never been forgotten in strategic planning, nor was it neglected in the  
Combined Bomber Offensive Plan. One of the chief ends of the strate-  
ic mission was to weaken Germany to such an extent that successful cross- 
channel landing operations could be undertaken by the Allies. It was  
just before and during such operations that attack on transportation would  
be most profitable. In the early stages of the CAS before the force was  
built up and before the timing would help ground forces, the transpor-

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The information system did not present a telling target. Limited and scattered attacks would do little good because of the ease of repair. There was no small number of points whose destruction would prove decisive. It would be necessary to hit a great many targets within a relatively short time in order to do the enemy the same harm as an attack on one of his other systems would accomplish. The wise course in regard to this category was to wait until the air offensive was well advanced and combined cross-channel operations were at hand.  

Questions concerning the judgment to be made of the target selection for the OBOE call for examination of several other systems. One, a question of exclusion, involves electric power. It will be recalled that the 1941 and 1943 target planning included this in high priority. It was not included in the Directive of 10 June 1943. Field Marshal Goering, in his interview of 28 June 1945, stated that an attack on electric power had been scored. He also declared that the Germans had planned attacks on 21 power plants in the U.S.S.R.  
Field Marshal Keitel has stated that an attack on electric power plants, while dangerous, would not have stopped transportation on electric railroads because of the possibility of the switch to steam locomotives. The key to the thinking back of the exclusion of this category from the OBOE targets may be found in the GSA Report of 3 March 1943. This stated that while German industry as a whole was in large measure dependent on electrical energy for continued operation, in almost no instance was a single industry dependent upon a single generating plant. It rather depended upon a network which pooled the electrical power within an area. As a bombin problem, then, an
attack on electric power resolved itself into the deactivation of a given region rather than an assault upon the whole industry, which was too big and too dispersed to be entirely destroyed. There was also some doubt about the vulnerability of electric power plants.\(^{43}\)

The windows of the inclusion as target systems of industries manufacturing rubber, tires, and motor vehicles is evident upon examination of some of the data collected about them in 1943. The German position in rubber at that time was thought to be precarious, since one-third of her supply was provided by blockade running and the reclamation of scrap, and the other two-thirds by synthetic production. Nearly one-half of the synthetic rubber was turned out by two plants at Buls and Schkopau, and these plants were responsible for an even larger fraction of the synthetic suitable for tires.

Tire-manufacturing plants, particularly those for manufacturing airplane tires, presented a fine target system for the standpoint of concentration and vulnerability. Four plants located in Kaisau, Hannover (2), and Milan produced practically all the aircraft tires. The destruction of six other plants (Lachen, Enschede, Montlucon, Hanburg, Clémont-Ferrand, and Munich) was deemed sufficient to deprive Germany of more than 70% of all tires (truck, passenger vehicle, aircraft, etc.). Rubber-tire plants were believed to be especially susceptible to incendiary attack. All these factors made the rubber and tire industry too lucrative a target system to be neglected.\(^{44}\)

The motor vehicle industry fell into the test of military significance, concentration, and vulnerability. Furthermore, attrition was
succeeded during the winter of 1942-43 to have been twice as great or production. The German vehicle position was such that it was essential that scarcely any vehicles could have been withdrawn from industrial and other uses for the military service. Although there were about 30 truck-assembly and manufacturing plants, it was believed that above 35% of the total truck output was concentrated in seven plants (Ford-Solingen, Opel-Brandenburg, Daimler-Benz, Stuttgart, Matford-Maris, Matford-Soorjeu, Citroen-Slichy, and Fiat-Choria) four of which were less than 400 miles from London.45

On the face of the thing, it would appear that any attempt to undermine the economy of a modern industrial nation would involve attacks upon the very foundations of that economy, namely, iron and steel, coke, and machine tools. The conclusions of the COA on these industries as strategic targets are pertinent.

Concerning the steel industry the conclusion was that the western Axis position was strong and the destruction of one-half the plants would not produce much military effect for more than a year. Moreover, because of their ruggedness of construction the vulnerability of steel plants was not high. The western Axis was thought to be more vulnerable in high-grade alloy steels, but even here the result of attacks was considered questionable because of the existence of a number of alternate facilities.46

Jute ovens were considered vulnerable to air attack, but their number was so great that they did not represent a profitable target for achieving decisive results in the crippling of the German military machine.47
The OA conclusion in regard to machine tools was that the industry did not constitute a high-priority target because it lay too deep in the industrial process. There was, however, a recommendation that the plants making machine tools for a particular industry should have a high priority in order to prevent resumption when that industry was successfully attacked. 43
Chapter II

THE FIRST BATTALION 4TH INFANTRY OFFICERS, APRIL-JULY 1943

Size of the United States Forces

The basic measure of strategic bombardment has been the unit weight of bombs on target. The chief vehicles employed by the Eighth Air Force in carrying bombs to enemy targets were the B-17 and B-24 heavy bombers. The carrying capacity of these aircraft changed somewhat during the course of the 20-odd months the Eighth operated in the European theater, and the number of trips per unit time (sortie rate) also changed, but the quantity of bombs delivered always depended in a definite way on the size of the force of heavy bombers and upon the crews available to fly them.

Behind the sortie rate of the operational aircraft are very many highly important factors which are beyond the scope of this examination of the forces available to the Eighth Air Force for conducting the combined bomber offensive. Here the concern is to be primarily with the size of the force in terms of combat groups, aircraft, and crews—that is, with the effective operating strength. The important matter of providing service units in support of combat units is too large for treatment at this time. The aim is to set forth the effective combat strength available to the Eighth during the first three months of the combined bomber offensive, and to raise a brief inquiry as to why it was not larger.

The Eighth Air Force had been sent to the United Kingdom in the spring of 1942 as a part of the so-called "Lentil Task Force." BOLIHO was the plan for the build-up of a force in the British Isles which was to launch
an invasion of the Continent. This invasion was to be preceded by an air
offensive designed to gain the necessary degree of air superiority. After
that was accomplished, air forces were to disrupt the German industrial
machine by strategic bombardment and to operate in conjunction with
ground forces. As long as the invasion of the Continent was planned
for the summer of 1943, the Eighth had a definite mission. But a change
in plans occurred in July of 1943 when the decision was made to invade
North Africa (Operation Torch). The Eighth was, in consequence, left
without a clear-cut mission for some time, or perhaps it is better to say,
with its mission postponed for an indefinite time. Nevertheless, it con-
tinued to carry the fight to the enemy as best it could.

The size of the force available was, of course, adversely affected
by the strategic decision. During the last five months of 1942 the
Eighth really served as "a giant replacement pool" for the Twelfth Air
Force in North Africa. During that time the Eighth dispatched to the
new air force more than 1,500 aircraft, practically all its organizational
equipment, and huge quantities of supplies. It supplied three B-38 fighter
roups (1st, 31st, and 33d) in October, one heavy bomb group (97th) in
November, and two in December (901st and 93d). In addition it provided
training for other Twelfth Air Force groups.

During these last months of 1943 the Eighth never had more than
seven heavy bomber groups operating at any one time, and after September
it had but one fighter group (361st). Its average number of opera-
tional heavy bomber aircraft was less than 100 during every month except
December; its average number of heavy crew available was never much
above 100; and its greatest average effective heavy bomber strength, attained in December, was only 114. This Commanding General of the Eight was not exaggerating; when he described his command at this period as "our diving force of Fortress."

The U.S. air arm in the British Isles had its mission restated in clear-cut terms at the Casablanca Conference in January 1943, but that did not immediately raise the size of the effective forces. During the first quarter of that year there were operational no more than six heavy bomb groups, one fighter group, and one photo-reconnaissance group. The effective heavy bomber strength was even lower than it had been during the last quarter of 1942.

The failure of the Eighth Air Force to build up to greater strength was not due to lack of planning by the Army Air Forces. Lack of the air strength in Great Britain there was planning of two general types. In the first place, such over-all plans as AAF-41 (1941) and AAF-42 had made theoretical calculations of the size of forces necessary to do a certain kind of strategic job against Germany. In the second place, considerable attention was given to the very practical matter of allocating what was available among the various theaters and shorting the rate of flow of units and replacements. The Arnold-Toweert-Spota modification of June 1942 specified a definite build-up plan for the Eighth to be achieved by the first of April 1943. In September of 1942 the so-called Peacoby Flow Chart set forth a rate of build-up for the air forces in the United Kingdom as well as in other theaters.

A variety of other factors governed the flow of aircraft and crew
to the lights. Over-all strategical decisions, as that to invade North
Africa before Western Europe, continued to affect the build-up of force,
and demands of the Mediterranean and other theaters were again to draw
strength from the United Kingdom. As important as any other factor was
the rate of production of aircraft and equipment, and closely parallel to
this was the state of training of combat and service units. The limita-
tions of shipping, moreover, were constantly threatening to upset any
planned flow of units and matériel to a theater. 13

Despite these difficulties there was an understandable demand from
the European theater for definite commitments. The British wanted a
reliable plan for the flow of new units in order that they might prepare
the airfields and accommodations for their reception. 14 The air force
commander wanted a chart of the arrival of new units in order that he
might plan his operations accordingly. 15 His forces sunk to such a low
point in February 1943, that he pleaded for just two air echelons of groups
even though there was no shipping available for ground echelons. 16 He
needed to know the rate at which replacements, particularly crews, would
arrive, or there determined the rate at which the old units could conduct
operations. 17 The theater commander needed to know the dates on which
units and certain types of equipment would be ready in order that he might
properly assign shipping priorities.

The AIF expended great effort in the preparation of flow charts for
the United Kingdom, both to meet the needs of the European theater and to
aid in the planning of allocations to all theaters. Some of the flow
charts were sent to the British and some to the United Air Force. During
the first quarter of 1943, and even thereafter, they were produced in quantity, but all were subject to change without notice and none could be carried out on schedule.

At the Casablanca Conference of January 1943 General Arnold gave to Air Vice Marshal J. H. Creer, C-in-C Director of Plans, a table showing the build-up of the 11th Air Force Command for 1943. It had a goal of 32 heavy groups with unit equipment (V17) on 3,700 aircraft and 10 medium groups with unit equipment of 770 aircraft, and indicated that the command would be maintained at this strength during 1944. Later in January Air Vice Marshal Foster received from Maj. Gen. George C. Stratemeyer, U. S. Chief of Air Staff, another chart which forecast the rate of build-up of the 11th in all types of combat aircraft, but projected the expansion to 23 June 1943, at which time the heavy bomber strength was to reach 45 groups; medium bomber, 71 groups; and fighter, 26 groups. Strength was also forecast for 30 June 1943, and 31 December 1943. According to this chart, heavy bomb groups were to have 48 aircraft per group; medium groups, 6; and fighters, 100. Air Vice Marshal Foster received a revision of this schedule about a month later in a letter from General Arnold which stated that changing circumstances made it impracticable to forecast the flow of aircraft with any degree of accuracy. The Commanding General of the AFM explained that the situation in the Mediterranean theater had occasioned the revisions of the Strategic program of January. 23

General Foster concluded on 1 March to General Arnold that he was greatly embarrassed in his conferences with the British Chief of the Air
Staff by not having accurate figures on the proposed build-up of his air force. General Arnold relied on the 28th with another chart that forecast the flow of all types of aircraft as of 30 June and 31 December 1943, and 30 June 1944. He told the commander of the Eighth, however, that the figures were not sufficiently reliable to be used as definite commitments. They were simply the best estimate that could be made at the time on the basis of the training and activation schedule and the expected availability of aircraft. That was all that any flow chart could be because it was impossible to predict with exactness the rate at which men and materials would arrive in any theater.

Another flow chart taken to Europe in April by the Chief of Air Staff, and called in the theater the Strategic Flow Plan, seems to have had more significance during the first phase of operations than any of the others. It evidently was the basis for planning on both sides of the Atlantic until it was amended by the Dudley Plan in May.

The latter plan, named for Inspector General of the Army Air Forces, Maj. Gen. Hollett H. Dudley, was the most significant step taken in the build-up of the Eighth Air Force and deserves somewhat detailed consideration. It had much greater scope than simply the charting of the flow of units or aircraft to the United Kingdom. It made recommendations for fundamental organizational changes in the strategic air force, provided for the organization of a tactical air force, and set up a trace basis for both of them. It had a difficult time in the War Department and was finally approved only after it was out of date. It did, however, serve the theater, the AAF, and the War Department as a basis for planning and...
therein little significance.

Lao Combined Bomber Offensive Plan which was drawn up in the theater in April 1943 and approved by the Combined Chiefs of Staff in May, provided for the build-up of heavy and medium bomber forces by three-month intervals beginning with 30 June 1943. There was drawn up at the same time by General Arnold's staff a troop basis incorporating the combat and service units for the strategic air force as well as for the tactical air force which was to support the invasion. All the units included in the troop basis were standard for Department units designated to operate in any theater. This troop basis was not accepted because it was believed that in a stabilized theater where bases were located in a highly industrialized section a considerable saving in manpower could be effected by organizing certain units under similar tables. General Arnold realized that the air build-up plans for the United Kingdom current in April of 1943 called for more personnel (631,081) than could ever be shipped or than could ever be approved by the War Department. On 14 April he sent a cable to General Spaatz directing that he initiate a study with the purpose of determining what economy could be exercised and telling him that he was sending General Bradley and two other officers to the theater for the investigation of the same problem.

Somewhat later in the month the Commanding General of the AAF gave definite instructions to General Arnold for his incipient assignment.

The Air Inspector was to: (1) Find whether the ultimate planned strength of 125 groups for the United Kingdom could be operated and maintained with no more than 500,000 personnel, and if that could not be done, to determine
that strength could be operated with that number; (2) study certain proposed adjustments in organization and maintenance with the view of incorporating them in other theaters; (3) make an estimate of the operational saturation point of RAF and USAAF numbers in the theater; (4) obtain the preference of the theater commander concerning the ratio of ASF ground to combat troops; and (5) collaborate with Generals Andrew and Maker in preparing a troop basis to implement the plan for the bomber offensive. 26

General Bradley conferred with General Maker, who had come to Washington with the 0-0 plan, before leaving the country and arrived in the United States on 5 May, accompanied by Col. Hugh F. Herr, then chief of the Control Division of the Air Service Ground, and other officers. The committee of officers went at once to its task, which it viewed as the determination of the most economical personnel requirements for the theater and the balancing of these against available shipping. 27

The Bradley Committee visited a number of typical RAF and ASF installations, interviewed the agencies concerned, and on 23 May made its recommendations which were based upon the following assumptions: (1) that since strategic bombardment was the mission of the Eighth during 1943 and 1944, rapid build-up of the bomber command was necessary to success; (2) that there was to be a separate tactical air force to operate initially from fixed bases in England and eventually from the Continent; (3) that both tactical and service units on a station should be under the same commander, who was to have the assistance of competent air and ground executives; (4) that a proved method by which technical control of service functions by the Air Service Ground could be accomplished was through the
establishment of control areas to operate subdepots on tactical stations.

Important recommendations were made concerning the organization of the bomber command and the air service command, a troop basis and rate of build-up were set forth for both strategic and tactical air forces, and naming tables were drawn up for a variety of units in order to effect the saving in turnover that has been directed by Air Headquarters.

The most important organizational recommendation for VIII Bomber Command was that there be activated the administrative units known as air divisions. A recommendation for such units had already been made by the Commanding General of the 14th Air Force. This departure from the conventional Air Force organization was based partly upon the VIII Bomber Command model, partly on the signals arrangements of British air forces, and partly upon the need for some decentralization in the administration of so large an organization as the VIII Bomber Command was destined to become. The air division was to consist of five or six combat wings, each of which in turn would be composed of three heavy groups. A heavy bomb group, made up of four squadrons, would occupy a single airbase. The combat wing was not to have administrative functions but was to be entirely a tactical organization. Thus the VIII Bomber Command was a counterpart of the RAF where the bomber command is divided into groups, each composed of a series of bases, each base controlling three (3) stations with two (2) squadrons on each station with an L.E. [Initial equipment] of twenty-four (24) aircraft each.°

Other organizational recommendations affecting tactical units were (1) that there be air and ground executives at each station responsible to the station commander who would normally be the tactical group commander;
commander, and (2) that station complement organizations (for housekeeping functions) and guard organizations be provided for each station. 30

Important recommendations of the Bradley Committee also affected the VIII Air Force Service Command. The details of this matter cannot be covered here and need not be since the history of the Service Command is available. The significant recommendation was that decentralization should be achieved in the operation of this command through the creation of subdivisions known as control areas. There was to be a Base Air Depot Area to control the base air depots, 31 an Air Service Strategic Control Area for advance air depots serving the heavy bomber-stationed stations, and an Air Service Tactical Control Area to supervise the units serving tactical aviation.

The Bradley Committee recommended that troop allocation for the air forces in the United Kingdom should eventually be:

- Strategic air force 354,886
- Tactical air force 333,847
- Total 685,733

It was intended that the air force strength should grow during 1943 at the following rate:

<table>
<thead>
<tr>
<th>Total by 30 June</th>
<th>Added during third quarter</th>
<th>Added during fourth quarter</th>
<th>Total by end of 1943</th>
</tr>
</thead>
<tbody>
<tr>
<td>110,000</td>
<td>82,000</td>
<td>23,400</td>
<td>215,400</td>
</tr>
</tbody>
</table>

Strategic air force units were given priority over tactical units in the planned build-up, which was envisaged during 1943 as: 34

<table>
<thead>
<tr>
<th></th>
<th>June</th>
<th>September</th>
<th>December</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy bomber groups</td>
<td>15 3/4</td>
<td>25</td>
<td>33</td>
</tr>
<tr>
<td>Medium</td>
<td>4</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Light and dive</td>
<td>--</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Fighter Groups</td>
<td>June</td>
<td>September</td>
<td>December</td>
</tr>
<tr>
<td>----------------</td>
<td>------</td>
<td>-----------</td>
<td>----------</td>
</tr>
<tr>
<td>Light Fighter Groups</td>
<td>6</td>
<td>9</td>
<td>16</td>
</tr>
<tr>
<td>Photo Recon. Groups</td>
<td>--</td>
<td>--</td>
<td>1/4</td>
</tr>
<tr>
<td>Troop Carrier Groups</td>
<td>1/2</td>
<td>4 1/2</td>
<td>7 1/2</td>
</tr>
<tr>
<td>Observation</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

The so-called Bradley Plan was favorably endorsed by the Commanding General of the Eighth Air Force on 28 May, and by Lt. Gen. Jacob L. Devers, Commanding General of AAF, on 2 June 1943. The plan was promptly approved by AAF headquarters, and after much study, by the War Department, tentatively on 18 August, and finally on 8 November 1943. The over-all troop basis as finally approved was cut to 807,000.36

The Commanding General of the Eighth stated that the Bradley Plan met the organizational and personnel problems of both the strategic and tactical air forces. He felt that the rate of build-up and the flow of replacement crews and aircraft would permit six to eight maximum divisions per month which would enable the Eighth to carry out the task set for it in the CBO plan. He pointed out that the rate of operations were controlled by the flow of replacements, especially of crew replacements. This was to remain the controlling factor until fairly late in 1943, for the Eighth's position with respect to operational heavy bombers was better than that for available crew until December of that year.37

Headquarters AAF set about fulfilling the requirements of the Bradley Plan in June of 1943, some months before it was finally approved by the War Department, and this plan thus became the principal guide for the buildup of the air force in the United Kingdom, even during the summer of 1943.38
The fact that the Army Air Forces and the theater had a build-up plan did not mean that unit and replacement flow would follow it automatically. The same matters of intertheater competition, training, and activation schedules, production of equipment, and shipping were still to worry. The question of balance between training and production was very troublesome. In fact, the deficiency of the Eighth in replacement combat crews became so serious before the first phase of the D Day offensive was over that it had to slow down the arrival of new units because AEF Headquarters not a goal of 2 1/2 crews per aircraft unit equipment in order to be sure that crews could operate at full strength.62

The demands of the Mediterranean theater, which had so depleted the strength of the Eighth in 1942, were again to make inroads during the first phase. Planned in that theater were two important operations which required more heavy bombardment than was there available. These were the invasion of Sicily (operation HUSKY) and the attack on the Florenti oil refinery (operation MARSU). Although they were not to be undertaken until later in the summer, the presence of the aircraft and crews was required for training. Consequently, the War Department ordered the 35th Bomb Group (E), which was scheduled for the United Kingdom, diverted to North Africa,63 and the 303d and 44th Groups sent from the United Kingdom. The 35th Group left on 23 June with 39 B-32 aircraft, and the 44th departed on 27 June with 36 B-24's.64

Despite the drain of heavy crews strength at the end of June, the Eighth had more than doubled its unit strength during the first phase of
the bomber offensive. In the matter of operational groups the growth experienced was indicated by the total on hand at the end of each month:

31 March 30 April 31 May 30 June

Heavy Bomb Groups 6 6 13 13
Light 1 3 3 3

The effective combat strength in terms of bombardment aircraft and crews was not so great, however, as the increase in units might indicate:

<table>
<thead>
<tr>
<th>Daily Avg.</th>
<th>Aircraft (EI)</th>
<th>Crews</th>
<th>Effective Strength for Combat</th>
</tr>
</thead>
<tbody>
<tr>
<td>by Month</td>
<td>In Use, Fully Operational</td>
<td>Asst.</td>
<td>available</td>
</tr>
<tr>
<td>Units in Use, Units</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>March</td>
<td>150</td>
<td>137</td>
<td>151</td>
</tr>
<tr>
<td>April</td>
<td>231</td>
<td>153</td>
<td>187</td>
</tr>
<tr>
<td>May</td>
<td>340</td>
<td>233</td>
<td>318</td>
</tr>
<tr>
<td>June</td>
<td>458</td>
<td>237</td>
<td>419</td>
</tr>
</tbody>
</table>

An examination of the above table makes it at once evident that the controlling factor in effective strength during the first three-month phase was the availability of crews and not the maintenance of aircraft. The wide difference between assigned and available crews is explained by the fact that most of the crews arriving in the theater had to undergo a considerable period of training before they were ready for combat.

The growth in personnel during the first three-month phase was more than 100%, the total climbing from 43,380 on 31 March to 101,349 on 30 June. It will be recalled that the Bradley Plan forecast the growth of the Eighth to reach 110,000 by 30 June.

**General Nature of First-Phase Operations**

The combined bomber offensive was a joint undertaking of the United States and British air forces. The aim for the offensive that was drawn
up in the theater in April 1943 and presented to the Combined Chiefs of Staff. The combined capabilities of the two forces were complementary. The Eighth Air Force was the major attacking precision targets by daylight. The RAF was the bludgeon destroying German material facilities and undermining the morale of the German worker. The coordination of the two forces was not left to chance. Moreover, the problem was not simply one of coordinating the efforts of two separate commands. Much of the fighter support provided for the U. S. heavy bombers during the first three months (April–June 1943) was by the RAF Fighter Command. It was necessary to assure the closest cooperation among bomber and fighter commands of both forces and with R.A.F. Coastal Command in connection with air-sea rescue.

The chief agency for coordinating the efforts of the forces involved was called the Combined Operational Planning Committee (COPC). It was established about April 1943, shortly after the VIII Fighter Command put three groups of P-47's into operation. This committee was composed of representatives of VIII Bomber Command, VIII Fighter Command, R.A.F. Bomber Command, and R.A.F. Fighter Command. After 15 October 1943 the Eighth Air Force representative was included. The committee was charged with the function of planning the operations against major targets. The plans, after completion, were submitted to the commanders concerned, and after "approval" by the Eighth Air Force Commander, they were given code names and filed at each operating headquarters in case future need. Then the VIII Bomber Commander, at his daily operational conference, selected one of these targets for attack, the code name was immediately passed to all
related commands and the operational plan previously prepared was put into effect. 450

The CCG received the function of the Combined Chiefs of Staff in the directive of 10 June 1943. Certain terms of reference under which this committee was to operate were set forth in an enclosure to this directive which formally launched the combined bomber offensive. Not only was the CCG given a planning function; it was instructed to "observe critically the tactical execution of these plans and to report to their Commanders of the four commands concerned." 451

The operations of the combined bomber offensive made full use of the scientific methods in the application of air power to destruction, and this subject merits consideration. Air warfare, employing so many of the products of scientific research, might have been quite unscientific in its operations had these operations been controlled merely by the opinions of commanding officers, even though the latter possessed great experience. The Eighth Air Force agency for the scientific study of all phases of air operations was known as the Operational Research Section (OR). There were, of course, agencies in the United States which made valuable studies of the tactics of air warfare. The AE School of Applied Tactics made many contributions to the solution of the problems of the Eighth and other Air Forces, but the Operational Research Section functioned in the field, secured its data at the sources, and drew its conclusions on the facts as they were found. As General Eaker's report later pointed out, "Operational research was originated in the VIII - eaker Command . . . . It is composed of a group of scientists who study every phase of our operations and of
enemy reaction, catalogue results and draw conclusions. It has now been definitely demonstrated that the studies of this organization are invaluable to air force commanders and that operational research has a staff function and staff agency in modern aerial warfare and fills a requirement not supplied by any other staff section. The results of some of the studies of G-2S will presently be examined.

The scale of Eighth Air Force operations during the first phase does not now seem consequential. During the eight months prior to April 1943, General Eaker's 'bidding force of Fortresses' had engaged in 48 missions, flown 3,387 sorties, and dropped 4,131.7 tons of bombs on targets. April, May, and June were the months with the greatest effect. The scale of operations had increased, for the total tonnage dropped by the Eighth in Europe, and for correspondingly small proportions of the other factors which indicate the magnitude of strategic air warfare. Yet, even though this effort of the second quarter of 1943 was small when compared with what was to follow, it did constitute the first experience with an expanding force and it did help to make succeeding efforts more effective.

April 1943 was a slack month for VIII Bomber Command, its operations falling considerably short of the record set up in March. The reasons were no. It has already been noted how small were the effective forces;
Furthermore, the conduct of operations was greatly hindered by bad weather. During this month there were but four missions flown by the heavy bombers, and on only one of the four (17 April, Bremen) were there as many as 100 aircraft reported attacking the target. The four April operations cost 31 heavy bombers against claims of 146 enemy aircraft destroyed, 41 probably destroyed, and 31 damaged.

Reasonably good bombing weather and the execution of the force combined to make May the best month the VIII Bomber Command had ever seen. The heavy bombers were out nine days during the month and dropped approximately 2,300 tons of bombs on 18 different targets. Three of these were attacked by more than 100 bombers each. The last operation in May (on the 29th) ran the highest record ever set, for a single day as well as for a month, 272 missions of which 236 actually attacked. The May operations cost 66 heavy bombers against claims of 359 enemy aircraft destroyed.

The month of May witnessed also the initial experimental operations of the medium bombers of the Eighth Air Force. The Combined Bomber Offensive Plan had provided for medium bombers as necessary adjuncts to heavy bombers and as a vital factor in the support of combined operations scheduled for 1944.

The first U.S. medium bomb group to become operational in the United Kingdom was the 325th, which had arrived in the theater on 8 March. Before its herculean task it was given eight weeks of training in low-level operations. This type of training indicated the tactics that were to be employed to capitalize on the speed and ruggedness of the B-26. Since these tactics...
were changed after but two missions, it is agreeable to inquire into
the reasons for their adoption. In the first place, since mediums were
to be used to support surface operations, low-level tactics would be
needed, and training in them would be of great value. In the second place,
the B-26’s were not equipped with bombights for medium-altitude attack.
Furthermore, it was desirable to learn whether a well trained force could
utilize the element of surprise on an important objective.

The strategic directives for the Eighth Air Force were delivered
through the British Air Ministry, so in March then the commander of the
Eighth was planning the operations of the mediums, he wrote to Air Chief
Marshal Sir Charles Portal and asked that certain targets in occupied
Europe be cleared for attack. These targets required very shallow penetra-
tions of the Continent and included airfields as first priority, marsh-
elling yards, power stations, and port facilities in France, Belgium,
and Holland. Mediums were also to be used in Germany on targets within
250 miles of bases.

Air Marshal Portal's reply suggested that the most important matter
to consider in planning the operations of the medium bombers was to see
that their activities were coordinated with other daylight operations. It
was his idea that the Eighth’s mediums should give first priority to trans-
portation targets rather than to airfields. This was the policy of the
IAF light bombers, and was in accord with the directives of the Combined
Chiefs of Staff. (In March the bomber offensive was functioning under the
Combined Chiefs directive which placed transportation targets in third priority)
the change to airfields as first priority for mediums, in his opinion.
night prove profitable later. If it were decided to shift the main effort of the entire bomber attack to the German Air Force.

Eventually, during the first week in May when the 380th Group was well advanced in its low-level training, certain industrial installations were cleared as "freshman targets" for the 3d wing, which contained this medium bomb group. 66

The objective actually selected for the initial medium mission of 14 May was the power station at Ijsselmen, Holland. The same objective was hit three days later on the ill-fated second operation that finally convinced the Eighth Air Force commander that the low-level technique was not feasible in Western Europe. 67 One intelligence officer of the 3d Air Force command had been convinced of this for many months before the attack.

This officer, Major Von Hahn, had advised the commander of the 3d Wing in December 1942 that in his opinion low-level attacks on heavily defended targets would be disastrous. Between the 14 May and 17 May missions the same officer made strong representations to the commander of the 380th Group about the dangers of the operation. It certainly would seem, however, that the first attack on Ijsselmen was not a fair test of the ability of the B-25 to surprise the defense, for the B-25 had hit it on the 24th and 5th of May. 68

On the 14 May mission, 13 B-25's had taken off and 11 of them dropped 10,750 tons of high-explosive bombs from an altitude of between 2,000 and 3,000 feet. The bombs employed had 30-minute delayed-action fuses. Apparently very little damage was done to the power station. The one medium that failed to return had an engine shot out by flak as it crossed the enemy.
coast and was forced to return to base. No enemy fighters were encountered, but nine of the bombers were damaged by flak. One ship crash-landed at its base and killed the pilot after the remainder of the crew had bailed out. Since this test was inconclusive, the second attempt was made three days later. Twelve B-26s set out on the 17th, and again one turned back, this time because of engine failure. The attack was again made from minimum altitude employing 30-minute delayed-action fuses. Of the 11 attacking, not one returned, although one of them, badly shot up, was abandoned by the crew near its base. The remainder were lost to flak, ground fire, collision, and unknown causes. This was enough to convince the Commanding General of the Eighth that a change in policy for medium was required:

The simple truth appears to be that worthwhile targets on the coast of Western Europe are too heavily defended to make low-level attack feasible and economic... I am now convinced that we must discontinue low-level attack except for that against surface vessels. We have a plan to get some training and experience of the latter category. I am going to put the medium bombers in the Air Support Command and give them maximum training as part of the tactical air force to support any ground force invading the Continent. Their crews will get their fighting experience by medium-altitude attacks heavily defended by fighter aviation. This will necessitate the installation of nose bomb sights, at least for lead aircraft.

The B-26 group was removed from operations, and the mediums got no more action against the enemy until July.

June operations by the Eighth fell short of the record achieved in May, for the weather kept both the USAF and the RAF grounded during the first 10 days of the month. The first mission, run on 11 June, saw 232 heavies dispatched and 218 of them sent to two targets. Including this mission of the 11th, the last two-thirds of June saw the Eighth
operational on nine days, but on two of these days (18th and 20th) the missions had to be abandoned because of weather.\textsuperscript{73} The seven successful missions totaled 2,166 sorties and dropped 7,610 tons of bombs. The cost in heavy bombers missing in action was 65 against claims of 270 enemy aircraft destroyed.\textsuperscript{74}

The geographical pattern of the Eighth Air Force operations during the first phase of the bomber offensive calls attention to what has been one of the great tragedies of World War II—the necessity of destroying, over and destroying, so much in territory belonging to peoples who were enemies of the Axis powers. Of the 8,736.4 tons of bombs dropped by United States-based U.S. heavy bombers during the second quarter of 1943, just slightly more than half (52.2\%) fell on Germany. France received 37.3\% of their slightly more than 10,000 bombs dropped in the remainder.\textsuperscript{75}

A balanced policy in Allied or neutral territory occupied by the enemy was carefully regulated. Only military objectives (those were narrowly defined) were to be bombed and such bombing was subject to certain principles. The bombing of civilian populations as such was forbidden. The military objective had to be clearly identified and the attack made with reasonable care to avoid undue loss of life to civilians in the vicinity of the target. If doubt existed as to the possibility of accurate bombing, the attack was to be withheld. Allied cross conventions were observed.\textsuperscript{76} Despite the fact that both IAW and AAF took every possible precaution to reduce the risks to civilian populations in occupied countries to a minimum, criticism could not be avoided. The protests of the subject peoples and their representatives to the Allied powers did not
make the task of the air leaders any easier. They were faced with the
fact that many of the facilities in occupied countries were contributing
to German war effort, and they had no choice but to attempt to destroy
them.

The efficiency of daylight precision bombardment is difficult to assess,
but one can hardly study the operational side without becoming aware of
the tremendous effort necessary to achieve even a small result. Some
notice has already been given to the size of the forces available to the
Eighth during the first phase of the bomber offensive, but it must be
remembered that only the winner in conclusion can engage in operations.

During April, May, and June more than two-fifths of the heavy bombers were
unserviceable because they were undergoing repair, being modified, or awaiting
parts. In May of 1943, the average serviceability was only 36%.

Planes in conclusion, even planes airborne on operations, are of slight
offensive account unless they can hit over the target. Out of 4,237
sorties flown in April, May, and June, only 65 actually accomplished the
mission assigned (effective sorties) of dropping bombs in the target area.

The question as to the accuracy of the bombing is very difficult, particu-
larly in the early period of operations. First-choice bombs, accurate by
the Eighth, have been estimated at 12% of bombs within 1,000 feet and 30
within 3,000 feet of the mean point of impact. This measure tells more
about the pattern of the bomb fall than about accuracy with respect to
the aiming points in assigned targets. The scant evidence available
indicates that first-choice daylight bombing accuracy was low, even lower
than during the first quarter of 1943. This may have been due in part
to the lower level of experience resulting from the sudden expansion of \*\*\*\* in May.

