# Breakthroughs:

# Armored Offensives in Western Europe 1944

Ed., Barry R. Posen
and the MIT/DACS Conventional Forces Working Group

**Preface**

June 6, 2009 marked the 65th anniversary of the D-Day landings, the beginning of the challenging campaign to invade Germany from the West. Less remembered is that a period of brutal attrition fighting then began on the Normandy Peninsula, which did not end until the success on July 25 of "Operation Cobra," a classical "breakthrough battle." Shortly before the end of the Cold War, I and a group of graduate students became interested in the potential lessons that the experience of breakthrough battles on the Western Front could offer for a possible clash of arms between NATO and the Warsaw Pact. Though that danger subsided, our interest did not. We launched a comparative study of several of the best known battles of this kind initiated by the British, the Americans, and the Germans and completed a draft of the study in 1994. As one might imagine, no publisher was then interested. As the 65th anniversary of the Normandy landings approached, I recalled that I had retained digital copies of this work, and that an intervening invention, the internet, would allow us to share it. This study would normally have gone through one more editing before publication. We do not view this as a truly finished product. In the last fifteen years, however, the authors have developed other interests, and additional work is out of the question. Some of their names will be familiar to regular visitors to this site, as they have gone on to careers in security studies, while other authors have pursued different kinds of careers. We offer this study in the hopes that it will be of some interest and utility to students of armored warfare, and as a modest tribute to the allied soldiers who liberated Western Europe from the Nazi regime.

Barry R. Posen
July, 2009

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# Introduction

Barry R. Posen

This is a study of armored breakthrough operations. This type of battle has been central to the conduct of warfare since the emergence of the tank as the core element of modern ground armies at the beginning of the Second World War. Wherever a defender can cover an extended front with many, reasonably well armed units, attackers must find a way to pierce these positions, widen the gap, and then push sufficient forces deep into the defender's territory to cause a general collapse of the frontal defenses. Since the early years of the First World War it has been clear that breakthroughs of extended defended frontages, and exploitations of these breakthroughs, is no easy task. There are, of course, other kinds of armored battles that merit study--flanking attacks, encounter battles, pursuits, and even ambushes. But where the opponents are strong and competent, their ability to execute or thwart breakthrough operations will likely influence the entire course of a campaign, and even a war. The tank was devised, but not yet perfected, during World War I to deal with the problem of penetration of defended fronts. Since then, many armored breakthroughs have occurred, but many have been thwarted. The subject of breakthrough operations has thus been of keen interest to attackers and defenders alike. Much craft knowledge has developed about the conduct of such operations, and much of it has been codified in military training manuals.

Yet, the study of past armored breakthrough battles has been somewhat unsystematic. Single case studies abound. Systematic comparative case studies are rare. This book adds to the literature on this central question of modern conventional warfare. We conduct focused, comparative case studies of five armored breakthrough battles that occurred on the Western Front in 1944--Goodwood, Cobra, Bluecoat, Mortain, and the Bulge.

My interest in this subject emerged during the great debate on the NATO-Warsaw Pact conventional balance that began in the late 1970s. It would be tempting to believe that the evaporation of the Cold War has rendered the whole question moot. But it has not. Wherever

heavily armed conventional combatants oppose each other, the question of armored breakthroughs or defense against them will arise.

In the Middle East and the Persian Gulf, mechanized warfare has been a normal political transaction among states since the end of the Second World War.[1] The Arab-Israeli dispute saw a series of wars that prominently featured breakthrough operations. Peace agreements between Israel and her neighbors will of necessity involve arms control agreements that account for the possibility of a resurgence of mechanized warfare. Although the Iranians were relatively impoverished in terms of equipment, the Iraq-Iran war prominently featured attempted breakthroughs and exploitations-some successful. Even in Desert Storm the dim outlines of breakthrough operations can be discerned, although the massive coalition material and technological superiority and the huge preliminary air bombardment overdetermined the success.

US force planning in 1993 for the preparation of the self-styled "first post-Cold War defense plan," the "Bottom-Up Review" aims to forestall a North Korean breakthrough operation. An even weightier planning contingency is a potential future mechanized attack against Kuwait or Saudi Arabia, by Iraq or Iran.

