

AN EVALUATION OF THE AERIAL INTERDICTION
CAMPAIGN KNOWN AS THE “TRANSPORTATION PLAN”
FOR THE D-DAY INVASION, EARLY JANUARY 1944 TO
LATE JUNE 1944

A Research Paper
Presented To
The Research Department
Air Command and Staff College

In Partial Fulfillment of the Graduation Requirements of ACSC

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March 1997

Report Documentation Page		
Report Date 01MAR1997	Report Type N/A	Dates Covered (from... to) -
Title and Subtitle An Evaluation of the Aerial Interdiction Campaign Known as the "Transportation Plan" for the D-Day Invasion, Early January 1944 to Late June 1944	Contract Number	
	Grant Number	
	Program Element Number	
Author(s) Veeder, Timothy A.	Project Number	
	Task Number	
	Work Unit Number	
Performing Organization Name(s) and Address(es) Air Command and Staff College Maxwell AFB, AL 36112	Performing Organization Report Number	
Sponsoring/Monitoring Agency Name(s) and Address(es)	Sponsor/Monitor's Acronym(s)	
	Sponsor/Monitor's Report Number(s)	
Distribution/Availability Statement Approved for public release, distribution unlimited		
Supplementary Notes		
Abstract		
Subject Terms		
Report Classification unclassified	Classification of this page unclassified	
Classification of Abstract unclassified	Limitation of Abstract UU	
Number of Pages 54		

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Preface

This research project was kindled by an interest in the use of air power in World War II. As I sat down and started narrowing the scope of the research topic, I became aware of the “Transportation Plan;” the interdiction campaign to deny the German’s ability to reinforce against the Allied invasion forces on D-Day. I chose this subject because it was something new and I had never heard it discussed before doing this research.

I would like to offer my thanks to Dr. Rich Muller for his guidance and inputs as my Faculty Research Advisor. Also, I would like to thank my family for putting up with me as I put the finishing touches on this project. I hope you as the reader will find this topic of interest.

Abstract

The various airmen leading the air war had great differences of opinion regarding what to target in the European theater of operations in support of Operation Overlord. The central leadership figures were Lt. General Carl Spaatz, USSTAF commander, and Air Chief Marshal Trafford Leigh-Mallory, AEA commandant. Each of these military men obviously wanted to support the planned Allied invasion, but they held differing opinions in regard to how to best support the invasion troops. They were greatly influenced by both personal experience and the advice of their respective scientific advisors, Walt W. Rostow and Dr. Solly Zuckerman. Also, Air Marshal Tedder, Deputy Supreme Allied Commander, and Air Marshal Harris, Commander of the RAF Bomber Command, contributed to the decisions to carry out the transportation interdiction campaign.

This research focuses on the period January 1944 through the end of June 1944. It includes a literature review of published memoirs and historic accounts of the individuals involved in the decision to implement the transportation plan. The archives of the Air Force Historical Research Agency were accessed to obtain actual accounts and directives implementing the pre-D-Day interdiction campaign. Numerous facts support a discussion of each of the airmen's interests and the controversy that surrounded the transportation campaign.

The implementation of the transportation interdiction campaign resulted in the successful denial of German reinforcements to the Normandy beachhead. This success was a result of five significant factors. These were as follows: 1) the vast numbers of Allied aircraft relative to the Germans helped achieve and maintain air superiority; 2) the increased variety of targets which were attacked in implementation of the transportation plan; 3) the oil campaign with its impact on German aircraft availability and quality of German combat pilots; 4) the German's indecision to commit their reserves based on the belief that the real invasion had not yet occurred; and 5) the impact of the scientific advisors on the military leadership's decisions. These factors were crucial in contributing to the success of the transportation plan in support of the D-Day invasion.

Chapter 1

Introduction

Interdiction delays, disrupts, diverts, or destroys an enemy's military potential before it can be brought to bear against friendly forces.

—AFM 1-1

When the Allies began preparation for the invasion to regain a foothold on the European continent, the commanders developed several courses of action to ensure success. The development of an interdiction campaign which eventually became the transportation plan was one of these courses of action. This transportation plan began a two-part debate amongst the Allied leadership. The first part of the debate was whether execution of this interdiction campaign would detract from the overall air strategy already being carried out, while the second part questioned the selection of targets for interdiction by the Allied air forces. Several leaders played significant roles in the decisions that would eventually ensure air supremacy over the Allied invasion force while simultaneously denying enemy reinforcements from reaching the invasion battle zone.

Organization

This paper is organized into four chapters. Chapter One outlines the basic scope of this research document. Chapter Two introduces and examines the differences of opinion between the leadership, and the decisions that finally lead to the implementation of the

transportation plan. Chapter Three outlines the basic objectives of the transportation plan, examines Allied and German preparations for the eventual invasion, and reviews the results of the campaign from both the Allied and German perspectives. Chapter Four concludes with an examination of the significant factors contributing to the success of the transportation plan.

The Problem

The various airmen leading the air war had great differences of opinion regarding targeting in the European theater of operations. The central leadership figures were Air Chief Marshal Trafford Leigh-Mallory and Lt Gen Carl Spaatz. Each of these men wanted to support the Allied invasion, but each held different views on how to best support the invasion troops. They based their ideas both on the advice of their respective advisors, Dr. Solly Zuckerman and Walt W. Rostow, and their personal experiences.

Leigh-Mallory believed the primary targets should be the transportation systems linking Germany and France. Spaatz, on the other hand, believed the best way to support the Allied invasion was through bombing strategic targets such as German oil and aircraft production facilities. He believed this would hinder movement of troops and supplies and guarantee air superiority. ACM Arthur Harris and ACM Arthur Tedder also contributed to the debate determining if the transportation plan would be put into effect. These men provided advice to Gen Dwight Eisenhower on the decisions to be made. The first decision regarded, “Should there be an interdiction campaign prior to D-Day to prevent the Germans from being able to bring reinforcements to the landing zone?” The second was, “Should strategic air assets be allocated to support this interdiction campaign?”

Operation Overlord, as known today, was a great success in terms of both air attack and combined arms tactics. This paper reviews the transportation campaign and analyzes what significant factors contributed to the success of the transportation plan.

Limitations

This study will be limited in both the time period it covers and the examination of individuals involved in instituting the transportation plan. The time period is from early January 1944 through late June 1944, thus allowing this study to focus on the events leading up to the decision to implement the transportation plan.

Also, only the most significant leaders responsible for the decision to implement the transportation plan are included, keeping the scope of this research within reasonable bounds. The previously mentioned Allied leaders and two German Field Marshals, Erwin Rommel and Gerd von Rundstedt, are the central figures discussed in this paper.

The Other Transportation Plan

To clarify what might be a confusing situation for the reader, there is another plan also sometimes referred to as “the transportation plan.” This “Other” transportation plan was from mid-1944 through May 1945 and targeted the German transportation network within the heart of Germany itself in a strategic interdiction campaign. This second plan should not be confused with the orientation of this paper which is limited to the pre-D-Day interdiction campaign and not the continued strategic transportation interdiction campaign applied against Germany, post D-Day.

Chapter 2

The Leadership Conflict

“Madness in great ones must not unwatched go.” Claudius in Hamlet, act 3, sc. 1

—William Shakespeare

The Individual Leaders

Each man in the Allied leadership had his own opinion of what should be done to support Operation Overlord and each vigorously argued for his plan. This debate by the leadership on how to best support Operation Overlord took place over a period of several months. As early as January 1944, both ACM Trafford Leigh-Mallory and ACM Arthur Tedder were convinced of the necessity to implement an interdiction campaign, subsequently known as the “Transportation Plan.” This plan required the combined efforts of all tactical and strategic air power for its support. The key person who convinced these two British airmen that this transportation plan should be carried out was Dr. Solly Zuckerman, the scientific advisor to Leigh-Mallory. Lt Gen Carl Spaatz, on the other hand, remained opposed to the employment of any strategic air assets in the transportation plan. He desired all USSTAF efforts be directed solely towards strategic bombing. For Spaatz, the strategic campaign centered on the destruction of German aircraft (in the air and on the ground) and oil production facilities. The analysis of Walt

Rostow and the Enemy Objectives Unit served to further convince Spaatz of the “correctness” of his views. Lastly, ACM Arthur Harris opposed any change in Bomber Command’s night area bombing tactics of German cities and industrial centers. Harris believed this was the best use of the RAF’s strategic air power. Eisenhower, of course, made the final decision and issued orders to implement the transportation plan. Each of these men had his own opinions on what should be targets for the tactical and strategic air forces.

Air Chief Marshal Trafford Leigh-Mallory

Leigh-Mallory was the Allied commander of all tactical air forces based in England. He was convinced that the transportation plan was the best way to support the D-Day invasion by the advice of Tedder and Zuckerman. Early on, he became the main proponent of the transportation campaign in attempting to persuade the other Allied leaders to implement this plan. He first proposed the idea of the transportation plan to Eisenhower and the combined chiefs of staff in early February 1944. He sincerely believed the best way to support the troops during the invasion was by attacking the rail marshaling yards and associated servicing centers.