The Defense of the Low Bomber

Presently the effectiveness of first-phase combatant is to be examined with another point of view, but this one of the most important problems of first-phase operations deserves our attention. As a statement from the Eighth Air Force intelligence report indicated, the United States heavy bomb posed a formidable problem to the German Air Force.

The first operations of Flying Fortress formations in high altitude daylight precision bombing attacks over Europe opened a new chapter in the oldest conflict in warfare. That conflict is the perpetual struggle between offensive and defensive technique. Our Fortresses, as used here, were a new offensive weapon.

Against this the Germans confidently vited the three-fold mechanism of defense which aerial combat has itself generated: Radar detection and counter attack by both fixed and mobile radar, and airmen massed fighter planes. This defensive technique was developed by both Germany and British was believed to be achieved in the large scale daylight bomber in this theater forever.

But the Fortress brought to its cost two unique features. The first was its ability to operate effectively, above the invasion effectiveness of light fighter. The second was its formidable armor of .50 caliber machine gun, which compounded by the mutual support of close formation flying, provided a learning air power against conventional fighter plane attack.

It is true that the countermeasures taken against the Fortresses and the Liberator threatened to restore the balance between the offense and the defense which the first operations had upset. The complete redress of the balance would have nullified the bomber offensive. Our air leaders were forced to accept efforts in the defense of the day bombers to keep the offensive going. It is necessary to note some of these efforts as
they developed during the first phase.

The simplest statement of the problem is presented in the loss and damage figures for the heavy bombers. The operations of the last five months of 1942 cost 31 heavy bombers in action; 26 attributed to enemy aircraft and 5 to flak or a combination of flak and enemy aircraft; and the first quarter of 1943 saw 59 of our bombers lost on operations. During the first month of the period under review, April 1943, 30 heavy bombers were lost; in May there were 69, and in June 30, giving a total of 161 for this first phase of the G-20. Of these losses, 89 were due to the action of enemy aircraft, 22 to flak or a combination of flak and enemy aircraft, and the remainder due to accidents and unknown causes.

The rate of loss is more revealing than the absolute loss. Taking those planes that were lost due to combat (lost in action or to operational salvage) as a percentage of planes attacking (correlating effective sorties), we find the following:

<table>
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<tr>
<th>Lost five months of 1942</th>
<th>4.6</th>
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<tr>
<td>First quarter, 1943</td>
<td>7.1</td>
</tr>
<tr>
<td>Second quarter, 1943</td>
<td>7.6</td>
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Another side of the bomber loss problem is seen in the attrition rate. This considers all kinds of lost aircraft (operational and non-operational) as a percentage of unit equipment. During 1942 the attrition rate for the B-17's was 3.5, and for B-24's was 2.1. For the first quarter of 1943 for both types of heavy bombers it was above 7.2. That the attrition rate turned sharply upward for B-17's is evident from the figures for April, July, and June. It is to be remembered that the Fortresses constituted the bulk of the bomber force during this period. Attrition as
Another measure of the severity of the opposition encountered by the heavy bombers is found in the amount of battle damage sustained by aircraft which were able to return from missions. During the 1943 operations, 27% of heavy bombers completing "credit sorties" (that is, sorties entering areas where enemy action was normally anticipated) were damaged in varying degrees of severity; in the first quarter of 1943 the rate was 31%; and for April, May, and June it was approximated 30.7%. That meant that three out of every ten heavy bombers entering enemy territory were damaged.

Loss and damage figures can be interpreted in various ways. "The Statistical Survey of Eighth Air Force Operations in the European Theater, 17 August 1942-9 May 1945" and various studies by the Operational Research Section are excellent sources for these figures. The interest here is in that these data tell about the intensity of enemy opposition. The evidence indicates that the effectiveness of that opposition was increasing during the first phase of the bomber offensive.

It is evident also that the defensive problems presented by this severe opposition were recognized by AEF leaders and that energetic steps were taken to overcome the formidable efforts of the Germans to halt the heavy bomber offensive.

It has been noted that the three principal German defenses were the
rural installations for detecting the approach of hostile forces, the
German fighter force with its elaborate control system, and antiaircraft
artillery (flak). Since the principal defensive efforts of the Eighth
during the first phase were concerned with fighter and antiaircraft fire,
these measures will be considered here. Radar countermeasures are treated
in connection with the third phase when they were first used.

The plan for the bomber offensive which was drawn up in the European
theater in April called attention to the growth of the German fighter force
and the changes that had taken place in the disposition of that force. The
RAF was increasing its fighters at the expense of other types, and it was
concentrating them on the Western Front at the expense of other theaters.
Both these trends were to continue for many months.

The German fighter force was not only increasing in numbers and con-
centrating them against the bomber offensive; it was improving its standard
pursuit tactics and even making some rather startling tactical innovations.
Two of these innovations began to appear during the first half of 1943.
The first was air-to-air bombing, both dive and level, by individual planes
and in formation. Apparently the first use of this tactic against the
Eighth Army bombers was on 16 February 1943, in a mission against St.
Lazare. Reports of its use were made in March, and the four April heavy
missions encountered it. Air-to-air bombing was not on at least nine
missions in May and several times in June. This German measure was never
successful because of the great difficulty of insuring the detonation of
a projectile at just the right instant sufficiently near a rapidly moving
target. Undoubtedly the reason for its use was that the size of the
lethal burst of 4. Gun was very great—perhaps six times as large as that of the best field. 26

The other new tactic of the German fighters which was initiated during the first phase was the employment of 21-cm. rockets by both Fw-190's and Me-163's. Their use was first reported positively 26 on 21 May 1943 during the raid on Wilhelmshaven, but there is some evidence that they were used earlier. 27 The danger to the heavy bombers from the rocket projectiles lay in the fact that the rocket gun could be carried to 50,000 feet by either of the enemy's two best single-engine fighters, and once at that altitude could fire an 88-cm. shell very accurately at ranges well beyond those of the 20-caliber machine guns carried by U. S. bombers.

Another great danger from the rocket projectile lay in the fact that it had a lethal burst of 100 feet and its detonation could be well controlled. 28

The rocket threat from enemy fighters during the first phase was not due to these innovations, however, but to improved pursuit tactics and to the fact that more German fighters were armed with larger caliber guns. During the 1942 operations, there were 40 cannon hits for every 100 machine-gun hits on American bombers; but during the first half of 1943, there were 77 cannon hits for every 100 machine-gun hits. The hits by heavier guns help to explain the increased loss rate of bombers to fighter action. 29 The decrease rate due to enemy fighters became particularly noticeable during the first two months of extended 8th Air Force operations (May-June 1943) than more than 10% of the bombers crossing into enemy territory were damaged by fighters. This was approximately one and one-quarter times the rate for all operations prior to May. 30
An indirect product of damage from enemy aircraft was self-inflicted damage to the heavy bombers. This was caused both by the guns on the damaged planes and by guns on friendly planes in the same or near-by formations. This category of battle damage became prominent first in May 1943. On missions 6 through 60, carried out between 15 and 21 May, 24 of 125 aircraft damaged by machine-gun fire were reported damaged by their own guns. Other cases of self-inflicted battle damage came from empty shell cases falling from higher planes. Most of the self-inflicted machine-gun fire damage occurred to B-17's and was caused by waist gunners firing into the horizontal stabilizers and elevator struts on their own ship.91

The other German weapon for contesting the day bomber was flak. Although the damage rate from flak was higher than from enemy fighters, the threat from the flak was generally less severe. It was often true, however, that flak damage was a contributing factor in many cases of aircraft reported lost to enemy aircraft, for an initial hit by antiaircraft frequently caused a bomber to struggle behind its formation and made it easy prey for fighters. All important German targets were heavily defended by flak; these included the submarine yards and airfields that were the particular targets during the first phase of the offensive. In France, the most heavily defended areas were around Paris and St. Nazaire, both of which were attacked by the _Juno_ caribou; the second quarter of 1943.93

Defense of the day bomber involved both material and tactical developments. Two of the more outstanding material problems that demanded attention during the first phase were the modification of the heavy bomber to increase fire power and the development of escort for the bomber formations.
During the early months of the bomber offensive certain complaints were voiced against the armament of the heavy bombers. The most serious was that the forward fire power was entirely inadequate. 2-17's and B's were to the European theater with a single hand-held .50-caliber center nose gun or with no center nose gun at all. 2-17's had no side nose guns and none B's had two hand-held side nose guns. B-24's generally had one .50-caliber gun in the nose. Such armament was not a sufficient deterrent to the German fighter armed with 20-mm. cannon.

When Marshal Goering was interviewed as a prisoner of war, he said that tail attacks on the day bombers were preferred to head-on attacks because the closing-in speed involved in the latter allowed too short a firing time. Tail attacks were the rule during the period from August 1942 to November 1943, but head-on attacks predominated in December 1943, and during the whole first half of 1944. The evidence is quite clear, and it was recognized in the theater at the time.

Modifications were performed on the heavies throughout the first half of 1943 in order to increase their forward fire power. On the 2-17's either one or two .50-caliber guns with ring-and-post sights were installed in the center nose section. On B-24's an additional .50-caliber nose gun was mounted.

These hand-held guns were the best answer to the problem during the first three. They were recognized as a temporary measure, for the manufacturers of the 2-17 were working on a power-driven chain turret for the aircraft. Barrel nose possessed several advantages over
hand-held guns in field of fire, accuracy, and fire cover per round.

Since the chin turret was not erected until late in 1942, another temporary experiment in the form of a reversed pedestal lower turret was tried out during the first phase. An airplane with one of these experimental turrets arrived in the theater on 37 June and was given thorough tests. The preliminary results indicated some superiority over the hand-held guns, but combat tests proved the latter better. The reworked turret would not react quickly enough on simultaneous attacks from several directions. Orders were given from Headquarters, ABS to stop installation of the repositioned lower turret and to continue with the development of the original chin turret. This one was known to be satisfactory because of experiments with it on the E-4th's which will be noticed presently. Meanwhile it should be remembered that the initial dependence for forward fire cover by heavy bombers during the first phase was upon the hand-held .25-caliber machine guns provided with direct sighting. Other armament modifications were performed on the heavier, but those designed to increase forward fire cover were not significant.

Correlated closely with the effort to increase the fire power of the bomb-carrying bomber was the attempt to convert a bomber to an escort cruiser by substituting fire power and armor for bomb-carrying capacity. In the spring of 1942, Maj. Gen. Carl L. Spaatz had calculated on the possibilities of such an aircraft: "Auxiliary (extendable) tanks offer the only immediate solution for extending the range of fighters, unless it can be developed that the bomber, with its fire-cover, can substitute..."
ammunition for bomb-loads and act as an accompanying fighter. The escort carrier which was developed—a heavily armed and armored E-17—was designated the ES-49, later the ES-49. This craft had the chin turret, upper turret, ball turret, direct-elevation power-boosted twin .50's on each side of the waist, twin .50's in a Martin electric power turret in the radio compartment, and twin .50's in a power-boosted tail gun mount with reflector sights. It carried 49,000 rounds of ammunition. General Dyer was quite interested in the development and in mid-March 1943 expressed a desire to try it out against the Germans, but at the same time voiced doubt about the economy of taking bombers that did not carry bombs on combat missions. In the escorting role there was more enthusiasm for the escort airplane, particularly for the chin turret which was one of its most promising features.

In mid-April, when the German fighters were concentrating on the lead formations of his bomber forces, the Eighth's commander became very anxious to get some of the ES-49's as quickly as possible. He was told that 15 ES-49's were to be sent to the United Kingdom just as soon as the crews had completed their gunnery training.

These heavy cruisers arrived in the theater in the first part of May, and most of them were assigned to the 92d Bomb Group (H). After additional training and modification they embarked on their first mission on 20 May, when seven were dispatched to St. Nazaire. The initial experience dictated the necessity for modification of waist and tail gun feeds and ammunition supply, and indicated the basic defect of the craft, which was its inability to keep up with normal B-17's—especially...
after the latter had dropped their bombs. Modifications were complete by 15 June, and YB-40's took part in five missions during the last half of the month. On the 29 June raid on Kula, 11 were dispatched and one was lost. On the 30th, only four of the seven dispatched were able to accompany the formations to Northwest Germany. Five took off on the 30th, but not one was able to complete the attack. Their record was better against St. Nazaire on the 31st, then all six dispatched completed the mission. The mission to Le Havre on 22 June found the two that were dispatched abortive.

Although the YB-40's were to see further action in the theater, the June experience was sufficient for the lighthouse commander to form an adverse judgment on this version of the escort cruiser. His report confirmed it because it had different flight characteristics (it was tail-heavy) and was so much heavier than the normal P-47 that it could not fly formation with them. The YB-40's had been tried in their own formations and on either side of the lead ship in a combat wing, but in neither case were they successful. The crew of the YB-40's did not like the planes because they had to occupy the hot spots in the formation and because they carried no bombs. General Hickey was strongly sold on one feature of the YB-40—the chin turret—which was, presently to be placed on all operating heavies. He did not entirely condemn the whole idea of such an escort, but the June experience convinced him that such a craft required two features which the 40's did not have: the ability to carry bombs and the same flight characteristics as other bombers.

At the same time that the development of the heavy escort was taking...
attention was given to the build-up of a fighter force and the extension of the range of our fighter craft for escort purposes.

The fighter situation in the Eighth Air Force during the first quarter of 1943 was vitiated. It has been noticed that three P-39-equipped groups had been sent from the Eighth to the Twelfth Air Force in October 1942. Four additional fighter groups were trained by the Eighth for the North African theater during the last part of 1942. There was but one operational group left to the Eighth and that was the 4th (Thunderbolt) Fighter Group, equipped with Spitfires. This situation prevailed until 3 April 1943, when three groups became operational. These three (4th, 78th, and 56th) were all using the P-47 Thunderbolt at the time. The 4th first had had some P-47's assigned to it in January, and was converted to this craft in March. The 78th came to the theater equipped with P-39's but was presently re-equipped with the P-47. The 56th came to the United Kingdom on 13 January 1943, already outfitted with the Thunderbolt. The tardiness in getting the P-47 into operation was due partly to radio and mechanical difficulties in the aircraft and to the necessity for 'selling' it to the pilots. Moreover, the Fighter Command had to proceed cautiously, for it did not want to run the risk of a serious setback in making a newly-developed operational.

Three operational groups of fighters were all the Eighth had during the first phase of the bomber offensive. Although the 353d Group arrived in the theater in June, it did not become operational until August.

Inquiry as to the VIII Fighter Command was no better off in the early part of 1943 and not very profitable. Intertheater competition
trained the crews many and there seems to have been some weight of opinion that the B-17 could carry out daylight operations without escort. The B-29 Plan had provided no build-up rate for fighters as it had for bombers, although it had called attention to the need for the latter craft. General Bradley, chief author of the build-up and troop basis for the Eighth, had made the assumption that strategic bombing would generally be unreported by fighters because of the inherent deficiency of range. Whatever the reason, VIII Fighter Command was really lacking in numbers all during the first year.

The realization that they were needed, however, became strongly impressed upon the minds of the air force leaders on both sides of the Atlantic. The attrition and damage figures were easy to read. In April the Commander-in-Chief of VIII Fighter Command expressed the need for 25 groups and the opinion that opposition to the bomber offensive would grow heavier unless the German fighters were neutralized by an American fighter force. The German fighter tactics of concentrating against the bombers during the bombing run made it clear that protection would have to go all the way to the target. This was set forth by Assistant Secretary of War for Air Robert A. Lovett after a trip to the United Kingdom in June, as declared, "The greatest single factor differentiating the 8th Air Force operations from those in other theaters is the extremely high proportion of battle damage resulting from combat with the best German fighter. . . . There is an immediate need for long-range fighters. This may be met by tanks for P-71, but ultimately P-39's and P-47's will be needed." The story of increasing fighter range by use of ground attack takes is
well covered in the histories of VIII Fighter Command and VIII Air Force Service Command. Here all that is necessary is to note the progress that was made in this development during the first phase of the bomber offensive. Expendable tanks were not a development of the European theater, but had been used for some time for ferrying purposes. One of the first tanks used by the B-47 was a 200-gallon-carrying upper ferry tank. The tests which were made on this tank in March 1948 were only partially satisfactory because fuel could not be extracted above 30,000 feet. Moreover, its structure was such that it was not capable of pressurization, and it was not good aerodynamically. However, the range of the Thunderbolt could be extended by using fuel from this tank while climbing to altitude. Such tanks were employed on the first escort mission in which VIII Fighter Command used droppable tanks. This event did not take place until 23 July.117

Before the tests on the 200-gallon ferry tanks, there were two other developments in the expendable tank problem during the first phase. One was the testing and procurement for procurement of a smaller upper tank of British design. VIII Air Force Service Command's maintenance division designed a steel tank which was approved by Fighter Command on 39 days. British agencies were asked to manufacture these, but because of production difficulties, the British procured the substitution of a 100-gallon upper tank which could be pressurized and which had been successfully used on the Mustang. Tests were run on the tank and it was officially approved by the Fighter Command on 23 June. The British began delivery of this tank on 12 July.118

The third development in the expendable...
The problem was experimentation with a variety of metal tanks ranging in capacity from 75 to 150 gallons. All these were capable of leak-proofing and pressurization but required the installation of certain fixtures on the P-47. Although the solution to the fighter range problem was not reached during the first phase, the need for extending the range was thoroughly realized and progress in design and production was made on both sides of the Atlantic.

The fighter protection plan to the heavy bomber operations during the first phase was provided by both RAF Fighter Command and VIII Fighter Command. In fact, the latter was under the control of RAF Sector Controller until 30 June 1943. All four of the April missions of VIII Alert Controllers were given fighter support by Spitfires of the RAF.

The first escort of heavy bombers by P-47 Thunderbolts was furnished on 4 May during the mission against the Ford and General Motors plants at Antwerp. On this mission six squadrons of P-47s and six of RAF Spitfires were used. The sector controller described the support as excellent and attributed the reduction of enemy fighter opposition to the presence of the P-47s. During May and June the Thunderbolts escorted the day bombers on at least five other occasions. The other operations of VIII Fighter Command consisted of sweeps, or sorties into enemy territory, and diversions designed to give indirect support to the bombers. The P-47's flew 6,787 sorties in 31 operation days during the first phase and about 30 of them were in support of heavy bombers.

Defence against enemy fighters involved tactical deployment of
bombers as well as materiel developments. Principal tactics were the use of the formation, the diversion, and the feint.

The formation as a defensive weapon witnessed such experimentation and development in the 1940s. In the early operations building was done by elements of three aircraft in formation and later by squadrons of six. The intensity of enemy fighter attacks forced the bringing together of more aircraft to secure mutual fire support. From January to April 1943 the formations flown were boxes of 12 to 14 aircraft rather widely spaced. The formations were generally loosely flown, for individual evasive action was encouraged. After May the basic group formation was a combat box of 16 to 21 aircraft flown much more tightly than in the earlier period. Such a box ideally flown would occupy 650 feet in altitude, 900 feet in breadth, and 600 feet in trail. Actually, it was always much larger in breadth and trail. Two or three combat boxes stacked together constituted the combat wing. Experience indicated that three groups was the maximum number that could be practically flown together in a defensive formation. The combat wing was not maintained during the bombing run, since bombing was done by groups. After bomb release the combat boxes would reassemble for support on the route to base.125

Formation flying required great skill on the part of the pilots, and the Eighth constantly emphasized the necessity for better training in this specialty at operating altitude. The use of smoke screening also influenced another aircrew position. One or two bombardiers in a group became very important because generally all 800,000 released bombs on one sighting operation, lest one of the bombardier in the lead aircraft. Others
circular top-deck their bomb out on his own. 123

The diversion as a defensive tactic was employed by both fighters and bombers. The chief defensive value of the diversion lay in its proper timing to attract enemy fighter action to itself from the main bombing effort of the day. The diversionary force was at times dispatched ahead of the main effort in order to arouse the enemy ahead of time, have his use up his fuel, and so find his fighters rounded when the main attack was delivered. It was also dispatched after the main effort had gone out in order to lessen enemy pressure on a withdrawing force. The diversion was employed at least five times by VIII Bomber Command and several times by VIII Fighter Command during April, May, and June. During the raid on the 21A aircraft plant at Antwerp on 5 April, a force of 35 B-24's conducted a diversionary sweep over the North Sea and toward the French and Belgian coasts. 127 This measure brought us no fighter opposition, but a similar venture on 9 May was highly successful. On that occasion the bombing objectives were the Ford and General Motors plants at Antwerp. Seventeen B-17's were dispatched on the main effort and 29 B-17's and 13 B-24's were dispatched on a diversionary raid toward the French coast. The diversion as well as the main effort was provided with fighter cover. The raid scored more than 100 fighters (about half the Germans had in the region) and kept many of the aircraft so long that they could not affect the main effort. The principal force encountered out 30 enemy aircraft.

VIII Fighter Command engaged in diversionary indirect support of heavies even before it undertook direct close support. On the 17 April
raid against France, 76 B-47's carried out a sweep of the Holland coast while the bomber mission was in progress.134

The diversion not only had defensive value; it was excellent training to participate air crews. The bomber diversion was but a variation of that has been called the "split-target" technique. This involved the dispatch of strong forces to several different objectives at the same time, thus causing the enemy to disperse his forces. Although practiced during the first phase, the best use of the tactic had to await the buildup of the Luftwaffe's greater strength.

Another defensive variation of the diversion was the joint or false by the main attack force toward one target with a return turn toward the intended objective at the last moment. Route to and from the target was not left to the crews but was carefully prescribed by higher headquarters.135

Except for rear countermeasures, the defensive tactics against flak were fairly well developed by the time of the first phase. These involved selection of operating altitude and route, reduction of bombing run, control of personnel of groups and number of groups bombed together, and evasive action. Further protection from flak was provided by armor plate and the development of special flak curtains and flak suits for crews.

Bombing altitude of heavy bombers during the first phase was generally above 20,000 feet. The lowest reported bombing altitude was 19,600 feet on the Leningrad mission of 30 June, and the greatest, 27,500 feet on the 25 June raid against northwest Germany. Although it is not possible to strike in evasive, it is safe to say that most of the day bombing was from about 25,000 feet.135 This was high enough to take the planes out of
the range of the enemy's light flak. Bombing altitude, as is the case with many other operational policies, was a compromise. Such better bombing accuracy could have been achieved and many operational problems could have been eased at lower levels. On the other hand, the charge for heavy flak could have been greatly decreased by operating at greater altitudes. The Commanding General of the Eighth stated that the reason for not going higher were that above 25,000 feet increasing difficulties were experienced with oxygen equipment and with propeller and supercharger action. Operations above 25,000 feet brought to the light a host of problems connected with oxygen, electrically heated flight suits, machine guns, and the functioning of internal combustion engines. Only of the casualties in the United Kingdom about the lack of training of new crews and replacements were due to the altitudes to which the enemy forced operations.

Intelligence and antiaircraft officers played a prominent part in the situation, of routes designed to avoid as much flak as possible. It was the enemy's chief employment known, not only the front route from base to target could be selected but the best angle of initial approach could be charted. In cases of approach and departure were determined by calculating the effectiveness of all possible AA batteries along each 30-degree direction about the target. Omission of such courses be a very important and existing portion of mission planning. Likelihood of mission loss was also diminished by refining the turn along the predetermined route of attack, at the last count and the reduction of the bombing run to the shortest possible, all correlating with accurate bombing.
The common methods of air fire control used by the Germans were the predicted barrage and the continuous-following method. In the predicted barrage case, gun sites are at a particular spot in the sky through which the formation is due to pass; hence the Allies could protect from barrage fire by increasing the spread of the entire formation in altitude and width. Protection from continuous-following fire control was secured by closing up the units in trail and thus a scattering the enemy fire defense at a particular time. This tactic reduced the risk to any single unit.

Various types of evasive action were taken by the bombers to reduce the likelihood of hits by flak. One was a change of altitude by at least 1,000 feet on the approach to the bombing run or after bombs were released. Another was the making of irregular changes in course of at least 20 degrees every 30 to 40 seconds except on the bomb run. Such tactics gave protection because of the tracking; time necessary in continuous-following fire control and because of the time required for a projectile to reach operating altitude.

In addition to protection offered by armor plate, further protection was given to aircrews by the development of flak suits and flak curtains which were capable of stopping low-velocity projectiles. In the autumn of 1942, an analysis of the wounds to crew members on combat missions had showed that 70% were due to missiles of relatively low velocity. The Surgeon of the Eighth Air Force, Col. Lincoln Crew, was of the opinion that many of these wounds could be prevented by body armor. As a result of research by the medical department and by the British, the Surgeon had
the "Millenson Sword Company" of London made us simple suits of body armor.

"These were made of Hi-Cap (30 gauge) copper plate 1/16 inch in thickness, approximately two inches square, which overlapped 3/4 on all sides. This armored suit covered the vital parts of the
tank, and was designed with a quick release mechanism to facilitate re-
move in case the wearer was required to abandon the aircraft." The
armor also formed a loose fitting outer garment which weighed about
20 pounds. By the end of May enough of these were being manufactured in
the theater to outfit some 500 Heavy crews, and orders were to be placed
in the United States for additional quantities.

\[\text{Defensive measures and devices constantly called for the best efforts of air leaders. But these efforts brought forth both makeshift and very clever contrivances is already evident. Subsequent defensive developments will be taken up as they appeared in later phases of the offensive.}\]

**Air Operations in Accordance with C-3 Target System**

During most of the second quarter of 1943 the bomber offensive was

\[\text{conducted under the Combined directive of 31 January 1943. This had made}
\text{submarine construction wards the first-priority target system. The direc-
tive had also called for experimental attacks on submarine operating bases}
\text{on the Baltic coast in order that an assessment of their effectiveness}
\text{might be made. The January directive made the German aircraft industry}
\text{second priority; transportation third, oil plants fourth, and other war}
\text{industries fifth.}\]

After 10 June 1943 the Eighth Air Force operated under the Combined

\[\text{Bomber Offensive directive issued on that date. As has been noted above,}\]
this had given submarine yards and bases first priority on; ordinary objectives; but another target system, consisting of the German fighter force and their supporting installations, was given even higher priority, by calling these an intermediate objective of first importance. After the German fighter force installations and submarine yards and bases, the 10 June directive called for attacks on the remainder of the aircraft industry and on production of ball bearings, oil, synthetic rubber and tires, and military motor transport, in that order.\textsuperscript{138}

It was the policy of the Eighth Air Force, commanded by General Eaker, and of VIII Bomber Command, under Maj. Gen. Leemon Lemass, until the end of the first phase (1 July 1943), to attack 020 targets at every opportunity.\textsuperscript{140} The weather out of this policy was controlled to a considerable degree by weather conditions, particularly those prevailing in target areas. When Bomber Command was ready to run a mission, the first step called for a check on Continental weather to determine the areas available for operations. If not known, the highest priority target or targets were selected within the open region. This decision was usually reached the afternoon preceding the day set for the operation. The commanders of wing (later called divisions) were notified of the operational decision and told target designations by code numbers. Bomber Command then issued the field order, which usually reached the wings in the early evening. The field order left some details to be filled in by the wing commanders. These were supplied by their orders to group commanders. Each group kept a file of target folders (each target designated by a code number) in which all pertinent information was kept up to date.
this information and that carried by the field order, the anti-aircraft, intelligence, weather, and other staff officers could immediately make final preparations for briefing the participating crews before the take-off next morning. All the dramatic details of rail-film, take-off, assembly, flight to target, return, and interrogation have been told and pictured too many times to need attention here.

Submarine Installations. The eighth was not expected to make deep penetrations into enemy territory during the first phase. More than half of the German submarine construction was done in yards that were more than 400 miles from British bases, but about 33% of building capacity located at Lisbon, Brest, Wilhelmshaven, and Bremerhaven could be reached by flights of less than 400 miles. Liverpool and Miel, two of the most important German cities in the German U-boat industry, were both outside that range, as were Flensburg and Kiel, cities of lesser importance.

Of the principal operating bases on the Bay of Biscay, Bordeaux at 470 miles and La Pallice at 450 involved more than a 400-mile round trip. St. Nazaire, Brest, and Bordeaux could be reached by shorter flights of 320 to 370 miles. 142

Submarine yards and bases absorbed more than 50% of the AF effort during the first quarter of 1944, but during April, May, and June only slightly more than one-half the tonnage of bombs dropped fell on these installations. 153 This second-quarter war on the submarines involved about a score of raids carried out on 11 operational days. Twelve of the raids and seven operational days fell in May.
In general, high-explosive bombs were used against yards, bases, and port areas. However, some incendiary bombs were employed in plant buildings. One of the most commonly used high-explosive bombs against yards was the 100-pound variety, although some 1,000-pounder shells were used. The shells with their thick concrete cores were called for heavier munitions. Two-thousand-pound bombs were employed against St. Nazaire and La Falaise and 1,000-pounder shells against L'Orient, but 500-pound projectiles were used at Bordeaux. 146

In April there were two small-scale attacks made on French ports, L'Orient and Lorient, both on the 18th of the month. Fifty-nine out of 63 fortress ships dispatched raided L'Orient, doing some damage to a power station and other facilities. Liberators were used in the attack on the port area of Lorient. This small force (29 dispatched—19 bombed), which served as a diversion for the main operation of the day, was hindered in its bombard by a very effective smoke screen. The B-24's were escorted by RAF Spitfires on both penetration and withdrawal. The bombers encountered from 10 to 15 single-engine enemy fighters and the escort about 20. The B-17's on the L'Orient raid encountered 20 to 25 fighters, some of which attempted air-to-air bombing. 147

During the first half of May two attacks on U-boat installations were achieved, a small-scale raid on St. Nazaire on 1 May in heavy clouds and a much bigger mission against the French Germans yards at Bizel on the 14th. The latter raid combined fortress and Liberators (123 attacked) in the direct penetration. American bombers had made up to that time. The long trip (40 miles) to Bizel was completed without escort.
and aroused intense fighter opposition both to and from the target. The enemy attacked the bombers from all directions with machine-gun and cannon fire and tried aerial machine-bombing. These enemy aircraft and moderate to intense flak brought down nine hercules, five of them B-34's. The weather conditions were excellent, and the bombing was most successful accomplished by the 16th, to that date despite the strong resistance.147

The last half of May saw the bomber war on the submarine increase in size and volume. On 17 May good weather in western France enabled the hercules to strike hard blows against L'Orient and Bordeaux. This was the first American raid on the latter, more distant French port. The L'Orient mission was carried out by 113 B-17's of the 1st and 6th Groups. Eight 1st May raid concentrated on the submarine bases and 194th Bombardment put the north river station out of action. The Bordeaux raid was carried out by a small force (34 bombed) of B-4's which swept in on the port from the sea to achieve complete surprise. The lock gates to the U-boat basin were fully energized.148

On 20 May good weather in North Germany permitted 101 B-17's to return to Liel and a smaller force (24) to hit the Ludwigshafen yards at Flensburg just route of the border of Denmark. The Liel raid was not very satisfactory or the one on 14 May, and there is some doubt about aided of the three yards (Germania Werft, Friedrichshavensw, or Deutsche Werke) at Liel was the target on the 10th.149 But the smaller force achieved excellent results at the Flensburg yards.150

During the final 10 days in May five submarine targets, including two yards in Germany and three bases in France, were attacked on two
operational days. The German yards at Emden and Alkemade were raided with indifferent success on 21 May by medium-sized forces. On 29 May the Eighth dispatched 273 heavies against a naval storage depot at Kemas, the base at La Pallice, and off-broad St. Nazaire. The latter target called for the big effort of the day with 160 B-17's dropping 277 of the 2,000-pound bombs on locks to the U-boat basin, workshops, and various dockside buildings. The results were described as fair. Seven B-40's completed the St. Nazaire mission and withdrew cover against fighters was supplied by 10 fighter-air and three fighter squadrons.

During June the U-boat construction facilities were attacked on the 11th and 15th. A B-17 force of 3-17's (187) hit the Strumwerk at Alkemade on the 11th, while a smaller force (20) was delivering a blow to the port area of Emden. Two days later on 13 June, a two-armed attack was delivered at Emden and Kiel. Brenner's Henschler U-boat yards called for the big effort (102 B-17's dropped 244 tons) and the Deutsche Werke at Kiel received about 65 tons. The cost of the raids was in inverse proportion to their size, for the Kiel raid stirred up the strongest fighter opposition the Eighth had ever met.

The first-phase attack on submarines was completed, appropriately enough, by the 23 June raid on the St. Nazaire base. A large force (152) of B-17's in two waves dropped 600 tons-size bombs in an effort to destroy the one serviceable lock entrance to the U-boat basin. Strike photographs indicated that the mission was successful.

Facilities. Eighth Air Force operations against German Air Force facilities are thoroughly covered by another study.
Against the Inland Air, April 1943—June 1944. And these operations were considered here only briefly, as an integral part of the first-phase of the 850. Missions against OF installations absorbed about one-fifth (21%) of the entire first-phase bomb tonnage dropped by the 8th and involved attacks on nine operational days. Assembly plants, engine works, repair facilities, and airbases were included among the OF objectives. 154

During April the attacks were delivered, one against the 19th aircraft and engine repair works at Antwerp on the 6th, and the other against the Poedro-17 assembly plant at Bremen on the 17th. In the Antwerp mission 64 B-17's dropped 2,126 tons on the 19th works and stirred up a hornet's nest of enemy fighters (53-78) which crossed their attack halfway across the channel on the return here. 155

The enemy fighter reaction to the important Antwerp mission was twice as severe (160 encounters), and sort 10 heavy bombers, four times as severe as the Antwerp operation. The Antwerp mission was one of the most important of the first phase. The Poedro-17 assembly plant at the city was estimated at the time to be the producer of better than 1% of all enemy single-engine fighters and 34% of all the P-40's. 156 General Coelingh still remembered the raid in his interviews as a warning of war in June 1940. 157

The attack was made by 207 B-17's carrying 3,000 tons of 1,000-pound H.D. explosive bombs. The Fortresses met no prepared defense that seemed to indicate the enemy had advance warning. German fighters concentrated on the bombing run and the ferocity of the air battle is attested by the loss of 15 of the B-17's to fighters (one was lost to flak). The bombers, however, claimed 66 fighters destroyed, 15 probably destroyed, and 17
The bombing of the assembly plant was considered successful. The first operation against GAF facilities in May was a coordinated two-prong attack on the Bosch airplane factory, really a German repair depot, in Munich, and on the St. Étienne aerodrome. The munite target had been attacked inconclusively three times by the Eighth during 1942, but this 13 May attack seemed to achieve a good concentration of 236 tons of bombs and to do much damage to shops and storage facilities. The airdrome that was bombed the same day was not much hurt by the first efforts of new groups. The Courtcoul airdrome was attacked next day (14 May) with no better results.