More generally, where borders are in dispute, and political agreement is unachievable, it is conventional forces that are brought in to settle the issue--in Bosnia-Herzegovina, Azerbaijan, or Georgia. While the disputants are often poorly armed, they endeavor to acquire tanks and the weapons to support them as soon as they can. These are the ultimate weapons of territorial acquisition. The end of the Cold War has dumped a vast number of late-model heavy weapons onto the world market. Insofar as the collapse of Soviet power has removed Russia's ability and America's incentive, to suppress local conflicts, it is quite likely that the post-Cold-War world will see new incidents of mechanized warfare. For all these reasons, armored breakthroughs remain a fit subject for study.

## METHODOLOGY

[1] Armored warfare and mechanized warfare are synonyms for engagements that involve large numbers of tanks, other tracked or wheeled combat and combat support vehicles, and (usually) truck borne logistical support units.

We have adapted a now standard methodology employed both in political science and history--the focused, comparative, case study method. Briefly, we isolated the factors that the expert community deems to be associated with successful breakthrough operations, or successful defenses against breakthrough operations. This was based on both a general survey of literature on military tactics, and a survey of breakthrough battles. We treat these posited associations as what they in fact are- hypotheses about what causes success in breakthrough battles.

Our first purpose then was to examine breakthrough battles to see which of these hypotheses could be empirically supported in any way. We looked to see if the causes proposed by these hypotheses could actually be seen to contribute to success. For example, one looks for the processes through which quantitative superiority actually solves the multiple problems faced by an attacker in breakthrough operations. This is the crudest kind of "test."

Historical cases are natural experiments. One conducts multiple case studies in part for the purpose of finding variation in the power of specific causes, and examining whether such variation produces variation in outcomes. To the extent that multiple case studies naturally vary the power of a given cause, they produce confidence in the importance of that cause if one also sees variation in the proposed consequence. For example, if quantitative superiority were a critical driver of offensive success, as the force ratio increases across a sample of battles, the operations should prove more successful.

Multiple case studies can also produce variation in the simple presence of one of many possible causes. This is particularly useful in the study of complicated processes that seem to have multiple causes. In some breakthrough battles, the attacker has air superiority, in others not. In some cases the attacker had mastered combined arms tactics previously, in others not. In some cases defenders had tactical warning; in others not. Comparative case studies thus provide some insights into whether or not certain hypothesized contributors to successful breakthrough battles are necessary or sufficient.[2] Of course, the extent of such insights is limited by the

[2] The term "sufficient" should not be taken literally. There are many possible contributors to success in a breakthrough battle, including some irreducible element of luck. For example, at Goodwood the British enjoy almost every material advantage that an attacker could want, yet they do almost everything else wrong. The Germans do most things right. One could then argue that this battle is nearly conclusive proof that material

natural variation offered up by the cases themselves. We can't get armies to fight battles for us that would constitute laboratory experiments.

## THE CHOICE OF CASES

The universe of possible cases of armored breakthroughs is quite large.[3] Why pick these? Both recent wars in the Middle East and World War II battles on the Eastern Front offer alternative sets of cases. Obviously, a study of all cases would be worthwhile, but with limited resources a choice had to be made. These Western Front cases allow us a rare look at combat between forces of relatively equal competence, under "mixed" (not ideal but not appallingly bad) weather and terrain conditions. While the Allies are much wealthier than the Germans, all three combatants have fine industrial war economies to draw on for their equipment. At the same time, variations in the operational circumstances of each battle allow us to observe the effects of the variables in which we are most interested. Finally, there is a great wealth of source material, particularly English language sources, on each of the cases.

It is important to choose from the universe of available cases with some care. One wants to hold as many contributors to general combat effectiveness constant to focus on the specific causes of successful breakthroughs. For this reason, one wishes to screen out as much as possible large qualitative differences in armies that might dominate outcomes. Many early battles on the Eastern Front in World War II and many battles in the Middle-East seem to be dominated by general qualitative disparities in the professionalism of officers, the training and "trainability" of soldiers, sheer administrative competence, or the absence of anything that even

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superiority is "insufficient" for success under the specified conditions of a competent adversary. Yet, one could also argue that topographical constraints doomed the operation. In their absence, and with a little luck, British material superiority might in and of itself have produced a success, though we doubt it. But, as far as real world tests are concerned, Goodwood may be as good as it gets. We wish that we had a battle where the attacker has material superiority, does most things right, and faces a competent adversary. Cobra ought to qualify, but the German commander makes several uncharacteristically stupid mistakes. Thus, we still do not have evidence of the "sufficient" conditions for success against a competent adversary.