His plan was to begin 90 days in advance of D-Day and targeted rail yards in the Belgian and French regions. This plan also called for the use of *all* American and British air power. Leigh-Mallory chose this plan of action based on two sources. The first source was an AEF Bombing Committee study showing that two-thirds of French rail capacity was being used for military traffic.¹ The study’s analysis suggested that disrupting this rail traffic would provide support for the Allied invasion force. The second source was the

combined advice of Zuckerman and Tedder. These men based their advice on personal experience and observation from the MAAF campaign in Italy.

The first source, the AEAF Bombing Committee, consisted of representatives from the AEAF, RAF Bomber Command, the AAF and the British Air Ministry. Zuckerman held the position of scientific advisor on the committee.² The Bombing Committee study provided information regarding marshaling yard size (typically over 500 acres) and the number of 500 pound bombs per acre (estimated at a total of four) needed to devastate a rail yard. This study recommended using a total of 45,000 tons of bombs for about 60 rail marshaling yards.³ This bomb tonnage was approximately half of what the Allies planned to drop between February and the D-day invasion. Since the tactical air forces could not alone deliver this quantity of bombs, the strategic air forces would have to assist in delivering the total amount of ordnance required.⁴ Another point evident in the study was that most of the targets were within range of fighter escort and fighter coverage. This would reduce the threat presented by German fighter aircraft. These facts helped convince Leigh-Mallory that the transportation plan should be implemented. A point also worth mentioning is Leigh-Mallory himself had originally established the AEAF Bombing Committee.

Zuckerman embraced the AEAF study and also helped to personally convince Leigh-Mallory of its validity. Zuckerman backed the AEAF study based on his analysis of the interdiction campaign which had been accomplished in Italy. Tedder also based his recommendations from his personal experiences in the Italian campaign. The AEAF study, and Zuckerman and Tedder's advice, combined to convince Leigh-Mallory of the soundness of the transportation plan.

Contrary to Spaatz and Harris, Leigh-Mallory also believed that bombing targets deep in Germany would not induce the Germans to fly their aircraft any more than the bombing of rail yards. The goal of which was to allow the Allies to destroy German aircraft in the air and gain air superiority. Instead, he believed (incorrectly as it would turn out) that the battle for air superiority would occur over the channel and invasion beaches on D-Day. In spite of continuous and vehement protests from Spaatz and Harris, Leigh-Mallory stuck to his guns and continually asked Eisenhower to execute the transportation plan with the participation of the strategic air forces.

Air Chief Marshal Arthur Tedder

During the Mediterranean campaign, Tedder became convinced that the best way to isolate the invasion battlefield was by attacking the rail transportation system, particularly the rail marshaling yards. As the former MAAF commander, Tedder had observed the results of bombing the lines of communication and the devastation of the rail marshaling yards. Simultaneously, he was also convinced of the inefficiency of targeting bridges because of the number of sorties that had to be flown to ensure their destruction.⁵ This interdiction campaign combined with the Allied ground offensive, helped breach the impasse which the Allies experienced in Sicily. He took the lessons learned from this smaller scale Italian interdiction campaign and applied it to the requirements to support the Normandy invasion.

Tedder also discussed with Zuckerman the idea of using the transportation attack concept in north-west Europe that Tedder had seen used in the Mediterranean campaign. It was during these discussions that Zuckerman persuaded Tedder of the validity of interdicting the rail centers to prevent the Germans from bringing reinforcements of men

and material to repel the Allied invasion forces. Tedder accepted Zuckerman's ideas, combined them with his lessons learned from the Mediterranean campaign, and subsequently convinced Leigh-Mallory that this was the proper method to support Operation Overlord.

Dr. Solly Zuckerman

During the Mediterranean campaign, Dr. Zuckerman had been the scientific advisor to Tedder. It was during this period that Dr. Zuckerman, a biologist, concluded that attacks on enemy railway and road lines of communication would make the best use of air assets during the invasion campaign. His analysis of the Mediterranean interdiction campaign determined that the railway marshaling yards were the critical target nodes. From his observations of Operation HUSKY (the invasion of Sicily), he recommended large rail yards were better targets than individual bridges or tunnels. He based his reasoning on the fact that larger targets required less bombing accuracy yet allowed achieving decisive results.⁶ On January 22, 1944, Zuckerman published a planning paper entitled *Delay and Disorganization of Enemy Movement by Rail* for review. It called for attacks on over seventy of the most important servicing and repair facilities in northwestern Europe and promised to paralyze movement of reserves.⁷ The paper detailed implementation of the transportation plan and was the basis of Leigh-Mallory's arguments in favor of the transportation plan.

One of the problems with Zuckerman's proposed transportation plan was the prediction of French civilian casualties in excess of 100,000. This was a cause for great concern among the Allied leadership. He predicted far fewer casualties and was able to persuade Harris to execute an operational experiment by having Bomber Command raid

and destroy six marshaling yards. This experiment proved to be a success and demonstrated that actual casualties would be much lower.⁸

Thus, Zuckerman advised Leigh-Mallory of the necessity to implement the transportation plan. He based his recommendations upon bombing accuracy, the ability to deny the Germans from moving reinforcements against the invasion, and the fact that civilian casualties were going to be lower than predicted. He helped convince Leigh-Mallory, who in turn, would finally convince Eisenhower to direct execution of the transportation plan.

Lt Gen Carl “Tooey” Spaatz

The transportation plan placed Leigh-Mallory directly at odds with Spaatz over use of strategic bombers. Spaatz did not support the transportation plan as he believed it would detract from the primary mission of the heavy bomber forces. Spaatz also held that the strategic bomber missions would ensure air superiority by forcing destruction of the Luftwaffe in the air. He frankly believed the transportation plan would not achieve air superiority.

Spaatz believed that the plan as outlined by Leigh-Mallory should, at the earliest, occur no more than 60 days prior to the mainland invasion. His primary concern was that the interdiction campaign would prevent him from following up on attacks in the Combined Bomber Offensive campaign.⁹ Spaatz did agree with Eisenhower that the USSTAF must come under the operational control of the Supreme Commander for support and execution of the invasion plan, but disagreed on the necessity of bombing rail yards.

During February and March, Spaatz repeated his misgivings to Eisenhower in an attempt to dissuade Eisenhower from implementing the transportation plan. In a final exhortation attempt to Eisenhower, Spaatz wrote a letter in which he clearly stated his thoughts on the misdirection that the targeting of the rail transportation system would cause. He wrote:

In our opinion, the proposed plan will not accomplish any worthwhile results in achieving these aims, and we are strongly supported in this view by the J.I.C. paper No. J.I.C. (44) 106 (0) (Final) dated 18 March 1944 and by inquiries from responsible agencies. The J.I.C. paper estimates that in the period D-Day to D plus 5 weeks, the German military rail requirement into the assault area will be about 80 trains per day, and in the period following D plus 5 weeks, about 50-55 trains per day. This is but a fraction of the available rail capacity. The inescapable conclusion from this is that the transportation “cushion” is so large, and essential traffic so small, that the proposed attack on transportation will be a misdirection of effort.¹⁰

Spaatz further emphasized that his plan for attacking the oil refineries was the best use of the strategic air forces. He ended this letter commenting on the value of strategic attacks on rail transportation versus oil production facilities:

Our final conclusions on rail transportation and oil as strategic targets are as follows:

- A. Strategic attacks on rail transportation with the forces and time available will not affect the course of the initial battle, and will not prevent the movement of German reserves from other fronts. On the other hand, our forces employed against oil will force policy decisions in anticipation of impending reduction in fuel supplies and consequent reduction in fighting power.
- B. We believe attacks on transportation will not force the German fighters into action. We believe they will defend oil to their last fighter plane.
- C. Attacks on the vast European rail transportation system cannot within any acceptable length of time weaken the resistance of his ground armies on all fronts simultaneously. Oil will do this very

thing, and expedite the success of OVERLORD in the period subsequent to D-Day.¹¹

Spaatz recommended three target priorities for attacks by the strategic air forces: the German Air Force, German aircraft production to include ball bearing manufacturing, and Axis oil production facilities. He concluded his letter by suggesting that SHAEF, AEAFF, and the air staff combine together and produce a plan for the tactical support of Overlord to "...provide for attacks in great strength upon communications and military installations of all kinds in order to assist to the maximum the initial phases of OVERLORD."¹² In short, Spaatz was against the transportation plan as suggested by Leigh-Mallory and believed transportation centers would be the wrong targets to attack.