The June attack on the facilities of the GAF was not impressive, and it did not develop until late in the month. An airdrome and repair depot at Villacoublays were attacked in adverse weather conditions by a handful (12-15) B-17s on the 28th, and a somewhat larger force (30) hit at the Trinquetaille airdrome the same day. Bomber Co. and reported the results negative. Somewhat better results were achieved two days later on the Lourmel-le-Press airdrome. Next day, 29 June, only 75 or 35 Sdn matched B-17s were able to bomb the chiefs and France motor-engine works at Le Mans. The low percentage attacking was due to heavy cloud over the target. Part of the bombs that were dropped did little or no damage.

Hülsen. There was but one operation by the Eighth during the first phase on the synthetic-rubber production, the 22 June attack on Hülsen near Harburg in northwest Germany. The plant at this city was one of the two most important synthetic producers and was the source of a
considerable portion (17%) of Axis supply. Its selection was probably dictated by its distance from bomber bases (350 miles), which was much less than that of the Schwaben plant (620 miles).

The Malta attack was, for the time, a large-scale effort. It involved 11 operating groups dispatched; 30 B-17s, of which 17B actually dropped bombs on Malta. Eleven of the planes participating in the mission were B-40s, one of which was lost to flak. Although the Malta raid was the main show for 30 June, the Eighth dispatched two other missions on the same day, one to hit Antwerp and a diversion over the North Sea. The Axis contributed another small diversionary attack on Rotterdam. Two diversions, which were strongly supported by AAF and RFC escort, contributed greatly to the success of the main effort by disrupting the enemy's escort and driving off a number of his fighters activated at 160. 163

The Malta mission was considered a success despite the loss of 18 heavies. It prompted RAF Fighter Commander Sir Crisford Leigh-Mallory to say it opened "a new chapter in aerial warfare." 163

Motor Vehicles. The Axis industry producing military motor vehicles was right after the production of rubber and tires on the target-priority list in the directive of 10 June 1943. Most of the first-phase effort against motor vehicles took place prior to the issuance of the O-3 directive, but it was justified under the Airborne directive which, although it did not specifically name the vehicle industry as a target category, did call for attacks on industries supporting the Axis war effort. 164

The first blows against motor vehicles were small to medium-sized efforts against plants in occupied countries. The mission of 4 April
against the Renault-Billancourt works, the salon southeast of Paris was the most important. It involved 66 attacking B-17s, which aroused 76 German fighters to vigorous resistance and the use of aerial dive bombers. This technique did not destroy any bombers, but other tactics brought down four. The 321 tons placed on the Renault works did severe damage to this facility.

The May operations against motor vehicles were carried out on the 4th and 11th of the month against the Ford and General Motors truck plants at Antwerp. The first of these involved 66 attacking B-17s dropping 161 tons of bombs and the main effort of 1 May. The small-scale second mission (28 B-17s) was but one of the attacks delivered on 14 Apr., which also roamed the Stiel, the Courtrai windmills, and the first B-24 mission of the 31st against Ljouwden in Holland.

On 23 June, 29 B-17s were used to bomb the Antwerp Ford and General Motors plant and to divert every fighter away from the main effort of the day, which was the bombing of synthetic rubber at Halle. Four days later six B-17s dropped 122 tons on a motor transport plant at Folsay to wind up the first-phase attack on motor vehicles.

There were no first-phase attacks by the Eighth on either oil or ball bearings, both of which were high on the priority list. Already noted are the facts that more than half the weight of bombs during the second quarter of 1943 was on submarine facilities and 31 on oil supporting installations. Rubber received 7 and motor vehicles 9. Only a little more than 10 of the efforts were dissipated on other than 625 targets.
Even though diversion was due to circumstances beyond the control of
the leaders of the Eighth, a mission aimed at Usine on 18 May was can-
sidered by cloud that most of the participating bombers based targets of
opportunity in northwest Germany. Cloudy weather was also responsible
for failure to bomb Gotha targets on 11 June, and again on the 26th. On
the latter date then the submarine facilities at Bremer and Kielburg were
scheduled objectives, the bombers' crews showed great persistence in seek-
ing targets and provoking battles with enemy fighters. Their bombs
were dropped on half a dozen towns in northwest Germany and on two convoys.

The fight they sought was provided by 100 to 110 enemy aircraft and the
score was 12 heavies lost against claims of 32 enemy fighters destroyed,
11 probably destroyed, and 40 damaged. 100

The USAF part of the combined bomber offensive was small during
this period, and it neglected two important target systems entirely.
Nevertheless it did exhibit a strong adherence to its cardinal principle
of "maintenance to the air."

The RAF Attack on the Ruhr

Raf bomber command operations during the second quarter of 1945 were
on a far larger scale than those of the Eighth Air Force. While the
Eighth was dropping 6,000+ tons the RAF bombers, particularly the
Halifex and Lancaster heavies, unloaded more than 60,000 long tons (52
civcde 1,122 U.S. tons) of bombs of which 30,750 long tons (42,133.7 short
tons) hit Germany. Relatively all factions of the effort were devoted
to targets in France and other occupied countries. Each week RAF attack

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was delivered at a cost of 631 aircraft, and 708 of these were lost over Germany.\textsuperscript{170}

The RAF bombardment of Germany was facilitated by the use of new "actuators," which allowed an "accurate bombing" to which former weather obstacles made the battle much easier against German night fighters, which found it difficult to operate on one of the nights chosen by the RAF for attacks.\textsuperscript{171}

RAF Bomber Command's air war on Germany was particularly concentrated against three types of objectives in the Ruhr and Rhineland:\textsuperscript{172}

1. The industrial centers of the Ruhr valley—Essen, Dortmund, Bochum, Duisburg, and their satellites.
2. The great Ruhr textile centers of Mönchengladbach and Cologne.
3. Subsidiary targets not strictly concerned with heavy industry, but important for the production and transport of other badly needed raw materials. Münster, Arnsberg, Harsefeld, and Harsefeld were in this category, as was the important synthetic-rubber works at Hulse.

The RA LEVELED THE Ruhr, attacking against Essen during April and May, which were designed to finish the destruction that had been started in that city in March 1943. Dortmund, industrial and transport center, suffered two heavy attacks in May, which involved nearly 1,000 attacking aircraft and which caused such damage that Bomber Command's "quarterly review" for April, May, and June 1943 said that it was virtually abandoned; indeed, for a short time, there the attacks probably made Dortmund the most heavily wrecked city in the Reich.\textsuperscript{173}

Bochum, a coal-producing center northwest of Essen, was attacked once in May (night of 13-14) and once in June (night of 13-13) by more than 600 aircraft dropping more than 2,000 tons of high-explosive...
and immediately bombed. Its extensive coke, ca, benzol, iron, and steel plants were consequently damaged.

Duisburg, at the junction of the Ruhr and Elbe rivers, suffered three raids in April and one in May. Oberhausen, east of Duisburg, and Billig, on the Elbe River and just south of Oberhausen, were attacked once each during June.

One of the most spectacular accomplishments of the Bomber Command during the first phase was the breaching of the Rhine and Elbe dams on the night of 16 May by 19 Lancasters equipped with special mines, the Rhine dam controlled the level of the Ruhr River, and the Elbe dam helped to control the waters of the river. The breaching of these dams was a severe blow to the water supplies of many Ruhr towns. 175

Düsseldorf and Cologne, the great cities of the Rhine, were both attacked twice during the second quarter of 1945. The first attack on Düsseldorf (5–8 May) employed blind-bombing methods and was not successful. The second (11–13 June) used visual methods and achieved good concentration. The two June attacks against Cologne were made to destroy the progress achieved by the Germans in their attempt to rehabilitate the city since the 1,050-plane raid of May 1943 and to round out the RAF Bomber Command's campaign against the Ruhr.

Other towns in this important industrial region attacked during this phase were Leverkusen (twice), Arnsdorf, and Münster. The attack on the last named was small, but the other two received large-scale raids and the devastation in both towns was widespread. 176
Outside the Ruhr and the Saarland regions, the RAF war on Germany included large-scale attacks on Niel, Frankfurt, Stuttgart, and Stettin in April. Smaller forces hit Lübeck and Hamburg during the same month. The Niel and Frankfurt attacks did not do great harm, but Stettin suffered heavily. Both of the two smaller attacks (Lübeck and Hamburg) were quite successful. The Hamburg raid was made as a diversion for a heavier blow which was designed against the Eboe works in Allen, Czechoslovakia, on the night of 16 April. This attack on Hlaren and another on the night of 15 May did little harm. 176

Only twice during May and June did any large force hit targets outside the Ruhr. In Creast, reported to have reconnoitered from a daylight attack which had been delivered against it back in October 1942, was again put out of action by a heavy blow on the night of 19 June. On the next night, a formation of Lancasters successfully attacked Friedrichshafen on the way to North Africa, and then hit Sardinia on the return trip. In Berlin under a series of nuisance raids one was attacked 10 times by nightfighters. 177

The Tentative Results of First-Phase Attacks

The statement of so small a segment of the combined bomber offensive as was encountered in the second quarter of 1943 can have very little value in the measurement of the part played by strategic bombing in the victory over Germany. An assessment that was true at the time does have value in an operational story, however, for it tells something about what the air leaders were doing, the strategic job believed their efforts were accomplishing.
The next strictly first-rate assessment of the bomber offensive, made shortly after the close of that period, was the work of the British Air Cabinet Joint Intelligence Committee, "Effects of Bombing Offensive on German Air Effort," dated 23 July 1943. Given here is a brief summary of the effects reported. 178

The bombing offensive had forced Germany to adopt a defensive air strategy. That strategy involved strong efforts to increase the fighter force and to so distribute it that more than half was employed on the western front at the expense of the Mediterranean and U.S.E.F. fronts.

German aircraft and maintenance facilities suffered very little damage from first-rate attacks. The Eighth Air Force raid on Aachen in April seems to have been partially nullified by a previously effected dispersal.

The judgment of the effectiveness of U-boat yard-bombing was uncertain, but it was estimated that the Germans had been enabled of 12 to 13 submarines, which would show up in decreased output between September 1943 and March 1944.

It was believed that the bombing of submarine bases had caused delay in the sailing of submarines from the bases; ports, and that valuable stores of ammunition and other supplies had been destroyed. The towns and docks of Le Cateau and St. Nazaire had been severely damaged, but it was not believed that their concrete-covered submarine pens had been put out of action.

The examination of the results of the attack on the synthetic rubber plant at Fulda led to the belief that it had been put out of action for
several units. This meant a further tightening of an already difficult situation for the Western Axis.

The bombing of Axis motor-vehicle production may have deprived the German armed forces of an output of between 3,000 and 5,000 motor trucks, this was equivalent to the full motor-transport establishment of three to four infantry divisions.

The RAF's heavy attacks on the Ruhr had caused grave effects in the production of solid fuels, iron and steel, and alloy steels. Evidence of falling oil in deliveries of Ruhr coal to Italy, to North German ports, and to Berlin was found. Rate of operations in the Ruhr iron and steel industry had been curtailed by the second-quarter bombings. Steel production at the end of June in that region was estimated at 30% of capacity as compared with 81% at the start of 1943. It was not clear in July that the shortage of steel had affected the armament industry.

The effects of bombing of rail transportation appeared to have caused the enemy to step up his locomotive construction program. This meant a diversion of core resources from the production of armaments.

Diversions or dislocations of effort was believed to have been one of the very important results of bombing. Prominent examples of diversion were the recall of skilled manpower from other jobs to improve radar and fighter defenses. It was also necessary to keep men from other employment at the time in order to maintain air-raid protection and fire services at a high level of efficiency.

It was judged that the destruction of housing had caused some decrease in the willingness of the people in heavily bombed areas to hold out.

In a new kind of destruction was believed responsible for some deterioration
in the name of the armed forces.

This summation of the results of the first-phase offensive is intended to do no more than to describe the estimate of those results as they appeared at the time, there was enough evidence available of 'the softening' of Germany to warrant the continuance of the effort and to step up the rate of strategic operations.
Organizational and Build-Up Problems

In the preceding chapter it was stated that the principal guide for the build-up and organization of the strategic and tactical air forces in the United Kingdom was the Bradley Plan. This plan had been drawn up primarily to achieve the maximum economy in the utilization of manpower in the U.S. Air Forces in Europe. The plan was promptly approved by the theater commander and by the Commanding General of the Army Air Forces. It was given conditional approval by the War Department in the third week of August 1943 and did not receive complete approval until 8 November, after the end of the second phase of the bomber offensive.

The reason the Bradley Plan failed to secure immediate and complete approval by the War Department was that it was believed the plan did not accomplish the purpose for which it was drawn—the cutting down of air force personnel to the smallest number with which the offensive could be carried out. The War Department and the Army Air Forces manpower position was such that no single force and no single unit of a force could be augmented without taking from some other force or some other unit.

Specifically, the chief conditions set up by the War Department for its approval of the Bradley Plan were:

1. The theater was to requisition only standard Iraq of organization units, which were somewhat different from the regular Iraq units.
provided for in the Bradley Plan. The difference between the two was to be solved by cadre, technically trained "fillers" to the theater, where they were to be incorporated into the proper units, which would be reorganized in the theater and reported to the Adjutant General.

2. Certain overseas organizations provided for in the plan were to be eliminated. General Marshall thought that the Eighth Air Force was too far away to work closely with headquarters. Especially did he object to certain features of VIII Air Force Service Command organization, namely, the area commands through which the command aimed to decentralize its operations. Under the headquarters of the Service Command were the area air depot area commands for controlling the three base air depots (Forton, Burtonwood, and Langford Lodge), the Strategic Air Depot Area Command for supervising the depots serving heavy bomber stations, and the Tactical Air Service Area Command for control of installations serving the tactical air force. The war department believed that the base air depots and the strategic depots could be supervised from the VIII Air Force Service Command headquarters. Only the Tactical Air Service Area Command was approved at first, probably because this organization was needed to secure the service command for the Tactical Air Force when it assumed its separate existence.

3. The troop strength figure of 489,543 set up in the plan was accepted for planning purposes only. The war department did not see it itself to this figure but rather reserved judgment in order to determine whether it could be thinned down.

Neither dissatisfaction with conditions laid down by the war department was strongly expressed. The organization of the various areas...
overall plan had already been set up as provided by the Bradley Plan without 
revision for the department approval. The recommendation for the elimina-
tion of certain parts of a joint organization was rejected as unnecessary.
Inspecting officers who were too far removed to understand the problem.
The chairman of the Joint Control Group and the Joint Staff Department 
that the elimination of the overall Bradley Plan was nullified it, 
for it was regarded as an 'integrated whole.' It was felt in the theater 
that the elimination of the strategic and basic defense control areas was 
unsound, for there was no reason for them as for the tactical control 
area which was removed. The official in the VIII Air Force Service 
Command was that the failure to secure unconditional approval effectively hindered 
the improvement of its maintenance and service functions. 3

Eventually the Air Force got its way in the matter of the service 
control organization. The control areas, which were not strictly 
operational regions but really functional sub-divisions, had been provisionally 
activated on 1 August, and were somewhat more formally launched on 4 
September, after General Marshall had stated that the Air Department 
accepted the Bradley Plan as an "integrated whole." In the theater this 
statement was taken to mean that the earlier conditions were withdrawn. 
Although this theater interpretation of the statement of the Chief of 
Staff went beyond his intentions, apparently no further objections were raised and the control area commands carried out their supervisory functions long before they were finally sanctioned in November. 4

The functional organization of VIII Air Force Service Command was 
but one of the problems in the implementation of the Bradley Plan. One
of the important parts of the program was a schedule of the flow of combat and service units into the United Kingdom. This schedule proved impossible of fulfillment in either category.

In the matter of combat units it was found necessary during the third quarter of 1943 to reduce the sending of four heavy groups and six medium groups because the service training program could not meet both the demand for replacement combat crews and the scheduled flow of new units. Some attention was already being given to the problem of replacement crews. Shortage of these constituted the chief limiting factor on the rate of heavy bombardment operations during most of 1943. During the Israel report in this chapter the problem was not primarily of two decades. The crews of about six groups in the United States that had been trained in the E-36 were converted to heavy bombers, and four new heavy groups scheduled for the United Kingdom during the summer were withheld in order that their crews might be sent as replacements for crews already in the theater. In July, the AAF pool for heavy crews had been set at two per unit equivalent pounds and, to the groups, with a sufficient flow of replacements to care for a 25% attrition rate per month. Noting this, and the difficulty that the scheduled flow of new heavy units could not be set until after 1 October.

The problem of meeting the Bradley schedule of service units was even more difficult than that pertaining to combat units and replacement crews. It was the opinion in the War Department that the buildup only called for an excessive number of service units. It seemed also that these generally arrived in the theater in the wrong order. Air echelons of
combat units would arrive first, and somewhat later than would come the service units designed for their support. In practice, there was a very heavy burden on the service forces already in the theater, for they had to do double duty. The build-up of service units had lagged so far behind schedule in August 1945 that General Marshall's office made it the subject of a special memorandum for the Commanding General of the Army Air Forces. The latter was told: "It is desired that positive and immediate action be taken to eliminate this deficit and bring into balance the AAF program for Tactical Service units and combat units. In this cannot be accomplished by other means at your disposal, the activation of additional combat units will be deferred until the structure of the AAF is balanced." 6

The lack of balance between service and combat units was due to a variety of factors. Shortage of personnel and training equipment slowed down the training program and shortage of shipping delayed the movement to the theater. Combat units usually had higher priority on the shipping lists than service units and consequently arrived in the theater first. When supporting units were not available or when there was no shipping to transport them, leaders in the theaters were reluctant to stop the flow of combat units simply to preserve balance. They preferred to have their forces increase as rapidly as possible and to resort to improvisations to support them. 7

In the Eighth Air Force the unbalance was due in part to the great variety of units (especially nonstandard units) that was required. Before the end of the third quarter of 1945 it became evident that the AAF could not meet the requirements for many of the units. Rather than delay
the build-up too much, the decision was made to ship large numbers of individuals in various stages of training to the theater as 'fillers' with the understanding that certain units could then be activated.

These fillers were charged against the troop allotment as set up in the Bradley Plan. The procedure placed an added burden on the forces in the theater, but it seemed to be the wisest solution of a difficult problem. This was one of the most important decisions made in the build-up of the air forces in the United Kingdom. General Marshall's proposal to the theater commander is worth quoting:

"Our expectation is that you reconsider your air organization effective every moment you can, particularly in service units and service organizations. Service units that you need will be activated in the theater. If, on the other hand, you will begin sending you trained personnel from your units, assignment for fillers and replacements out of the personnel assigned to the overall air force service allotment. Where you may use to organize provisionally while repair and replacements are handled and other regular units for which there is no provision here too be trained by the travel date. As these units are provisionally organized, we will you request formal constitution and activation. You will do all possible to send these trained men and women authority for your activation within existing policies. Units so activated will be charged against the Bradley Plan."

In accepting this proposal the theater commander indicated a purpose to work on the following basis:

The Bradley Plan will be used as the overall guide and organization will be set up as provided therein. However, will be used wherever possible in all echelons of Command and Staff but the overall organizational framework will be implemented as provided in that plan.

You will advise us that organizations can be dispatched as units, you will dispatch all other personnel as individuals and we shall first provisionally organize and activate, and later request formal constitution and activation authority from you.

The principle which it is urged be followed in this connection is that whenever personnel cuts are necessary, we be allowed to indicate in what units the cut will be taken. If the organization
proposed it will be carefully studied and any headquarters or unit
down to be unnecessary will be promptly deactivated.

This basic decision in the carryover of the build-up plan required
the services in the theater of a consultation of officers from Washington
to explain the personnel situation as it existed in the United States and
to discuss the Department of Air intentions in restating the program. The
work of this commission, headed by an air officer, Col. J. V. Taylor, of
the European Section, G-2, belongs to the account of the next phase of
the bomber offensive.  

The third quarter of 1943 saw certain progress made in the organiza-
tion of the U. S. Tactical Air Force in the United States and some discus-
sion by U. S. and British leaders of the organizational setup under
which the air force was to function in support of a Continental invasion.
The first commander of that force, Maj. Gen. H. H. Harkness, was selected
and approved, the beginnings of a service command organization were made
in the activation of the Tactical Air Service Area Command (later Tactical
Air District), and General Arnold exchanged views with Air Chief Marshall
Hartel on the subject of a directive to the commander in chiefs of Allied
Expeditionary Air Forces, who was to have over tactical control of the U. S.
tactical air force.  

The U. S. strategic air force also experienced some important com-
mand and organizational changes during the third quarter of 1943. On 1 July
1943, Gen. Nathan F. Twining was replaced by Brig. Gen. Frank L. Andrews
as Commanding General of VIII Frontier Command, and VIII Frontier Command
received a new commander on 12 August when Maj. Gen. R. R. Howard succeeded

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Fri., Con. Frank O.B. Hunter. The Eighth Air Force pressed for and received authorization for the creation of the air divisions and combat wings that had been recommended in the Bradley Plan. The authority was granted by the Adjutant General on 30 August, and formal activation was accomplished shortly thereafter.

This brief account of some of the more significant build-ups and organizational changes that were made by the U.S. Air Force based in the United Kingdom has intentionally refrained from detailed discussion of the problems mentioned and has ignored many others that are also quite important but more appropriate to the administrative history of an air force. It is not necessary to examine certain aspects of the operations that constituted the second phase of the Combined Bomber Offensive.

**Laundrado and Rate of Operations**

In the third quarter of 1943 the Eighth Air Force operated at a rate well above that achieved during the April-May-June period. July, August, and September missions accounted for 23,000 sorties (dispatched aircraft) by all units and more than three-fourths of these were effective sorties—that is, they reached and caused damage to targets or accomplished other purposes set for them. The numbers of sorties and effective sorties were more than double the corresponding figure recorded for the second quarter, while in the weight of bombs, the July-Sept. interval saw the figures drop 18,000 tons, or more than three times the figure established during the previous quarter, i.e.,

The increased rate of operations was due in part to sounder strategy.
weather conditions and in sport to the extension of available forces. 

The 5th Air Command had 83 daylight operations between 1 July and 30 September as compared with 76 for the quarter ending 30 June. On the latter date there had been 18 heavy bombardment, crews in the command: on 31 July there were 16, and by 30 September there were 20 3/4. Of these 16 3/4 were equipped with B-17 aircraft and four had B-24s. 14

The 16th had been required at the close of June 1943 to send its two 3-21-equipped groups to the North African theater, while the 36th scheduled for 16 was diverted temporarily to the Mediterranean. There these units had operated from 7 to 19 July in support of the Sicilian campaign. On 1 August they had engaged in the attack on the oil refineries in the Trapani region, and between 18 and 21 August they took part in certain other operations. One of the most important of these sorties was an attack on a lumber factory in Genoa. A torrent in this chapter. During the July and August operations the three North African forces had flown 70,000 tons of toner. 15

The North African theater attempted during July to secure additional heavy air forces from the Mediterranean theater, heavy bombers, heavy fighters, and fighters. But this was strongly resisted by the commanders of both the Mediterranean theater and the North African theater. Gen. Jacob L. Devers (US, 143) strongly defended the necessity of 1-Fleeting the OTO from the United Kingdom to the fullest possible extent that the OTO of OTO supported the committee's request that four major groups be sent from England to

14

15
the Mediterranean. General Eisenhower’s reaction to this suggestion was
that while mediums were no substitute for heavies, the mediums were better
than nothing and could be used effectively. General Devers countered
with another statement of the significance of operations in his own
theater and stressed the important part the mediums could play in the
GBO. He said that their diversion would cut down attacks on enemy air-
fields, increase heavy bomber losses, reduce the pressure that the Eighth
was applying to the GAF, and reduce the air support for Operation SHAKY
(an experimental landing on the French coast). The outcome of this
intertheater contest was that General Marshall in August sided with GBO,
and there was no further diversion of air strength to the Mediterranean
at that time.16

Not only did the GBO strongly resist the diversion of additional
strength to the Mediterranean, but it pressed for the return of the three
groups that it had previously dispatched to that theater. General
Eisenhower wanted to keep these as long as possible and made a strong
case for their retention. The United Kingdom forces won again. For the
Combined Chiefs of Staff directed that the 1-24s be returned to GBO
because of the critical struggle the Eighth was having with the GAF.
The three groups returned in August, and by 3 September the U.S. forces
and four 1-24 groups (44th, 93d, 359th, plus the 492d) operational.17

But this return of the borrowed 2-24s did not end the diversion
of heavy bomber strength from the United Kingdom. By the middle of
September, the American Fifth Army was in serious trouble on the Salerno
beachhead and there was not sufficient air power to properly support this

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operation. On 14 September, General Eisenhower told the CC/S that there were possibilities of a serious reverse and that his tactical and strategic air forces were being badly overworked, with each unit attempting to execute two missions daily. On the 16th, he reported that the situation was precarious and urged that long-range bombers from the United Kingdom operate against German lines of communication in North Italy and that the three B-24 crews which had been in his theater be returned without a moment's delay. This plea was not denied. The Joint Chiefs of Staff in Washington told General Devers to approach the British Chiefs of Staff about the dispatch of the crews, and if concurrence were secured, to start the movement at once. General Devers acted with the promptness demanded by the critical situation and by 16 September the 388th, 389th, and 446th groups, with approximately 20 aircraft each, were on their way back to Africa. The long-range support from the United Kingdom came on the night of 16 September when five B-17s operated with 340 aircraft of RAF Bomber Command to bomb the marshalling yards at Lodane in southeastern France in an effort to close the northern end of the Mont Cenis tunnel to Italy.

All told, the Eighth dispatched 80 aircrews, 98 combat crews, and 446 noncombatant personnel to the Mediterranean for the support of the Fifth Army in the Salerno battle. Between 21 September and the first of October this force flew 191 sorties, dropped 406.6 tons of bombs, claimed 80 enemy aircraft destroyed, and lost 11 heavy bombers in combat. General Eisenhower assured the Chief of Staff that the force would be returned as soon as it could be spared; by 21 September General Marshall was told
that the crisis had passed, and that it was safe to release the planes. They participated in a second raid on Meret Nouvadt on the 1st of October before returning to the United Kingdom bases which they reached on the 4th. Of the 50 heavies sent out, 63 returned to England. 18

The intertheater concept for B-25 groups has been recounted to show some of the difficulties experienced by the Eighth in building and keeping its forces. In addition to the heavy groups in VIII Bomber Command, VIII Air Support Command had four groups operational with B-24 mediums during a portion of July and throughout August and September. VIII Fighter Command doubled its operational groups during the third quarter. There had been three P-47 groups at the close of June, but at the end of September there were six. 20

Aircraft and crew strengths are much more important indexes of striking power than the number of groups. Daily average heavy bomber strength in operational aircraft, available crews, and effective strength during the third quarter of 1943 were: 21

<table>
<thead>
<tr>
<th>Month</th>
<th>A/C Fully Ctrl. with Tac. Units</th>
<th>Avail. Crews</th>
<th>Effective Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>378</td>
<td>315</td>
<td>279</td>
</tr>
<tr>
<td>August</td>
<td>406</td>
<td>341</td>
<td>291</td>
</tr>
<tr>
<td>September</td>
<td>461</td>
<td>403</td>
<td>373</td>
</tr>
</tbody>
</table>

The figures make it evident that VIII Bomber Command was better off with respect to operational aircraft than available crews during this period, but it is worthy of note that the effective strength was less than the number of available crews seems to indicate it should have been. The reason for this condition was that the group was the operational unit. 22
Effective strength on a given day was not represented by either the aggregate number of fully operational aircraft or that of available crews in the bomber column, but by the name of the operational aircraft or available crews assigned to the group.\textsuperscript{26}

Heavy bomber strength was about 31 short of the goal that had been set up by the CGS P-St. This had called for 1,102 heavy bombers to be in the theater by 10 September. Actually, on the 23rd of that month there were 831, and the average figure for the whole of September was only 831.\textsuperscript{23}

The CGS had assumed that about three-eights (37.5) of the heavy bombers assigned to the theater would actually be available at any one time for dispatch on missions. This assumption had been made upon the basis of Eighth Air Force experience prior to April 1943, and second-line operations were about in line with this experience. In the table below are shown the average number of assigned heavy bombers and the average number dispatched on missions for the three-month period:\textsuperscript{74}

<table>
<thead>
<tr>
<th>Month</th>
<th>Air Force avg.</th>
<th>Missions avg.</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>800</td>
<td>283</td>
</tr>
<tr>
<td>August</td>
<td>901</td>
<td>283</td>
</tr>
<tr>
<td>September</td>
<td>831</td>
<td>333</td>
</tr>
</tbody>
</table>

The average number of aircraft dispatched on operations was obtained by dividing the total dispatched aircraft on daylight missions for the month by the number of daylight operations. Night operations, involving very few aircraft, were excluded. There were 10 operational days during July, and on each of nine days VIII Bomber Command dispatched more than 200 aircraft. On five out of the nine more than 500 heavy bombers were sent
out. The only operational day in July when fewer than 200 heavy bombers were sent out was the 30th, and that was probably due to the fact that the command had been operational six of the seven days ending with the 30th.35

August had but eight operational days, and on seven of them more than 200 heavy bombers were dispatched. Four of the seven saw more than 500 sent out, and the well-known 17 August raid on Schweinfurt and Regensburg found 542 attacking aircraft out of the 376 dispatched.36

The month of September saw the Eighth attain the figure of 500 dispatched bombers five times; and on one occasion, 6 September, some 707 were sent out. The top second-week figure for attacking aircraft was not attained on this date, but came two days later on the 9th, when 330 out of 377 dispatched bombers hit a number of airfields in occupied countries.37

In general the VIII Bomber Command was able to utilize its effective strength in excellent fashion. This is evident from figures for effective strength and average number of aircraft dispatched on operations are compared.38

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>279</td>
<td>233</td>
<td></td>
</tr>
<tr>
<td>August</td>
<td>281</td>
<td>233</td>
<td></td>
</tr>
<tr>
<td>September</td>
<td>373</td>
<td>333</td>
<td></td>
</tr>
</tbody>
</table>

It has been seen already that the utilization of all heavy bomber aircraft assigned to the theater was not nearly so satisfactory. This is further emphasized by an examination of the sortie rates for the period

...
under review.²³

<table>
<thead>
<tr>
<th></th>
<th>No. of Sorties per Unit</th>
<th>No. of Sorties per Effective Aircraft</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Effective Strength Employed Aircraft</td>
</tr>
<tr>
<td>Heavy Bombers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>July</td>
<td>3.9</td>
<td>10.1</td>
</tr>
<tr>
<td>August</td>
<td>2.8</td>
<td>7.3</td>
</tr>
<tr>
<td>September</td>
<td>3.4</td>
<td>9.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>27.1</td>
</tr>
</tbody>
</table>

When it is recalled that there were but 22 operational days during the second phase of the bomber offensive, it is clear that effective strength was quite well used in so much of the heavy bombers ready for operations were used at a rate of about 35% (27.1/22) of capacity. However, the sortie rate for unit equivalent aircraft (column 1 in above table) shows that VIII Bomber Command was not making such effective use of the planes assigned to units. In no month was the average bomber assigned to a group able to fly as many as four sorties per month. The sortie rate per heavy bomber, considering all aircraft assigned to the theater (that is, including those assigned to combat units), was naturally even lower.

This unsatisfactory operational rate was recognized in HQ Headquarters and in the theater at the time, and great efforts were extended to improve the situation. The operational rate for heavy bombers was held down by two factors: (1) errors necessitated by battle damage and repairs and overhaul required after a certain amount of flying time; and (2) the replacement rate for crew and equipment. Although it was possible to improve the maintenance and repair situation considerably, the other factor, replacement flow, still operated to lower down rate of operations, for a greater operational rate would have carried losses above replacements.

* This conclusion is based on the premise that no bomber ever flew or was expected to fly more than one sortie on any one operational day.
and thus resulted in a diminution of the loss curve.  