[3] Col. Trevor N. Dupuy, et al, "A Study of Breakthrough Operations," Report No. DNA 4124 F, Prepared for Defense Nuclear Agency, (Dunn Loring, VA: Historical Evaluation and Research Organization, October 1976.) takes a more generic approach, examining a number of infantry and armored breakthrough battles over a fifty year period.

looks like a shared tactical doctrine, much less whether the doctrine is right. Obviously, one cannot account for all such factors. Any choice of a set of cases involves tradeoffs. But the question for us was where differences of this kind were narrowest.

Three major military organizations are involved in these battles--and we have quite good knowledge of all three.[4] They are all three western armies; they recruit from literate, technically skilled, urbanized populations. The soldiers all grew up in a "capitalist" economy, which demanded a certain amount of initiative and personal responsibility. Each army was lead by a core of experienced professionals.[5] There are, of course, also substantial qualitative differences across the three armies. The German Army shows a very high standard of command and tactical proficiency, perhaps the highest of any combatant in the war. The British and the Americans are uneven in these categories. The US Army improves speedily and substantially in command and tactical competence from June 1944, and gradually reveals a knack for mobile, combined arms warfare, and air-ground cooperation, that seems markedly to surpass the British, and occasionally surpasses the German. US forces are more willing to take casualties than the British. As of June 1944, the British probably have more experienced soldiers and commanders, and have vast experience fighting the Germans. (The latter, however, may contribute to what often appears as an excess of caution.) In spite of these oft noted differences, the three armies demonstrate enough competence in these battles so that it is reasonable to suggest that sheer qualitative disparities do not overwhelm the range of other factors that may produce success in breakthrough operations, the factors we hoped to investigate.

The material situation greatly favored the Allies in 1944. This helps offset somewhat German operational and tactical skill. The Allies are lushly equipped, possess extraordinary

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[4] Obviously a fourth, the Canadian Army, was heavily involved in the supporting attack on the right flank of Operation Goodwood.

[5] All three military command structures were accustomed to operating with a substantial degree of political autonomy. Hitler's tendency to intervene in critical, high -level, operational decisions, and to relieve commanders who disagreed is an important exception. But even German Army commanders made most decisions on their own authority, and felt free to argue with Hitler up to a point. Many Arab armies are characterized by officers who are unwilling to make tactical or operational decisions on their own authority, in part because their political leaders discouraged them from doing so out of a fear of coups. Soviet officers were undoubtedly similarly paralyzed in 1941 by their recent experience of the purges.

mobility as a result of their plentiful supplies of fuel and trucks, and possess virtual command of the air. British and American artillery is on the whole quantitatively and qualitatively superior to the German. (The British Army is, surprisingly, slightly better armed than the US Army) The Germans have substantially superior tanks and anti-tank weapons, mortars and machine guns. While Allied aerial interdiction and the pressures of the Eastern front substantially limit the flow of supplies to the West until the German preparations for the Bulge, it is nevertheless true that the German Army still has a fully mobilized, productive, technologically advanced industrial war economy to draw upon. Though outweighed, the Germans are still in the game.

The place where these battles occur also makes them a good set of cases. For the most part, the terrain is not ideal "tank country." The weather often makes flying difficult. War is most often made in such places. Most of the world is not ideal tank country and the weather is often bad--both in contrast to the Arab-Israeli wars, for example. While Eastern Front weather was quite bad, the terrain frequently favored the employment of large mechanized forces, and increasingly penalized the Germans as the war progressed for their sparse truck inventory and fuel shortages.

The defensibility of much of the terrain in Western Europe also helps the Germans neutralize some of the previously noted Allied material advantages in mobility and firepower-trucks, gas, artillery ammunition, and bombs. The territorial scale of the battles is more limited than on the Eastern Front. The Germans can thus achieve better force densities than in the East, and reserves have to travel shorter distances. Western Europe is richly endowed with roads and railroads, compared to Russia and Eastern Europe, which arguably permits the Germans a greater degree of relative tactical mobility vs. the Allies in the West than vs. the Russians in the East, in spite of Allied air power.