Walt W. Rostow

Spaatz's line of reasoning came from Walt W. Rostow. Rostow was a first lieutenant in the Enemy Objectives Unit (EOU) of the Economic Warfare Division in the US Embassy in London. The EOU was a joint creation of the OSS and the Board of Economic Warfare and was staffed by a team of economists. The EOU's primary purpose was to develop and provide targets to the USSTAF.¹³

Rostow and the EOU office provided the counter arguments for Spaatz's use against Leigh-Mallory's transportation plan. Rostow and the EOU disagreed with Zuckerman's analysis derived from the Sicilian campaign. Instead, the EOU evaluated bombing results based on "aiming-point reports." According to Rostow, "These were analysis of particular German industrial plants or installations designed to establish the most vulnerable point of attack."¹⁴ This is known today as nodal analysis. These "aiming-point reports," and the successes of the USSTAF against the German aircraft production

facilities during the “Big Week” (February 20-25, 1944) provided the basis for the EOU to recommend enemy oil production facilities as the next target series. According to the EOU and Rostow, attacking oil production would hasten the end of the war. This was a major point convincing Spaatz of the correctness of his belief that bombing alone could win the war.

Not only had the EOU developed the a plan for attacking the enemy’s oil production, but they had also provided a counter plan to Leigh-Mallory’s transportation plan devised by Zuckerman. This alternative plan called for bridges, rail junctions, open stretches of rail line, ammunition and fuel dumps, ordnance depots, etc., to be included in the target list, along with rail marshaling yards. Rostow believed these types of targets would more thoroughly disrupt and deny German support against the invasion than Leigh-Mallory’s plan. EOU’s plan allowed Spaatz to use this targeting advice to promote his oil attack plan to Eisenhower.

Air Chief Marshal Arthur Harris

As commander of RAF’s Bomber Command, Harris did not initially side with Leigh-Mallory’s ideas of tactical support targeting in the transportation plan. Leigh-Mallory’s transportation plan was directly at odds with Harris’ ideas for the use of strategic bombers. Like Spaatz, Harris did not support the transportation plan. He thought it would detract from his command’s primary mission, the destruction of German cities and industry. He also believed the heavy bomber missions would ensure air superiority by forcing destruction of the Luftwaffe in the air. He held that changing from the current mission of night area bombing to daytime tactical targets would undo everything for which

Bomber Command had worked to achieve. He believed that switching Bomber Command's roles would allow Germany to further disperse and harden its industries.

However, each of Harris' arguments was defeated by the AEAF staff workers. He was shown his arguments concerning bombing accuracy, weather forecasting, and sortie rates were based on only deep strategic penetration missions and that the transportation plan targeting campaign in support of the D-Day campaign would allow his forces to overcome these obstacles.¹⁵ Eventually he was persuaded to support the targeting plan against the railway transportation system and began to study the requirements needed to send Bomber Command aircraft against these types of targets. Thus, Harris came to support the objectives of Leigh-Mallory's transportation plan.

Gen Dwight D. Eisenhower

The day of reckoning came on 25 March 1944. General Eisenhower formally decided the oil plan by itself was not sufficient to make an appreciable contribution to Operation Overlord.¹⁶ His decision was reached in spite of Spaatz's continued and vigorous protests against the transportation plan. An important point to remember is that prior to this day, Eisenhower's primary concern was unity of command over all the forces involved in the invasion effort. The strategic air forces were responsible to the combined chiefs and to no one else. Eisenhower found this to be unacceptable for his command which was to have responsibility for the main effort against Germany yet not have command over all forces. Eisenhower voiced his concerns and was finally given complete operational control over all the air forces.

While voicing his opinions concerning command, he also emphasized his belief in the necessity of attacking the rail network. Prime Minister Churchill vigorously protested the

attacks as they predicted numerous French casualties as well as the possible detrimental post war economic impact. Both of these issues could possibly alienate the French as Allies. Eisenhower, however, stuck to his reasoning and persuaded the combined chiefs of staff of the military necessity to attack these targets.¹⁷ Eisenhower approached the French and found out that they believed that this was a necessity of war and would be born uncomplainingly by the French.

To clear any misunderstandings which Spaatz and Harris might be harboring, Eisenhower finally issued a directive to USSTAF and Bomber Command on the use of strategic air forces in support of Overlord. In this directive Eisenhower states:

1. The overall mission of the Strategic air forces remains the progressive destruction and dislocation of the German military, industrial and economic system, and the destruction of vital lines of communication. In the execution of this overall mission the immediate objective is first the destruction of German air combat strength, by the successful prosecution of the Combined Bomber Offensive. Our re-entry on the Continent constitutes the supreme operation for 1944; all possible support must, therefore, be afforded to the Allied Armies by our air forces to assist them in establishing themselves in the lodgment area.
2. The first pre-requisite of success in the maintenance of the Combined Bomber offensive and our re-entry on the Continent is an over all reduction of the enemy's air combat strength and particularly his air fighter strength. The primary role of our air forces in the European and Mediterranean theatres is, therefore, to secure and maintain air superiority.
3. Our Armies will also require the maximum possible assistance on the ground preparatory to the actual assault. This can best be given by interfering with rail communications, particularly as affecting the enemy movements and concentrations in the "OVERLORD" area. A further directive covering the employment of the Strategic air forces during the assault period and the succeeding land operation will be issued in due course.
4. The particular mission of the Strategic air forces prior to the "OVERLORD" assault is:

- (a) to deplete the German air force and particularly the German fighter forces and to destroy and disorganize the facilities supporting them
- (b) to destroy and disrupt the enemy's rail communications, particularly those affecting the enemy's movement towards the "OVERLORD" lodgment area.¹⁸

The directive specifically addressed the USSTAF and the RAF Bomber Command and described their individual Operation Overlord support responsibilities. This directive from Eisenhower is what finally made Spaatz and Harris comply with the implementation of the transportation plan. It did, however, enable Spaatz to attack German oil and aircraft production facilities by allowing him to loosely interpret Eisenhower's first priority for the strategic air forces—defeat of the Luftwaffe.¹⁹

Notes

¹ Wesley Frank Craven and James L Cate, eds., *The Army Air Forces in World War II*, vol. 3, *Europe: Argument to V-E Day, January 1944 to May 1945* (1951; new imprint, Washington, DC: Office of Air Force History, 1979), 74.

² Solly Zuckerman, *From Apes to Warlords* (New York: Harper and Row, 1978), 220.

³ Craven and Cate.

⁴ Eduard Mark, *Aerial Interdiction, Air Power and the land Battle in Three American Wars* (Washington DC: Center for Air Force History, 1994), 225.

⁵ Ibid., 144.

⁶ Charles Messenger, *'Bomber Harris' and the Strategic Bombing Offensive, 1939-1945* (New York: St. Martin's Press, 1984), 158.

⁷ Walt W. Rostow, *Pre-invasion Bombing Strategy* (Austin, TX: University of Texas Press, 1981), 14.

⁸ Royal Air Force Historical Society, *Overlord-1944 Bracknell Paper No.5, A Symposium on the Normandy Landings* (Great Britain: Hartnolls, Bodmin, Cornwall, 1995), 77.

⁹ Richard G. Davis, *Carl A. Spaatz and the Air War in Europe* (Center for Air Force History, 1996), 327.

¹⁰ Lt General Carl Spaatz to Gen Arnold, letter, subject: Employment of Strategic Air Forces in the support of OVERLORD, 25 March 1944.

¹¹ Ibid.

¹² Ibid.

¹³ Mark, 227.

¹⁴ Rostow, 20.

Notes

¹⁵ Messenger, 156.

¹⁶ Rostow, 5.

¹⁷ Gen Dwight D. Eisenhower, *Eisenhower's Own Story of the War* (New York: Arco Pub. Co., 1946), 14-16.

¹⁸ Supreme Commander to USSAF and Bomber Command, draft letter, subject: Directive by the Supreme Commander to U.S.St.A.F. and Bomber Command for Support of "OVERLORD" during the preparatory period, 17 April 1944, 1.

¹⁹ Craven and Cate, 175.

Chapter 3

The Interdiction Campaign

In preparing for battle I have always found that plans are useless, but planning is indispensable.