Problems of Balance and Tracking Accuracy

The explanation of the loss and survival figures for first-choice heavy bomber operations led to the conclusion that close cooperation was occurring more intense during April, May, and June. The effect of this cooperation seems to have continued to be very great during July and in fact, but it diminished perceptibly in September. There were 103 heavy bombers lost in action in July, 107 in August, and 66 in September. Of this total of 376 lost in combat, 107 (nearly 30%) were lost to enemy aircraft; 47 (nearly 13%) were lost to flak or a combination of flak and enemy aircraft; 43 (11%) were lost to accidents; and 182 (48%) were lost to other causes. In addition to the 376 lost in action there were 14 so badly damaged that they could not be economically repaired; consequently, the loss due to combat was 362 heavy bombers for the second phase of the offensive. Then this loss due to combat is translated into a percentage of credit cost, it becomes a measure of the severity of enemy cooperation. It is not mere simply to calculate loss as a percentage of credit cost but as a percentage of dispatched planes, for some dispatched planes never were in a position where they could be attacked by the enemy. However due to combat computed as a percentage of credit cost for the three months of the second phase were:

<table>
<thead>
<tr>
<th>Month</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>5.6%</td>
</tr>
<tr>
<td>August</td>
<td>8.0%</td>
</tr>
<tr>
<td>Entire 1st</td>
<td>8.2%</td>
</tr>
<tr>
<td>Entire second quarter</td>
<td>3.07%</td>
</tr>
</tbody>
</table>

This is to say that during the third quarter of 1943, of every 100 bombers
flying into positions where contact with the enemy was possible, one was lost due to contact. 33

Battle damage to aircraft that returned from operations showed the same trends during the second phase as the combat loss rates. Considering damaged heavy bombers as a percentage of combat sorties, the following is observed:

<table>
<thead>
<tr>
<th></th>
<th>No. Damaged</th>
<th>% of Credit Sorties</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>1,095</td>
<td>43.9</td>
</tr>
<tr>
<td>August</td>
<td>932</td>
<td>42.2</td>
</tr>
<tr>
<td>September</td>
<td>745</td>
<td>23.2</td>
</tr>
</tbody>
</table>

July and August rates are high. The reasons for the low loss and damage rates in September are probably found in the nature of the operations for this month. Only two of the September operations were over German targets—a mission against Stuttgart and targets of opportunity on the 6th and the mission against Hagen on the 27th. The former was made on a cloudy day which did not favor German fighter operations, and the latter was also made under cloud conditions and employed blind bombing aids for aiming—the first time they were used by the Eighth Air Force. Many of the September operations were made against airfields during the daylight exercise and against other targets which required relatively shallow penetrations. Less than half the September sorties were flown against SSD targets. Hence it seems to have been due to the kind of operations conducted rather than to improved bomber defense or lessened enemy effort that losses and damage rates declined in September. 33

Force hout the three months of the second phase the German Air Force continued to exhibit the same trends that had become evident during the
first half of 1943. Fighter aircraft production, particularly of single-engine types, was emphasized at the expense of other craft, and the existing fighter force was so distributed to meet the bomber offensive that the Eastern Front gained in strength both absolutely (from an estimated 1,150 in June to about 1,350 in September) and in relation to the Western and Mediterranean fronts. 34

OAF tactical developments during the third quarter saw just one innovation—the flying of captured B-17's in or near the formations of VIII Bomber Command. The use of B-17's by the Germans was first reported during the early part of July, and the reports caused considerable agitation in AX Headquarters. 35 The Germans purposes in using the repaired B-17's that had crashed in enemy territory seem to have been to obtain performance data on Fortress formations, to confuse U.S. crewmen, and vectors to transmit direct-control data to rocket-carrying and aerial-bombing aircraft. U.S. countermeasures included distinctive markings for each mission and orders to train guns on strange craft not properly identified as part of our forces. 36

Germans fighters continued to make some use of air-to-air bombing during the second phase of the offensive, but this tactic was never developed to the point where it constituted a real threat to the day bombers. 37 As noted earlier, the Germans began the use of fighter-cought rocket guns in April 1944. Apparently they were used throughout July, August, and September but not on a very extensive scale. The mission reports did not begin to identify positively the use of rockets until the latter part of the period under review, but there seems to be little
doubt that they were used before 1940, and we are completely aware of the enemy weapon. There were probably a dozen cases of rocket employment by German fighter units during the period July-September, and quite certainly there were some losses to this tactic. The first proved success of the weapon occurred on 23 July during the mission to Hessel and Schermerhorn. 53

In the heavy bomber battle with the German fighter force there was a continued development of defensive techniques. But one perhaps the most important offensive measure adopted by the bombers—the increase in the size of attacking forces—also proved to the advantage of the defense. The Operational Research Section of VIII Bomber Command made a study of losses and damage suffered by heavy bombers during July-September and reached the conclusion that the amount of loss and damage suffered varied directly with the number of enemy fighters that were mounted. The concentration of a certain number of fighters by the enemy on a small force or the spreading out of the same number of his attacks in time and space against a large force caused approximately the same amount of damage to bombardment aircraft. The lesson for VIII Bomber Command from this study was clear—increase the size of the attacking force and lower the rate of loss, and at the same time, lessen the probability that any one plane or group could be successfully attacked. It has been seen that the average number of heavy bombers dispatched on daylight missions was 383 during July and August and was increased to 388 for September. 40

The increased forces of heavy bombers made possible the use of the diversion and the effective employment of the "split target" technique.
In the course of the 10 daylight operations in July, approximately 25 different targets were hit, or nearly three per mission. The worst record was not quite so high; eight operations dug out about 10 targets attacked. Scarcely, with 11 daylight operations, are two day bombers attack about four targets per operation.21 Strangely enough, however, the two west examples of the employment of the "split target" technique during the second phase were days of extremely high losses. On the anniversary mission of 17 August 1943, some 678 bombers were dispatched against the airmotive plant in Austria and the engine aircraft factory. At Schweinfurt, 163 actually attacked, while 176 bombed Regensberg. The losses for both raids totaled 66-18 of aircraft ditched and 19.7% of the number attacking. On the 6th of September 457 bombers were dispatched and 323 actually bombed at least 10 different targets. Loses were 77 (.5 missing in action and 3 battle damage) or 16.6% of the number dispatched and 16.3% of the number attacking. These two operations (17 August and 6 September) were the most costly during the entire third quarter of 1943, both absolutely and in relation to the number dispatched. The chief reason for the losses on the Schweinfurt-Regensberg mission probably were the importance of the targets and the depth of penetration; for the 6 September mission some of the loss seems to have been due to fuel shortage.42

The effective strength of the Eighth Air Force was augmented and the German fighter forces were moved still further by the use of 2-35 medium-bombers during the second phase of the bomber offensive. After a disastrous introduction to the western front with the tactical low-level tactics...
in May, the B-26's were removed from operations and transferred to VIII Air Support Command. After a period of training, during which the number of aircraft available was increased considerably, the mediums resumed operations on 15 July with an attack on the Abbeville marshalling yards. The two-engine bombers were now employed at medium altitudes (10,000-12,000 feet) and generally had the benefit of fighter escort. They were used to attack near-by industrial targets and airfields and to run diversions for both the heavy and their own missions. There was always the closest coordination between medium and heavy attacks: a run on the same day in order that the medium results in harassing enemy fighters might be obtained. Operations by medium bombers were on a small scale in July (223 sorties) but increased in size and importance in August (1,185 sorties) and September (3,023 sorties). In the latter month mediums dropped nearly three-fifths as great a weight of bombs as did the heavies.

VIII Bomber Command continued to study and experiment with the problem of formation. Formation flying was primarily a defensive tactic, but it had very important offensive implications for the accuracy of bombing; it was very closely related to the type of formation flown during the bombing run. There was considerable criticism by Allied headquarters of the Eighth's heavy formations during the second phase because of losses incurred and because of the poor accuracy attained on some missions.

General Arnold pressed on to the Eighth Air Force an extensive report (including photographs by eyeball) from the School of Applied Tactics dealing with heavy formations, in an effort to improve both defense techniques and bombing patterns by the United Kingdom forces. The basic group
Formation used during the second phase continued to be the 18- to 21-
plane combat box. This unit was lost intact during the coming run and
the way in which it was flown determined, in great measure, the bomber-
pattern achieved. Except on the bomb run, the combat box, consisting
of two or three combat boxes stacked together for mutual fire support,
as still the definitive unit. It was the opinion of the Commanding General
of the Eighth that the deficiencies in the defensive tactics of the heavy
bombers lay in the faulty technique of the pilots rather than in in-
correct planning or false conceptions of the theory of the formation. 43

Here the constant emphasis on the fact that pilots arriving in the theater
were not properly trained in formation flying, and efforts were made to
remedy this deficiency in the theater before crews were sent into combat. 44

Although bombing accuracy was definitely an offensive characteristic
of operations, it is so closely related to defensive problems, particularly
to formation flying, that it is appropriate to discuss it at this point.

There are more data available from the missions of the third quarter than
from those of the second quarter of 1943, but the assessment of the bom-
bardier accuracy for any period in these early stages of the offensive is
never entirely satisfactory. Many missions attacked targets of opportunity
without pre-assigned aiming points, as often on these, as well as on more
successful missions, photographic coverage was not at all satisfactory.

All figures on bombing accuracy of VIII Bomber Command have to be con-
sidered very cautiously, for they are never based upon the whole effort
of the command, but upon a fraction of it—necessarily upon the most
successful fraction.
Examination of bombing accuracy by the three-month phases of the bomber offensive is not necessarily the most satisfactory approach. The Statistical Summary of Eighth Air Force Operations reports bombing accuracy by quarter years, but the best OAS study on the subject for the 1943 operations used somewhat different time intervals.

The Statistical Summary reports the average percent of bombs which fell within 1000 ft. and 2000 ft., or pre-assigned LPI [aim point of issue] on visual missions of good to fair visibility for the third quarter of 1943 as follows:

<table>
<thead>
<tr>
<th>Within 1,000 feet</th>
<th>Within 2,000 feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Div. 3d Div. 8th AF</td>
<td>1st Div. 3d Div. 8th AF</td>
</tr>
<tr>
<td>13</td>
<td>19</td>
</tr>
</tbody>
</table>

The expression "pre-assigned LPI" is misleading and that is probably meant is the pre-assigned aiming point. Whatever the reference point, it would seem that day bombing accuracy was on the increase during the third quarter, for it will be recalled that but 12% of the bombs were reported within 1,000 feet of the LPI during the second quarter of 1943.

Other evidence from OAS studies also indicates improvement. The accuracy achieved by the entire air force and by divisions for each of the three months in the third quarter was reported as follows:

<table>
<thead>
<tr>
<th>Avg. % of Bombs Which Fell Within 1,000 ft.</th>
<th>Avg. % of Bombs Which Fell Within 2,000 ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6th Air Force</td>
<td>12.2</td>
</tr>
<tr>
<td>1st Bomb Div.</td>
<td>6.9</td>
</tr>
<tr>
<td>8th Bomb Div.</td>
<td>10.0</td>
</tr>
<tr>
<td>8th Bomb Div.</td>
<td>10.0</td>
</tr>
</tbody>
</table>
The reason for no report on the 3d Division in both July and August was the absence of most of the aircraft of that organization from the United Kingdom during these two months. The reason for the smaller figures in the September column for 1st and 3d Divisions and for the entire air force is probably to be found in the nature of the operations for last month—during the first nine days every sortie were flown in connection with V-1s (recently to be discussed), several missions were carried out in heavy cloud conditions, and several missions were devoted to targets at the request of the Admiralty. A monthly average of the accuracies given in the table immediately above will not give the true picture for the quarter unless the figures for the months are weighted in proportion to the tonnage of operations. Despite limited data it seems reasonable to conclude that Eighth Air Force accuracy, while improving during the second phase of the bomber offensive, was not outstanding. As a matter of fact, according to General Arnold's grading standards, 1st Air Force continued to be poor. Air Marshal Headquarters R.A.F. sent a grading system to all air force commanders for the purpose of standardizing reporting of bombing results. Certain objectives were designated to be with certain percentage of hits within 1,000 feet on named aiming points:

<table>
<thead>
<tr>
<th>%</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>excellent</td>
</tr>
<tr>
<td>40</td>
<td>good</td>
</tr>
<tr>
<td>30</td>
<td>fair</td>
</tr>
<tr>
<td>20</td>
<td>poor</td>
</tr>
<tr>
<td>15</td>
<td>unsatisfactory</td>
</tr>
</tbody>
</table>

General loops thought that such a scale might be satisfactory for peacetime training, but not good for wartime measurement because it did not take into account the destruction of the target, the amount of enemy opposition,
or the prevailing weather conditions.\footnote{23}

Losses and damage figures already examined were indicative of the severity of enemy opposition to the daylight attack. The other side of the picture, seen in claims of enemy aircraft destroyed and damaged, is a measure of the ability of the bomber and fighter aircraft to defend themselves.\footnote{23} The heavy bombers claimed the destruction of 540 enemy aircraft in July, 670 in August, and 373 in September. Italian fighter claims for the same months were 3, 4, and 5 respectively. Thus the total number of enemy aircraft destroyed by day bombers during the second phase was 1,583, if the claims represented the true results of the air battle. An additional 26 were reported as probably destroyed and 336 as damaged during the three months of operations.\footnote{24} It is very difficult to assess these claims accurately. They were recorded only after very rigid examination which attempted to eliminate all duplications. There is no fault to find with the standards set up for the various categories of combat claims, yet it seems that the toll of enemy aircraft claimed by the bombers might have been greater than the actual losses, experienced by the German air force.\footnote{25}

One of the difficulties involved in assessing claims of the 13th's heavy bombers is the constant criticism of the combat crew's work. An example, typical of many, is worth citing. The commanding general of the European Theater of Operations on 3 July 1943, reported to General Arnold:

"Your bombaimers can do their job with a high degree of proficiency, but your gunners need training and more training, particularly at high altitudes. It is the most important existing deficiency."\footnote{26}
The British Air Ministry estimates of German losses (total combat and non-combat losses) were generally considerably short of Luftwaffe claims of enemy aircraft destroyed. These estimates were made on the basis of combat reports by the RAF and were, in a period, and for different types of aircraft were counted on the basis of British claims with comparable types. In the following table, British Air Ministry combat losses, together with VIII Bomber Command claims (place nation included) of enemy aircraft destroyed, and total claims by both the Eighth and the RAFF for July, August, and September on the Western Front are shown in parallel columns:

<table>
<thead>
<tr>
<th>Western Front</th>
<th>VIII Bomber Command Claims</th>
<th>Total RAFF and RAF Claims</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>July</td>
<td>413</td>
<td>686</td>
</tr>
<tr>
<td>August</td>
<td>338</td>
<td>773</td>
</tr>
<tr>
<td>September</td>
<td>258</td>
<td>491</td>
</tr>
</tbody>
</table>

The following quotation from an OSS study presents an excellent statement of the problem:

The wide divergence between claims and Air Ministry estimates and the failure of the RAFF to use claims in any way in computing losses, implies that the Air Ministry believes claims to be worthless. This is disconcerting in view of the care with which it is reported that fliers' claims are scrutinized. Aircraft claims are recorded according to time, altitude, distance, and code and checked against the time, altitude, distance, and code of planes claimed by other fliers. If there is even rough coincidence of two or more claims, only one is allowed... because the source of initiation of claims is so obvious, it is said that there responsible for evaluation of flyers' reports 1 an excess in an attempt to be conservative. Furthermore, no planes are credited to lost aircraft. Then or nearly sixty tenors fail to return from a single raid, and are recorded; there enters the heaviest damage, this would seem to provide a more than adequate margin for the lower numbers.

[Handwritten notes on the page]
Captured records of the enemy reveal that the volume of non-cannon losses is frequently as high as or higher than the volume of cannon losses, and this is broadly confirmed by Allied experience. Thus, even if cannon's claims are discounted by 50 percent, the implied total loss figure is still well above the Air Ministry's estimate.

A complete and accurate account of the latter will probably have to wait for a careful analysis of our operational records.

The defensive power of the enemy bomber was great, but the opposition of the fighter forces of the enemy was so determined and his rocket guns were so accurate that it was well known that the only solution of the defensive problem lay in the development of fighter escort all the way to the target. The urgency of the matter was great during the second phase of the bomber offensive, and it can be understood even more easily from the words of Air Force leaders than from the statistics of operations.

A memorandum drawn up on 1 July by Maj. Gen. E. B. Giles for General Arnold said: "The 8th Air Force now has insufficient fighters to conduct escort for the strategic bombers and counter-aircraft artillery operations. A minimum of one fighter group to two heavy bomber groups for escort must be established in the U.S. at the earliest possible date. Therefore, at this time the ratio of fighter groups to bomber groups are less than 1 to 4.

After a visit to the 8th Air Force in England, Maj. D. J. Lumsden of the AEF Provost Ground Command reported in a memo to the Assistant Chief of Air Staff, Operations, that they "require one fighter to protect against enemy air-to-air and air-to-ground rockets in fighter protection. The fighters must be able to accompany our bombers on the entire mission in the area to render..."
efficient protection. The same idea was stated by General Anderson, the commander of VIII Bomber Command: "It is obvious that the ideal fighter protection is that which can accompany the bomber from enemy territory to target. Failing that, the greater the escorted penetration the better." Again in September General Anderson said: "... the most likely solution for the problem of low range, high caliber gun fire, as well as rocket projectiles from enemy fighters, is the extension and improvement of fighter escort." 

Toward the end of September the need became so strong that General Arnold wrote to Air Chief Marshal Portal, "The increasing strength of the fighter opposition to the Army Air Forces bomber offensive over continental Europe requires immediate strengthening of our fighter escort forces." The Commanding General of the VIII Bomber Command wrote that he requested that the VIII Bomber Command be under the control of the Eighth Air Force and release some of the same type to VIII Fighter Command. 

Other evidence of the desperate need for solution of the escort problem is to be found in a suggestion from VIII Headquarters at the beginning of the second phase that some of the B-25's be used as escort destroyers for the heavy bombers, and by the continued efforts to emphasize, of the B-25 after its disappointing showing during the second quarter of 1943. In the suggestion that B-25's be used for escort, "...to combat the obvious need for the enemy fighter. Although the idea of using B-25's for the fighter role has been considered in the United States, the bomber air force has never been able..."
to receive bombarding airдуances instead of additional Y-40's and to
convert those on hand to training uses.

The account of the development of the fighter escort during the
first three has called attention to the facts that VIII Fighter Command
had successfully introduced the P-47 Thunderbolt into the European theater,
that it had begun the escort of heavy bombers within very limited ranges,
and that it had made progress in solving the problem of range extension
by experimentation with various kinds of expendable tanks. The work on
the expendable tank was probably the most important development in the
history of VIII Fighter Command during the third quarter of 1943, and
two one of the most important single developments in the history of the
whole American air force.

It has been noted that the first expendable tanks to be used with the
Thunderbolt were poor sixty-three of 60-gallon capacity. These were
employed on the 30 and 31 July escort operations and on some missions in
August. Since the enemy in the theater was not yet not last long
to offer the idea to procure more of these tanks, for they were not
considered or procurement and had to be dropped at about 2,000 feet be-
cause fuel could not be extracted above that altitude, these tanks
would give the P-47 a range of about 900 miles if dropped as soon as the
plane had climbed to the critical altitude, and a little over 300 miles
if the climb to altitude were delayed until the fuel capacity of the tank
had been fully utilized.

A 100-gallon 50 per tank was designed by the British for VIII Fighter
Command and initial small scale deliveries were made in July. A

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text was capable of preigerization and promised to be quite satisfactory in extending the radius of action of the P-47 to about 300 miles.

British agencies at first were lured to take care of all fighter center requirements for extendible tanks after the end of September, but this proved to be impossible, and the problem was solved only by depending on extendible supplies on U.S. production. Some steel tanks of 100 and 150-gallon capacity were also manufactured in the United Kingdom. An effort to expand the capacity of the 100-gallon extendible tank to 150 gallons proved unsatisfactory from an aerodynamic standpoint.

Besides the limited number of 150-gallon extendible tanks and tanks of British make, Fighter Command used regular 75 and 100-gallon ferry tanks. These required a considerable amount of extendible equipment, in order to make possible the withdrawal of fuel during flight, and supplies for this purpose were obtained from the United States. Fuel tanks were transferred from both fuselage and wing. Supplies for this purpose prevented a troublesome difficulty. Extensive developable tank problem was not worked out until the last quarter of 1943. However, by the end of the year there were between 2,000 and 3,000 jettable tanks available at each of the Fighter Command stations, approximately 1,500 to each fighter station of the tactical air force.

While the P-47 was an excellent airplane for certain kinds of work in the European theater. Its acceleration and rate of climb were poor, and it could not operate on even terms with the best enemy fighters below 20,000 feet. To improve acceleration and rate of climb considerable
Experimental work was performed during the second phase on a new middle propeller and a water injection system designed to give the Thunderbolt more emergency power. Even with these improvements it was felt that the 8th Air Force demanded more than one type of fighter for the varied task that had to be performed. Even with cumulative tasks the P-47 did not live the more desired for the deepest penetration. To supplement the Thunderbolt fighter the 8th Air Force wanted both the P-38 and P-51, especially the latter—because of both its range and its performance characteristics at medium altitudes. But the state of aircraft production did not permit the Eighth Air Force to acquire these fighters in sufficient numbers 

There were, it is true, two P-38s delivered to the United Kingdom by mid-September (30th and 31st), but it was not until October before one of them (the 30th) was placed on operations. VIII Fighter Command had only six operational groups by the end of the second phase. The ratio of fighter groups to bomber escort groups was about 1:5.3 at the time. 

VIII Fighter Command became independent of VIII operational control on 30 June 1943, at which time all groups were placed under the operational control of the 8th Air Force. VIII Fighter Command grew during the third quarter of 1943 from an average effective strength of 171 for July to 277 for September, but in contrast to VIII Bomber Command, it found its effective strength limited by aircraft rather than area. 

Although some of the heavy-bomber escort work was performed by the 8th (support for medium bombers was practically all furnished by the 5th), the U.S. 8th took over the maior share of this task. Simultaneously...
erected several independent forces into the Continent, but most of their second-place forces in heavy bomber support. Of the July sorties, 60% of August sorties, and 50% of September sorties were flown on such missions.\footnote{76}

The testimony of VIII Bomber Command leaders makes very clear the reason that we sent for the escort that was furnished. It needed more time to get to the target, it allowed greater accuracy on the bombing run, and it brought more heavier bomb. The old story of second-place operations showed that loss and damage from enemy aircraft was about four times as great on unescorted missions as when escort was all the way to the target. During July, August, and September 316th Flights flew some 7,271 sorties on 61 operational days, claimed 123 enemy aircraft destroyed, 18 probably destroyed, and 63 damaged, at a cost of 32 B-47's missing in action.\footnote{77}

**Pattern of Over-Taking Operations**

The major sorties (75%) of the to-tonne bombs dropped during the second three months of the war fell on targets in occupied countries. Germany received only about \( \frac{2}{3} \) of the total tonnage of both heavy and medium bombers and approximately \( \frac{1}{3} \) of that dropped by heavies alone. Targets in France were objectives for nearly \( \frac{2}{3} \) of third-quarter tonnage (both heavies and mediums) and the remainder fell on Belgian, Dutch, and Norwegian targets, ad on every shivering. During July, Germany received slightly more than half (51%) of Eighth Air Force bomber in August less than one-third, but in September only 14.7. The heavy weight of target falling in France during the second three is accounted for by a large number of raids made on airfields, especially by the medium bombers.\footnote{78}
Although the weight of bombs dropped during the second phase of the bomber offensive was considerably greater than that of the first phase, the second-phase effort showed less tendency to keep to the target pattern that had been established by the O.S.O. Air Force facilities supporting the General Air Force still constituted first priority for the eighth, 14, of the tonnage dropped by the heavies was used against aircraft targets. Only 7.8% fell on aircraft construction facilities, for 92.2% of the total and storage tanks received slightly more than 16% of the tonnage received about 21 of enemy bomber tonnage. A major fraction of the Eighth Bomber effort was directed against the latter type of target. Submarine pens and bases (second-priority target category) received 8.0% of heavy bomber tonnage during July, August, and September, and port facilities nearby 5% fell within accounted for 1.3%, coastal defense and other military installations, and major industrial areas. In targets of opportunity, received about 11% of the tonnage dropped by the heavy bombers.

A bomb used during the second phase was of the 8.3500-cubic inch capacity type, but 78.1% of it was delivered during the second phase of the second type. The difference between the two types of bombs is that the 8.3500-cubic inch capacity is the larger type. In general, about 82% of the bombs were delivered in the second phase.

An excellent example of the efficient use of tonnage during the second phase was the delivery of 20,000 tons of bombs on the enemy's airfields in August, 1942, 9,388 tons in September, and 9,338 tons in October. The second phase was the second major phase of the bomber offensive.
German fighter production. These attacks were made on five operational days against seven separate targets, all lying down inside Germany, as follows:

<table>
<thead>
<tr>
<th>Date</th>
<th>Place</th>
<th>Factory</th>
<th>AJ Attacking</th>
</tr>
</thead>
<tbody>
<tr>
<td>23 July</td>
<td>Hessel—Fleetscher Flugzeugwerke (171-100)</td>
<td>48 2-17</td>
<td></td>
</tr>
<tr>
<td>25 July</td>
<td>Goerlitz—100 Flugzeugwerke (171-150)</td>
<td>33 5-17</td>
<td></td>
</tr>
<tr>
<td>29 July</td>
<td>Flensburg—Flieger Industrie Flugzeugwerke (171-150)</td>
<td>44 2-17</td>
<td></td>
</tr>
<tr>
<td>30 July</td>
<td>Hessel—Fleetscher Flugzeugwerke (Nortwell) (171-150)</td>
<td>25 2-17</td>
<td></td>
</tr>
<tr>
<td>30 July</td>
<td>Hessel—Fleetscher Flugzeugwerke (Nortwell) (171-150)</td>
<td>37 3-17</td>
<td></td>
</tr>
<tr>
<td>14 Aug</td>
<td>Goerlitz—Flugzeugwerke (Me-109)</td>
<td>51 5-17</td>
<td></td>
</tr>
<tr>
<td>17 Aug</td>
<td>Regensburg—Vosserschmitt AG (Me-109)</td>
<td>125 2-17</td>
<td></td>
</tr>
</tbody>
</table>

The 23 July raids on the Heinkel factories at Hessel (components) and Goerlitz (assembly) were made in very difficult weather conditions which cut the size of the attacking force badly. The bombing at Hessel was not very accurate, for a considerable portion of the bombs (55 tons of a explosive and 25 tons incendiary) fell south of the aircraft factories and caused some damage to textile factories and several other plants. Bombing at Goerlitz by the very small attacking force seems to have been more accurate than at Hessel. These missions of 23 July constitute one of the landmarks in American Air Force history, for this was the first time B-17s employed heavy tanks in escort work. The fighters did not go all the way to the targets (Hessel was 300 miles from base and Goerlitz at 420 miles was the deepest penetration made by heavy bombers at the time), but the bombers returning from Hessel were sighted up by another force of 11 hours in the vicinity of Cleve on the English border. The 25th of July was also the first day on which heavy bombers were lost to enemy action.
The nearest Heinkel Factory at Hannover, thought to produce about 30% of all He-111's, was hit on the 12th. Next day the Bottenhausen Fieseler Flugzeugwerk (components) in the Kassel area was hit for the second time, and a Focke-Wulf assembly plant near-oy (Goldsau) was bombed by a small force of 33 B-24's. 33 A Fieseler tanks were again employed by the B-24's, which furnished withdrawal reports for this 30 July mission. 

The two August raids on German fighter production involved very-long-range raids, one by the B-24's on loan to the Mediterranean Theater, which hit the Fieseler factory at the 16th, and the other against the Messerschmitt Factory at Regensburg on the 17th. The Messerschmitt Factory at Regensburg was a very important unit, for it supplied a large portion of all Me-109 production. This Regensburg operation was part of the first anniversary division of the Eighth Air Force (the other part went to Schweinfurt), and was the first occasion of shuttle bombing from the United States. After the attacks, which were reported as excellent, the heavy bombers went on to bases in North Africa. This desert penetration cost 21 heavy bombers to very vicious opposition, which crews reported as continuous from Algiers to the Alps. 

These two hit attacks on aircraft factories were given credit for cutting down by 33% single-engine fighter production and slightly more than 80% in July to about 60% for September. Without these raids it was estimated that single-engine production would have been approximately 200 aircraft in September. They constituted a severe blow against the highest priority item in the GAF production program and were bitterly resisted. 

The German Air Force utilized a number of facilities in occupied countries for repair of used aircraft and for storage of reserves.
There were about eight such major facilities in France and Belgium and a very large number of secondary importance located in these two countries and in Holland. Several of these, as the following table indicates, were second-phase targets for the Eighth Air Force in its war on the GAF:

<table>
<thead>
<tr>
<th>Date</th>
<th>Place</th>
<th>Target</th>
<th>A/C Attacking</th>
<th>Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 July</td>
<td>Le Mans—Gnome and Rhone Aero Engine Works</td>
<td>103 B-17</td>
<td></td>
<td>254.5</td>
</tr>
<tr>
<td>4 July</td>
<td>Nantes—SNCASE de L'Ouest</td>
<td>58 B-17</td>
<td></td>
<td>145.00</td>
</tr>
<tr>
<td>16 July</td>
<td>Paris—Le Bourget</td>
<td>52 B-17</td>
<td></td>
<td>122.85</td>
</tr>
<tr>
<td>16 July</td>
<td>Villacoublay—SNCASE du Nord</td>
<td>96 B-17</td>
<td></td>
<td>202.5</td>
</tr>
<tr>
<td>16 Aug.</td>
<td>Paris—Le Bourget</td>
<td>168 B-17</td>
<td></td>
<td>397.35</td>
</tr>
<tr>
<td>21 Aug.</td>
<td>Villacoublay—SNCASE du Nord</td>
<td>86 B-17</td>
<td></td>
<td>275.20</td>
</tr>
<tr>
<td>21 Aug.</td>
<td>Bordeaux—SNCASE du Sud Est</td>
<td>57 B-17</td>
<td></td>
<td>141.75</td>
</tr>
<tr>
<td>3 Sep.</td>
<td>Romilly-sur-Seine</td>
<td>100 B-17</td>
<td></td>
<td>294.25</td>
</tr>
<tr>
<td>3 Sep.</td>
<td>Meulan—Les-Yvres</td>
<td>38 B-17</td>
<td></td>
<td>112.5</td>
</tr>
<tr>
<td>3 Sep.</td>
<td>Paris—Société Caudron Renault</td>
<td>20 B-17</td>
<td></td>
<td>60.0</td>
</tr>
<tr>
<td>7 Sep.</td>
<td>Brussels—Evere Repair Depot</td>
<td>104 B-17</td>
<td></td>
<td>310.75</td>
</tr>
<tr>
<td>9 Sep.</td>
<td>Paris—Société Caudron Renault</td>
<td>20 B-17</td>
<td></td>
<td>58.0</td>
</tr>
<tr>
<td>15 Sep.</td>
<td>Paris—Société Caudron Renault</td>
<td>40 B-17</td>
<td></td>
<td>118.75</td>
</tr>
<tr>
<td>15 Sep.</td>
<td>Paris—Hispano-Suiza Ecos Colombes</td>
<td>78 B-17</td>
<td></td>
<td>229.0</td>
</tr>
<tr>
<td>15 Sep.</td>
<td>Romilly-sur-Seine</td>
<td>87 B-17</td>
<td></td>
<td>235.5</td>
</tr>
</tbody>
</table>

Of the facilities listed as targets in the above table, Romilly-sur-Seine, Villacoublay, Le Bourget, and Brussels—Evere were rated as major repair depots. Of the attacks, two are particularly worthy of attention: the 16 August raid on Le Bourget in Paris because of its size and because it was escorted all the way to target by P-47’s using drop tanks; and the 24 August attack on Bordeaux because it was a shuttle mission performed by bombers on the way from North Africa to English bases.  

It is not possible to state quantitatively the effect on the GAF of the bombing of storage and repair facilities. Such raids destroyed stored aircraft, lengthened the repair time, and lessened enemy air force mobility. Repair facilities constituted reasonably profitable targets at relatively short distances from United Kingdom bases.
In the attack on the German Air Force the VIII Senior Command and VIII Air Support Command (cindus leaders) made a very heavy raid on the airfields in occupied countries. It has already been noticed that approximately 50% of the tonnage dropped by the heavy bombers was directed at airfields. A much greater fraction of the medium effort was delivered to like targets. The reason for the heavy attention to airfields was that some targets were frequently taken when weather did not permit the heavyRAF target to go to Germany, the main centers within reach of the medium bombers, and aircrew attacks increased the attrition of the German fighter force and reduced its efficiency.

**Submarine, harbor, and port facilities.** There were two attacks on submarine bases and four on coal yards, one during July.23

<table>
<thead>
<tr>
<th>Date</th>
<th>Target</th>
<th>A/C Attacking</th>
<th>Tons of Bombs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Jul</td>
<td>In Flacelle</td>
<td>71 2-17</td>
<td>167.5</td>
</tr>
<tr>
<td>10 Jul</td>
<td>Stralsund</td>
<td>61 2-17</td>
<td>61.0</td>
</tr>
<tr>
<td>17 Jul</td>
<td>Kiel</td>
<td>60 2-17</td>
<td>163.0</td>
</tr>
<tr>
<td>23 Jul</td>
<td>Kiel</td>
<td>62 2-17</td>
<td>136.2</td>
</tr>
<tr>
<td>28 Jul</td>
<td>Kiel</td>
<td>91 2-17</td>
<td>207.9</td>
</tr>
</tbody>
</table>

In Flacelle, on this case on the 1st of July, was one of three targets struck by VIII Bomber Command on the 6th of July. The other submarine cases are the other submarine cases which are the other submarine cases which involve a 1,500-mile round trip to Flacelle, as are. The attack by force on the other targets, though small, achieved good results.23

An attack on the successive days in close coordination with the RAf, which emerged in a raid toDAF, destroy Germany's greatest threat in the period between 24 July and 8 August. The provision of targets for the Eighth racks, on which it were the days and Ross Building.
yards on 20 July and the Kondälværke on the 23rd, but the bombs apparently caused a number of other plants as well.91

The building yards at Kiel were also subjected to two attacks during the last week in July. On the 26th the Deutsche Werke and Kriegsmarine yards were the targets, and on the 29th a somewhat larger force hit the Kondälværke and the Deutsche Werke's second yard. The B-17's at Kiel dropped 800-pounders as well as bombs, for some 787,000 U. S. 500-pounders were released over the city.92

The great improvement in the submarine situation after July created the British Admiralty to move that the Eighth should shift its attention to more decisive targets. To raids against submarine installations were made during August, but B-17 raids did attack Le Havre shipping yards with a small force (10 bombs) on the 4th of the month.93

There were six September raids on submarine bases and port facilities:94

<table>
<thead>
<tr>
<th>Date</th>
<th>Place</th>
<th>S/J Attacking</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 Sep.</td>
<td>Le Havre Shipyard</td>
<td>15 2-25</td>
<td>57</td>
</tr>
<tr>
<td>16 Sep.</td>
<td>Dunkirk Fort Area</td>
<td>73 2-17</td>
<td>282.5</td>
</tr>
<tr>
<td>18 Sep.</td>
<td>Le Havre</td>
<td>73 3-17</td>
<td>178.0</td>
</tr>
<tr>
<td>23 Sep.</td>
<td>Dunkirk Fort Area</td>
<td>43 2-17</td>
<td>132.5</td>
</tr>
<tr>
<td>25 Sep.</td>
<td>Dunkirk Fort Area</td>
<td>83 2-17</td>
<td>178.0</td>
</tr>
<tr>
<td>27 Sep.</td>
<td>Le Havre</td>
<td>178 2-17</td>
<td>132.5</td>
</tr>
</tbody>
</table>

Fort installations and sheds at Dunkirk were considerably damaged by the three raids during the last half of September. Le Havre, French west-coast town, located close to the mouth of the Loire, was the principal target for both the morning and afternoon missions that were run on 73 September.95
The Iceni mission on 8th September was an outstanding event in the history of daylight bombing, for it marked the first use of B-37s blind-landing techniques by daylight in the European theater. Three B-37s, airlifted by F-100s to the port city which was covered by 2/10 cloud and a smoke screen, took off to the northwest of the city, starting at 1,500 feet above the airport and climbing to 15,000 feet 10 minutes later. The first air task force consisted of three aircraft, each led by a B-37. The second air task force, also composed of three aircraft, was led by one B-37. The first air task force crossed the city, the second crossed to the west, and the third crossed to the north and dropped its bombs visually, while the third could not see the factories and bombed targets of opportunity. The second air task force, also composed of three aircraft, was led by one B-37. The first air task force crossed the city, the second crossed to the west, and the third crossed to the north and dropped its bombs visually, while the third could not see the factories and bombed targets of opportunity.