It is difficult to find many cases where the players seem so well matched. In the Arab-Israeli wars there has usually been a huge qualitative disparity between the disputants. Desert Storm was even more lopsided. On the Eastern Front in W.W.II, the Germans started with a vast qualitative superiority on every dimension but ground weapons, which were more or less equal

in quality; they were already outnumbered. The middle of the war saw a brief period of parity in which German quality and Soviet quantity counterbalanced each other.[6] The later years saw the Russians vastly outweighing the Germans in every important material factor relevant to mechanized warfare: tanks, guns, munitions, manpower, combat units, tactical aircraft, and--by virtue of US supplies---trucks. More importantly, the Russians evolved a practical doctrine for the effective employment of their massive forces--albeit at a high rate of attrition.

The five battles provide natural variation in the power of variables often presumed to contribute to success in armored operations, the variables of greatest concern to us. We can compare operations launched with and without command of the air; with and without effective combined arms tactics; with and without massive artillery preparations or aerial bombardments; with and without great local material superiority, with or without a willingness to take high casualties for critical objectives, with and without the very best tanks in the world, with and without an adequate understanding of the breakthrough problem, etc.

The availability of source material provided a practical reason to focus on these western front battles. There is a vast quantity of English language work on these battles, simply because English speakers fought in them.[7] Moreover, the historical work is generally of a very high quality, particularly the US Army Official History. English-speaking historians have done us the favor of plumbing the German documents. And the sheer mass of material also translates into a very high degree of resolution, which is what one often needs when asking questions of the kind outlined below. It is difficult to find a set of battles about which so much has been written, from almost every perspective.

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[6] The middle period on the Eastern Front might provide good cases to support generalizations, but the more extensive, and frankly more accessible, source material on Western Front battles made them more attractive for this exercise.

[7] Our team was assembled out of individuals who were at the outset graduate students in security studies in the Defense and Arms Control Studies Program at MIT. They joined the effort on the basis of interest in general questions of mechanized warfare, not a special interest in the military history of a particular country. Thus the availability of a vast secondary and primary literature in English was nearly essential. Research teams who might wish to approach Eastern Front or Middle East battles would probably require a greater percentage of "area studies" experts.

Finally, confining the cases to the Western Front in 1944 permitted our working group to "cumulate" craft knowledge about weaponry, units, commanders, tactics and the like. Information of this kind developed by one case researcher would often prove very useful to another. (This would of course have been achieved by concentrating on any single region in a given period.)

In sum, while there is much to be learned from comparative case studies of the "universe" of breakthrough battles, these cases were most attractive from the point of view of analytic efficiency and the potential generalizeability of operational and tactical lessons.

## PRINCIPAL QUESTIONS

Our inquiry was guided by two sets of interrelated questions. The first set may be termed "operational-tactical." Rich qualitative research into the battles was the means to answer these questions. The second set of questions may be termed "physical." Here we endeavored to conduct as detailed a quantitative investigation into the available source material as our own resources permitted.

Our initial discussions suggested the importance of the following issues. These provided the common set of questions that guided each of our case studies. As the reader proceeds through the cases he or she will find that some questions yielded better and more complete answers than others.

### Operational/Tactical

>How important are combined arms tactics for success?

>What role does aviation play in breakthrough battles? How does it serve both the offense and the defense?

>Has the defender any noticeable special advantage simply for being on the defensive? Historically, soldiers have often credited the defender with such an advantage at the tactical level. How large have these advantages been historically?

>What types of ground forces are important to the outcome of breakthrough battles? a) Does infantry--both foot and mechanized have an important role to play? b) Can low-readiness forces play much of a role in breakthrough battles? c) Do armies that have small armored forces, and large infantry reserves have different capabilities for attack and defense? These three questions are central to the assessment of the military utility of many "defensive-defense" proposals, since they often rely heavily on reservist infantry formations for their strength, with small armored forces functioning as a reserve. Moreover, since infantry armies in the modern age to some extent substitute blood for iron, we should be alert to the issue of what motivates infantry soldiers to fight well in these types of battles.

>What part do tactical and operational reserves- "2nd echelon" forces- play in breakthrough battles? How easy is it for the attacker or the defender to move tactical reserves through exhausted forward divisions?