—Gen Dwight D. Eisenhower

The Objectives

In mid-April, Eisenhower issued the formal directive which outlined the use of air assets to support Operation Overlord. This directive prioritized the use of air power for two missions:

The particular mission of the strategical air forces prior to the “OVERLORD” assault is:

- (a) To deplete the German air force and particularly the German fighter forces, and to destroy and disorganize the facilities supporting them.
- (b) To destroy and disrupt the enemy’s rail communications, particularly those affecting the enemy’s movement towards the “OVERLORD” lodgment area.¹

Utilizing Eisenhower’s directive, the transportation plan implemented by the Allies consisted of four objectives. They were:

1. Destruction of servicing facilities at key rail centers to reduce over-all rail capacity;
2. Destruction of all rail bridges along selected interdiction lines to prevent through military movements by rail.
3. Fighter/fighter-bomber attacks on rail lines, railroad rolling stock and road vehicles to disorganize military movements within the battle zone.
4. Destruction of road bridges along the Seine-Loire interdiction lines, especially the Seine River, to reduce enemy ability to transport material and troops.²

These objectives “...aimed to create a railway desert within 150 miles of Caen...”³ It was assumed that after the beginning of the invasion, air power would be largely committed to supporting the ground forces and that the Germans would be unable to repair many of the damaged rail lines quickly. Subsequent attacks would be restricted to ones on which traffic would be observed. The Allies were careful to consider targeting throughout the French and Belgian regions to mislead the enemy as to the actual invasion point. Only portions of the actual interdiction lines were initially attacked to preserve the deception plan in effect. The remaining interdiction targets, those which would directly affect access to the Normandy area, were reserved until within a few days of the actual invasion.⁴

Allied Preparations

According to the plan, five rail interdiction lines were drawn. Three of these were between Normandy and Germany, while the other two lines were north of Paris along the Oise river and south of Paris along the Loire river. These rail lines included a total of 72 bridges and nearly a thousand miles of rail line. Two highway interdiction lines were developed along the Seine and Loire rivers. Over these particular rivers were bridges with long spans, the destruction of which would force the Germans to use alternative crossings. These alternative crossings would have significantly reduced capacity for supporting enemy movement.⁵

In preparing the defenses of the “Atlantic Wall,” the Germans had to contend with a massive Allied deception plan. This deception plan was Operation Fortitude, which created a fictitious U.S. First Army Group under the command of Patton. This plan included rubber tanks, a fake radio net, empty tent cities, and rows of wooden aircraft.

This deception plan was so effective that for an entire month after D-Day the Germans refused to believe that the actual invasion had occurred.⁶ This lack of intelligence about where the Allies would land, forced the Germans to thinly spread men and materials across their “Atlantic Wall.”

By 28 March 1944, the Allies had tremendous resources available. According to the report, “Status of Air Prerequisites for Operation Overlord,” prepared by the AC/AS Intelligence Analysis Division, European Branch, the numbers of aircraft planned for support of Overlord had been attained. Table 1 shows the number of aircraft available to

Table 1. Number of USAAF and RAF aircraft available on 28 March 1944

Type of Aircraft	8 th and 9 th Air Forces		RAF	
	# Of Acft	+/- Deltas	# of Acft	+/- Deltas
Heavy Bombers	2187	+ 42	1450	- 150
Medium Bombers	1194	- 469	74	- 166
Light & Dive Bombers			275	+ 15
Day Fighters	3266	+ 1137	1828	+ 1036
Night Fighters	36	+ 36	319	+ 169
Fighter Recce	108	+ 108		
Photo Recce	144	- 24	71	-29
Observation		- 336	160	
Troop Carrier	<u>844</u>	+ 544	<u>210</u>	+ 20
TOTAL	6935		4387	
Allied Aircraft Grand Total				11322

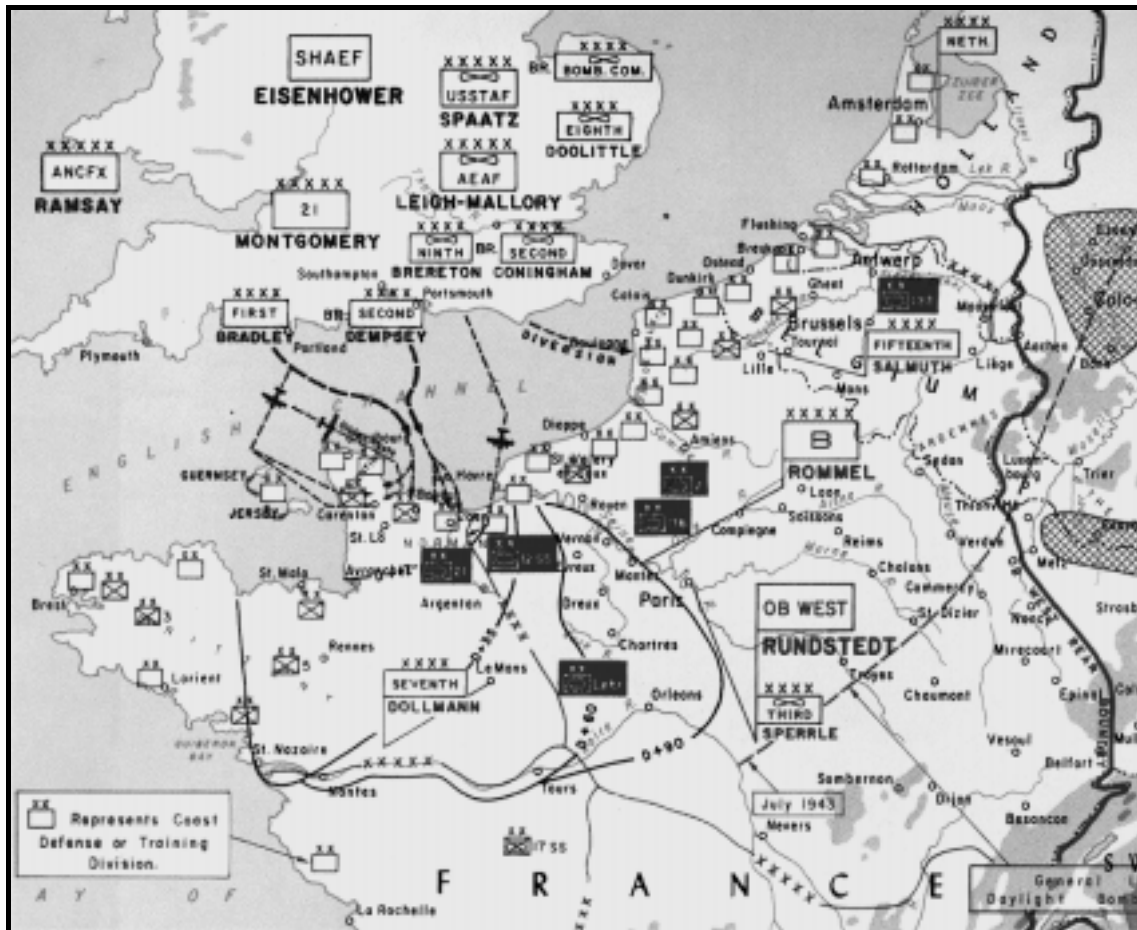
Source: AC/AS Intelligence Analysis Division, European Branch, Status of Air Prerequisites for Operation ‘Overlord’ with Estimate of Situation, staff study, 29 March 1944, 6

the Allies with the differences between what had been planned upon on 30 July 1943 to what was actually available on 28 March 1944. In contrast to the large numbers of Allied aircraft (over 11,000), intelligence reports estimated the Germans had only a total of approximately 1800 aircraft available on the entire western front. Of these 1800, the

Allies estimated only 555 aircraft would be usable against the Allied invasion. Only 50 percent (270 aircraft) of those usable aircraft were fighter or ground attack aircraft. The remainder were long range bomber and reconnaissance aircraft, which would be of little use in repelling the Allied invasion.⁷

German Preparations

As early as 1942, Hitler had decreed the French coast be fortified in anticipation of an invasion. In spite of this, the eastern front received priority in men and material at the expense of building the “Atlantic Wall.” Hitler’s attention on the west was not refocused until mid-October 1943, when Field Marshal Gerd von Rundstedt, the commander of German forces in France, submitted a report detailing the lack of preparations on the French coast. As a result, Hitler disseminated Directive No. 51 on November 3, 1943, to address the shortfalls in the defenses as outlined by von Rundstedt. This directive provided guidance calling for renewed efforts in fortifying the coastline from Denmark to the French Riviera. Figure 1 depicts the extent of the coastline. In December 1943, Hitler sent Field Marshal Erwin Rommel to appraise the defenses and report his findings directly back to Hitler.⁸ Rommel began work to improve the coastline defenses almost immediately. By the end of May 1944, Rommel had deployed 1.9 million men to the west, built 16,000 bunkers, and laid over 4 million mines. Of the 58 divisions in the west, 37



Source: Thomas E. Griess. *Atlas for the Second World War: Europe and the Mediterranean* (New York: Avery), 53.

Figure 1. This map outlines the length of coastline the Germans had to protect divisions were deployed directly along the coastline. Significantly, the Germans had placed more forces in the Pas de Calais region versus the Bay of Biscay coast, presumably as a result of the Allied deception campaign.⁹ While Rommel and von Rundstedt did agree on the fact that area defenses needed strengthening, they had completely different ideas of how to employ reserves allocated to the area. The differences in background, training and experiences of each man played significant roles.

Von Rundstedt's family was from the oldest Prussian nobility and he was a man trained in the style of the old school. His staff remembered him as being cool and sober,

polite, taciturn, and a personification of the last of the Teutonic knights. He had served in the military since 1888 and in World War I he served on the general staffs. He had retired in 1938 but was quickly recalled to active duty by Hitler. Von Rundstedt followed the old school traditions as he had learned through the years and directed his forces from maps and delegated work to his staff. He was a master strategist whose approach to the defense of the coast was on the strategic level, but left the employment details to his staff.¹⁰ His style would leave gaps between what he had planned at headquarters versus would actually happen in the field.