The Iceni mission is noteworthy for another reason: it was the first attack in Germany for which B-37s provided cover for all the way. Iceni was chosen for the first test of the blind-landing techniques by daylight because its position on the coast, as it was selected for location of H23, because the port had assumed increased importance for the day after the complete destruction of K-Burg 2, the F2, because Iceni was an important railroad assembly point, and because when provided a true precision target here ten one-half miles in diameter. The results of this first blind-landing raid were doubtful, for subsequent by photographic

* For a discussion of the development of this technique, see Chapter iv below.
recommendations was not obtained until after a second attack was made on 3 October.\(^{39}\)

The reaction of Axis Headquarters to the 

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General Arnold declared this use of the Condor force against a distant, cloud-covered objective and the long-range escort provided by the P-47s constituted another stride toward winning the air war. He questioned, however, whether the Eighth was using fast fighters on a sufficiently large scale, and emphasized a desire to see a whole series of raids on a scale even larger than the one accompanying mission of Ira that would go thoroughly smash German fighter factories that the Army could find it easier to build more than to repair the 

In conclusion, he urged: "Let's get on with the war in air and sea," he urged.\(^{35}\)

There is a right point in attempting to assess the effects of the bombardment of submarine yards and bases during the second wave of the bomber offensive. Other methods of dealing with the submarine craft had been far more effective. The Atlantic Fleet of U-boats reached a very low point in October 1943, not because of strategic bombardment but because of losses inflicted at sea and the withdrawal of submarines from

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engine flakier industry. At Schneinfurt there were three plants responsible for half of all letter mail production of all the roller bearings and for several thousand tons of all these bearings used by the German military in combat. Thetml order of the attacks on the three plants were:

<table>
<thead>
<tr>
<th>Plant</th>
<th>A/C Attacking</th>
<th>Bombs Dropped</th>
<th>A/C Missing in Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 1</td>
<td>63</td>
<td>113</td>
<td>3</td>
</tr>
<tr>
<td>No. 2</td>
<td>73</td>
<td>183</td>
<td>6</td>
</tr>
<tr>
<td>Schneinfurt total</td>
<td>163</td>
<td>337.2</td>
<td>33</td>
</tr>
</tbody>
</table>

The German civilian narrative of Operation rendered the Schneinfurt bombing results as "very good," but the intelligence assessment estimated that the raid cost the Schneinfurt plant 1-1/3 to about 11-1/3 of its output and the U.S. (Versailles to Saverne or Strasbourg) plants 4 1/2 days' output.

The German reaction to the mission was strong and virulent. Only 13 enemy aircraft were encountered by the bombers. Escort was provided by 1-1/3 or 1-2/3 of the 8th, and the bombers were shifted up to the air bases on return by hundreds of which subsequently were relieved at 3-1/3 squadrons. Air flak was severe and constant to both sides. U.S. escorts claimed 1-1/3 destroyed, 10 probable, and 47 damaged. The escorting B-17s claimed 25-2/3, and the 4th claimed 40. U.S. bomber losses were very evenly distributed. The smallest force (81) attacking the U.S. No. 2 plant lost 4 of the 11 lost bombing. The 81st Group, which lost 8 planes over the target, lost all of these in addition to 1 lost before reaching the target, and the 31st Group lost 11 of 15
Another raid on naval bases was made on 15 September when the G-5
Shell Boring Bombs at Marsa was hit at the same time as the Elefant-
Shell repair plant. As noted above, 78 B-17's dropped 223 tons of bombs,
but it is not possible to tell what fraction was devoted to the bearing
works. 103

III. The 2-32's on loan from the 11th participated with other
bombers in the Mediterranean theater in the 1 August raid on the oil re-
fineries located in the Siculia region of France. It was estimated that
this raid damaged the French refineries to such an extent that the
total area of refineries was reduced by 5,828,860 tons to 5,310,000
tons annually. This destruction of 5,828,860 tons of refining capacity
reduced the extent in that region and left capacity immediately equal
to crude production. This operation met the condition laid down in the
H.13 plan for successful attack on other Axis oil production. 104

As 11th dispatched a heavy mission to attack and disable oil pro-
cuction at tolleschmilen in the Ehrn on 12 August, but heavy cloud and a
very effective smoke screen prevented all but two raids from bombing the
objective. The operational narrative reported that results could not be
determined, but correctly they were not met. 105

Miscellaneous Post-Libya Operations. Six B-40's attacks were made during
the second wave on facilities considered in the other G-5 target area.
On 26 July two waves of the Continental Airlines (Hunover), producer

SECURITY INFORMATION
of a large fraction of German aircraft tires, were attacked by 91 B-17's carrying 216 tons of bombs. The tire plant and surrounding installations were badly damaged. It was estimated that this raid cost the Germans 25,000 aircraft tires and 30,000 for other vehicles.\textsuperscript{106} The French Motor Vehicle Armament Works at Paris (Billancourt) was hit by a small force (21 B-17's) on 16 September with excellent results reported.\textsuperscript{107}

One of the most remarkable of the Eighth's second-phase missions was the 21 July raid on a newly constructed magnesium, aluminum, and nitrate works at Kiroya, 70 miles southwest of Oslo, Norway. The "Bi-Monthly Report of Bombing Results" reported tremendous destruction "among installations vital in the operations of the works," but more remarkable was the execution of the large-scale mission in very difficult weather conditions. Some 324 heavy bombers made practically blind take-offs, climbed through solid overcast, and assembled over splasher beacons. All but 15 of those taking off made the rendezvous on time and, with superb navigation, arrived over their assigned distant targets. In addition to the 107 B-17's which dropped 414.3 tons of bombs at Kiroya, 41 bombed the submarine base at Trondheim, and a third force, finding its target cloud-covered, returned to base with its bombs. Many of these planes made a round trip of 1,500 miles, yet only one failed to return. The Norwegian mission was executed because of the importance of the targets and because weather over Europe did not permit a mission to Germany that day, but primarily to encourage a dispersion of German fighter defenses.\textsuperscript{108}

Marschallin yards were targets for a dozen medium missions and one heavy attack during July, August, and September. The initial B-24 operation at medium altitude was against the ... Marschallin yards on
16 July, and this target was attacked a second time by the 30's on 16
August. Other railroad targets for the medium, hit a part of the
SANNEX encorcel, included Lillo (2 raids), Courtrai (2), St. Pol (2),
Haut, Rouen, Amiens, and Soissons. Fifty-one 2-17's hit the Offenburg
yards on 6 September. Two or three other times during the period very
small numbers of heavies dropped bombs on railroad targets when primary
objectives could not be located. 109

Other miscellaneous targets for 2-30's included cooking plants, an
atomic plant, power stations, and ammunition dumps. Heavy bombers made
many raids on the Ruhr industrial area and on other German cities as tar-
ggets of opportunity when first-choice objectives could not be located.
Enemy convoys were attacked at least once in July and three times in
October. 110

**Operation SHARK**

**Operation SHARK** was the code name for a combined operation designed to de-
ceive the enemy and to give Allied forces experience for later operations.

Troops and vehicles were actually loaded into assault craft and naval
vessels were maneuvered to simulate a landing on the French coast in the
Calais region. The air aims of the operation were to compel the CAF to
fight battles of attrition at times and places advantageous to Allied
craft forces with the objects of destroying the maximum number of enemy
aircraft both in the air and on the ground and of building up sufficient
air superiority over the Luftwaffe to facilitate subsequent operations
against the Continent. 111
The air targets for STANZ were in two main classes: unarranged targets such as airfields, marshalling yards, industrial targets, ammunition dumps, oil stores, beach defences, gun emplacements, and roads; and second, targets of opportunity such as troop concentrations, mobile headquarters, shipping, and emergency airfields.

The operation was executed in three phases: a preliminary phase from 16 to 24 August, a preparatory phase from 25 August to 8 September, and a culmination phase on 8 and 9 September. D-day was originally scheduled for 8 September, but had to be postponed to the 9th because of weather. During the preliminary phase air operations were directed almost entirely against enemy airfields. During the first part of the preparatory phase (to 3 September) intensive attacks on airfields were continued; and from 4 to 8 September the attack was shifted to marshalling yards. In the final days there were heavy attacks on the beach defences, large gun emplacements, and airfields.112

The attacks on the beach defenses and special construction sites in the coastal region during this exercise were forerunners of many such raids which aircraft based in the United Kingdom were to make in an attempt to neutralize enemy preparations for launching new weapons against the British Isles. The principal STANZ missions against beach defenses and construction sites were:113

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Missiles</th>
<th>Fuel (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>27 Aug.</td>
<td>Watton</td>
<td>186 2-17</td>
<td>363</td>
</tr>
<tr>
<td>20 Aug.</td>
<td>Watton</td>
<td>34 2-20</td>
<td>40</td>
</tr>
<tr>
<td>7 Sep.</td>
<td>Watton</td>
<td>38 2-17</td>
<td>116</td>
</tr>
<tr>
<td>8 Sep.</td>
<td>Boulogne</td>
<td>69 2-20</td>
<td>100</td>
</tr>
<tr>
<td>9 Sep.</td>
<td>Boulogne</td>
<td>203 2-20</td>
<td>336</td>
</tr>
</tbody>
</table>
Ninth Air Force participation in SHARK involved the Bomber Command, Fighter Command, and Air Support Command.\(^{114}\)

<table>
<thead>
<tr>
<th>Sorties</th>
<th>Preliminary</th>
<th>Preparatory</th>
<th>Final</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIII Air Support Command—Bombers</td>
<td>554</td>
<td>1,196</td>
<td>231</td>
<td>2,031</td>
</tr>
<tr>
<td>Fighters</td>
<td>—</td>
<td>16</td>
<td>21</td>
<td>37</td>
</tr>
<tr>
<td>VIII Fighter Command</td>
<td>513</td>
<td>975</td>
<td>303</td>
<td>1,791</td>
</tr>
<tr>
<td>VIII Bomber Command</td>
<td>505</td>
<td>1,001</td>
<td>335</td>
<td>1,841</td>
</tr>
</tbody>
</table>

All participating forces claimed 261 enemy aircraft destroyed, 69 probably destroyed, and 163 damaged.

The anticipated large-scale air battle with the GAF did not materialize. Operations were greatly impeded by weather, but the Germans did not react as if they thought a Channel landing was imminent. Some air reinforcements were sent into the area, but the enemy air activity was quite reserved. Aerial reconnaissance was neglected. The chief concern of the German fighters seemed to be the prevention of deep penetrations by the heavy bombers. It was quite evident that the enemy was at no time deceived into thinking that a serious invasion landing was intended.\(^{115}\)

Eight Operations of the Ninth Air Force

Six times during September small numbers of specially equipped heavy bombers belonging to the 425th Squadron of the 305th Bombardment Group (H) participated in night operations with RAF aircraft. The first of these was on the night of 8 September, just prior to the day in the SHARK exercise. The targets for this first night mission were coastal defense in the Seulzone area. Targets for other missions were the Montlucon
German's greatest critical city was a commercial center and was also quite important in the ship and submarine building industries.

<table>
<thead>
<tr>
<th>Week</th>
<th>L/C Attacking</th>
<th>Long. Bom</th>
<th>L/C Missing</th>
</tr>
</thead>
<tbody>
<tr>
<td>24-30 July</td>
<td>700</td>
<td>2,007</td>
<td>12</td>
</tr>
<tr>
<td>31-06 July</td>
<td>703</td>
<td>2,617</td>
<td>17</td>
</tr>
<tr>
<td>07-13 July</td>
<td>703</td>
<td>2,612</td>
<td>23</td>
</tr>
<tr>
<td>14-20 July</td>
<td>623</td>
<td>1,686</td>
<td>52</td>
</tr>
<tr>
<td>21-27 July</td>
<td>3,653</td>
<td>6,623</td>
<td>57</td>
</tr>
</tbody>
</table>
Those aerial reconnaissances showed that 79, (6.2%) out of 1,290 acres) of the built-up area of the city was heavily damaged by the great weight of bombs that it received. 119

The RAF attack on Saar in mining and industry began during the second quarter of 1943 and continued throughout July, August, and September. The aims were to complete the destruction of industry in this region, to prevent the removal of defences to other threatened areas, and to discourage attempts at reconstruction. Cologne was hit twice (8-9 and 22-9 July), and the Krupp works at Essen were badly damaged by an outstanding attack on the night of 22-23 July.

Amphen, on the night of 12 July, and Dusseldorf, on 29-30 July, were thought to be virtually wiped out by similar attacks. Though less complete destruction was wrought at the textile center of Hanover (Head- roch on 12-21 July), and less satisfactory on the way to Koblenz (8-10 July), Leverkusen (8-22 August), and Zechen (22-29 September), 120

Three raids on Berlin in August and September were quite as bad (6.9 of attacking aircraft lost) but caused extensive civil damage and were thought to be even more damaging to Berlin industry. 121

<table>
<thead>
<tr>
<th>Date</th>
<th>1/3 Attacking</th>
<th>Fees</th>
<th>1/3 Waving</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-21 June</td>
<td>630</td>
<td>1,775.1</td>
<td>47</td>
</tr>
<tr>
<td>30 June</td>
<td>617</td>
<td>1,775.1</td>
<td>47</td>
</tr>
<tr>
<td>2-4 Sept.</td>
<td></td>
<td>1,629</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>428</td>
<td>1,629</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>7,156.7%</td>
<td>Keys</td>
<td>103</td>
</tr>
</tbody>
</table>

Hanover, in southwestern Germany, was attacked once in August (9-10) and twice in September. The raid of 28 September was one of the most successful. Four lights...
Air Force B-17's participated in the mission of 21-23, September to this 
important transportation center. 123

Jamburg was attacked twice in August (10-11 and 27-28) by large 
forces which did some damage to housing and industry. 111 which railroad 
communications received considerable severe damage by the night of 
21-27, September.

Likely heavy destruction of manufacturing buildings and living 
quarters was achieved in the 19-23 August mission to the unoccupied 
station at Koenmunde northwest of Stettin on the Baltic coast. The 
attack was made in full moon conditions, and the RAF inflicted heavy 
losses (40 aircraft of 171 attacking) on night fighters brought up from 
Berlin and the lake to intercept the bombers on the return trip. 123

The relatively ineffective missions were miners in September (27-28 
and 31-15) against显示器 in north central Germany. U. S. B-17's 
participated in each of those missions.

Outside Germany, the RAF attacked targets at Turin, Lejzorn, Milan, 
and Genoa in Italy during July and August. Great effort was made to 
the transportation system in Milan and to one of the Fiat works in Turin.

Three all-steel raids were made on French targets during July and 
August and three of lesser proportions in September. U. S. aircraft 
participated in a gallant in each of the European missions. The first 
of these (7-9) was against coastal defenses in the Biscay area in 
connection with the second (10-13) severely damaged the Dunkirk 
fire station at Nantes in central France, and the other (16-19) was 
designed to block the northern end of the Mont Cenis tunnel at Vena and 
thus hinder the flow of supplies to German armies in Italy. 123
Chapter IV
THE THIRD PHASE OF THE COMBINED BOMBER OFFENSIVE, OCTOBER-DECEMBER 1943

Organizational Developments

The third phase of the combined bomber offensive was coincident with the fourth quarter of 1943. This three-month period saw some very important decisions affecting not only strategic bombing but the whole course of the war in the European theater. The build-up plan for the United States air forces in England was completed and approved by the War Department, and the Ninth Air Force assumed its separate role in the United Kingdom. A new strategic air force was set up in the Mediterranean theater, a directive was issued for the Allied Expeditionary Air Forces' support of the planned Continental invasion, and a whole new slate of commanders was selected for many important roles in the European air drama.

The preceding chapter gave some attention to the difficulties experienced in working out the build-up and organizational problems in the most economical manner possible. The inability of the Army Air Forces to train on time the variety of special units required by the Eighth Air Force had been the cause of the basic decision to send a considerable portion of the air force troop strength to the theater as fillers rather than as units. It has been seen that this important decision necessitated the sending of a new commission from Washington to the theater to rework the organizational setup, the flow schedule for units and fillers, and
the troop basis. This Baylor Commission finished its work by 17 October and succeeded in effecting a considerable saving in manpower. The revised build-up plan was to take care of both the strategic and tactical air forces in the United Kingdom, the latter having by that time assumed an existence separate and distinct from the Eighth. The War Department formally approved the revised plan on 8 November 1943, and the Bradley Plan tag which had identified the air force build-up plan for six months was formally dropped.\textsuperscript{1}

During the second and third quarters of 1943 the Eighth Air Force had undertaken to perform two principal tasks. One was to bomb GBO targets and the other to build up a tactical air force. The latter task was at least partially completed on 15 October 1943 when the Ninth Air Force was established in the United Kingdom. The Ninth had, of course, quite a long record before 15 October, for it had been activated in the Middle East and had fought Rommel across the African desert. By the time the Germans had been expelled from North Africa and Sicily most of the Ninth's men and equipment had been absorbed by the Northwest African Air Forces, and in September 1943 Commanding General Louis H. Brereton took a skeleton organization to England to be reconstructed and to fight the Axis in a new theater.\textsuperscript{2}

What happened in England on 15 October was that the Ninth Air Force assumed command over most of what had been the VIII Air Support Command and the Tactical Air Service Area Command. The organizational work in the Ninth progressed rapidly in October and November, and medium bombers and fighters of that air force were active in support of the GBO and
in preparation for combined operations to come. 3

Thus the Ninth Air Force became the tactical force that had been contemplated in the build-up plans for U. S. air power in the British Isles. Now that there were two air forces in the United Kingdom, a higher headquarters was necessary to exercise supervision and to provide coordination. This need was met by the creation of the United States Army Air Forces in the United Kingdom (USAAFUK), which was established the same day (15 October) as the Ninth. This superior headquarters was commanded by Lt. Gen. Ira C. Eaker, the commander of the Eighth; its general staff was identical with that of the Eighth, and its special staff practically the same as the special staff of VIII Air Force Service Command. 4

The medium bombers that had belonged to VIII Air Support Command came under the jurisdiction of IX Bomber Command, and Generals Eaker and Broderick worked out an allocation of fighter strength between the strategic and tactical air forces about the middle of November. According to this agreement, the Eighth kept 10 groups of P-47's and five groups of P-38's. All other groups and types, including the P-51's, went to the Ninth but with the understanding that Ninth's fighters were to be used to support the heavy bombers until the invasion of the Continent was imminent. 5 Operational control of the Ninth remained with USAAFUK until 15 December 1943, when it passed to the Allied Expeditionary Air Forces. 6

A week after the Ninth was set up, the Combined Chiefs of Staff approved a directive for the establishment of a second United States
strategic air force to take part in the combined bomber offensive against the Western Axis. On 23 October General Eisenhower, in the Mediterranean theater, was informed that the Fifteenth Air Force was to be established under his command effective 1 November 1943. This force was initially to consist of the six heavy bombardment groups and two long-range fighter groups that were assigned to the Twelfth Air Force at the time. The scheduled growth of the Fifteenth in combat groups was forecast as follows:

<table>
<thead>
<tr>
<th></th>
<th>Heavy Bomb Groups</th>
<th>Long-Range Ftr. Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>By 31 December 1943</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>By 31 March 1944</td>
<td>21</td>
<td>7</td>
</tr>
</tbody>
</table>

General Eisenhower was directed to use the Fifteenth primarily against targets of the GBO, and to insure the close coordination between the Eighth Air Force and the Fifteenth against such targets.\(^7\)

For the Eighth this development meant another diversion of its strength to the Mediterranean. The same message that announced the directive to General Eisenhower forecast the augmentation of Eighth Air Force heavy groups to the end of June 1944 as follows:\(^8\)

<table>
<thead>
<tr>
<th></th>
<th>Heavy Bomb Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>By 31 December 1943</td>
<td>28</td>
</tr>
<tr>
<td>By 31 March 1944</td>
<td>34</td>
</tr>
<tr>
<td>By 30 June 1944</td>
<td>41</td>
</tr>
</tbody>
</table>

This ultimate strength of 41 heavy bombardment groups was 13 or 14 short of the goal established before the constitution of the Fifteenth. Preparations had been made by U. S. and British leaders in the United Kingdom to accommodate 54 or 55 heavy groups by the summer of 1944. The
reduction in planned strength consequently necessitated some revision and curtailment of the air drone construction program.\footnote{9}

To the commander of the Eighth the new Mediterranean diversion was not pleasing. Such diversions had been resisted by him throughout his connection with the Eighth, and this latest was no exception. General Eaker felt that the bomber offensive would be weakened and that Continental invasion would be jeopardized by the new deployment of heavy bomb groups. He made strong efforts to show General Arnold that the move was unwise, and to convince him that heavy bombers could operate at a satisfactory rate during the winter months from bases in the United Kingdom.\footnote{10}

Air Chief Marshal Portal criticised the directive creating the Fifteenth Air Force on the ground that it meant a reduction of the total number of heavy groups to be used against Germany, that bases available in Italy during the winter of 1943-44 could accommodate very little more than the six heavy groups that were already in the Mediterranean, that the Eighth would lose during the last six months of 1943 six groups for which preparations had already been made, and that weather in Italy gave no promise of great advantage over that in the British Isles.\footnote{11} General Arnold reported to Eisenhower that the British Chiefs of Staff challenged the wisdom of sending additional heavy groups to Italy and that they contended the groups could not be based, maintained, and operated there as efficiently as in the United Kingdom.\footnote{12}

The decision to create the second U. S. strategic air force in Europe seems to have been made by the U. S. Chiefs of Staff, and in
this decision General Arnold's influence was evidently very great. He informed Eisenhower that the reasons for the move were two. The bases in Italy provided a better point of take-off for (1) reduction of German ability to continue to wage war and (2) forcing the dispersion of German fighter and other defense agencies.13

To comply with the Combined Chiefs of Staff directive for coordinating the two strategic forces, a conference was held on 8 and 9 November at Gibraltar with Marshal Tedder and Generals Spaatz, Eaker, and Doolittle (the last named of whom had been given command of the Fifteenth at its activation on 1 November) in attendance. The conference arranged for: (1) allocation of targets to the two forces, (2) procedure for combined operations, and (3) liaison officers at each headquarters to insure rapid interchange of operational experience and intelligence data. Radio communications between the two headquarters were pronounced satisfactory. It was stated that full exploitation of the bomber effort was dependent upon an adequate supply of blind-bombing equipment for both forces. Organizational experience, operational technique, and technical data were discussed and agreement was reached for prompt and continuous interchange of ideas and experience.14

A further step in the coordination of the efforts of the U. S. forces engaged in the strategic bombardment of Europe was the creation of the United States Strategic Air Forces (USSTAF) in January 1944 with Spaatz commanding. This over-all air command was to function under the Supreme Allied Commander in Europe and was to be concerned exclusively with the combined bomber offensive. Its history falls, however, outside the
period covered by this study.15

Tactical air coordination for operation OVERLORD (Continental invasion) was to be secured through still another headquarters, the Allied Expeditionary Air Forces (AEAF). The directive for this organization was approved on 5 November by the Combined Chiefs of Staff and announced to the Commanding General of the European Theater on the 10th. The directive, which was to be issued through the Chief of Staff, Supreme Allied Command, provided: (1) under the Supreme Allied Commander, a British air officer with the title Air Commander, AEAF, was designated to exercise command; (2) the Allied Expeditionary Air Forces would comprise the RAF Tactical Air Force, the Ninth Air Force, and such formations as were allotted to the air defense of Great Britain; and (3) the U. S. Ninth Air Force was to pass to the operational control of the Air Commander, AEAF on 16 December 1943.16

All these organizational changes necessarily involved a shifting of air officers in preparation for the year 1944. On 18 December 1943, General Arnold sent to Air Chief Marshal Portal a cable which gave the American slate of air officers for top commands in Europe:

Allied Air Forces in Mediterranean theater  Lt. Gen. Ira C. Eaker
U. S. Strategic Air Forces  Lt. Gen. Carl A. Spaatz
Ninth Air Force  Maj. Gen. L. H. Brereton

It was General Arnold's opinion that this American setup was the most satisfactory that could be secured.17

After this brief review of changes in organization and command, it
is appropriate to examine certain characteristics of third-phase strategic operations.

Magnitude and Rate of Third-Phase Operations from the United Kingdom

In the account of second-phase operations given above in Chapter III it was noted that VIII Bomber Command ended the month of September with 20-3/4 heavy bombardment groups operational. That number was not changed during nearly two-thirds of the third phase, for throughout October and practically all of November the operational heavy group status remained at 20-3/4. On the 25th of the latter month the 401st Group became operational with B-17’s. On the 14th of December three B-24 groups (445th, 446th, and 449th) were declared operational, and on the 24th another B-17 group (447th) reached operational status. VIII Bomber Command therefore ended 1943 with 25-3/4 heavy groups operational—18-3/4 equipped with Fortresses and 7 with Liberators.

The Combined Bomber Offensive Plan had contemplated a heavy bomber strength of 1,746 in the theater by 31 December 1943, assuming that this number of aircraft would provide a striking force of 655 at the end of the period and that there would be a third-phase average striking force of 550. The last weekly status report for Eighth Air Force in December (as of the 28th) indicated that there were 1,636 heavy bombers assigned (1,309 B-17’s and 327 B-24’s), and that 908 were operational with tactical commands. At the same time there were 1,937 heavy bomber crews assigned to the Eighth. Therefore, the Eighth had attained about 93% of the assigned heavy bomber strength called for by the CBO Plan.
Even the figures for the average number of assigned heavy bombers and crews are quite formidable for the entire fourth quarter of 1943:

<table>
<thead>
<tr>
<th>Daily Average by Month</th>
<th>Heavy Bombers Assigned to Air Force</th>
<th>Crews Assigned</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 1943</td>
<td>1,000</td>
<td>820</td>
</tr>
<tr>
<td>November</td>
<td>1,254</td>
<td>1,085</td>
</tr>
<tr>
<td>December</td>
<td>1,503</td>
<td>1,556</td>
</tr>
</tbody>
</table>

The position of the Eighth Air Force in regard to effective strength for combat was actually better than the planning of April and May had anticipated. It was in December that for the first time the number of available heavy bomber crews was greater than the number of fully operational aircraft.

<table>
<thead>
<tr>
<th>Daily Average by Month</th>
<th>Heavy Bombers on hand, Opnl. Tac. Units</th>
<th>Full Opnl. in Opnl. Tac. Units</th>
<th>Heavy Bomber Crews Avail.</th>
<th>Str. for Combat</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 1943</td>
<td>763</td>
<td>535</td>
<td>479</td>
<td>417</td>
</tr>
<tr>
<td>November</td>
<td>902</td>
<td>705</td>
<td>636</td>
<td>578</td>
</tr>
<tr>
<td>December</td>
<td>1,057</td>
<td>752</td>
<td>949</td>
<td>723</td>
</tr>
</tbody>
</table>

VIII Bomber Command was able to perform 7 daylight missions in October, 11 in November, and 10 in December, a total of 28 during the last quarter of 1943, only one less than for the third quarter. In October, the average number of heavy bombers dispatched on daylight missions was 346; the largest number sent out during this month was 399 (on the 8 October Bremen mission); and on only one daylight mission during the month (20 October) were there fewer than 300 bombers dispatched. The October average for attacking bombers, 273, was pulled down considerably by the failure of blind-bombing equipment to function on the 20 October operation against Duren. Bad weather reduced the average attacking
force on November missions to 225, and a number of small operations
pulled down the average dispatched per daylight operation to 349, about
the same as October. There were, however, three occasions in November
when VIII Bomber Command was able to send out more than 500 bombers
and once (3 November, Wilhelmshaven) 539 actually bombed on a single
day.25 In December the 10 daylight missions dispatched 5,898 sorties
for an average of practically 590. The bombing average for the month
(469) was spoiled on 5 December when only three out of 546 taking off
were able to bomb targets in occupied France because of the weather.
Three times in December the Eighth was able to dispatch more than 700
heavy bombers, and on six other days more than 500. The record mission
for the quarter and for the year was on 24 December, when 722 B-17’s
and B-24’s were dispatched and 570 actually bombed special construction
sites for launching rocket weapons (CROSSBOY or COBALT targets) in the
Calais region. This Christmas Eve mission became even more impressive
because it was conducted without the loss of a single heavy bomber.26

During the fourth quarter there were 34 night operations by the
heavy bombers of the Eighth. These were small missions involving from
one to seven aircraft each and were run chiefly for the purpose of dropping
leaflets. Six of the night operations took place in October, 14 in
November, and a like number in December.27

The rate of VIII Bomber Command’s operations was never satisfactory
to AAF Headquarters. Just before the start of the third phase, General
Arnold sent a cable to General Faker in which he said that since German
air power appeared to be at a critical stage, it was necessary to send
the maximum number of planes against the enemy. "We are under constant pressure," he added, "to explain why we do not use massive flights of aircraft against a target now that we have planes and pilots to put over 600 planes in the air."\textsuperscript{28} Some days later, near the middle of October, in a letter to Sir Charles Portal he said, "... we are not employing our forces in adequate numbers against the German Air Force in being, as well as its facilities and sources. On my part, I am pressing Baker to get a much higher proportion of his force off the ground and put them where they will hurt the enemy."\textsuperscript{29}

The explanation of what AAF Headquarters considered an unsatisfactory rate of operations was to be found partly in weather conditions and partly in the fact that the bomber forces were organized by groups for operations. As was noted above, during most of the third phase there were only 30-3/4 heavy groups operational and each group had an authorized establishment of but 36 aircraft (not counting reserve).\textsuperscript{30} Nevertheless, a comparison of effective bomber strength and average number of aircraft dispatched on missions makes it appear that some of the criticism of the operational rate was justified.

<table>
<thead>
<tr>
<th></th>
<th>Avg. Effective Heavy Bomber Strength</th>
<th>Avg. No. Heavy Bombers Disp'd. on Daylight Missions</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 1943</td>
<td>417</td>
<td>345</td>
</tr>
<tr>
<td>November</td>
<td>578</td>
<td>349</td>
</tr>
<tr>
<td>December</td>
<td>723</td>
<td>590</td>
</tr>
</tbody>
</table>

Despite a somewhat unsatisfactory scale of operations, the third phase of the bomber offensive saw all units of the Eighth Air Force complete 37,285 sorties (about half of these were heavy bomber sorties)
and drop 23,470.4 tons of bombs on targets. This was a 41½ greater tonnage than in the previous phase and was more than 47% of the total weight dropped during the entire year 1943. 32

Defensive Side of Third-Phase Operations

Third-phase United States operations from British bases cost 431 heavy bombers missing in action, 44.4% of the total such loss in 1943. Enemy aircraft alone accounted for 115, flak and enemy aircraft together for 44, accidents for 15, and other causes for 253. October was the most costly month of the fourth quarter with 176 lost in combat; November had 93; and December, 163. The heavy battle loss in October is explained by that month's deep penetrations into Germany, including the famous Schweinfurt raid on the 14th which cost 60 planes. That loss represented nearly one-fifth of the number dispatched and more than one-fourth (26.2%) of the number actually dropping bombs on that mission. Three other October missions (on the 8th to Emsen and Weser, the 9th to Anklam and Marienburg, and the 10th the Münster and other targets) were also very costly, with 68 bombers lost in combat. These three plus the Schweinfurt operation cost more heavy bombers than were lost in any other entire month during 1943 save December.

Total heavy bomber loss during the third phase, counting both combat and nonoperational salvage as well as missing in action, was 550, or the equivalent of the initial equipment of nearly 16 heavy groups at 35 aircraft per group. When this loss is translated into an attrition rate calculated on the basis of unit equipment, the following is observed:
October had the highest heavy bomber attrition rate for the quarter and for the whole of 1943 as well, due principally to the four extremely costly missions already mentioned.  

Heavy bomber battle damage during the third phase showed 2,826 damaged in all categories, distributed by months as follows:

<table>
<thead>
<tr>
<th></th>
<th>Number Damaged</th>
<th>Credit Sorties</th>
<th>Damaged as % of Credit Sorties</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 1943</td>
<td>900</td>
<td>2,159</td>
<td>41.7%</td>
</tr>
<tr>
<td>November</td>
<td>649</td>
<td>2,916</td>
<td>22.3%</td>
</tr>
<tr>
<td>December</td>
<td>1,276</td>
<td>5,648</td>
<td>22.7%</td>
</tr>
<tr>
<td>Third Phase</td>
<td>2,826</td>
<td>10,693</td>
<td>26.4%</td>
</tr>
</tbody>
</table>

The damage rate for the last quarter was not so high as for the entire year 1943 (30.9%), but October's 41.7% was well above the annual figure and was surpassed only by January, July, and August.  