>If a rupture is achieved, how quickly does the attacker transition to the exploitation phase? Is there anything the defender can do to slow this transition?

Four distinct issues emerged in the course of our research as having independent importance, which we had simply treated as lesser included questions in our initial discussions.

>What is the utility of surprise in breakthrough battles?

>How does the "operational tempo" achieved by the attacker affect his odds of success?

>What difference does it make whether the defender has chosen a thin forward defense, a prepared defense in depth, or a mobile defense in depth? If breakthroughs do occur, which defensive strategies seem to work best to limit their success?

>What role is played by supporting attacks in the success of breakthrough efforts?

>How clearly did the commanders conceive of the operation as one of breakthrough and exploitation? How clear was the "concept of operations" and how many steps ahead had the planners prepared?

**Physical Questions**

>What is the effect of overall force ratios and local force ratios?

>What effect do "force-to-space" ratios have on the battle? Many analysts now believe that if a given width of front is populated according to a certain density, the attacker will have very great difficulty forcing the defender off his position. Moreover, there seems to be a limit to how much force the attacker can pack into a given space. He may be unable to pack in enough force opposite a the defender to generate a high force-to-force ratio. Without a high local force-to-force ratio the attacker's chances of success are low, unless he is vastly superior in quality of leadership, soldiers, and weapons.

>Rates of Change--Attrition, Movement, and Exchange Rates. a.) How violent are breakthrough battles ? At what rate are men and machines destroyed? b.) At what rate do attackers manage to force defenders to withdraw in breakthrough battles, if at all? What causes defenders to withdraw or attackers to break off their engagements?. If retreat rates tend to be fast, then defenders may suffer salients in their lines, requiring ever larger numbers of forces simply to populate the front at densities that permit a credible defense. If these reserves are not available, then a true rupture may occur. c), What exchange rates prevail between attackers and defenders? This relates to the defensive advantage question above. Does the attacker normally have to pay more than one unit to kill one defendings unit? If so, the absence of some degree of quantitative superiority may make breakthrough battles seem unattractive.

>How long do attackers and defenders need to prepare for breakthrough battles? Does this affect outcomes? What role do fortifications or terrain preparation play?

> How does terrain affect armored battles?

With these questions as our general guide, the members of our research team independently assembled detailed case studies. A series of group meetings addressed the mechanics of how quantitative data were to be gathered and displayed. Appendix _ briefly summarizes the kinds of data we chose to collect. In many cases we wanted better data than we found, and certain crude rules of thumb were employed to make educated guesses. Finally, in some cases we chose to normalize measurement to particular standards that we ourselves

created. For example, by July of 1944, the average German battalion is not likely to be at full strength. Comparing numbers of US or British battalions to the nominal number of German battalions to estimate a "force ratio" is likely to prove misleading. Thus, we developed a crude "maneuver battalion equivalent" measure. Drafts of each of the case studies were discussed by the entire group. After all the case studies were completed, the group met to assess lessons on a "cross-case basis." These "cross case" lessons are enumerated in the concluding chapter. Some readers may find it expedient to read the conclusions before they examine the cases.

**GoodWood: July 18-20, 1944**

Eric Heginbotham

On July 18th, the British mounted an offensive southeast of Caen involving two infantry corps and the British VIIIth armored corps. The operation, known as GOODWOOD by the British and ATLANTIC by supporting Canadian troops, was utterly disappointing. Despite the participation of 4,500 Allied aircraft[1] (on the first day alone), 700 artillery pieces, and 1,300 British and Canadian tanks, the attack netted an advance of only 10 kilometers in three days.

Several of the conditions often deemed propitious for military success were conspicuously present at GOODWOOD. By almost any measure, force-to-force ratios were extremely favorable to the British. British tanks alone outnumbered German tanks and assault guns by a margin of 3.4:1. Second echelon armored forces were available to by-pass and exploit the first echelon attackers. Finally, the Germans had only one day to prepare their defenses for the specific threat posed by the British "mailed fist." Yet these conditions did not decide the outcome of the battle.

When it came, the British attack was not a surprise. The volume of armored traffic moving to their starting points on the evening of July 16th betrayed British intentions.[2] With this early warning, slight though it was, Sepp Dietrich, the commander of the I SS Panzer Corps, was able to make important additions and adjustments to his deployments.