Rommel was a perfect contrast to von Rundstedt. He was the youngest German field marshal, rising through the ranks after the German military began to increase in size during the mid 1930s and was not a product of the staff system. He tended to be impulsive and often led from the front line of troops. His success in the Afrika Korps was well publicized and for a time he became the world's most famous general. This notoriety was testament to his consummate ability to handle public relations. Hitler appreciated Rommel's unconventional but successful methods and quickly promoted him to field marshal. However, when compared to von Rundstedt, Rommel was a better tactician but a poorer strategist and lacked an appreciation of the "...organizational side of strategy such as flank protection, supply and so on."¹¹ These men's individual experiences and backgrounds led each to arrive at a different set of plans on how to best employ the reserves to protect the coastline.

Field Marshal Erwin Rommel

Rommel believed the German forces should be deployed well forward, close to possible invasion landing zones. He thought the reserve forces deployed near Paris would

be unable to quickly deploy to where the invasion landing occurred. He based these opinions on his experiences with Allied air power in North Africa and Italy. Rommel outlined his invasion scenario in a 31 December 1943 report to Hitler in which he stated:

...The landing will probably be preceded by very heavy attacks from the air and be made under cover of a smoke-screen and of intense fire from numerous warships, with simultaneous heavy-bomber attacks....Our defence line, thin as it is at present, will suffer severely from the enemy bombing and artillery bombardment and it seems very doubtful whether, after this battering, it will be capable of beating off the enemy....With the coastline held as thinly as it is at present, enemy will probably succeed in creating bridgeheads at several different points and in achieving a major penetration of our coastal defences. Once this has happened it will only be by the rapid intervention of our operational reserves that he will be thrown back into the sea. This requires that these forces should be held very close behind the coast defences.

If, on the other hand, our principle reserves have to be brought up from well back inland, the move will not only require a great deal of time—time which the enemy will probably use to reinforce himself at his point of penetration and either organize his forces for defence or press the attack farther inland—but will also be under constant danger from the air... British and American superiority in the air alone has again and again been so effective that all movement of major formations has been rendered completely impossible, both at the front and behind it, by day and by night, and our own air force has only on rare occasions been able to make any appearance in support of our operations...

...The battle for the coast will probably be over in a few hours and, if experience is any judge, the rapid intervention of forces coming from the rear will be decisive.¹²

On 23 April 1944, Rommel repeated his fears in a letter addressed to Colonel General Jodl, a member of Hitler's Armed Force High Command (OKW) staff. He stated that he believed the mobile forces were dispersed too far inland and would arrive too late to participate in the battle. He also stated his belief that the movement of these forces would be exposed to tremendous air attacks when they began to move forward. Rommel wanted to ensure the tanks in the reserve forces could move into battle in less than three hours;

even if the infantry and local reserves had to fight a delaying action. However, Rommel could not convince von Rundstedt and the OKW that defense in depth was only theoretically sound and would in fact be impossible against Allied air interdiction efforts

Field Marshal Gerd von Rundstedt

Von Rundstedt believed it essential to have mobile armored forces in reserve. He wanted to enable the concentration of forces where the Allies were attempting to accomplish their invasion landings, when they were the most vulnerable. In his planning for the invasion, Von Rundstedt stated his preferred order for defeating the Allied invasion. His first (and ideal step) was to defeat the enemy at sea. The next was to counterattack the landing forces and drive them back into the sea. Local reserves would enhance this effort. If this effort failed, the reserves from the surrounding corps and army reserves would be called into action. The last resort would be moving the large armored divisions, stationed near Paris, into action.¹³

He succeeded in gaining approval for the creation of a “Panzer Group West” which commenced build up by the end of 1943 by General Baron Leo von Schweppenburg (von Rundstedt’s tank force commander.) In January 1944, after the unit was formed, it was placed under the command of von Rundstedt, who, in the tradition of the strategic approach to planning by the German General Staff, left the details of implementation to von Schweppenburg. Von Schweppenburg only partially appreciated the difficulties Allied air power would inflict and calculated that the “armored divisions 24 to 48 hours to get into position close to the enemy.”¹⁴ To compensate for this, von Schweppenburg believed the panzer divisions would be able to move up at night and that this delay would enable the Germans to “...clearly recognize the enemy’s main point of attack and plan adequate

countermeasures.”¹⁵ Both Von Rundstedt and von Schweppenburg believed that these efforts would defeat the Allied invasion. However, neither von Rundstedt nor von Schweppenburg had seen air power successfully used in an interdiction role and based their recommendations on their previous experiences. Von Rundstedt was able to convince Hitler and the OKW of the correctness of his plan.

Hitler's Decision

On 26 April 1944, Hitler ordered the formation of a new army group to oversee the armies already in southern France. His order created ten new tank divisions. Rommel's Army Group B received three of these tank divisions while three were placed under von Rundstedt's control. The four remaining tank divisions were placed as a strategic reserve of the OKW under Hitler's control and stationed near Paris. Rommel achieved only partial control of the tank reserves for which he had fervently argued. Von Rundstedt, on the other hand, was able to realize his idea of a “graduated operation along the coast” and assigned his reserves near Paris.¹⁶ These allocations of the reserve tank divisions by Hitler caused increasing command confusion in the west by allowing Rommel, von Rundstedt and the OKW to be in charge of the reserves near Paris.¹⁷ No single German would be in command during the invasion. Thus the Germans and Allies were prepared for the impending invasion.

The Results

Once Eisenhower made his decision to implement the transportation plan, the Allies began to attack marshaling yards, roads, bridges, and German airdromes in France in an even larger target set than had been originally envisioned by Leigh-Mallory. The Allies

avoided over concentrating on the invasion zone to keep the Germans from learning where the actual invasion was to take place and spread the attack throughout the French and Belgian regions. The results were very successful.

Allied Reports

According to a report by the Office of the Assistant Chief of Air Staff, Intelligence, Analysis Division, European Branch entitled *Strategic Bombing of Axis Europe January 1953 - September 1944, Bomb Damage to Axis Target Systems*, dated 15 November 1944, the Allies dropped over 400,000 tons of bombs in the European theater during the period January 1944 through June 1944. Of these 400,000 tons, 147,999 tons (37 percent) were dropped on the rail transportation system. Of the 147, 999 tons, 121,049 tons (81 percent) were dropped from April through June 1944.¹⁸ This clearly demonstrates the increased targeting of the rail system as directed by Eisenhower and the increased allocation of bomb tonnage for these targets.

The report “Estimates of Effect of Air Attack on Axis Transportation” prepared by the Office of the Assistant Chief of Air Staff, Intelligence, dated 17 June 1944, summed up the Allies’ targeting efforts against the European transportation systems. Prior to March 1944 there had been sporadic air attacks on the transportation infrastructure. Damage caused by these attacks was typically a by-product of both RAF area attacks and the close proximity of rail installations to USAAF attacks on industrial zones. Effectively, these assaults had little impact on the transportation system except for very brief periods.¹⁹

However, with the transportation plan directive in place, the Allies began to systematically target rail systems in Italy, Northern France, Belgium, Western Germany, and the Balkans. During the period March through May 1944, the Allied air forces

stationed in England dropped 32 percent of all tonnage against transportation. During this same period, the MAAF dropped 63 percent of its bomb tonnage against transportation. Between the two areas, a total of 42 percent of all bombs dropped were against transportation targets. Previously, French sources had estimated 30 percent of all rail traffic was in support of the German military and another 20 percent was for German economic support. By May, it was estimated that there was virtually no economic traffic on the rail system. The report further stated that it was highly probable that German military traffic was seriously affected as well. These reductions are significant in light of the fact that estimates showed the Germans had already proscribed rail traffic to 50 percent of pre-war levels.²⁰

These attacks resulted in heavy damage to transport systems supplying the axis fronts and successfully denied the capability of the Germans to carry adequate supplies for employment.²¹ Table 2 shows the bomb tonnage distribution by region on rail marshaling yards. During this period the amount of rail track, rail cars, locomotives and percentage of military and civil traffic moving on the French rail system declined dramatically. Significantly, the strategic air force's principal contribution prior to D-Day was a series of attacks in western France and Belgium. These attacks destroyed 37 rail centers and heavily damaged 23 more.²²

Table 2. Bomb Distribution on Rail Centers During the Transportation Plan

Location	<i>Prior to Apr 29, 1944</i>		<i>Apr 29 - Jun 5, 194</i>		<i>Total Pre D-Day</i>	
	Tons	Percent	Tons	Percent	Tons	Percent
North	13463	41	8350	22	21813	31
East	1765	5	2417	6	4182	6
West	5371	16	6662	18	12033	17
South West	2467	7	2448	7	4915	7

Table 2 (continued)

	Prior to Apr 29, 1944		Apr 29 - Jun 5, 1944		Total Pre D-Day	
Location	Tons	Percent	Tons	Percent	Tons	Percent
South East	2067	6	3104	8	5171	7
Belgium	5961	18	8113	21	14074	20
Other ^a	<u>2171</u>	<u>7</u>	<u>6798</u>	<u>18</u>	<u>8969</u>	<u>12</u>
Total	33265	100	37892	100	71157	100

^aIncludes Alsace-Lorraine, Luxembourg, and Germany.