Heavy bomber claims of enemy aircraft destroyed for the last quarter were 1,151, probably destroyed 256, and damaged 562. Nearly one-third (32.6%) of all claims of aircraft destroyed by bombers during 1943 were made during the third phase; October alone accounted for 68.6% of the claims for this phase and 22.4% of those for all of 1943. The four October missions noticed in connection with high loss rates were also responsible for great numbers of the enemy destroyed:  

<table>
<thead>
<tr>
<th>Date</th>
<th>Targets</th>
<th>Claims</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 October</td>
<td>Brezn and Vagesack</td>
<td>167--23--35</td>
</tr>
<tr>
<td>9 October</td>
<td>Anklam, Marienburg, and Polish targets</td>
<td>123--29--61</td>
</tr>
<tr>
<td>Date</td>
<td>Targets</td>
<td>Claims</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------</td>
<td>--------------</td>
</tr>
<tr>
<td>10 October</td>
<td>Münster</td>
<td>163–21–51</td>
</tr>
<tr>
<td>14 October</td>
<td>Schweinfurt</td>
<td>186–37–89</td>
</tr>
<tr>
<td>Total for four October missions</td>
<td></td>
<td>658–99–296</td>
</tr>
</tbody>
</table>

The loss of 60 bombers in combat and the bomber claims of 135 enemy aircraft destroyed marked the Schweinfurt mission in October as the year's outstanding air battle. The cabled report of the battle by the Commanding General of the Eighth to General Arnold contains a graphic description of the fight and proceeds to analyze the third-phase defensive program. The report begins: "Yesterday the Hun sprung his trap. He fully revealed his final counter measures to our daylight bombing."

General Haring's account declared, however, that these countermeasures were not unexpected, for many of them had been exhibited in previous air battles as the enemy experimented and trained with them. The Schweinfurt battle was but the culmination of these previously tried tactics executed with perfect timing.

The report stated that the first enemy maneuver was to attack from the front at very close range with a screen of single-engine fighters firing 20-mm. cannon and machine guns. Following this screen were numbers of twin-engine fighters in formation, firing rockets from projectors suspended under the wings. The rocket-firing craft began their attacks at a distance and did not come in nearly so close as the single-engine fighters. The Fortress formations were subjected to great numbers of the rocket projectiles.

After the single-engine fighters had made their initial assault, they refueled and returned to the battle, this time attacking from all
directions in an attempt to confuse the gunners in the heavy bombers. Then followed the second effort of the enemy twin-engine fighters, which attacked principally from the front and rear.

The rocket-firing craft seemed to concentrate upon a single combat wing until their ammunition was exhausted. After these maneuvers, all enemy fighters centered their attention on the bombers that had been crippled by the organized attacks. All told, more than 300 enemy aircraft participated in the battle and these made about 700 separate attacks on the bombers during the principal fight.

General Eaker's report did not minimize the losses at Schweinfurt. He said that one combat wing was practically wiped out and that the total loss amounted to 60 bombers. It was his opinion that all losses had been to enemy fighters rather than to flak. He believed, also, that the effect of the rockets had been to damage rather than to immediately destroy the bombers. The rocket-damaged heavies were forced to fall out of formation where they were finished off by single-engine fighters.

After an excellent description of the air battle over Schweinfurt, the Eighth's commander continued his report with an appraisal and a program. "This does not constitute disaster," he declared; "it does indicate that the air battle has reached its climax." The measures which the air force was to take in its future campaigns were stated in clear and positive terms. They were four in number:

1. It was proposed to use more fighter cover at longer range.

General Eaker was satisfied with the Thunderbolt to the limit of its
range, which was 350 miles with a 110-gallon droppable tank. But for longer ranges, he intended to use the P-38 and the P-51 as rapidly as these types became available.

2. In the second place, it was planned to use an expanding force to saturate the enemy defenses with multiple attacks. The employment of seven or eight combat wings against widely dispersed targets might result in heavy damage to one or two formations, but the others would escape with minor damage.

3. The third measure involved an emphasis on operations directed against the facilities supporting the German Air Force. All possible airfields were to be attacked with mediums and the heavies were to strike hard at repair and storage establishments.

4. Full advantage would be taken of blind-bombing equipment which would permit strikes on cloudy days when enemy fighters would find it difficult to operate.

After stating his operational program, General Eaker in this report presented a plea for the help he needed from the United States. He asked for replacement bombers and crews to be sent as rapidly as possible. He wanted the number of replacements to be larger than his losses in order that the air force might grow in striking power. In the second place, he asked for every available fighter, and he emphasized his need for Lightnings and Mustangs. Finally, he asked for large numbers of 110- and 150-gallon expendable tanks and a monthly shipping schedule for this equipment that would keep up with his rate of operations.

The Schweinfurt battle report concluded with a note of optimism.
"We must show the enemy we can replace our losses. . . . We must continue the battle with unrelenting fury. There is no discouragement here."

The lower loss and damage rates for heavy bombers experienced during the last two months of 1943 were no doubt due considerably to the way in which the measures proposed in General Eaker's report were carried out. The number of fighters for escort was increased, the range of escort was lengthened by a better supply of droppable tanks, the greater size of the bomber forces dispersed the enemy defenses, and blind-bombing techniques were frequently employed.

There was one defensive measure not mentioned in the Schweinfurt battle report. That development, the use of radio-countermeasures, became important during the last quarter of 1943. The two most important devices in this category were generally known by the names "Window" and "Carpet," and were first employed in October after RAF experience and U.S. tests had demonstrated their effectiveness. During the fourth quarter the Eighth made much greater use of Carpet (airborne jamming transmitter) than of Window (metal foil discharged from aircraft to upset German radar). An ORS study of 18 operations conducted between 8 October and 30 December indicated that Carpet was a definite protection against flak, for the average losses of unprotected groups attacking the same targets were 83% higher on the first 14 missions and 31% higher over the entire 13 missions that formed the basis for the study. There was not sufficient fourth-quarter use made of Window to determine its protective value.38
At the beginning of December, Eighth Air Force representatives held a conference with interested British agencies for the discussion of radio countermeasures and for the constitution of a special organization to be called Radio Counter Measure Unit. Both United States and British forces were to contribute 12 specially equipped B-17 airplanes and crews each to this unit, which was to operate in support of night bombers and day bombers without discrimination. Authority was received from Washington for this project and on 28 December the VIII Bomber Command was charged with the building and training of the organization.

**Blind Bombing Initiated by the Eighth Air Force**

Blind or overcast bombing by daylight is an important offensive technique in that it allows operations on days that would otherwise see the force grounded or, at best, unable to strike the most desirable target. According to an OES report, weather studies in the European theater stretching back over eight years prior to 1943 showed a need for some device which would allow bombing through heavy cloud; for, throughout the year, there were on the average fewer than six days per month suitable for high-level visual bombing of typical European targets. During the months from November to February suitable weather was to be anticipated only two or three days per month.

Overcast bombing is also a defensive technique, for it allows bombardment forces to operate under conditions much less advantageous to the enemy than those found in visual bombing.

The need for blind-bombing devices was recognized quite early in the war, and in the first part of 1942 experimentation was under way.
with several types of equipment. Two of these showed more promise than any others and were given special attention. Both employed the "phenomenon of pulse radiation giving highly directional radio waves." They are best known by their code names—O.30E and H2S. Both were largely British developments, but an American version of H2S, called H2X, was a considerable improvement of the British model. O.30E employed ground-sending stations and a receiver in an aircraft. The aircraft was guided to the target by a technical expert at one of the stations and told when to drop bombs. O.30E, dependent as it was upon airborne reception of radiation emanating from the ground stations, had a very limited range. H2S and H2X were completely airborne units involving no ground stations and consequently had at least the same range as the aircraft in which they were carried. They had the property of making a representation of the terrain over which the aircraft was passing by reception of reflected microwaves. In the early stages of development H2S was useful only for area bombing. The American H2X made possible a representation of landmarks in much sharper outline.41

Ideal conditions would have allowed blind-bombing equipment for several aircraft in each group, but because the sets were so scarce and production and training facilities so limited, it was determined to place all equipment and trained crews into a single unit known as a "pathfinder force." This force was modeled after a similar unit in the Royal Air Force which began to use the blind-bombing devices some months ahead of the Eighth Air Force.42
General Baker presented the plan for the organization of a pathfinder force to General Bradley in May 1943, when the latter was in the United Kingdom working on air force build-up problems. At that time there was a small force of about one squadron set aside for radar work. General Baker had drawn up a manning table for his proposed organization and he asked that it be approved. On 1 June, a special request for the approval of the pathfinder force manning table was sent to the Commanding General of the Army Air Forces through Headquarters, ATOUS. It was explained that the force would be made up of highly trained personnel and would be put in possession of the latest target-finding devices. The hope was expressed that the pathfinder unit would be ready to function about the first of October.43

The pathfinder force manning table was approved by General Arnold by 11 July, and by the War Department on 19 July. The 482d Bomb Group (B), which contained the radar equipment and crews, was activated on 20 August and became operational 10 days later. This pathfinder group contained three squadrons and furnished the overcast bombing leaders throughout 1943. It continued operations until March of 1944, when it became essentially a training unit.44

One squadron of the 482d Group was formed in the theater and fitted out with British equipment—O50E and H2S. The other two were formed in the United States from replacement crews destined for the Eighth Air Force. Their planes were equipped with H2X. One of these American-trained squadrons arrived in the theater about 1 October, and the other some months later.45
The first use of pathfinder (FFF) planes to lead daylight bombers was on 27 September, in a mission to Emden. This operation was guided by the squadron that had been outfitted in the theater with British equipment. B2S-fitted planes were used on this Emden raid and on most of the other blind-bombing missions of the third quarter. OBO3 was first used by the Eighth Air Force on 20 October in an operation against Duren. The pathfinder force might have participated in combat operations earlier in the year but Air Chief Marshal Sir Charles Portal objected to the possibility of the compromise of radar target-finding equipment. The RAF used B2S on night missions during the summer of 1943, but on very fast Mosquito bombers which ran much less chance of being shot down than United States pathfinders, which necessarily had to occupy the dangerous lead positions.46

Pathfinders were used on about 18 missions from 27 September to the end of the year. Many of these were run against port cities because places on the seacoast were much easier to identify than inland targets. Without the pathfinders November would have been a very poor month for VIII Bomber Command, as eight of the 10 daylight missions made use of planes equipped for blind bombing. Altogether, the first FFF operation in September and those of the last quarter of 1943 dropped 13,761 tons of bombs. The third-phase proportion of bombs dropped by the heavies with the aid of FFF was:47

<table>
<thead>
<tr>
<th>Month</th>
<th>Tons Dropped with Pathfinder Aid</th>
<th>% of Total Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 1943</td>
<td>1,169.4</td>
<td>24.9%</td>
</tr>
<tr>
<td>November</td>
<td>4,395.1</td>
<td>68.3</td>
</tr>
<tr>
<td>December</td>
<td>7,467.6</td>
<td>62.6</td>
</tr>
</tbody>
</table>
The PFF experience during the third phase definitely demonstrated the defensive advantage of blind bombing. Losses to enemy aircraft on blind-bombing missions were about one-third the figure for visual missions against similar targets. Flak damage was considerably less on the blind-bombing missions, and damage to bombers by enemy fighters occurred three to four times as often on visual as on blind-bombing raids. The lower rates of loss in November and December, mentioned earlier in this chapter, were due in considerable measure to the fact that most of the bombing was done with PFF. An OES study on losses and battle damages lists three factors in explanation of the November-December rates:

"Our loss rates are primarily attributable to the use of fighter escort, to our failure to get near enough to targets to come within flak range, and especially in December, to the advantage derived from the dispatch of a total force large enough to begin to saturate enemy fighter defenses in the zones penetrated." The phrase "failure to get near enough to targets to come within flak range" does not, however, give blind-bombing credit for much offensive value. In this connection, another statement from the above-quoted OES report is in point: "However, our offensive record to date indicates that blind-bombing results have been far from as accurate as visual bombing, with many targets missed altogether. Accordingly, even though losses seem to be cut to approximately 1/2, a balance in favor of blind-bombing technique requires that its offensive effectiveness be more than 1/3 as great as visual bombing." The implication seems to be that third-phase bombing
experience left the offensive balance in favor of visual sighting, but it must be remembered that the operations of this period were beginning efforts with a new and complicated technique. These initial efforts aided the daylight bombers to much more effective use of radar target-finding devices in subsequent months of the offensive.

The first mission on which B-17 aircraft led has been discussed in its proper chronological order in the account of the second phase (Chapter III). Third-phase blind-bombing missions are now to be considered along with visual missions in an examination of operations from the standpoint of target systems.

**Pattern of Third-Phase Daylight Operations**

The major portion (78%) of third-phase bomb tonnage dropped by the Eighth Air Force fell on German targets. Objectives in occupied countries—France (14%), Norway (4%), Holland, and Poland—received proportionately less attention than in preceding phases of the offensive. The Fifteenth Air Force hit targets in Italy, the Balkans, Austria, and southern France, with Italian targets getting most attention.50

The Combined Bomber Offensive Plan had anticipated that third-phase attacks should include all the principal target systems on the priority list and that repeat operations would be performed against installations previously neutralized. The German fighter-force facilities still had top priority in the fourth quarter of 1943, but submarine targets were of less consequence than they had been when the CBO Plan was drawn. Nevertheless, the Eighth Air Force hit German port cities where submarine
construction yards were located with greater tonnage than was allocated any other target category. Attention has been given to the fact that much of the Eighth's third-phase bombing was done with pathfinders and that these found coastal points much easier to locate than objectives in the interior. Both the Eighth and the Fifteenth gave some attention to aircraft construction, airfields, ball bearings, synthetic oil, and railroad transportation. There were no attacks on production of rubber or rubber tires and none of consequence on production facilities for motor transport vehicles. The Eighth made one big attack on German construction sites where preparations were being made to launch new weapons, but much of its effort was directed to miscellaneous industrial targets of opportunity, because of failure of pathfinder equipment and difficult weather conditions. The performance of both of the U.S. strategic air forces during the fourth quarter of 1943 presented, in general, a disappointing demonstration of strategic bombardment. 51

It is scarcely possible to make a valid general statement about the accuracy of third-phase bombardment because of the small proportion of attacks made by visual sighting. It does not appear to be worth while to examine statistically the accuracy achieved on blind-bombing missions, for in many cases there is no assurance that bombs fell even close to the target. That data there is on Eighth Air Force visual accuracy shows an improvement over the first and second phases, but the fourth quarter compilations are made on returns from very few missions. The "Statistical Summary of Eighth Air Force Operations" gives the average percentage of
bombs dropped which fell within 1,000 feet of pre-assigned MP1's under conditions of good to fair visibility:

<table>
<thead>
<tr>
<th>Division</th>
<th>1st Div</th>
<th>2nd Div</th>
<th>3rd Div</th>
<th>8th AF</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>25%</td>
<td>32%</td>
<td>27%</td>
<td>27%</td>
</tr>
</tbody>
</table>

and within 2,000 feet:

<table>
<thead>
<tr>
<th>Division</th>
<th>1st Div</th>
<th>2nd Div</th>
<th>3rd Div</th>
<th>8th AF</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>46%</td>
<td>53%</td>
<td>47%</td>
<td>48%</td>
</tr>
</tbody>
</table>

Several missions during the period achieved outstanding accuracy and deserve special consideration. The most remarkable job of precision bombing in 1943 was the attack on the fighter factory at Marienburg on 9 October. On that mission 58% of the bombs fell within 1,000 feet of the aiming point and 83% within 2,000 feet. The photographs taken after the raid show what seems to be almost perfect coverage with scarcely any cursts outside the target area. The raid on the factory at Anklam the same day achieved 23% within 1,000 feet and 52.5% within 2,000 feet of the aiming point. The relatively low bombing altitudes at Marienburg (from 11,000 to 13,000 feet) and at Anklam (from 12,200 to 14,500 feet) probably explain the better-than-average accuracy on 9 October. Other missions achieving accuracy above the average Eighth Air Force fourth-quarter accuracy were:

<table>
<thead>
<tr>
<th>Date</th>
<th>Target</th>
<th>% within 1,000 Feet</th>
<th>% within 2,000 Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 Nov.</td>
<td>Knaben (Norway)</td>
<td>35</td>
<td>57</td>
</tr>
<tr>
<td>24 Dec.</td>
<td>NOBAIL</td>
<td>36</td>
<td>56</td>
</tr>
<tr>
<td>31 Dec.</td>
<td>Paris (power station)</td>
<td>39</td>
<td>76</td>
</tr>
<tr>
<td>31 Dec.</td>
<td>Paris (ball-bearing plant)</td>
<td>40</td>
<td>82</td>
</tr>
<tr>
<td>31 Dec.</td>
<td>St. Jean D'Angley</td>
<td>60</td>
<td>77</td>
</tr>
<tr>
<td>31 Dec.</td>
<td>Cognac</td>
<td>29</td>
<td>56</td>
</tr>
</tbody>
</table>
The famous 14 October Schweinfurt raid under very strong opposition got
25% of the bombs within 1,000 feet and 51% within 2,000 feet of the aim-
ing points. 52

Aircraft Facilities. The Eighth Air Force made several important
attacks on German fighter and components factories in October. 53

<table>
<thead>
<tr>
<th>Date</th>
<th>Target</th>
<th>Bombers Attacking</th>
<th>Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Oct</td>
<td>Frankfurt--Vereinigte Deutsche (metal propellers and other A/G components)</td>
<td>77</td>
<td>216.3</td>
</tr>
<tr>
<td>8 Oct</td>
<td>Berlin--Vfz Flugzeugbau (air-frame factory)</td>
<td>33</td>
<td>81.0</td>
</tr>
<tr>
<td>9 Oct</td>
<td>Anklam--Arado Components Factory</td>
<td>106</td>
<td>186.5</td>
</tr>
<tr>
<td>9 Oct</td>
<td>Marienburg--Fw Assembly Plant</td>
<td>96</td>
<td>217.2</td>
</tr>
</tbody>
</table>

In addition to these operations, the B-24 aircraft sent in September
to the Mediterranean from the Eighth Air Force participated shortly
before their return to British bases in a raid at Wiener Neustadt on
1 October which saw 157 tons of bombs dropped on one of the Me-109
plants at that place. The Fifteenth Air Force dispatched 139 B-17's
and B-24's against Wiener Neustadt on 2 November, and 112 of the heavies
dropped 327 tons of bombs with excellent results reported. 54

All these attacks on manufacturing facilities were accomplished by
visual sighting, and except for the first Wiener Neustadt mission,
achieved good success considering the small size of the attacking forces.
As noted above, the Marienburg raid was outstanding.

The Assistant Chief of Air Staff, Intelligence made an assessment
of the results of strategic bombardment as of 15 November 1943. It was
estimated in this assessment that the attacks on aircraft construction
by that date had cut into German single-engine fighter production by
about 21.5% for the period which would extend from August 1943 through
April 1944: 55

Production anticipated without bomb damage 8,940
Estimated production after bombings 7,015
Production loss due to bombing 1,925

The results of the attacks do not seem to have been exaggerated, for the
estimates of production loss were somewhat more conservative than those
of the British Air Ministry. 56

Eighth Air Force B-24's made a medium-sized raid (202 tons) on
two engine-repair factories and an airframe-repair installation at Oslo,
Norway, on 18 November, and B-24's of the Fifteenth dropped 86 tons on
an Me-109 plant at Augsburg on 19 December. 57 Other attacks on GAF
facilities during the third phase were confined chiefly to airfields.
The Eighth made at least three such attacks in October and seven in
December. The Fifteenth made at least seven airframe attacks in November
and nine in December. The mediums of the Ninth Air Force contributed
more than a score of airfield attacks during the fourth quarter of
1943. 58

Port Cities, Submarine and Ship Building. Emden and Bremen were
favored targets of VIII Bomber Command during the October-December por-
tion of the strategic offensive. Emden was attacked twice:

<table>
<thead>
<tr>
<th>Date</th>
<th>Sighting</th>
<th>Attacking A/C</th>
<th>Tons Dropped</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Oct.</td>
<td>PFF</td>
<td>337</td>
<td>960</td>
</tr>
<tr>
<td>(8 Oct. 1 B-17 dropped bombs on Emden as target of opportunity.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Dec.</td>
<td>Visual</td>
<td>523</td>
<td>1,431</td>
</tr>
</tbody>
</table>
There is no certainty about what portion of the city was hit on the blind-bombing 2 October raid; the December attack did some damage to port and harbor facilities, but the operation probably should be classified as a general industrial area attack, for a railway station, a meat packing plant, and built-up areas of the city were hit. 59

The city of Bremen was a target seven times:

<table>
<thead>
<tr>
<th>Date</th>
<th>Sighting</th>
<th>Bombers Attacking</th>
<th>Tons Dropped</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 Oct.</td>
<td>Visual</td>
<td>241</td>
<td>602</td>
</tr>
<tr>
<td>13 Nov.</td>
<td>PFF failed to function</td>
<td>114</td>
<td>262</td>
</tr>
<tr>
<td>26 Nov.</td>
<td>PFF</td>
<td>422</td>
<td>1,205</td>
</tr>
<tr>
<td>29 Nov.</td>
<td>PFF</td>
<td>138</td>
<td>41.0</td>
</tr>
<tr>
<td>13 Dec.</td>
<td>PFF</td>
<td>174</td>
<td>457.3</td>
</tr>
<tr>
<td>15 Dec.</td>
<td>PFF</td>
<td>528</td>
<td>1,520.0</td>
</tr>
<tr>
<td>20 Dec.</td>
<td>PFF and Visual</td>
<td>465</td>
<td>1,099.5</td>
</tr>
</tbody>
</table>

On 8 October a small portion of the force (44 B-17's) hit one of the submarine and warship building yards, and the balance of the force (197 B-17's) bombed the city of Bremen and its port facilities. The 13 November mission was ruined by failure of all PFF equipment; the raid of 26 November was really an area raid of the city and not a precision attack; and the operation of the 29th was of the same type. Somewhat better success attended the December raids on oft-bombed Bremen, largely because of the better functioning of PFF aircraft. 60

Other port-city operations by the Eighth Air Force during the fourth quarter of 1943 were:

<table>
<thead>
<tr>
<th>Date</th>
<th>Target</th>
<th>Sighting</th>
<th>HD Attacking</th>
<th>Tons Dropped</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 Oct.</td>
<td>Vegesack</td>
<td>Visual</td>
<td>46</td>
<td>142.5</td>
</tr>
<tr>
<td>9 Oct.</td>
<td>Gdynia</td>
<td>Visual</td>
<td>127</td>
<td>308.0</td>
</tr>
<tr>
<td>9 Oct.</td>
<td>Danzig</td>
<td>Visual</td>
<td>23</td>
<td>50.3</td>
</tr>
<tr>
<td>3 Nov.</td>
<td>Wilhelmshaven</td>
<td>PFF</td>
<td>639</td>
<td>1,450.3</td>
</tr>
<tr>
<td>13 Dec.</td>
<td>Kiel</td>
<td>PFF</td>
<td>365</td>
<td>881.75</td>
</tr>
<tr>
<td>13 Dec.</td>
<td>Hamburg</td>
<td>PFF</td>
<td>116</td>
<td>264.85</td>
</tr>
</tbody>
</table>
The mission to the Baltic ports on 9 October was noteworthy at the time for the distance covered, and the Wilhelmshaven raid on 3 November for the size of the attacking force, but the accomplishments of these operations do not appear to have been great. 61

The submarine base at Toulon was hit by 108 Fifteenth Air Force B-17's on 24 November, the Marseilles pens were bombed by Fifteenth formations (118 planes attacked) on 2 December, and on the 5th of the latter month, two Eighth Air Force B-17's bombed St. Nazaire. 62

Antifriction Bearings. The third-phase daylight assault on the Western Axis ball-bearing industry was distributed over the three months and engaged both U. S. strategic air forces. The Eighth contributed one raid in October and one in December, and the Fifteenth struck four times in November and once in December. 63

<table>
<thead>
<tr>
<th>Air Force</th>
<th>Date</th>
<th>Target</th>
<th>Attacking A/C</th>
<th>Tons Dropped</th>
</tr>
</thead>
<tbody>
<tr>
<td>8th</td>
<td>14 Oct.</td>
<td>Schweinfurt</td>
<td>223</td>
<td>483</td>
</tr>
<tr>
<td>15th</td>
<td>8 Nov.</td>
<td>Turin</td>
<td>81</td>
<td>183</td>
</tr>
<tr>
<td>15th</td>
<td>9 Nov.</td>
<td>Villar Perosa</td>
<td>20</td>
<td>60</td>
</tr>
<tr>
<td>15th</td>
<td>10 Nov.</td>
<td>Villar Perosa</td>
<td>22</td>
<td>66</td>
</tr>
<tr>
<td>15th</td>
<td>11 Nov.</td>
<td>Amnecy</td>
<td>15</td>
<td>39</td>
</tr>
<tr>
<td>15th</td>
<td>1 Dec.</td>
<td>Turin</td>
<td>118</td>
<td>354</td>
</tr>
<tr>
<td>8th</td>
<td>31 Dec.</td>
<td>Paris</td>
<td>121</td>
<td>350</td>
</tr>
</tbody>
</table>

The Schweinfurt mission of 14 October by the 1st and 3d Heavy Bombardment Divisions of the Eighth Air Force was the most important and the most damaging to the German war effort. On the three bearing factories at Schweinfurt the Eighth Air Force effort was distributed as follows: 64

<table>
<thead>
<tr>
<th>Factory</th>
<th>Type Bombs</th>
<th>High Explosive</th>
<th>Incendiary</th>
<th>Total Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kugelfischer Werke</td>
<td>165.7</td>
<td>--</td>
<td>--</td>
<td>165.7</td>
</tr>
<tr>
<td>Vereinigte Kugellager Fabriken No. 1</td>
<td>63.0</td>
<td>--</td>
<td>74.1</td>
<td>137.1</td>
</tr>
</tbody>
</table>
Factories

Type Bombs

<table>
<thead>
<tr>
<th>Factory</th>
<th>High Explosive</th>
<th>Incendiary</th>
<th>Total Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vereinigte Kugellager Fabriken</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. 2</td>
<td>166.5</td>
<td>13.5</td>
<td>180.0</td>
</tr>
<tr>
<td>Total Weight of Bombs Dropped</td>
<td></td>
<td></td>
<td>482.8</td>
</tr>
</tbody>
</table>

The Kugelfischer Werke, which was thought to employ about 12,000 workers at the time and to turn out about one-quarter of Germany's ball and roller bearings, was apparently heavily damaged by hits on assembly and machine shops. The VKF plants, estimated to employ about the same number of laborers as Kugelfischer, were likewise heavily damaged. An intelligence assessment of the raid made a month later calculated the loss in production in the two plants at: 65

<table>
<thead>
<tr>
<th></th>
<th>Pre-Raid Production—Units per Day</th>
<th>Estimated Loss of Output—Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kugelfischer</td>
<td>100,000</td>
<td>1,275,000</td>
</tr>
<tr>
<td>VKF</td>
<td>100,000</td>
<td>2,250,000</td>
</tr>
<tr>
<td>Totals</td>
<td>200,000</td>
<td>9,525,000</td>
</tr>
</tbody>
</table>

The Schweinfurt raid damaged a motorcycle factory, a bearing-cage plant, a malt factory, railroad buildings and rolling stock, and barracks buildings in addition to the three main bearing plants. 66 Despite the heavy loss of bombers (60 missing in action, 26.5% of the number attacking), the operation called forth hearty congratulations to the Eighth from the Secretary of War, the Chief of Staff, the commanding General of the Army Air Forces, Air Chief Marshal Portal, the British Air Staff, and the Royal Air Force. 67

It was thought that the destruction wrought at Schweinfurt had occasioned great concern to the Germans and caused efforts to increase output and to bolster the defenses at Turin in Italy. 68 The Fifteenth
Air Force operation against the latter plant on 8 November achieved good concentration and caused considerable damage, and the 1 December mission was thought to have produced good results. The raids on the Villar Perosa and Amnécy plants seem to have had very slight effect. 69

The Eighth Air Force attack on the last day of 1943 wrought damage to the OAI bearing plants at Bois Colombes and Ivry (Paris) and seems to have hurt the Hispano-Suiza aero-engine works as well. 70

Oil. The German oil industry was not much damaged by United States strategic air forces during the last three months of 1943. Two Eighth Air Force raids may have affected this target category slightly. On 5 November 329 B-17's, including 5 pathfinders equipped with "CBO-2," dropped bombs on Gelsenkirchen. Despite the presence of PFF, the sighting seems to have been visual on this raid, for the weather was reported clear with some industrial haze present. The majority of the Fortresses apparently attacked marshalling yards, but 96 of the bombers dropped about 238 tons on the Hydrier Werke Scholven A.G. and Gelsenkirchener Bergwerks synthetic oil plants. The first plant was damaged but the second seems to have been missed. On 19 November Gelsenkirchen was a first-priority objective for a pathfinder mission, but the equipment functioned imperfectly and other targets were hit. 71 A large-scale raid on Ludwigshaven (653 attacking bombers), aimed at the I.G. Farbenindustrie chemical works and other installations, on 30 December may have caused some damage to synthetic oil production. The target was completely cloud covered and bombing was done with the aid of pathfinders. 72
Miscellaneous Operations. A relatively large number of the fourth-quarter operations were completed against targets that were not on the POINTBLANK priority list. Railroad marshalling yards were Eighth Air Force objectives on four days for fairly large forces and on a number of other days for smaller numbers of bombers. The most important third-phase raids on marshalling yards were: 73

<table>
<thead>
<tr>
<th>Date</th>
<th>Sighting</th>
<th>Target</th>
<th>Attacking A/G</th>
<th>Tons Dropped</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Oct.</td>
<td>Visual</td>
<td>Münster</td>
<td>138</td>
<td>351</td>
</tr>
<tr>
<td>5 Nov.</td>
<td>PFF and Visual</td>
<td>Gelsenkirchen</td>
<td>229</td>
<td>495</td>
</tr>
<tr>
<td>5 Nov.</td>
<td>PFF and Visual</td>
<td>Münster</td>
<td>104</td>
<td>233</td>
</tr>
<tr>
<td>11 Nov.</td>
<td>PFF</td>
<td>Münster</td>
<td>58</td>
<td>122</td>
</tr>
<tr>
<td>22 Dec.</td>
<td>PFF</td>
<td>Osnabruck</td>
<td>219</td>
<td>543</td>
</tr>
<tr>
<td>22 Dec.</td>
<td>PFF</td>
<td>Münster</td>
<td>197</td>
<td>438</td>
</tr>
</tbody>
</table>

The Fifteenth Air Force conducted nearly half of its November and December missions against railroads, bridges, and marshalling yards in Italy and the Balkans. 74

An Eighth Air Force mission to Norway on 16 November hit a molybdenum flotation plant at Knaben and power and hydrogen plants at Rjukan, two days before the aircraft repair facilities were attacked at Oslo. The electrolysis hydrogen plant, reported the largest of its kind in the world, was a subsidiary of I. G. Farben. The Norway operation was a fine demonstration of airmanship and navigation against a very distant target. 75

Many of the operations performed by the United Kingdom-based U. S. strategic bombers are best classified as area raids of industrial towns. These missions were frequently performed under adverse weather conditions with the aid of pathfinder aircraft. On both PFF and visual operations targets of opportunity were hit when the primary objectives were not
Located. Principal industrial area raids involving more than 20 attacking heavy bombers were:

<table>
<thead>
<tr>
<th>Date</th>
<th>Target</th>
<th>Attacking A/C</th>
<th>Tons Dropped</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Oct.</td>
<td>Frankfurt (city)</td>
<td>37</td>
<td>88</td>
</tr>
<tr>
<td>4 Oct.</td>
<td>Saarlauben</td>
<td>67</td>
<td>169</td>
</tr>
<tr>
<td>4 Oct.</td>
<td>Saargauines</td>
<td>47</td>
<td>98</td>
</tr>
<tr>
<td>10 Oct.</td>
<td>Targets of opportunity</td>
<td>20</td>
<td>89</td>
</tr>
<tr>
<td>10 Oct.</td>
<td>Goesfeld</td>
<td>68</td>
<td>187</td>
</tr>
<tr>
<td>20 Oct.</td>
<td>Duren</td>
<td>96</td>
<td>209</td>
</tr>
<tr>
<td>7 Nov.</td>
<td>Duren</td>
<td>38</td>
<td>84</td>
</tr>
<tr>
<td>7 Nov.</td>
<td>Wesel</td>
<td>52</td>
<td>125</td>
</tr>
<tr>
<td>7 Nov.</td>
<td>Endertal</td>
<td>20</td>
<td>48</td>
</tr>
<tr>
<td>19 Nov.</td>
<td>Fuhr targets of opportunity</td>
<td>130</td>
<td>281</td>
</tr>
<tr>
<td>30 Nov.</td>
<td>Solingen</td>
<td>98</td>
<td>221</td>
</tr>
<tr>
<td>1 Dec.</td>
<td>Solingen</td>
<td>261</td>
<td>702</td>
</tr>
<tr>
<td>22 Dec.</td>
<td>Targets of opportunity</td>
<td>23</td>
<td>65</td>
</tr>
</tbody>
</table>

Special construction sites which the Germans were preparing for the purpose of launching pilotless aircraft against England became targets of great importance in the last quarter of 1943. The British Chief of the Air Staff asked that medium bombers of the Ninth Air Force be used to attack these objectives, and after it became apparent that the number of sites was large and the enemy was pushing their completion with maximum effort, it was decided to use heavy bombers on them when the weather was suitable in coastal areas and unsuitable for attack on fighter factories. The B-26's completed many raids against such targets and on 24 December, VIII Bomber Command dropped 1,745 tons of bombs on 23 sites from 478 B-17's and 192 B-24's. The bombing on this occasion was done by squadrons using individual sightings. By the end of December 83 construction sites had been discovered and photographed, and at 70 of them the work was believed to be 50% complete. There were at the same time 82 other locations where suspicious activity had been reported. Since it was
believed that if the Germans were left unmolested they would be able to launch the equivalent of a 1,000-ton raid on England by February, the "Ski" sites, as they were called, had become high-priority targets."