In hindsight, General Montgomery's decision to utilize such a large force in the small and constrained area east of Caen provided the Germans with their three biggest advantages: warning of an attack, adequate forces to defend the threatened terrain, and congestion in the allied lines. The extent of the British loss could have been mitigated somewhat by better tank-infantry coordination and improved

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[1]See Ellis, P. 338 and Maule P. 85 for aircraft numbers.

[2]The Luftwaffe flew an aerial reconnaissance mission over the Orne on July 16 and predicted an attack on the night of the 17th-18th. Hastings, P. 233.

communications between close air support pilots and controllers. Nevertheless, only major changes in the Goodwood plan would have yielded significantly different overall results.

**STRATEGIC BACKGROUND**

By early July, 1944, it was clear to the Allies that a breakthrough was needed somewhere. In the month since the Allies landed, the 21st Army Group[3] had grown to more than one million men. Despite having control of the air and a four-to-one numerical edge over the Germans on the ground, the Allies were nowhere more than thirty kilometers inland. In places, objectives established for D-Day had not yet been taken. The Allies, hemmed in on 114 kilometers of front, held 3,600 square kilometers in total. With the early North Sea winter not far off, the space limitations loomed large. Moreover, the Allies supply situation was growing worse, not better. Between the 19th and 21st of June, one of two Allied artificial harbors was completely destroyed and the other badly damaged by rough seas and gale force winds.[4] Cherbourg, which fell to the Americans on June 26th, was seriously damaged and its port would not be operational for some time.

On July 7th, while U.S. forces were slogging towards St. Lo, the major road hub in the U.S. sector, the British unleashed a new and destructive military innovation. Heavy bombers were used for the first time to clear a path for ground forces. Some 2,500 tons of bombs were dropped on the outskirts of Caen to prepare the way for attacking infantry.[5] The impact on the German defenders was devastating. Ultimately, the attack stopped short of its objectives, because the rubble created by the bombing impeded the advance. Nevertheless, the attack inspired both General Dempsey, commander of the British Second

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[3]The 21st Army Group, commanded by British General Montgomery, contained, at the time of Goodwood, all of the thirty allied divisions ashore. Thirteen infantry divisions, three armored divisions, and eight independent armored brigades were held in the British Second Army, under the command of British General Dempsey. An slightly smaller force was held under the U.S. First Army, commanded by General Bradley. Although all of the ground forces in Normandy were under Montgomery's command, General Eisenhower was the Supreme Commander of Allied Expeditionary Forces. As such, Eisenhower was responsible for supervising and coordinating the activities of the ground, air, and sea forces operating in northern Europe. [See U.K. official history for U.K. formations. See ? for U.S. forces--note, U.K. history misses the 51st I.D. (Highland) and the British 3rd I.D.. Churchill gives number of thirty divisions, Vol. 6, P. 24.]

[4]Wilmot, P. 321.

[5]Wilmot, P. 351.

Army, and General Bradley, commander of the U.S. First Army, to formulate more imaginative and ambitious attack plans.

During a commanders meeting of the 21st Army Group held on July 10th, both Dempsey and Bradley approached Montgomery with plans to blast through German lines with massive bomber-tank attacks.[6] That same day, Montgomery, who had said six months before that he would "never employ an armoured corps,"[7] directed Dempsey to prepare an armored corps for a "massive stroke"[8] from the Caen area to Falaise, a distance of 35 kilometers. Two days later, Dempsey briefed an ambitious plan of operation involving three corps to Montgomery, who approved the plan.

The wartime rivalry between Britain and the United States has obscured many wartime events. Our current knowledge about the intentions of Goodwood's engineers has suffered as much as our knowledge of any other single event. Did Montgomery intend to break the German lines or merely to draw German forces away from the U.S. sector, where an attack was planned for several days later?[9]

For our purposes, the question is somewhat mute. As Liddell Hart observed in 1959, "it would have been foolish not to reckon with the possibility of a German collapse and be ready to exploit it...."[10] Moreover, in order to draw German reserves, the attack would have to look threatening, and, presumably, be threatening. Dempsey, who was frustrated with Montgomery's caution and micromanagement, clearly saw this as an opportunity to strike a blow for British arms regardless of his immediate superior's intentions. On July 13th, Dempsey published his operations order, assigning the following tasks to the VIIIth Corps:

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[6]General Bradley apparently recalled his meeting with Montgomery during an interview in 1946. The events were probably first made public with the publication of the U.S. Army Official History, 19XX. [U.S. Army History, pp. 188-189] Dempsey discussion with Montgomery, recorded in 1952, have only recently been tapped. [Carlo d'Este, P. 355] Dempsey was apparently farther along in the planning stages for his attack.