Source: Eduard Mark, *Aerial Interdiction, Air Power and the land Battle in Three American Wars* (Washington DC: Center for Air Force History, 1994), 234

By May 9, 17 rail centers had been rendered unusable and another 12 had been heavily damaged. In 32 of 92 observed cases of repair activities, no attempt to repair damage to sidings or installations occurred within 2 to 53 days post attack. In 35 more cases of observed repair attempts, the only activity was clearance of rolling stock and removal of debris. In only 5 instances was nearly complete repair observed. This is a dramatic testament to the effectiveness of the targeting campaign and the difficulties the Germans encountered in repairing the damage. The damage was sometimes so severe that the German's attempts to prioritize repairs through lines were hampered and the lines remained completely closed for three to eight days.²³

During this time, Spaatz continued to lobby Eisenhower for attacks on oil production facilities. Eisenhower's published priorities for air power actually allowed Spaatz to continue efforts on his own priority targets, the oil and aircraft production facilities. Spaatz persevered in the belief that there were sufficient strategic bombers available to devote a simultaneous effort to both invasion support and his strategic campaign. In fact, under the guise of defeating the Luftwaffe (the supreme commander's stated number one priority), Spaatz directed attacks against German oil production facilities utilizing the strategic air forces under his command. Spaatz also harbored a belief

that the D-Day invasion would probably be a failure, but did not want it to appear that he had not done everything Eisenhower had asked of him. Accordingly, he grudgingly supported the transportation campaign with strategic bombers.²⁴

The oil campaign also significantly influenced the success of the transportation campaign. The combination of the oil and transportation campaigns combined synergistically and allowed the Allies to gain air superiority for the invasion for two reasons. First, the interdiction campaign forced the Germans to pull back their deployed fighter forces from the invasion area. The oil campaign then compelled the Germans to cut back on the training of new pilots while forcing them to fly longer distances. The longer distances reduced the German aircraft loiter times and forced them to cut even deeper into their fuel reserves. The amount of fuel available to the Germans was reduced from 927,000 tons in March to 472,00 tons in June.²⁵ The Office of the Assistant Chief of Air Staff, Intelligence Analysis Division, European Branch estimated that by July refinery production output had dropped to 50 percent of pre-attack production level.²⁶ These attacks began to diminish the available fuel supply and subsequently the combat capability of the German pilots by reducing the amount of training they received before being placed in a combat unit.

The impact for the Allies are further summed up in a staff study from AC/AS Intelligence dated 11 May 1945 which stated,

The measure of the success of these attacks on the enemy lines of communication in delaying the movement of enemy troops into the battle area exceeded the highest hopes of the allies. It had been estimated that in spite of air attack the enemy forces on D plus 7 would have increased from 9 to 24 divisions and by D+17 would total 31 divisions. Actually the strength on D+7 was only 15 divisions and by D+17 only 18 divisions. Moreover, some enemy formations suffered heavily en route. Long

detours were forced on troops which had to move by truck, horse-drawn vehicles, bicycles and even on foot from the Paris area. Heavy equipment, especially tanks, entered the battle with greatly reduced efficiency and the fighting value of troops which walked a hundred miles from Paris under constant air attack must also be considered in assessing the results of the air attacks on communication.²⁷

In total, the Allies flew 29,019 sorties and dropped 75,433 tons of bombs against rail centers, rail bridges and road bridges. The enemy was unprepared for the weight and intensity of attacks against the rail marshaling yards. Typically, the only response by the Germans was to begin clearing and repairing a minimum of the marshaling yard track and facilities to enable movement of through traffic. Any effort to move functions to other marshaling yards became impossible when yard after yard was destroyed or damaged. The only choice presented to the Germans was to abandon the affected marshaling yards and accept the reduction in capacity. In contrast, the Germans were somewhat better prepared for the attacks on bridges. They were able to prepare alternative crossings but had to accept the fact that these alternatives did have reduced capacity for movement. The transportation plan was clearly a success for the Allies in terms of the interdiction of men and supply movement to the front.

German Reports

The Germans encountered great difficulties in reinforcing the troops engaged with the Allies on the Normandy beachhead. The lack of defense build up in the Normandy area coupled with indecision regarding where, when and how to allocate and move reinforcements, rendered the Germans highly ineffective. Translations of extracts from German 7th Army reports show that on 8 July 1944, Hitler ordered the German Army in France to continue preparations to repel a second enemy landing. He further ordered the

reserves of the 15th Army to remain in place until there was sufficient evidence of whether or not the Allies would be attempting a second landing.²⁸ Operation Fortitude, the deception plan, had been so effective that for a month beyond the Normandy landings, the Germans continued to assume the real invasion was still to occur at Pas de Calais.²⁹ This delay allowed the Allies to destroy rail yards, rail bridges, and road bridges before movement of the German reserves began, contributing to the success of the transportation plan.

During the period 15 May to 3 June 1944, German situation reports from the 7th and 15th Army Headquarters in the Normandy area outlined Allied air activity and summarized the results of air attacks by the Allies. These reports clearly show the increased attacks on transport targets and Luftwaffe installations. As the reports progress through June, the concentrated effects of the air attacks can be seen with details on the number of personnel killed/wounded, and objects destroyed or damaged. In early June, the German commanders also stated a belief that the Allies were increasing preparations for invasion.

Here is a portion of the weekly situation report for 28 May to 3 June 1944:

The continuation and systematic increase of enemy air attacks and more intensive minelaying in our harbors with improved mining equipment indicate an advance in the enemy's readiness for invasion. Concentration of air attacks on coastal defences between Dunkirk and Dieppe and on the Seine-Oise bridges confirm the presumed focal point of a large-scale landing, and the possibility that communications may be cut off on the on the flanks and the rear.³⁰

This situation report clearly shows the deterioration in the transportation situation. Also, according to the report, Allied air attacks had destroyed or damaged all crossings between Paris and Rouen by early June. It also warned of the weakened defensive capabilities resulting from the lack of fuel supplies and the closure of Luftwaffe airfields in the area.³¹

Translations of other situation reports show almost continuous successful attacks on communications targets in France during the transportation plan execution period. Messages dating from early March through late June report numerous attacks on bridges, rail yards, and other military targets. These reports give detailed results of the damages caused by the Allied air attacks against transportation targets.³²

Once the invasion had begun, another German situation report, dated 11 Jun 1944, clearly showed the difficulties the Germans experienced in moving forces to the front:

Owing to the enemy's overwhelming air superiority it was not possible to bring up the 1st SS Panzer Corps, the 7th Mortar Brigade, III Flak Corps and II Paratroop Corps (Meindl) quickly into the area between the Orne and the Vire, or to make a counter-attack on the enemy forces which had landed.

Almost all transport on roads, byroads and on open country is prevented by day by strong fighter-bomber and bomber formations. Movement of our troops in the battle area by day are almost completely prevented, while the enemy can operate freely. In rear areas all confined areas are continually exposed to attacks, and it is very difficult to bring up the necessary supplies of ammunition and fuel to the troops.³³

Interviews with German POWs also show the impact the interdiction campaign had on the Germans. A report entitled "Evaluation of Transportation as an Air Target, A Summary of European Experience" from the Office of the Assistant Chief of Air Staff, Intelligence, dated 15 Jun 1944, quotes several German officers on the difficulties the transportation interdiction campaign caused for the Germans. Oberst Hans Hoeffner, general staff officer for railway transport matters under von Rundstedt clearly stated the impact of the Allied interdiction efforts:

"The Allied air attacks which started on the railway network in FRANCE and BELGIUM in March 1944, and which continued throughout the invasion period, played out a decisive part in the difficulties and the defeat of the German Armies in France..."³⁴

Clearly, these German reports show the effect the transportation campaign had on the their ability to repel the Allied invasion. The Allied attacks on bridges, marshaling yards, road intersections, airfields, etc., coupled with the German's inability to commit their reserves all contributed to the success of the Allies' transportation plan.

Notes

¹ Rostow, 6.

² Office of the Assistant Chief of Air Staff, Intelligence Analysis Division, European Branch. *Evaluation of Transportation as an Air Target, A Summary of European Experience, Tab B, Overlord - The Interdiction Campaign*. Washington DC. 15 June 1945, 1.

³ Royal Air Force Historical Society, 77.

⁴ Office of the Assistant Chief of Air Staff, Intelligence Analysis Division, European Branch. *Evaluation of Transportation as an Air Target, A summary of European Experience, Tab B, Overlord - The Interdiction Campaign*.

⁵ Ibid.

⁶ Mark, 216-217.

⁷ Ibid., 7-11.

⁸ Mark, 216-217.

⁹ Dieter Ose, "Rommel and Rundstedt: The 1944 Panzer Controversy," *Military Affairs*, vol. 50, no. 1, January 1986, 8-9.