NIGHT MISSIONS BY THE EIGHTH AIR FORCE

The Eighth Air Force engaged in 34 night operations during October, November, and December. These missions involved three kinds of activity—participating in RAF Bomber Command attacks, dropping of propaganda leaflets, and the testing of special equipment. In October there were two bombing and four leaflet missions. Seven and one-half tons of bombs were dropped over Munich and Frankfurt and 2,293,543 leaflets were dropped in France and Germany. In November there were 12 leaflet and two special photographic and instrument-testing missions. The 12 propaganda missions dropped 16,167,500 leaflets in France, Belgium, Holland, and Germany. The 14 night missions in December beat this record slightly with 17,496,300 leaflets on targets in these countries.

RAF Operations. Fourth Quarter 1943

During the last quarter of 1943 the RAF Bomber Command carried out a series of very difficult operations against distant German targets, including eight attacks on the Reich's capital city. These operations were made successful by the use of new tactics and countermeasures designed to reduce losses and by improvements in navigation and night target-marking designed to secure better bombing concentrations. Nearly all (94.7%) of the 40,070 long tons of bombs dropped by the RAF during the last three months of 1943 fell on German targets. This fourth-quarter
tonnage was slightly more than one-fourth (25.3%) of the total effort of Bomber Command for 1943, which saw 157,434 long tons dropped.

The German capital had been attacked three times in force during the third quarter of 1943, but the month of November marked the real beginning of the Battle of Berlin. Fourth-quarter major raids on Berlin involved more than 3,600 attacking aircraft and dropped 14,000 long tons of bombs.

<table>
<thead>
<tr>
<th>Date</th>
<th>Attacking A/C</th>
<th>Total Tons</th>
<th>A/C Missing</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-19 Nov.</td>
<td>402</td>
<td>1,594</td>
<td>9</td>
</tr>
<tr>
<td>22-23 Nov.</td>
<td>670</td>
<td>2,465</td>
<td>26</td>
</tr>
<tr>
<td>23-24 Nov.</td>
<td>332</td>
<td>1,335</td>
<td>20</td>
</tr>
<tr>
<td>25-27 Nov.</td>
<td>407</td>
<td>1,576</td>
<td>28</td>
</tr>
<tr>
<td>2-3 Dec.</td>
<td>401</td>
<td>1,686</td>
<td>40</td>
</tr>
<tr>
<td>16-17 Dec.</td>
<td>450</td>
<td>1,815</td>
<td>25</td>
</tr>
<tr>
<td>23-24 Dec.</td>
<td>338</td>
<td>1,288</td>
<td>15</td>
</tr>
<tr>
<td>29-30 Dec.</td>
<td>656</td>
<td>2,515</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>3,646</td>
<td>14,074</td>
<td>163</td>
</tr>
</tbody>
</table>

The Berlin operations of November and December did very heavy damage to the industry of that great city. Electrical concerns, plants making aero and other type engines, machine tool factories, and a variety of other plants were heavily damaged. Commercial concerns and railway services were also seriously affected. Public utilities and public buildings in great number were destroyed or damaged, and certain military installations were badly hurt. The Berlin raids accounted for more than one-third of the entire fourth-quarter effort expended by Bomber Command.

Hammer was attacked twice in October by fairly large forces:

<table>
<thead>
<tr>
<th>Date</th>
<th>Attacking A/C</th>
<th>Total Tons</th>
<th>A/C Missing</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-9 Oct.</td>
<td>457</td>
<td>1,782</td>
<td>26</td>
</tr>
<tr>
<td>18-19 Oct.</td>
<td>248</td>
<td>1,697</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>806</td>
<td>3,479</td>
<td>43</td>
</tr>
</tbody>
</table>

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The first attack seemed to have been more important than the second and did effective damage to business and residential property and to public buildings around the central portion of the city. 81

One raid was made in October and one in December against the important commercial city of Leipzig in southern Germany:

<table>
<thead>
<tr>
<th>Date</th>
<th>A/C Attacking</th>
<th>Tons Dropped</th>
<th>A/C Missing</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-21 Oct.</td>
<td>285</td>
<td>1,085</td>
<td>16</td>
</tr>
<tr>
<td>2-3 Dec.</td>
<td>451</td>
<td>2,451</td>
<td>24</td>
</tr>
</tbody>
</table>

The December raid was the more successful and caused tremendous damage to the most important business districts of the city. Railroads, aircraft engine manufacturing concerns, and other industrial plants were also hurt badly. 82

Two of the most successful RAF attacks were made on the important manufacturing city of Kassel:

<table>
<thead>
<tr>
<th>Date</th>
<th>A/C Attacking</th>
<th>Total Tons</th>
<th>A/C Missing</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-4 Oct.</td>
<td>501</td>
<td>1,616</td>
<td>24</td>
</tr>
<tr>
<td>23-23 Oct.</td>
<td>436</td>
<td>1,824</td>
<td>43</td>
</tr>
<tr>
<td>23-23 Oct.</td>
<td>937</td>
<td>3,440</td>
<td>67</td>
</tr>
</tbody>
</table>

These October raids damaged the three great Henschel locomotive factories at Kassel which were reported responsible for approximately one-third of the total German output. 93

Germany's third largest inland port, Düsseldorf, was the objective for a very successful mission on the night of 3-4 November when 527 aircraft dropped 2,193 tons of bombs at a cost of 16 planes missing. Some 21 identified factories were damaged and the devastation was so great that the city was no longer regarded a first-priority target. 94
One medium and three small raids were made against the Mannheim-Ludwigshaven area in western Germany largely for the purpose of preventing recovery from damage caused on previous missions:

<table>
<thead>
<tr>
<th>Date</th>
<th>A/C Attacking</th>
<th>Total Tons</th>
<th>A/C Missing</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-5 Oct.</td>
<td>57</td>
<td>235</td>
<td>--</td>
</tr>
<tr>
<td>17-18 Nov.</td>
<td>75</td>
<td>508</td>
<td>1</td>
</tr>
<tr>
<td>18-19 Nov.</td>
<td>325</td>
<td>952</td>
<td>23</td>
</tr>
<tr>
<td>20-21 Dec.</td>
<td>62</td>
<td>223</td>
<td>=</td>
</tr>
<tr>
<td></td>
<td>579</td>
<td>1,618</td>
<td>24</td>
</tr>
</tbody>
</table>

The great city of Frankfurt was attacked three times during the fourth quarter, once in each month:

<table>
<thead>
<tr>
<th>Date</th>
<th>A/C Attacking</th>
<th>Total Tons</th>
<th>A/C Missing</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-5 Oct.</td>
<td>357</td>
<td>1,105</td>
<td>10</td>
</tr>
<tr>
<td>25-26 Nov.</td>
<td>237</td>
<td>646</td>
<td>12</td>
</tr>
<tr>
<td>20-21 Dec.</td>
<td>576</td>
<td>2,281</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>1,170</td>
<td>4,032</td>
<td>62</td>
</tr>
</tbody>
</table>

The October raid was quite damaging to the east side of the city. The subsequent raids, while larger, were less successful; but they did considerable damage to business and industrial property.

Other major RAF Bomber Command fourth-quarter attacks included two raids on Stuttgart in southwestern Germany and one each against Hagen in the Ruhr, Munich in south Germany, and Modane in southern France:

<table>
<thead>
<tr>
<th>Date</th>
<th>Target</th>
<th>A/C Attacking</th>
<th>Total Tons</th>
<th>A/C Missing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2 Oct.</td>
<td>Hagen</td>
<td>240</td>
<td>1,150</td>
<td>1</td>
</tr>
<tr>
<td>2-3 Oct.</td>
<td>Munich</td>
<td>273</td>
<td>1,015</td>
<td>8</td>
</tr>
<tr>
<td>7-8 Oct.</td>
<td>Stuttgart</td>
<td>314</td>
<td>1,257</td>
<td>4</td>
</tr>
<tr>
<td>10-11 Nov.</td>
<td>Modane</td>
<td>301</td>
<td>1,121</td>
<td>--</td>
</tr>
<tr>
<td>25-27 Nov.</td>
<td>Stuttgart</td>
<td>162</td>
<td>446</td>
<td>5</td>
</tr>
</tbody>
</table>

Hagen in the Ruhr, important in the manufacture of submarine components, was damaged quite heavily. Scattered damage was done to an I. G. Farbmindustrie instrument factory, other industrial plants, and...
military installations in Munich. Business and residential property and about 40 concerns in Stuttgart suffered in the two fourth-quarter attacks, and the November mission to Modane in France produced an excellent concentration on transportation facilities. 87

The major RAF attacks during the last quarter of 1943 were well calculated to serve the aims of the bomber offensive. The heavy weight of explosives dropped on Berlin contributed to both the destruction of German industry and the undermining of German morale. Hannover had been designated as a third-phase RAF objective and was the seat of important rubber-tire plants and other industries. Kassel and Stuttgart had also been assigned in the USO Plan as third-phase targets and both possessed important production facilities in the aircraft industry. One of the outstanding features of 1943 RAF operations was the campaign against the Ruhr-Rhine industrial region. The missions to Dusseldorf and Hagen were a continuation of that campaign. The strike on Modane in France was designed to cripple transportation facilities supplying the German forces in Italy. Frankfurt, Mannheim, and Munich were important transportation targets in Germany.

Besides the major attacks of Bomber Command, well over 100 minor raids were made on a variety of targets. These operations were important in themselves and in many cases were of great assistance to the conduct of major raids. In addition to the dropping of explosives and incendiaries the RAF distributed 143 million propaganda leaflets during the quarter. 86
CONCLUSION

The first three phases of the combined bomber offensive were, for the United States Army Air Forces, more important in the preparations they made for future action than for the operations they witnessed. Developments during the last three quarters of 1943—the organizational changes, the materiel and personnel build-up attained, the plans made for future growth of forces, and the tactical and technical improvements achieved—all made possible the tremendous assault on the Western Axis in 1944 and after.

Of the preparations made for future strategic aerial warfare, three developments of 1943 seem to be of outstanding importance.

1. The build-up of the Eighth Air Force to formidable striking proportions and the organization of the Fifteenth Strategic Air Force for the utilization of Italian bases appear as achievements of first magnitude in the European air war.

2. The need for fighter and radio defenses to aid the heavy bomber in the accomplishment of its task was recognized, and progress was made in the build-up of the fighter forces with a variety of types, in the extension of the fighter range with expendable tanks, and in the use of countermeasures against German radar.

3. The offensive capabilities of the strategic air force were augmented by the experimentation with blind-bombing techniques during the fourth quarter of 1943.

On the operational side, the 1943 effort of the United States
strategic air forces seems to have had far reaching consequences on two chief target categories.

1. The German aircraft industry, or specifically the planned single-engine fighter production program, was delayed by approximately three months by strategic attacks on Fw-190 and He-109 assembly plants in July, August, and October. Acceptances of the He-109 single-engine fighter were cut from 725 in July to a low of 357 in December. Acceptances of Fw-190's were reduced from 325 in July to 203 in December 1943. Some of the reduction for both types was due, in part, to the fact that bad weather hindered acceptance flights; furthermore, aircraft acceptances were not necessarily the same as production figures. Nevertheless, the results of the 1943 air attacks on fighter production facilities had an important bearing on the defeat of the GAF in 1944. 1

2. The center of the German antifriction bearing industry was very badly damaged by the important August and October missions of the Eighth Air Force to Schweinfurt. The heavy losses incurred on these raids strongly reinforced the lesson that other deep penetrations had taught—the heavy bomber had to have fighter help on long missions over Germany if it was to accomplish its purpose. The intervals between raids may have hindered the accomplishment of the strategical aim for this target category because of the time given the enemy to effect dispersal. 2

The relatively large proportion of Eighth Air Force 1943 effort devoted to submarine yards and bases and port cities, reinforced as it was by RAF area raids, particularly those on Kiel and Hamburg, seems to have had slight effect on Germany's U-boat output. It has been pointed
out elsewhere that the battle against the submarines was won at sea and not in the yards and bases. 3

Operations against other GBO target categories during 1943 now seem of relatively small importance. The August raid against the Ploesti oil refineries apparently had only a temporary effect; 4 other attacks on this category gave only slight results. Of the U. S. attacks on the rubber industry, the 22 June Eighth Air Force mission to Ruels was the only one of real significance. This one raid apparently closed the entire plant for a month and caused such damage that full production was not regained for seven months. 5 The output of motor vehicles does not seem to have been seriously affected by the raids on plants in occupied countries. 6

The enemy's efforts to develop new aerial weapons and his determined construction of sites for launching them gave the USAF a new target category that did not exist when the GBO Plan was drawn, but one that was to become of great importance in 1944.

Of the 1943 accomplishments of the RAF, the Ruhr campaign aimed especially at the German steel industry seems most significant. Loss in enemy steel production because of the direct and indirect effects of bombing during all of 1943 was something above 13½ of actual output. So great was the impact of the air attack on Ruhr industry that the section was never able, after the middle of 1943, to match the steel output that had been achieved at the beginning of the year. 7 RAF area raids did tremendous damage to a number of German cities during 1943; the outstanding example here was the terrible destruction wrought on Hamburg in July and August. So great was the havoc that this city never recovered
its productive capacity. The same thing can be said, however, of Düsseldorf, Bochum, and other cities in the Ruhr.\textsuperscript{8}

The total loss of German armament production from air raids has been estimated by the United States Strategic Bombing Survey at from 3 to 5\% for 1943. It appears that the indirect effects of the 1943 attack may have been greater than the direct. That is to say, the enemy lost more production because of shifts and dispersal than he did from bomb damage.\textsuperscript{9}

In a sense, this 1943 preparatory, experimental period made the subsequent phases of the bomber offensive more difficult because of this dispersal and because of the time given to the enemy to improve his aerial defenses. That was unavoidable, however, for strategic air power in Europe could not, like Pallas Athene on Lake Triton, spring into being fully armed and ready for tremendous action. It had to grow slowly and learn operational lessons as it grew.
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAG</td>
<td>Air Adjutant General</td>
</tr>
<tr>
<td>AEAF</td>
<td>Allied Expeditionary Air Forces</td>
</tr>
<tr>
<td>AFADP</td>
<td>Plans Division, Hq., AAF</td>
</tr>
<tr>
<td>APOWID</td>
<td>Air Prisoner of War Interrogation Detachment</td>
</tr>
<tr>
<td>ASC</td>
<td>Air Service Command</td>
</tr>
<tr>
<td>Asgd.</td>
<td>Assigned</td>
</tr>
<tr>
<td>Avg.</td>
<td>Average</td>
</tr>
<tr>
<td>BAM</td>
<td>British Air Ministry</td>
</tr>
<tr>
<td>BCNO</td>
<td>Bomber Command Narrative of Operations</td>
</tr>
<tr>
<td>CBO</td>
<td>Combined Bomber Offensive</td>
</tr>
<tr>
<td>CCS</td>
<td>Combined Chiefs of Staff</td>
</tr>
<tr>
<td>COA</td>
<td>Committee of Operations Analysts</td>
</tr>
<tr>
<td>COPC</td>
<td>Combined Operational Planning Committee</td>
</tr>
<tr>
<td>O/S</td>
<td>Chief of Staff</td>
</tr>
<tr>
<td>DCG/AS</td>
<td>Deputy Chief of Air Staff</td>
</tr>
<tr>
<td>Dd.</td>
<td>Destroyed</td>
</tr>
<tr>
<td>Dsp.</td>
<td>Dispatched</td>
</tr>
<tr>
<td>ETUSA</td>
<td>European Theater of Operations, U. S. Army</td>
</tr>
<tr>
<td>Exh.</td>
<td>Exhibit</td>
</tr>
<tr>
<td>GAF</td>
<td>German Air Force</td>
</tr>
<tr>
<td>MID</td>
<td>Military Intelligence Division, WDGS</td>
</tr>
<tr>
<td>MPI</td>
<td>Mean Point of Impact</td>
</tr>
<tr>
<td>MTO</td>
<td>Mediterranean Theater of Operations</td>
</tr>
<tr>
<td>OAS</td>
<td>Operational Analysis Section</td>
</tr>
<tr>
<td>Opnl.</td>
<td>Operational</td>
</tr>
<tr>
<td>ORS</td>
<td>Operational Research Section</td>
</tr>
<tr>
<td>RAF</td>
<td>Royal Air Force</td>
</tr>
<tr>
<td>Str.</td>
<td>Strength</td>
</tr>
<tr>
<td>USAAF UK</td>
<td>U. S. Army Air Forces in the United Kingdom</td>
</tr>
</tbody>
</table>
NOTES

Chapter 1


3. United States-British Staff Conversations, 1941.

4. Ibid., p. 5.


7. AWD-42, 9 Sep. 1942.


13. Ibid.


15. Ibid., p. 7.


16. Ltr., Hq AAF to AC/AS Management Control, 9 Dec. 1943, in COA general correspondence file, AFSEO.


21. The 19 target systems were aircraft, antitank and antiaircraft artillery, ball bearings, chemicals, coke, electric power, electrical equipment, food, grinding wheels and abrasives, iron and steel, machine tools, military transport vehicles, nitrogen, nonferrous metals, optical precision instruments, petroleum, submarines, synthetic rubber and rubber tires, and transportation. COA Report, 8 March 1943.

22. Ibid. The 8 March report was signed by the following committee members: Edward M. Earle, Special Consultant, AAF; Fowler Hamilton, Board of Economic Warfare; Thomas W. Lamont, Special Consultant, AAF; Edward S. Mason, Office of Strategic Services; James Root, Jr., Special Consultant, AAF; Col. Edgar P. Sorensen, AC/AS, A-2, Lt. Col. Malcolm W. Hoyt, AC (A-2); Lt. Col. Thomas C. Lamphier, AC (A-2); Lt. Col. W. Barton Leach, AC; Col. Guido E. Perora, AC; and approved by Col. Byron E. Gates, AC/AS, Management Control.


24. 05/S 217, 14 May 1943.


26. Ibid., p. 5; Plans Annex, p. 4, and Exh. 3.


31. COA Report, 8 March 1943, Tab 7.

32. Cf. U. S. Strategic Bombing Survey, Interview No. 56, Reichsmarschal Hermann Goering, 29 June 1945 (KO-16950); Generalierabteutnant Gallura (A.O.C. Fighters), 17 May 1945 (KO-11423); Testimony of a GAF Field Marshal received in Britain 3 June 1945 (KO-18-35); and others.
33. Cf. KO-18936, KO-15325 (K numbers of F/V interrogations).

34. COA Report, 8 March 1943.


38. KO-11423. See also note 32 above.


40. COA Report, 8 March 1943.

41. U. S. Strategic Bombing Survey, Interview No. 56, KO-18990.

42. U. S. Strategic Bombing Survey, 27 June 1945, KO-18991.

43. COA Report, 8 March 1943, Tab 13.

44. Ibid., Tab 6.

45. Ibid., Tab 6.

46. Ibid., Tab 11.

47. Ibid., Tab 10.

48. Ibid., Tab 12.
Chapter II


2. Biennial Report of the Chief of Staff of the United States Army, 1942-1943, to the Secretary of War.

3. Ibid.


6. Ibid.


9. Ibid.


11. AAFP-2, p. 33.


13. Ibid., pp. 20-29.


16. Ltr., Eaker to Stratemeyer, 26 Feb. 1943, in AAG 312.1-D.

17. Ltr., Eaker to Stratemeyer, 18 Feb. 1943, ibid. Ltr., Eaker to Stratemeyer, 2 March 1943, in WP III A-2, Great Britain, AAFEF.


19. Ltr., Stratemeyer to Air Vice Marshal Foster, 29 Jan. 1943, ibid.

20. Ltr., Arnold to Foster, 4 March 1943, in III B-1, AAFEF.
21. Ltr., Arnold to Eaker, 24 March 1943, Misc. file, AFSEO.


23. O0/S 217, 14 May 1943.


26. Ltr., Arnold to Bradley, 22 April 1943, in AAG 320.2-F.


28. Ltr., Bradley to CG AAF, thru CG 8th AF and ENUSA in turn, 26 May 1943, in III B-1, AFAFP.


30. Ltr., Bradley to CG AAF, 28 May 1943, in III B-I, AFAFP.

31. Base air depots performed modification and overhaul for both strategic and tactical aircraft.

32. Ltr., Bradley to CG AAF, 28 May 1943, in III B-I, AFAFP.

33. Ibid., and incl. entitled "Proposed Air Force Program in Relation to Shipping and Ground and Combat Training Bases," Organization tables for various units prepared under direction of the Bradley Committee are in file entitled "Bradley Plan" in AFAFP; also in AAG files.


35. 1st and 2d Ind. to Ltr., Bradley to CG AAF, 28 May 1943. General Devers had succeeded General Andrews as CG, ENUSA, upon the death of the latter.


38. Stat Sum of Ops.


40. GM-OUT-5823, 15 June 43, Arnold to Eaker.

41. GM-OUT-2158, 7 June 43.
42. C-91-17138, 27 June 43, London to War.

43. Stat Sum of Ops.

44. Ibid.

45. Ibid. There are many figures available for the strength of the Eighth Air Force. The Statistical Summary is used throughout this study for the sake of consistency.


47. VIII Bomber Command Narratives of Operations [VIII BCNO], April–June 1943.


51. Ibid., Exh. 10, Plans Annex.

52. Ibid., p. 13.

53. Stat Sum of Ops.

54. Ibid.


56. VIII BCNO, April 1943.

57. Stat Sum of Ops.


59. Ibid.

60. Stat Sum of Ops.


62. AAF Historical Studies: No. 32, Ninth Air Force in the ETO, p. 121.

63. Ltr., Eaker to Giles, 28 May 1943, in AAG 312.1-F.
64. Ltr., Eaker to Portal, 4 March 1943, and incl. (list of targets), Exh. 5, Plans Annex to Eaker's Report.


66. 8th AF, "Freshman Targets for 3rd Wing," 3 May 1943.

67. Ltr., Eaker to Giles, 23 May 1943.

68. **Ninth Air Force in the ETO**, pp. 121-123.

69. VIII EO, 14 May 1943.

70. Ct-IN-19992, 29 May 43, USAF/ London to WAR.

71. Ltr., Eaker to Giles, 28 May 1943. The initial operations of the medium bombers from United Kingdom are fully discussed in **Ninth Air Force in the ETO**, pp. 123-125.

72. Stat Sum of Opns.

73. VIII EO, 11-29 June 1943.

74. Stat Sum of Opns.

75. Ibid.


78. Stat Sum of Opns. These figures have little meaning, for they are based on scant data. There is a study by Operational Research Section entitled "Analysis of VIII Bomber Command Operations from the Point of View of Bombing Accuracy, 1 January-15 October 1943." This study summarizes accuracies for different time periods thus:

<table>
<thead>
<tr>
<th>Missions</th>
<th>1,000 ft.</th>
<th>2,000 ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Missions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jan. 1-May 15, 1943</td>
<td>11.3</td>
<td>24.5</td>
</tr>
<tr>
<td>May 15-Aug. 1, 1943</td>
<td>6.3</td>
<td>17.6</td>
</tr>
</tbody>
</table>


01. Stat Sun of Opsns. The B-24's in the United Kingdom departed for NTO the latter part of June. Tactical unit equipment of B-24's was 95 for April and May. Tactical unit equipment of B-17's was 340 at the end of April, 460 end of May, and 624 end of June.

02. Ibid.


04. CO/S 217, 14 May 1943.

05. HQ 8th AF, CO/S A-2, Special Rpt. #83.

06. Ibid.

07. Memo by CO/S A-2, 8th AF, 19 July 1943, in AAG 312.1-J.

08. 8th AF, CO/S A-2, Special Rpt. #93.

09. "Eval. of Defensive Measures."


17. "Eval. of Defensive Measures."

18. ltr., Stratemeyer to Baker, 19 Feb. 1943, in AAG 312.1-0; CH-OUT (?), 19 June 43, Eq AAF to CG 8th AF; ltr., Baker to Giles, 29 June 1943, in AAG 313.1-H.

19. CH-1N-217, 2 July 43, USAFFE London to WAR; CH-1N-12575, 18 July 43, London to WAR.
100. OK-OUT-7963, 20 July 43, Hq AAF to CG 8th AF.


102. Memo Report on Trip to UK, 17 March 1943; "Eval. of Defensive Measures."

103. OI-IN-7811, 14 April 43, USFOR London to WAR; ltr., Baker to Giles, 17 April 1943, in AAG 312.1-N.

104. OK-OUT-6908, 16 April 43, Eq AAF to CG 8th AF.

105. OK-IN-9346, 16 June 43, USAW to WAR.

106. VIII 312.0, June 1943.

107. ltr., Baker to Giles, 29 June 1943, in AAG 312.1-N.


111. History, VIII Fighter Command, p. 367; Stat Sum of Ops.

112. GO/S, 217, 14 May 1943.

113. Bradley to CG AAF, 28 May 1943, in III B-I, AFAFP.


115. OI-IN-14323, 24 April 43, USAW to WAR.


117. OI-IN-21333, 30 July 43, 8th AF to WAR.

118. History of VIII AFSU, Chap. V, p. 44; OI-IN-6962, 11 June 43, USAW to CG AAF.

120. Ltr., Baker to Giles, 13 May 1943, in AAG 312.1-F; CM-IN-6932, 11 June 43, USAW to CAG AAF.

121. Chronological Record of VIII Fighter Command to 10 Oct. 1944.

122. VIII BOMO, April 1943.

123. VIII BOMO, 4 May 1943. Chronological Record of VIII Fighter Command to 10 Oct. 1944; CM-IN-3762, 6 May 43, London to WR.


125. "Eval. of Defensive Measures."


127. VIII BOMO, 4 April 1943.

128. Lbid., 4 May 1943.

129. Command Informational Intelligence Series, #48-S, 3 May 1943, in AAG 300-A.


131. VIII BOMO, April–June 1943.


135. "Eval. of Defensive Measures."


139. Ibid., Exh. 8, Directive of 10 June 1943.
140. Ibid., Opns. Annex, p. 6; ltr., Eaker to Arnold, 8 June 1943, in AG 312.1-G.

141. Interview with Brig. Gen. E. S. Hansell.

142. CO/S, 217, 14 May 1943.


144. VIII BCNO, April-June 1943.

145. Ibid.

146. Ibid., 16 April 1943.

147. Ibid., 14 May 1943; 8th AF Bi-monthly Rpt., 1-15 May 1943.

148. VIII BCNO, 17 May 1943; Bi-monthly Rpt., 16-31 May 1943.

149. 8th AF Target Summary gives the Fried Krupp Germania Werft while VIII BCNO says that 101 B-17's bombed Kiel Deutsche Werft and one bombed Kriegsmarinewerft.


151. Ibid.

152. Ibid.; 8th AF Target Summary.

153. Ibid.


155. Ibid., 5 April 1943; CM-IN-3702, 7 April 43, London to WAR.


158. VIII BCNO, 17 April 1943; CM-IN-1225, 20 April 43, London to WAR; Bi-monthly Rpt., 15-30 April 1943.

159. Ibid., 1-15 May 1943; CM-IN-9971, 16 May 43, London to WAR; VIII BCNO, 13 and 14 May 1943.
160. Ibid., 26-28 June 1943; Bi-monthly Rpt., 16-30 June 1943.


162. VIII ECHQ, 22 June 1943; CL-IN-14358, 23 June 43, 8th AF to WAR.

163. Ibid.


165. 8th AF Target Summary; VIII ECHQ, 4 April 1943.

166. Ibid., 4 and 14 May 1943.

167. Ibid., 22 and 26 June 1943.

168. "The Strategic Aerial Bombardment of Europe."

169. VIII ECHQ, 15 May, 11 and 25 June 1943; CL-IN-16767, 26 June 43, London to WAR.


171. RAF/Quarterly Review, April-June 1943, #5, in A-2 Lib.

172. Ibid.

173. Ibid.

174. Ibid.

175. Ibid.

176. Ibid.

177. Ibid.

Chapter III

1. CI-OUT-3951 (18 Aug. 43), Hq AAF to CG ETO, G7973, 17 Aug. 43; CI-OUT-520 (2 Oct. 43), WDGS to CG ETO, G7999, 29 Sep. 43.

2. CI-OUT-4007 (11 Aug. 43), WDGS to CG ETO, G81720, 10 Aug. 43; CI-OUT-6097 (15 Aug. 43), WDGS to CG ETO, G1906, 15 Aug. 43; CI-OUT (13 Aug. 43), Hq AAF to CG ETO, G7973, 17 Aug. 43.


4. Ibid., Chap. 2, p. 58; CI-OUT-1836 (3 Sep. 43), WDGS to CG ETO, G82657, 1 Sep. 43; CN-IN-5572 (7 Sep. 43), London to WAR, G74179, 7 Sep. 43; CI-OUT-530 (2 Oct. 43), WDGS to CG ETO, G7999, 29 Sep. 43.

5. CI-OUT-191 (1 July 43), AC/AS, OCR to CG 8 AF, G72788, 1 July 43; CI-OUT-1000 (3 July 43), AC/AS OCR to CG USFOR, G7335, 2 July 43; CI-OUT-543 (3 July 43), AC/AS OCR to CG 8 AF, G7376, 30 June 43; CI-IN-2459 (4 July 43), London to WAR, G7448, 3 July 43; memo for C/S, Inspector General's Report on 8th AF, 16 Sep. 1943 by Brig. Gen. Edwin Ferin, DC/AS, in AAG 380-A; CI-OUT-520 (2 Oct. 43), WDGS to CG ETO, G7999, 29 Sep. 43; CI-OUT-1121 (2 Oct. 43), London to WAR, G75195, 2 Oct. 43.


8. CI-OUT-1836 (3 Sep. 43), WDGS to CG ETO, G72657, 1 Sep. 43.

9. CI-IN-5572 (7 Sep. 43), London to WAR, G74179, 7 Sep. 43.


11. These subjects are completely discussed in the study entitled Ninth Air Force in ETO. CI-IN-18881 (22 July 43), London to WAR, G72841, 22 July 43; CI-IN-2430 (4 Aug. 43), Cairo to AGWAR, G74151; 8AF USAFE 1941, 4 Aug. 43; Ltr., Arnold to Portal, 6 Sep. 1943, and Portal to Arnold, 9 Sep. 1943, in WP III A-2, AFSPA; History of VIII AFSC, Chap. II, p. 78.

12. Eckor's Report, Personnel Annex, pp. 8-9; CN-IN-15289 (21 Aug. 43), London to WAR, G73426, 20 Aug. 43; CI-OUT-477 (1 Sep. 43), Hq AAF to CG 8th AF, G73426, 1 Sep. 43.

14. Ibid.

15. Ibid.

16. CL-IN-8429 (12 July 43), London to WAR, #Jl843, 12 July 43; CL-OUT-5152 (13 July 43), AC/AS Plans to CG 8 AF, #J2691; CL-OUT-8200 (20 July 43), CG/S to CG Freedom Algiers; CL-IN-32207 (28 July 43), Algiers to AGMAK, #J5915/5144, 28 July 43; CL-IN-21175 (29 July 43), London to WAR, #J2550; CL-IN-21774 (30 July 43), Algiers to WAR, #J6099, 30 July 43; CL-OUT-12421 (31 July 43), WDGs to CG EPW, #J1331, 31 July 43; CL-IN-995 (2 Aug. 43), London to WAR, #J2557, 2 Aug. 43; CL-OUT-333 (2 Aug. 43), CG/S to CG Freedom Algiers, #J131, 2 Aug. 43; CL-IN-1739 (3 Aug. 43), Algiers to WAR, #J5411, 3 Aug. 43; CL-OUT-1137 (4 Aug. 43), Opns. Div to CG NARC Freedom, #J2650, 4 Aug. 43.

17. CL-IN-10280 (14 Aug. 43), London to WAR, #J55160, 14 Aug. 43; CL-IN-12549 (17 Aug. 43), AF HQ in NACO to WAR, #J7544, 17 Aug. 43; CL-IN-14807 (20 Aug. 43), Quebec to WAR, #J8740, 19 Aug. 43.

18. CL-IN-11206 (14 Sep. 43), Algiers to WAR, #J71, 14 Sep. 43; CL-IN-11206 (15 Sep. 43), Algiers to WAR, #J71, 15 Sep. 43; CL-OUT-7195 (15 Sep. 43), JOS to CG EPW, #J2145, 15 Sep. 43; CL-IN-12128, 16 Sep. 43, London to WAR, #J4528, 16 Sep. 43; VIII BICO, 16-17 Sep. 1943.

19. CL-IN-14863 (20 Sep. 43), London to WAR, #J4732, 20 Sep. 43; CL-OUT-10334 (22 Sep. 43), WDGs to CG NACO, #J3565, 22 Sep. 43; Stat Sum of Opns.; ltr., Eaker to Arnold, 1 Oct. 1943, in WP III A-2, AFAF.


21. Ibid.

22. Ibid.

23. CL-IN-258 (1 Oct. 43), 8th AF to WAR, #D1221, 30 Sep. 43; Stat Sum of Opns.; CG/S 217, 14 May 1943.

24. VIII BICO, July-Sep. 1943; Stat Sum of Opns.

25. VIII BICO, July 1943.


27. Ibid., Sep. 1943.

28. Ibid., July-Sep. 1943; Stat Sum of Opns.
29. Ibid.

30. CI-OUT-9784 (24 July 43), Hq AAF to CG 8th AF, 7A3014, 24 July 43; C1-IN-23945 (24 July 43), USFOR to WAR.


32. Stat Sum of Opns.


35. CI-OUT-11575 (23 July 43), GG AAF to GG ETO, 7R1236, 29 July 43.

36. C1-IN-22949 (4 Aug. 43), London to WAR, 7P1715, 4 Aug. 43; ltr., Baker to Arnold, 30 Aug. 1943, in AAF 312.1-M.


40. VIII BONO, July-Sep. 1943.

41. Ibid.

42. Ibid., 17 Aug. and 6 Sep. 1943.

43. Hq 3d Bomb Wing (!1), Summary of Mission #1, 16 July 1943, in A-2 Lib.

44. Hq 3d Bomb Wing (!1), Mission Summaries, Stat Sum of Opns.; Medium Bomber Operations are discussed in the study, Ninth Air Force in ETO.