[7]Carlo d'Este, P. 356.

[8]U.S. official history, P. 188.

[9]There are actually several other debates which break along national lines. The official British history of the war, for example, emphasizes the weakness of the U.S. bombing attacks on their designated targets in explaining the failure of Goodwood.

[10]Hart, The Tanks, P. 359.

> On 18 July will cross R. Orne North of Caen, attack southwards and establish an Armd. Div in each of the following areas: Bretteville Sur Laize-Vimont-Argences-Falaise.[11]

Falaise, the most distant of these targets, was thirty-five kilometers from Caen. Dempsey's hopes, however, went even beyond his written orders of July 13th. Liddell Hart reported that, in a post-war interview, Dempsey said:

> What I had in mind was to seize all the crossings of the Orne from Caen to Argentan--the nearer ones with the Canadians and the further ones with the armour--thus shutting off the enemy's main force, which lay west of the Orne. The air, too, would have been concentrated on the crossing.[12]

Argentan, his most ambitious objective, was fifty-five kilometers from Caen.

Dempsey's enthusiasm was apparently contagious. On 12 July, Montgomery requested full air support from Eisenhower, writing that "My whole eastern flank will burst into flames on Saturday."[13] Eisenhower replied that "With our whole front acting aggressively against the enemy so that he is pinned to the ground, O'Connor's [Goodwood] plunge into his vitals will be decisive."[14] On 17 July, Dempsey moved his own headquarters forward and collocated it with the VIIIth Corps headquarters so that he could take over the exploitation if the attack were successful.[15] Word filtered down to subordinate commands

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[11]Este, P. 362. As Este notes, the operations order did not stand as written. On 15 July, Montgomery visited the VIIIth Corps headquarters and wrote out a much more modest directive, which established that only armored cars were to go as far as Falaise. [P. 364] Even if Montgomery intended the directive to serve as firm guidance, he did not forward the more modest objectives to the Supreme Headquarters Allied Expeditionary Forces. Nor, in light of comments by Dempsey and his own subordinate commanders, were these lesser objectives taken to heart.

[12]Hart, The Tanks, P. 361.

[13]Este, P. 361. Montgomery later argued that this statement was designed only to secure air support from a very reluctant Allied air force and had little to do with his actual expectations. His behavior before and during the battle, however, suggest that this argument was a sham, and the excellent investigative work of Carlo d'Este have established firmly that Montgomery, despite last minute cold feet, sought to create a major British breakthrough.

[14]Este, P. 361. Eisenhower clearly expected this operation to produce, or at least, seek, a breakthrough. He described the operation as "a drive across the Orne from Caen towards the south and south-east, exploiting in the direction of the Seine and Paris. Cited in Wilmot, P. 353.

[15]Hart, The Tanks, P. 361.

that something big was in the offing. Colonel Brian Smith, GSO I of the 11th Armored was stated directly that "we really did think that this was to be the breakout."[16]

On the 17th, Montgomery sent a message to Prime Minister Churchill that the "conditions for big attack tomorrow (are) now very favorable, as main enemy weight has moved to west of Orne, as was intended, to oppose my attacks in Evrecy area, and these attacks will be continued today and tonight."[17] The next day, after sixteen hours of operations, Montgomery issued a communiqué to the press which read: "Early this morning, British and Canadian troops of the Second Army attacked and broke through into the area east of the Orne and south-east of Caen."[18]

**THE BATTLEFIELD**[19]

The area into which these forces were launched was the best tank country in Normandy. The entire country west of the Orne and as far south as the Brittany Peninsula was covered with Boccage--tight, thick hedgerows, which provided excellent cover and concealment to defenders and virtually impassable barriers to attackers. To the northeast of Caen, the ground was swampy and unsuitable for the cross-country passage of armored vehicles. Fifteen kilometers to the east lay the River Dives, with a dense tangle of woods, orchards, and towns along its banks.