¹⁰ Ibid., 8.

¹¹ Ibid.

¹² Quoted in Directorate of General Purpose and Airlift Studies Assistant Chief of Staff, Studies and Analysis, HQ, USAF, *The impact of Allied Air Interdiction on German Strategy for Normandy Saber Measures (Bravo)* (Washington DC: USAF Headquarters, August 1969), 4-5.

¹³ Ose, 9.

¹⁴ Ibid.

¹⁵ Ibid.

¹⁶ Ibid., 10.

¹⁷ Mark, 220.

¹⁸ Office of the Assistant Chief of Air Staff, Intelligence, Analysis Division, European Branch, *Strategic Bombing of Axis Europe January 1943 - September 1944, Bomb Damage to Axis Target Systems* (Washington DC: 15 November 1944), 9-10.

¹⁹ Office of the Assistant Chief of Air Staff, Intelligence, *Report to C.O.A. on European Axis Transport as an Air Target System, Appendix B, Estimates of Effect of Air Attack on Axis Transportation* (Washington DC: 17 June 1944), 1.

²⁰ Ibid., 1-8.

²¹ Ibid., 39.

Notes

²² Office of the Assistant Chief of Air Staff, *Strategic Bombing of Axis Europe January 1943 - September 1944, Bomb Damage to Axis Target Systems*, 40.

²³ Office of the Assistant Chief of Air Staff, *Intelligence Report to C.O.A. on European Axis Transport as an Air Target System, Appendix B, Estimates of Effect of Air Attack on Axis Transportation*, 8.

²⁴ Davis, 395.

²⁵ Craven and Cate, 286.

²⁶ Office of the Assistant Chief of Air Staff, Intelligence Analysis Division, European Branch, *Strategic Bombing of Axis Europe January 1943 - September 1944 Bomb Damage to Axis Target Systems*, 2-3.

²⁷ AC/AS Intelligence Dossier on Air power, *Air Power – Significance* (42 - 45), staff study, 11 May 1945.

²⁸ Air Ministry, A.H.B.6., “German Anti-Invasion Measures November 1943 - 1944 Extracts from the war diaries of the German 7th Army.” Translated, 31 March 1948, 8-9.

²⁹ Mark, 216.

³⁰ Air Ministry, A.H.B.6., “Situation Reports by German Army Commanders in Normandy May 15 - October 11, 1944.” Translated, 1 July 1948, 1-15.

³¹ *Ibid.*, 10-11.

³² Air Ministry, A.H.B.6., “The Effects of Allied Bombing Raids on French Targets.” Translated, February, 1950.

³³ *Ibid.*, 15-16.

³⁴ Office of the Assistant Chief of Air Staff, Intelligence, Analysis Division, European Branch, *Evaluation of Transportation as an Air Target, A Summary of European Experience* (Washington DC: 15 June 1945), ii.

Chapter 4

Conclusions

Opinions are made to be changed—or how is truth to be got at?

—Lord Byron (1788–1824), English poet

The debate to execute the transportation plan was a somewhat dramatic clash of personalities and opinions of the men involved in deciding how to best support the Allied invasion forces. The numerous alternatives put forth by Spaatz and the unwaveringly single-minded plan of Harris' area bombing of German cities and industrial centers, provided a great deal of information to the air leaders for discussion and decision. The transportation plan was a high risk endeavor in that if it did not prevent the Germans from reinforcing the invasion area, the Allies would lose in their bid to gain a foothold on the continent with the subsequent implications for the remainder of the war. The converse was that if it did work, it would virtually guarantee the Allies in being successful in putting enough men and supplies into Normandy. This leads to the question, "What were the major factors which contributed to the success of the transportation plan?"

Synergism

The use of the fighter bombers and medium bombers against the bridges and tunnels and the strategic attacks against the oil production facilities was synergistic. The Germans

were unable to reinforce and increase men and supplies in the Normandy area, while at the same time they were experiencing critical shortages of fuel, thus preventing employment of their aircraft against the Allied invasion force. These factors, coupled with the overwhelming numbers of aircraft the Allies were able to bring to bear against the Luftwaffe, ensured not just air superiority but air supremacy for the Allied invasion.

Air Supremacy

The Allies had more than five times the total quantity of aircraft of the Germans. In numbers of fighter aircraft alone, the Allies had over 5000 day fighters versus the 250 the Germans had on hand in the French region. Even the 1,100 additional fighters the Germans attempted to deploy into the area for operations were not adequate to challenge Allied air supremacy. The Germans were unable to penetrate the air defenses and resorted to protection of supply lines and attacks on Allied artillery spotting aircraft. These limited roles proved to be ineffective and had little impact on the Allies' invasion efforts.¹ The Allies operated freely over their invasion forces against the German military.

Greater Variety of Interdiction Targets

The transportation plan successfully prevented the Germans from reinforcing their engaged forces in Normandy. Additionally, air power's flexibility was demonstrated by expanding the original target list from rail marshaling yards to include rail/road bridges, tunnels, and road intersection choke points. The use of fighter-bombers allowed the Allies to knock out bridges with minimal amounts of bomb tonnage. For example Leigh-Mallory and Zuckerman, who originally believed that fighter bombers would be unable to cut railway lines and destroy bridges and tunnels, were shown how a flight of 12 P-47's with

six tons of bombs could effectively destroy bridges.^{2,3} Also, Tedder, as the Deputy Supreme Commander, gave the go ahead for more of these attacks when shown this fighter-bomber capability. By increasing the variety of target types, the Allies halted the movement of German reinforcements from Paris.

Even Harris was pleased with the efforts of RAF Bomber Command in spite of the fact that he had originally feared that changing the targets and tactics would not be the best use of the men and aircraft under his command. RAF Bomber Command flew 13,349 sorties against the rail system of North-West Europe, dropping 52,347 tons of bombs with a low casualty rate of 2.6 percent for four months of operations.⁴ He commented on the efforts of Bomber Command:

Bomber Command's attacks in the three months before D-Day were so effective, and the new means and tactics of precision bombing were so rapidly mastered (I myself did not anticipate that we should be able to bomb the French railways with anything like the precision that was achieved) that the invasion proved to an infinitely easier task than had been expected; not even the most hopeful of the allied leaders had thought the casualties would be so light or the setbacks so few.⁵

The conclusion can be drawn that Harris was satisfied with the efforts of Bomber Command in support of the invasion interdiction plan even after his initial opposition to the plan. The increase in target variety and use of all aircraft, tactical and strategic, contributed to the success of the transportation plan.

The Oil Campaign

Spaatz's oil campaign contributed to air supremacy over the invasion beaches by causing the Germans to spread their fighter forces around Germany. His crusade of destroying the aircraft production factories was not as successful as he desired. Captured German documents showed the availability of German aircraft did not change appreciably

from January 1944 through August 1944. The number and types of German aircraft available continued to remain approximately 3800 to 4000.⁶ This occurred in spite of the fact that the number of bombs dropped against German aircraft production facilities increased tremendously in 1944.⁷

However, Spaatz's oil campaign produced significant results in reducing the amount of fuel available for both combat air forces as well as training for new Luftwaffe pilots. The fuel for training was trimmed significantly and prioritized to the front. This reduced the training and qualifications of the new pilots to an absolute minimum. The new pilots were ill equipped to cope with the poor German weather and suffered significant losses against the more experienced Allied pilots.

The lack of fuel impacted the availability of German aircraft on the front for two reasons. The first was because of the successful Allied interdiction campaign in France. The Germans were forced to move their fighter aircraft further inland, thus reducing the available loiter times and the ability to rapidly turn the aircraft for the next flight. Second, because of the longer flight times from within Germany, the Germans were compelled to use more of the fuel reserves they wished to husband. Thus Spaatz's oil production facility destruction campaign significantly impacted the transportation plan by allowing Allied aircraft to freely roam the skies over France in support of D-Day.

Scientific Analysis

Lastly, the interdiction campaign was the beginnings of scientific analysis in application of targeting science. The two men who were the primary analysts were Walt Rostow and Dr. Solly Zuckerman. Both of these men had no previous military experience

yet attempted to “scientifically” analyze the Germans and quantify the amounts of weapons needed to successfully destroy a “system” of targets and impact the war in favor of the Allies. Today, this quantification of capability versus an enemy is known as operations analysis. The selection of a particular target set and the further selection of the key link in that target set is today known as nodal analysis. Rostow and Zuckerman attempted to do operational and nodal analysis and advise the military leadership on the best course of action. These men and their use of scientific analysis played a significant role in the development of the transportation plan and the targets prioritized for attack.

Summary

The overwhelming numbers of Allied aircraft, the increased numbers of interdiction targets from what was originally proposed in the transportation plan, the impact of the oil campaign, and the German indecision to commit their reserves combined synergistically and allowed the Allies to realize a successful invasion. Also, the use of targeting science was successfully employed even if at times the analysts opposed each other. The advisors each influenced their respective military leaders and influenced what the Allies attacked.