45. Ltrs., Arnold to Eaker, 1 Aug. 1943, and Eaker to Arnold, 30 Aug. 1943, in AAF 312.1.

46. Ibid.
47. CI-IN-15878 (22 July 43), London to WAR, 7W2215, 22 July 43.


All Missions
% of HE Bombs Which Fell Within
1,000 feet of AP  2,000 feet of AP

1 Jan-15 May 1943  11.3  24.6
15 May-1 Aug 1943  6.3  17.6
1 Aug-15 Oct 1943  13.0  23.7

49. Stat Sum of Opns.


52. Ltr., Baker to Giles, 16 Sep. 1943, in AG 312.1-K.

53. Certain standards were established for reporting enemy airlplane losses:

- Enemy aircraft in flight considered destroyed when:
  1. Seen to crash.
  2. Seen to disintegrate in the air or to be enveloped in flames.
  3. Seen to descend on friendly territory and be captured.
  4. Pilot and entire crew seen to bail out.

- Probably destroyed: While in flight the enemy airplane is seen to break off combat under circumstances which lead to the conclusion that it must have been a loss, although it is not seen to crash.

- Damaged: Enemy aircraft considered damaged when so injured that it requires repair before beginning another mission, but had better than even chance of continuing its flight.

Stat Sum of Opns.

54. Ibid.


56. CI-IN-1556 (3 July 43), USFOR to WAR, 7W1410, 3 July 43.

CONFIDENTIAL


59. Memo for Gen. Arnold, Fighter Requirements in UK, 1 July 1943, in WP III A-2, Great Britain, AAF.

60. Stat Sum of Opns.


64. Ltr., Arnold to Portal, 26 Sep. 1943, in WP III A-2, Great Britain, AAF.

65. CH-Quel-543 (2 July 43), AG/AS OGR to GG 8th AF, #A2796, 30 June 43; ltr., Baker to Giles, 12 July 1943, in AAG 512.1-H.

66. CH-IN-3113 (12 Sep. 43), London to WAR, #DL065, 11 Sep. 43.


68. CH-IN-21332 (30 July 43), London to WAR, #DL663, 29 July 43.


71. History of VIII AFSC, Chap. V, p. 45; ltr., Keyner to Giles, 7 Sep. 1943, in AAG 312.1-X.

72. VIII FC Rpt.; ltr., Keyner to Giles, 7 Sep. 1943.

73. History, VIII Fighter Command, p. 113; Stat Sum of Opns.


75. Ibid.

76. Ibid.; VIII ECO, July-Sep. 1943.

78. Stat Sum of Opns.; "The Strategic Aerial Bombardment of Europe."

79. Ibid.

80. Stat Sum of Opns.

81. VIII BCKO, July and August 1943; CK-I-I-11401 (15 Aug. 43), Cairo to WAR, /\K\W/ 7432, 15 Aug. 43. For a complete discussion of the attack on GAF facilities, see AAFFH-10.

82. VIII BCKO, 26 July 1943; CK-I-I-1711 (1 Aug. 43), London to WAR, /\K\W/ 66264, 31 July 43. 8th AF, "Bi-Monthly Report of Bombing Results," 16-31 July 1943.

83. VIII BCKO, 29 and 30 July 1943; CK-I-I-686 (2 Aug. 43), London to WAR, /\K\W/ 62676, 1 Aug. 43.


85. "The Strategic Aerial Bombardment of Europe."

86. CK-I-I-6532 (16 Oct. 43), London to WAR, /\K\W/ 14410, 16 Oct. 43; VIII BCKO, July-Sep. 1943; 8th AF Target Summary; Semimonthly Rpt., July-Sep. 1943.

87. "The Strategic Aerial Bombardment of Europe."

88. Ibid.; VIII BCKO, July-Sep. 1943.

89. VIII BCKO, July 1943; 8th AF Target Summary.

90. VIII BCKO, 4 and 24 July 1943; CK-I-I-18104 (25 July 43), London to WAR, /\K\W/ 3370, 25 July 43.

91. VIII BCKO, 25 and 26 July 1943; Semimonthly Rpt., 16-31 July 1943.

92. VIII BCKO, 25 and 29 July 1943.


94. VIII BCKO, Sep. 1943.

95. Ibid., 23 Sep. 1943.
96. CI-II-19909 (28 Sep. 43), London to WAR, #W6010, 28 Sep. 43; VIII BGO, 27 Sep. 1943. The cable story of the mission followed in this account is slightly different from the report in the Narrative of Operations. The cable account seems to be the clearer report.


98. CW-OUT-13688 (29 Sep. 43), CG AAF to CG 8th AF, #A3767, 29 Sep. 43.

99. "The Strategic Aerial Bombardment of Europe."

100. 8th AF Target Summary; VII BGO, 17 Aug. 1943; Semimonthly Rpt., 16-31 Aug. 1943.

101. VIII BGO, 17 Aug. 1943; "The Strategic Aerial Bombardment of Europe."

102. VIII BGO, 17 Aug. 1943; CI-II-14266 (19 Aug. 43), London to WAR, #A3552, 19 Aug. 43.

103. 8th AF Target Summary.


105. VIII BGO, 12 Aug. 1943; CI-II-3688 (13 Aug. 43), London to WAR, #W3128, 12 Aug. 43; CI-II-3646 (13 Aug. 43), London to WAR, #YL720, 13 Aug. 43.

106. VIII BGO, 26 July 1943; "Strategic Aerial Bombardment of Europe."

107. VIII BGO, 15 Sep. 1943.

108. Ibid., 24 July 1943; CI-II-18104 (25 July 43), London to WAR, #W3670, 25 July 43; CI-II-18061 (25 July 43), London to WAR, #WL62, 24 July 43.


110. Ibid.


112. Ibid.


114. VIII Air Support Command, Report of Operation STEAKED.

115. Ibid.

116. VIII BGO, Sep. 1943.
117. RAF Bomber Command. Quarterly Review, July-Sep. 1943; "The Strategic Aerial Bombardment of Europe."

118. Ibid.

119. Ibid.

120. Ibid.

121. Ibid.

122. Ibid.

123. Ibid.

124. Ibid.
Chapter IV

1. CM-IN-13750 (23 Oct. 43), Devers to Marshall for Arnold and Craig, #45099, 22 Oct. 43. AAF Ltr. 55-1, 4 Dec. 1943, Discontinuance of the term Bradley Plan (AAG 371 D, Theater of Operations), read:
   "1. It is directed that the term "Bradley Plan" be discontinued effective at once.
   "2. The plan for the augmentation of the Army Air Forces in the European Theater of Operations is contained in a letter dated 8 Nov 43, file AG 320.2 (3 Nov 43) CP-I-E-M, to the Commanding General, European Theater of Operations, subject: Troop Basic for Air Forces, European Theater of Operations (Less I30)."

2. CM-IN-5119 (7 Sep. 43), Arnold to Marshall, #44139, 7 Sep. 43; CM-OUT-6400 (14 Sep. 43), Arnold to Royce, #6774, 13 Sep. 43; "Organization for the Air Offensive," Air Forces General Information Bulletin, Jan. 1944; Ninth Air Force in ETO.

3. History of VIII AFSC, Chap. I, p. 26; Hq 9th AF, 60 101, 16 Oct. 1945; CM-OUT-636 (2 Nov. 43), TAG to OG ETO, R5206, 2 Nov. 43; CM-IN-157 (1 Dec. 43), London to WAR, #78399, 27 Nov. 43.


7. CM-OUT-9934 and 9935 (22 Oct. 43), CC/S to CG Freedom Algiers, #698, and to Brit COS, #757.

8. Ibid.


10. Ibid.; ltr., Baker to Arnold, 1 Oct. 1943, in WP III A-2, Great Britain, AFAP.


12. CM-OUT-14208 (31 Oct. 43), Hq AAF to CG Freedom Algiers, #1420, 31 Oct. 43.

13. Ibid.

14. CM-IN-5620 (9 Nov. 43), Algiers to WAR, #74779, 9 Nov. 43.

17. C.I.-OUT-7103 (18 Dec. 43), CG AAF to CG ETO, W/7076, 18 Dec. 43.

18. C.J.-IN-12161 (19 Dec. 43), London to WAR, W/3695, 19 Dec. 43;
C.J.-IN-12615 (20 Dec. 43), London to WAR, W/3720, 20 Dec. 43;
C.I.-OUT-7585 (20 Dec. 43), CG AAF to CG 8th AF, W/4989, 20 Dec. 43.


23. Ibid.


25. Ibid., Nov. 1943.


27. Ibid., Oct.-Dec. 1943.


30. Ltr., Anderson to Giles, 17 Nov. 1943, in AAG 312.1-H; Ltr., Air
Marshal W. L. Welch to Arnold, 14 Dec. 1943, in WP III A-2, Great Britain.

Force Operations shows sorties per operational day as follows:

<table>
<thead>
<tr>
<th>Month</th>
<th>Sorties</th>
</tr>
</thead>
<tbody>
<tr>
<td>October</td>
<td>384.3</td>
</tr>
<tr>
<td>November</td>
<td>406.2</td>
</tr>
<tr>
<td>December</td>
<td>633.7</td>
</tr>
</tbody>
</table>

But this obviously includes all types of heavy bomber sorties (night
leaflet, participation with RAF, and daylight) divided by the number
of operational days per month.

32. Stat Sum of Opns. Bomb totals include 396 tons by medium in October,
16.8 tons by fighter bombers in November, and 10.5 tons by fighter
bombers in December.
34. Stat Sum of Opns.
35. Ibid.
36. Ibid.; VIII EC; Oct. 1943.
37. CM-IN-8967 (15 Oct. 43), 8th AF London to WAR, 21383, 15 Oct. 43.
43. Ltr., Baker to Bradley, 28 May 1943, in AAG 322-G; ltr., Hq 8th AF to USAAF, Washington, thru CG ETOUSA, 1 June 1943, Naming Table for Pathfinder Force, in "The Bradley Plan" file, AAFHQ.
44. CM-IN-4767 (11 July 43), Hq AAF to CG 8th AF, 23879, 11 July 43; CM-IN-17109 (23 Aug. 43), London to WAR, 293463, 21 Aug. 43; Stat Sum of Opns.
48. OES Report, Reduction of Losses and Battle Damage.
49. Ibid.
50. Stat Sum of Ops.; Targets of 15th AF, Nov. and Dec. 1943, in AFSnC.


52. OES, "Bombing Accuracy of 8th AF Bomb Divisions, Combat Wings, and Groups," (n.d.), in Research and Analysis Br., Office of Statistical Control.

53. VIII ECHO, Oct. 1943; 8th AF Target Sum.


55. "The Strategic Aerial Bombardment of Europe."


57. VIII ECHO, 18 Nov. 1943; Targets of 15th AF, Dec. 1943.


59. VIII ECHO, 2 and 3 Oct., and 11 Dec. 1943; 8th AF Target Sum.

60. VIII ECHO, Oct.-Dec. 1943.

56. Ibid.; 8th AF Target Sum.


64. 8th AF Target Sum.


66. VIII ECHO, 14 Oct. 1943.


68. CL-OUT-1382 (26 Oct. 43), CG AAF to CG WAC.

THIS PAGE Declassified IAW EO12958

70. VIII ECHO, 31 Dec. 1943.

71. Ibid., 5 and 13 Nov. 1943; 8th AF Target Sum.

72. VIII ECHO, 30 Dec. 1943.

73. Ibid., Oct.-Dec. 1943; 8th AF Target Sum.

74. Hq IASAF, Intops Sum., Nov. and Dec. 1943.

75. VIII ECHO, 16 Nov. 1943; Semi-monthly Rpt., 16-30 Nov. 1943.


77. C1-VII-17047 (28 Dec. 43), London to WAR, ADM 1273, 37 Dec. 43;


80. Ibid.

81. Ibid.

82. Ibid.

83. Ibid.

84. Ibid.

85. Ibid.

86. Ibid.

87. Ibid.

88. Ibid.
Conclusion

1. The United States Strategic Bombing Survey: Over-all Report (European War), 30 Sep. 1945, pp. 16-17.

2. Ibid., pp. 26 and 29.
3. Ibid., p. 70.
4. Ibid., p. 41
5. Ibid., p. 46.
6. Ibid., p. 65.
7. Ibid., p. 78.
8. Ibid., p. 73.
9. Ibid., p. 37.
APPENDIXES

(The source of all data in these Appendixes is: "Statistical Summary of Eighth Air Force Operations, European Theater, 17 Aug 1942-8 May 1945.")
Appendix 1

Eighth Air Force 1943 Order of Battle
Heavy bombardment Groups Operational at End of Each Month

<table>
<thead>
<tr>
<th>Month</th>
<th>B-17 Groups:</th>
<th>B-24 Groups:</th>
<th>Total Operational</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 1943</td>
<td>92d (Tr only), 305th, 91st, 303d, 305th</td>
<td>93d, 44th</td>
<td>6</td>
</tr>
<tr>
<td>Feb 1943</td>
<td>92d (Tr only), 306th, 91st, 303d, 305th</td>
<td>93d, 44th</td>
<td>6</td>
</tr>
<tr>
<td>March 1943</td>
<td>92d (Tr only), 306th, 91st, 303d, 305th</td>
<td>93d, 44th</td>
<td>6</td>
</tr>
<tr>
<td>April 1943</td>
<td>92d (Tr only), 306th, 91st, 303d, 305th</td>
<td>93d, 44th</td>
<td>6</td>
</tr>
<tr>
<td>May 1943</td>
<td>92d, 306th, 91st, 303d, 305th, 95th, 96th, 351st, 94th, 379th</td>
<td>93d, 44th</td>
<td>12</td>
</tr>
<tr>
<td>June 1943</td>
<td>92d, 306th, 91st, 303d, 305th, 95th, 96th, 351st, 94th, 379th, 100th, 331st, 384th</td>
<td>93d, 44th</td>
<td>13</td>
</tr>
<tr>
<td>July 1943</td>
<td>92d, 306th, 91st, 303d, 305th, 95th, 96th, 351st, 94th, 379th, 100th, 381st, 384th, 385th, 398th</td>
<td>93d, 44th</td>
<td>15</td>
</tr>
<tr>
<td>Aug 1943</td>
<td>92d, 306th, 91st, 303d, 305th, 95th, 96th, 351st, 94th, 379th, 100th, 381st, 384th, 385th, 398th, 482d (3 squadrons FFI)</td>
<td>93d, 44th</td>
<td>16</td>
</tr>
</tbody>
</table>
SEP 1943
B-17 Groups:
92d, 306th, 91st, 303d, 305th, 95th, 96th,
351st, 94th, 379th, 100th, 381st, 384th,
385th, 388th, 390th, 482d (3 sqdns, PFF) 20-3/4

B-24 Groups:
93d, 44th, 339th, 392d

OCT 1943
B-17 Groups:
92d, 306th, 91st, 303d, 305th, 95th, 96th,
351st, 94th, 379th, 100th, 381st, 384th,
385th, 388th, 390th, 482d (3 sqdns, PFF)

B-24 Groups:
93d, 44th, 339th, 392d 20-3/4

NOV 1943
B-17 Groups:
92d, 306th, 91st, 303d, 305th, 95th, 96th,
351st, 94th, 379th, 100th, 381st, 384th,
385th, 388th, 390th, 483d (3 sqdns, PFF),
401st

B-24 Groups:
93d, 44th, 339th, 392d 21-3/4

DEC 1943
B-17 Groups:
92d, 306th, 91st, 303d, 305th, 95th, 96th,
351st, 94th, 379th, 100th, 381st, 384th,
385th, 388th, 390th, 482d (3 sqdns, PFF),
401st, 447th

B-24 Groups:
93d, 44th, 339th, 392d, 445th, 446th, 449th 25-3/4
Appendix 2

Eighth Air Force
1943 Personnel Strength by Months

<table>
<thead>
<tr>
<th>Month</th>
<th>Officers Assigned</th>
<th>Enlisted Men Assigned</th>
<th>Total Assigned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 31</td>
<td>4,526</td>
<td>31,716</td>
<td>36,241</td>
</tr>
<tr>
<td>Feb 28</td>
<td>4,608</td>
<td>31,990</td>
<td>36,598</td>
</tr>
<tr>
<td>March 31</td>
<td>5,189</td>
<td>35,111</td>
<td>40,298</td>
</tr>
<tr>
<td>April 30</td>
<td>5,499</td>
<td>37,984</td>
<td>44,483</td>
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<tr>
<td>May 31</td>
<td>8,981</td>
<td>65,567</td>
<td>74,548</td>
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<tr>
<td>June 30</td>
<td>11,664</td>
<td>89,685</td>
<td>101,349</td>
</tr>
<tr>
<td>July 31</td>
<td>11,966</td>
<td>87,366</td>
<td>99,332#</td>
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<tr>
<td>Aug 31</td>
<td>14,781</td>
<td>115,213</td>
<td>129,994</td>
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<tr>
<td>Sep 30</td>
<td>15,790</td>
<td>129,747</td>
<td>145,537</td>
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<tr>
<td>Oct 31</td>
<td>16,792</td>
<td>127,289</td>
<td>144,081##</td>
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<tr>
<td>Nov 30</td>
<td>21,045</td>
<td>151,312</td>
<td>173,357</td>
</tr>
<tr>
<td>Dec 31</td>
<td>22,945</td>
<td>173,382</td>
<td>196,327</td>
</tr>
</tbody>
</table>

# July drop in assigned strength due to Mediterranean diversion.
## October drop in assigned strength due to loss of personnel to Ninth Air Force, which was established 15 Oct in United Kingdom.
### Eighth Air Force Aircraft and Crew Strength

**Daily Average by Month—1st Line Tactical Aircraft—Heavy Bombers**

<table>
<thead>
<tr>
<th>Month</th>
<th>Asgd to Air Force</th>
<th>On Hand in Opnl Tac Units</th>
<th>Fully Opnl in Opnl Tac Units</th>
<th>Aircraft Crews</th>
<th>Crewws Avail</th>
<th>Crewws Effective Strength for Combat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>225</td>
<td>155</td>
<td>80</td>
<td>147</td>
<td>85</td>
<td>80</td>
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<tr>
<td>Feb</td>
<td>209</td>
<td>146</td>
<td>84</td>
<td>143</td>
<td>74</td>
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<tr>
<td>March</td>
<td>257</td>
<td>190</td>
<td>112</td>
<td>151</td>
<td>87</td>
<td>87</td>
</tr>
<tr>
<td>April</td>
<td>337</td>
<td>231</td>
<td>153</td>
<td>137</td>
<td>140</td>
<td>140</td>
</tr>
<tr>
<td>May</td>
<td>547</td>
<td>340</td>
<td>200</td>
<td>313</td>
<td>178</td>
<td>178</td>
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<tr>
<td>June</td>
<td>775</td>
<td>459</td>
<td>287</td>
<td>419</td>
<td>222</td>
<td>222</td>
</tr>
<tr>
<td>July</td>
<td>800</td>
<td>599</td>
<td>378</td>
<td>464</td>
<td>315</td>
<td>279</td>
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<tr>
<td>Aug</td>
<td>761</td>
<td>582</td>
<td>406</td>
<td>509</td>
<td>341</td>
<td>251</td>
</tr>
<tr>
<td>Sep</td>
<td>881</td>
<td>656</td>
<td>461</td>
<td>661</td>
<td>409</td>
<td>373</td>
</tr>
<tr>
<td>Oct</td>
<td>1000</td>
<td>763</td>
<td>535</td>
<td>820</td>
<td>479</td>
<td>417</td>
</tr>
<tr>
<td>Nov</td>
<td>1254</td>
<td>902</td>
<td>705</td>
<td>1035</td>
<td>636</td>
<td>578</td>
</tr>
<tr>
<td>Dec</td>
<td>1503</td>
<td>1057</td>
<td>752</td>
<td>1555</td>
<td>949</td>
<td>723</td>
</tr>
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</table>
## Eighth Air Force
### 1943 Bombing Operations

<table>
<thead>
<tr>
<th>Month</th>
<th>1943</th>
<th>Days Operations Carried Out</th>
<th>Total Sorties</th>
<th>Credit Sorties</th>
<th>Effective Sorties</th>
<th>Tons of Bombs on Targets (Visual)</th>
<th>Tons of Bombs on Targets (PFF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>4</td>
<td>358</td>
<td>279</td>
<td>263</td>
<td>665.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feb</td>
<td>5</td>
<td>526</td>
<td>298</td>
<td>250</td>
<td>636.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>March</td>
<td>9</td>
<td>956</td>
<td>716</td>
<td>610</td>
<td>1662.5</td>
<td></td>
<td></td>
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<tr>
<td>April</td>
<td>4</td>
<td>480</td>
<td>373</td>
<td>353</td>
<td>962.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>May</td>
<td>9</td>
<td>1640</td>
<td>1340</td>
<td>1217</td>
<td>2851.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>May H/B</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>11</td>
<td>10.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>June</td>
<td>7</td>
<td>2154</td>
<td>1447</td>
<td>1128</td>
<td>2610.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>July</td>
<td>10</td>
<td>2523</td>
<td>2234</td>
<td>1609</td>
<td>3698.2</td>
<td></td>
<td></td>
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<tr>
<td>July H/B</td>
<td>23</td>
<td>245</td>
<td>184</td>
<td>193.4</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Aug</td>
<td>8</td>
<td>2267</td>
<td>2058</td>
<td>1653</td>
<td>3570.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aug H/B</td>
<td>1190</td>
<td>996</td>
<td>879</td>
<td>908.4</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Sep</td>
<td>11</td>
<td>3419</td>
<td>2561</td>
<td>2088</td>
<td>4728.5</td>
<td></td>
<td>748.9</td>
</tr>
<tr>
<td>Sep H/B</td>
<td>3033</td>
<td>2344</td>
<td>1897</td>
<td>2777.0</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Oct</td>
<td>7</td>
<td>2690</td>
<td>2159</td>
<td>1911</td>
<td>3528.5</td>
<td></td>
<td>1169.4</td>
</tr>
<tr>
<td>Oct H/B</td>
<td>579</td>
<td>485</td>
<td>266</td>
<td>396.0</td>
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<td>2916</td>
<td>2483</td>
<td>2030.4</td>
<td></td>
<td>4395.1</td>
</tr>
<tr>
<td>Dec</td>
<td>10</td>
<td>6337</td>
<td>5618</td>
<td>4720</td>
<td>4458.1</td>
<td></td>
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<td>21332</td>
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### Eighth Air Force

**Types of Bombs Dropped by Heavy Bombers**

<table>
<thead>
<tr>
<th>Month</th>
<th>High Explosive</th>
<th>Fragmentation</th>
<th>Incendiary</th>
<th>Total Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>666.6</td>
<td></td>
<td></td>
<td>666.6</td>
</tr>
<tr>
<td>Feb</td>
<td>636.6</td>
<td></td>
<td></td>
<td>636.6</td>
</tr>
<tr>
<td>March</td>
<td>1662.5</td>
<td></td>
<td></td>
<td>1662.5</td>
</tr>
<tr>
<td>April</td>
<td>962.5</td>
<td></td>
<td></td>
<td>962.5</td>
</tr>
<tr>
<td>May</td>
<td>2727.3</td>
<td>124.5</td>
<td></td>
<td>2851.8</td>
</tr>
<tr>
<td>June</td>
<td>2610.4</td>
<td></td>
<td></td>
<td>2610.4</td>
</tr>
<tr>
<td>July</td>
<td>3186.1</td>
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<td>3698.2</td>
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<tr>
<td>Aug</td>
<td>3140.4</td>
<td>80.7</td>
<td>349.4</td>
<td>3570.5</td>
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<tr>
<td>Sep</td>
<td>4810.7</td>
<td>318.4</td>
<td>348.4</td>
<td>5477.5</td>
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<tr>
<td>Oct</td>
<td>3405.3</td>
<td></td>
<td>1292.6</td>
<td>4697.9</td>
</tr>
<tr>
<td>Nov</td>
<td>4042.6</td>
<td></td>
<td>2382.9</td>
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<tr>
<td>Dec</td>
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<td>4189.6</td>
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</table>

**1943 Totals**

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<th>High Explosive</th>
<th>Fragmentation</th>
<th>Incendiary</th>
<th>Total Tons</th>
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<tr>
<td>35,584.1</td>
<td>399.1</td>
<td>9199.5</td>
<td>45182.7</td>
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### Appendix 6

#### Eighth Air Force

**Bomb Tonnage by Country, Bombers and Fighters**

<table>
<thead>
<tr>
<th>Month</th>
<th>Germany</th>
<th>France</th>
<th>Belgium</th>
<th>Holland</th>
<th>Norway</th>
<th>Poland</th>
<th>Shipping</th>
<th>Other</th>
<th>Total</th>
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<tr>
<td>1943</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jan</td>
<td>202.0</td>
<td>463.6</td>
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<td></td>
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<td></td>
<td></td>
<td>665.6</td>
</tr>
<tr>
<td>Feb</td>
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<td>377.0</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>.3</td>
<td>638.6</td>
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<tr>
<td>March</td>
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<td>961.5</td>
<td>169.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>April</td>
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<td>450.0</td>
<td>245.5</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>962.5</td>
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<tr>
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<td>1232.0</td>
<td>325.8</td>
<td>10.7</td>
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<td></td>
<td></td>
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<tr>
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<td></td>
<td></td>
<td>45.0</td>
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<td>14.6</td>
<td>80.2</td>
<td>495.3</td>
<td></td>
<td></td>
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<td>2633.8</td>
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<td></td>
<td>2.5</td>
<td></td>
<td>4478.9</td>
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<td>6538.1</td>
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<td></td>
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<td></td>
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<tr>
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<td>291.8</td>
<td></td>
<td>420.6</td>
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<td></td>
<td>358.3</td>
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<td>Nov</td>
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<td>16.8</td>
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<td>1001.3</td>
<td></td>
<td>7.2</td>
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<tr>
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<td>10.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11954.2</td>
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<td>17976.8</td>
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<td>1496.6</td>
<td>358.3</td>
<td>140.5</td>
<td>49495.5</td>
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---

**SECURITY INFORMATION**

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### Appendix 7

**Eighth Air Force**

**1943 Heavy Bomber Loss Pattern Combat Operations**

<table>
<thead>
<tr>
<th>Month</th>
<th>Combat Unit Credit Sorties</th>
<th>A/C Lost N/A, and Cat E</th>
<th>Losses as % of Credit Sorties</th>
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<tbody>
<tr>
<td>January</td>
<td>279</td>
<td>21</td>
<td>7.5</td>
</tr>
<tr>
<td>February</td>
<td>236</td>
<td>24</td>
<td>8.1</td>
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<tr>
<td>March</td>
<td>716</td>
<td>23</td>
<td>3.2</td>
</tr>
<tr>
<td>April</td>
<td>373</td>
<td>29</td>
<td>7.8</td>
</tr>
<tr>
<td>May</td>
<td>1340</td>
<td>73</td>
<td>5.4</td>
</tr>
<tr>
<td>June</td>
<td>1447</td>
<td>93</td>
<td>6.4</td>
</tr>
<tr>
<td>July</td>
<td>2334</td>
<td>128</td>
<td>5.5</td>
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<td>August</td>
<td>2058</td>
<td>134</td>
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<td>September</td>
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<td>101</td>
<td>3.9</td>
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<tr>
<td>October</td>
<td>2139</td>
<td>198</td>
<td>9.2</td>
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<tr>
<td>November</td>
<td>2916</td>
<td>114</td>
<td>3.9</td>
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<tr>
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<td>200</td>
<td>3.6</td>
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<td><strong>22039</strong></td>
<td><strong>1128</strong></td>
<td><strong>5.1</strong></td>
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N/A—Missing in Action.

Category E—Damaged beyond economical repair.
## Appendix B

### Eighth Air Force

**1943 Bomber Command Units Missing in Action and Claims**

<table>
<thead>
<tr>
<th>Month</th>
<th>Bombers MIA</th>
<th>Enemy Aircraft Claims Destroyed</th>
<th>Probably Destroyed</th>
<th>Damaged</th>
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<td>Jan</td>
<td>18</td>
<td>40</td>
<td>42</td>
<td>26</td>
</tr>
<tr>
<td>Feb</td>
<td>22</td>
<td>71</td>
<td>24</td>
<td>12</td>
</tr>
<tr>
<td>March</td>
<td>19</td>
<td>147</td>
<td>41</td>
<td>53</td>
</tr>
<tr>
<td>April</td>
<td>28</td>
<td>148</td>
<td>41</td>
<td>31</td>
</tr>
<tr>
<td>May</td>
<td>69</td>
<td>389</td>
<td>82</td>
<td>175</td>
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<tr>
<td>May N/B</td>
<td>10</td>
<td>--</td>
<td>--</td>
<td>--</td>
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<tr>
<td>June</td>
<td>85</td>
<td>300</td>
<td>81</td>
<td>146</td>
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<tr>
<td>July</td>
<td>109</td>
<td>542</td>
<td>155</td>
<td>325</td>
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<tr>
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<td>3</td>
<td>2</td>
<td>2</td>
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<td>Aug</td>
<td>107</td>
<td>440</td>
<td>55</td>
<td>162</td>
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<tr>
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<td>4</td>
<td>2</td>
<td>3</td>
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<tr>
<td>Sep</td>
<td>84</td>
<td>273</td>
<td>45</td>
<td>125</td>
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<tr>
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<td>13</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
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<td>Nov</td>
<td>93</td>
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<td>46</td>
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<tr>
<td>Dec</td>
<td>163</td>
<td>227</td>
<td>89</td>
<td>133</td>
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<tr>
<td><strong>1943 Totals</strong></td>
<td><strong>995</strong></td>
<td><strong>3521</strong></td>
<td><strong>843</strong></td>
<td><strong>1628</strong></td>
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### Appendix 9

**Eighth Air Force**

**Heavy Bombers Missing in Action by Cause**

<table>
<thead>
<tr>
<th>1943 Months</th>
<th>Enemy A/C</th>
<th>Flak or Flak &amp; B/A</th>
<th>Accident</th>
<th>Other and Unknown Cause</th>
<th>Total</th>
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<tbody>
<tr>
<td>Jan</td>
<td>11</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>18</td>
</tr>
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<td>12</td>
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<td>2</td>
<td>4</td>
<td>22</td>
</tr>
<tr>
<td>March</td>
<td>14</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>19</td>
</tr>
<tr>
<td>April</td>
<td>18</td>
<td>1</td>
<td>-</td>
<td>9</td>
<td>23</td>
</tr>
<tr>
<td>May</td>
<td>25</td>
<td>14</td>
<td>1</td>
<td>23</td>
<td>63</td>
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<td>June</td>
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<td>1</td>
<td>31</td>
<td>85</td>
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<tr>
<td>July</td>
<td>41</td>
<td>22</td>
<td>8</td>
<td>38</td>
<td>109</td>
</tr>
<tr>
<td>Aug</td>
<td>50</td>
<td>13</td>
<td>7</td>
<td>37</td>
<td>107</td>
</tr>
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<td>51</td>
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<tr>
<td>Oct</td>
<td>71</td>
<td>11</td>
<td>1</td>
<td>93</td>
<td>176</td>
</tr>
<tr>
<td>Nov</td>
<td>14</td>
<td>8</td>
<td>10</td>
<td>61</td>
<td>93</td>
</tr>
<tr>
<td>Dec</td>
<td>30</td>
<td>25</td>
<td>4</td>
<td>104</td>
<td>163</td>
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<td><strong>120</strong></td>
<td><strong>41</strong></td>
<td><strong>463</strong></td>
<td><strong>972</strong></td>
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### Eighth Air Force
#### 1943 Heavy Bomber Battle Damage by Category

<table>
<thead>
<tr>
<th>Month</th>
<th>Combat Unit Credit Sorties</th>
<th>Category of Damage</th>
<th>Total Heavy Bombers Damaged</th>
<th>Number of Credit Sorties</th>
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<tbody>
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<td>A 110  B 20  C 3</td>
<td>135</td>
<td>43.4%</td>
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<tr>
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<td>288</td>
<td>A 100  B 10  C 2</td>
<td>113</td>
<td>37.9%</td>
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<tr>
<td>March</td>
<td>716</td>
<td>A 127  B 15  C 1</td>
<td>147</td>
<td>20.5%</td>
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<tr>
<td>April</td>
<td>373</td>
<td>A 67   B 19  C 0</td>
<td>87</td>
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</tr>
<tr>
<td>May</td>
<td>1340</td>
<td>A 304  B 100  C 4</td>
<td>413</td>
<td>30.8%</td>
</tr>
<tr>
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<td>1447</td>
<td>A 391  B 66  C 8</td>
<td>473</td>
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</tr>
<tr>
<td>July</td>
<td>2334</td>
<td>A 876  B 126  C 4</td>
<td>1036</td>
<td>43.9%</td>
</tr>
<tr>
<td>Aug</td>
<td>2058</td>
<td>A 756  B 90  C 6</td>
<td>869</td>
<td>42.2%</td>
</tr>
<tr>
<td>Sep</td>
<td>2561</td>
<td>A 669  B 59  C 3</td>
<td>748</td>
<td>29.2%</td>
</tr>
<tr>
<td>Oct</td>
<td>2159</td>
<td>A 770  B 95  C 13</td>
<td>900</td>
<td>41.7%</td>
</tr>
<tr>
<td>Nov</td>
<td>2916</td>
<td>A 540  B 83  C 5</td>
<td>669</td>
<td>22.2%</td>
</tr>
<tr>
<td>Dec</td>
<td>5518</td>
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<td>1276</td>
<td>23.7%</td>
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<tr>
<td>Totals</td>
<td>22099</td>
<td>6715  905  59  155</td>
<td>6835</td>
<td>30.9%</td>
</tr>
</tbody>
</table>

**Cat A**—An airplane which, by nature of the damage, may be repaired within 36 hours, and is repairable by a combat unit.

**Cat AC**—An airplane which, by nature of the damage, requires 36 or more hours to repair, and is repairable by a subdepot or service sq.

**Cat B**—An airplane which, by nature of the damage, is repairable by a repair depot activity or establishment, regardless of whether the work is done on site or in a depot.

**Cat E**—An airplane damaged beyond economical repair while in performance of an operational mission.
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