Thus, the five significant factors which had the greatest impact on the transportation plan and its support of the D-Day invasion were as follows: 1) the vast numbers of Allied aircraft relative to the Germans helped achieve and maintain air superiority; 2) the increased variety of targets which were attacked in implementation of the transportation plan; 3) the oil campaign with its impact on German aircraft availability and quality of German combat pilots; 4) the German’s indecision to commit their reserves based on the belief that the real invasion had not yet occurred; and 5) the impact of the scientific

advisors on the military leadership's decisions. These factors were crucial in contributing to the success of the transportation plan in support of the D-Day invasion.

Notes

¹ Mark, 243.

² Zuckerman, 217.

³ Davis, 408.

⁴ Arthur Harris, *Bomber Offensive* (New York: The Macmillan Company, 1947), 203-204.

⁵ Ibid., 266.

⁶ Air Ministry, A.H.B.6. "Luftwaffe Strength and Serviceability Tables, August 1938 - April 1945." Translated, October 1951, 37-40.

⁷ Stephen L. McFarland and Wesley Phillips Newton, *To Command the Sky* (Washington DC: Smithsonian Institution Press, 1991), 123.

Glossary

AAF	Army Air Force
ACM	Air Chief Marshal
AEAF	Allied Expeditionary Air Forces
EOU	Enemy Objectives Unit
MAAF	Mediterranean Allied Air Force
OKW	German Armed Forces High Command
OSS	Office of Strategic Services
RAF	Royal Air Force
SHAEF	Supreme Headquarters, Allied Expeditionary Forces
USAAF	United States Army Air Force
USSTAF	US Strategic Air Force

Bibliography

Letters

Spatz, Lt General Carl A. To Gen Arnold. Letter. Subject: Employment of Strategic Air Forces in Support of OVERLORD, 25 March 1944. Maxwell AFB, AL: Historical Research Agency, 168.1612.

Supreme Commander. To USSTAF and Bomber Command. Draft Letter. Subject: Directive by the Supreme Commander to U.S.St.A.F. and Bomber Command for Support of “OVERLORD” during the preparatory period, 17 April 1944. Maxwell AFB, AL: Historical Research Agency, 505.33-37.

Staff Studies

AC/AS Intelligence Analysis Division, European Branch. Status of Air Prerequisites for Operation ‘Overlord’ with Estimate of Situation (Including Effectiveness of Combined Bomber Offensive). Staff study, 29 March 1944. Maxwell AFB, AL: Historical Research Agency, 142.042-13.

AC/AS Intelligence Dossier on Air power. Air Power—Significance (42-45). Staff study, 11 May 1945. Maxwell AFB, AL: Historical Research Agency, 142.021-6.

Translations

Air Ministry, A.H.B.6. German Translation No v11/67. “German Anti-Invasion Measures November 1943—July 1944.” 31 March 1948. Maxwell AFB, AL: Historical Research Agency, 512.621 v11/67.

Air Ministry, A.H.B.6, 31 July 1948. German Translation No.v11/73. “Situation Reports by German Army Commanders in Normandy May 15–October 11, 1944.” 31 July 1948. Maxwell AFB, AL: Historical Research Agency, 512.621 v11/73.

Air Ministry, A.H.B.6, October 1951. German Translation No. v11/107. “Luftwaffe Strength and Serviceability Tables, August 1938–April 1945.” February 1950. Maxwell AFB, AL: Historical Research Agency, 512.621 v11/107.

Memoirs

Eisenhower, Gen Dwight D. *Eisenhower’s Own Story of the War*. New York: Arco Publishing Company, 1946.

Harris, Arthur. *Bomber Offensive*. New York: The Macmillan Company, 1947.

Rostow, W. W. *Pre-Invasion Bombing Strategy, General Eisenhower’s Decision of March 25, 1944*. Austin, TX: University of Texas Press, 1981.

Zuckerman, Solly. *From Apes to Warlords*. New York: Harper and Row, 1978.

Periodicals

Ose, Dieter. "Rommel and Rundstedt: The 1944 Panzer Controversy." *Military Affairs* 50, no. 1 (January 1986):7-11.

Lytton, Henry D. "Bombing Policy in the Rome and Pre-Normandy Invasion Aerial Campaigns of World War II: Bridge-Bombing Strategy Vindicated—and Rail yard-Bombing Strategy Invalidated." *Military Affairs* 47, no. 2 (April 1983): 53-58.

Reports

Directorate of General Purpose and Airlift Studies Assistant Chief of Staff, Studies and Analysis, Headquarters, USAF. *The Impact of Allied Air Interdiction on German Strategy for Normandy Saber Measures (Bravo) August 1969*. Washington DC: USAF Headquarters. August 1969. Maxwell AFB, AL: Historical Research Agency, K143.044-15.

Headquarters, United States Strategic Air Forces in Europe, Office of Director of Intelligence. *Special Report on Effects of Allied Air Power on First Month of Overlord Operations*. Washington DC. 12 July 1944. Maxwell AFB, AL: Historical Research Agency, 519.4511-1, 6 June - 6 July 1944.

Office of the Assistant Chief of Air Staff, Intelligence. *Report to C.O.A. on European Axis Transport as an Air Target System, Appendix B Estimates of Effect of Air Attack on Axis Transportation*. Washington DC. 17 June 1944. Maxwell AFB, AL: Historical Research Agency, 142.042-24 v.2.

Office of the Assistant Chief of Air Staff, Intelligence Analysis Division, European Branch. *Evaluation of Transportation as an Air Target, A Summary of European Experience*. Washington DC. 15 June 1945. Maxwell AFB, AL: Historical Research Agency, 142.042-24 v.4.

Office of the Assistant Chief of Air Staff, Intelligence Analysis Division, European Branch. *Evaluation of Transportation as an Air Target, A summary of European Experience. Tab B, Overlord—The Interdiction Campaign*. Washington DC. 15 June 1945. Maxwell AFB, AL: Historical Research Agency, 142.042-14 1944 v.1.

Office of the Assistant Chief of Air Staff, Intelligence, Analysis Division, European Branch. *Strategic Bombing of Axis Europe January 1943-September 1944, Bomb Damage to Axis Target Systems*. Washington, DC. 1 December 1944. Maxwell AFB, AL: Historical Research Agency, 142.042-8.

Unpublished Works

Montemaro, Commander Anthony S. "Operation Overlord: A Case Study of the Command and Control Aspects of the Operational Art." Research Report no. NDU-NWC-86-1 A-33FD. Ft McNair, Washington DC: National War College, National Defense University, February 1986.

Stahl, Major Steven C. "Securing the Beachhead: Air Operations in the Invasions of Sicily and Germany." Research Report no. 2260-81. Maxwell AFB, AL: Air Command and Staff College, 1981.

Government Manuals

Air Force Manual (AFM) 1-1. *Basic Aerospace Doctrine of the United States Air Force*. 2 vols., March 1992.

Books

Ambrose, Stephen E. *D-Day, June 6, 1944, The Climatic Battle of World War II*. New York, NY: Simon and Schuster, 1994.

Craven, Wesley Frank, and Cate, James L., eds. *The Army Air Forces in World War II*. Vol. 3, *Europe: Argument to V-E Day January 1944 to May 1945*. 1951. New imprint, Washington, DC: Office of Air Force History, 1979.

Davis, Richard G. *Carl A. Spaatz and the Air War in Europe*. Washington DC: Center for Air Force History, 1993.

Delve, Ken. *D-Day The Air Battle*. Strand, London: Arms and Armor Press, 1994.

Drez, Ronald J. *Voices of D-Day, The Story of the Allied Invasion Told by Those Who Were There*. Baton Rouge, LA: Thomson-Shore, Inc., 1994.

Dunn, Bill N. *Big Wing, The Biography of Air Chief Marshal Sir Trafford Leigh-Mallory*. KCB, DSO and Bar. Shrewsbury, England: Airline Publishing, 1992.

Gries, Thomas E., ed. *Atlas of the Second World War: Europe and the Mediterranean*. Wayne, New Jersey: Avery Publishing Group Inc.

Mark, Eduard M. *Aerial Interdiction: Air Power and the Land Battle in Three American Wars*. Washington, DC: Center for Air Force History, 1994.

McFarland, Stephen L., and Wesley P. Newton. *To Command the Sky*. Washington DC: Smithsonian Institution Press, 1991.

Messenger, Charles. "Bomber Harris." New York: St. Martin's Press, 1984.

Metz, David R. *Master of Airpower, General Carl A. Spaatz*. Presidio Press, CA: The Aerospace Education Foundation and the Air Force Historical Foundation, 1988.

Owen, Robert. *TEDDER*. London and Glasgow, 1952.

Royal Air Force Historical Society. *Overlord-1944, Bracknell paper no. 5 A Symposium on the Normandy Landings, 25 March 1994*. Great Britain: Hartnolls, Bodmin, Cornwall, 1995.

The United States Strategic Bombing Surveys (European War) (Pacific War). Maxwell AFB, AL: Air University Press, October 1987.

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