The usable tank country around Caen was the corridor of land between the Orne and the Dives Rivers. The road from Caen to Argentan, where armor could empty out into more open country, was 55 kilometers long. The width of the corridor varied between ten and twenty kilometers.[20]

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[16]Hastings, P. 235.

[17]Churchill, vol. 6, P. 25.

[18]Keegan, P. 216.

[19]Except where otherwise noted, the description provided here is based on an examination of contemporary 1:25,000 scale maps (Sheet No. 40/16 S.W., Second Edition, March 1944), of contemporary aerial and combat photographs, and from the various descriptions found in the bibliographic sources.

[20]In places, the distance between the Orne and Dives River expanded to thirty kilometers. However, nowhere is there more than fifteen kilometers of ground suitable for cross-country movement. West of Falaise, the Boccage country of Normandy spilled over the Orne River.

Within the corridor were gentle hills. Immediately south of Caen, the ground rose towards the Bourguebus ridge. The heights of the ridge stood sixty meters higher than the eastern suburbs of Caen, eight kilometers to the north. The gentle slopes of this feature were typical of the rolling hills throughout the corridor.

The ground offered several advantages to defenders. Small towns and farming villages dotted the area in a regular patchwork pattern. No town was more than three kilometers from its neighbor and most were at intervals of 800 or 1,500 meters. The houses themselves were of sturdy stone Norman construction, offering not only concealment, but also a good deal of cover from both direct and indirect fire. Although small orchards abutted some towns, there were almost no trees in the open space between towns, the ground instead being taken up by chest high corn crops. Hence, except in the Troarn area to the east, fields of fire were clear from each town to the next. Bourguebus Ridge provided both excellent observation and direct fire positions, as well as reverse slope positions suitable for the sighting of divisional and corps artillery.

On the other hand, there were few obstacles to the movement of attacking forces. In the actual event, the largest obstacle, the Orne River, was behind British lines. On D-Day, the British had established a bridgehead over the river, but the bridgehead had grown little since that time. In early July, it was being held by the 51st Highland Division and the British 6th Airborne Division. The perimeter held by these units was twelve kilometers in length. In all, the British held nine square kilometers of ground on the east side of the Orne. Consequently, their armored drive from this bridgehead would have to be conducted in stages, with follow-on units crossing the Orne's two bridges as the units ahead moved to the attack.

Beyond the river lay two other, though lesser, linear obstacles. These were the two rail lines, the Caen-Troarn and Caen-Vimont lines, that lay across the intended path of the armored attack. In the "History of the VIIIth Corps," they are described in the following terms:

> The first [Caen-Troarn] is a single line and for a large part of its length on both sides it has six-foot-high embankments, which during the battle were found to be impassable to wheeled vehicles. The second railway, Caen-Vimont, runs alternately along an

> embankment or through a deep cutting and in each case the banks are ten or more feet high, and, except in a few places, considerable obstacles to the tanks.[21]

During the battle, the embankments around the Caen-Vimont tracks proved to be a blessing as well as a bane. British units thrown back from the Bourguebus Ridge found shelter behind its walls.

**BRITISH INTELLIGENCE AND THE PLAN OF ATTACK**

Despite the limitations of terrain, General Dempsey had some reason to be optimism about the prospects for success. Montgomery ordered a corps level diversionary attack West of the Orne.[22] The diversionary attack began on 15 July and early intelligence reports suggested that it had indeed drawn in the bulk of German reserves.

On the eve of the battle, the daily intelligence summary of the Second Army confirmed that the first line of resistance east of Caen would come from the 16th Luftwaffe Field Division, which had lost fifty percent of its strength in the defense of Caen itself.[23] In Vaucelles, where the Canadians were to mount their supporting attack through the southern suburbs of Caen, the depleted 21st SS Panzer Division was believed to be inextricably committed.[24] On the British left, where the 3rd Infantry Division was to mount its attack, the 346th Infantry Division was in position. None of the defenses were expected to extend southwards beyond the Caen-Vimont railway tracks, some eight kilometers from the start point. Hence, once the line was reached, nothing except supporting German artillery was expected to impede the British advance towards Falaise.

On 17 July British intelligence had concerns about two other divisions. The 1st SS Panzer division had recently arrived in the area and a precise location for the division was not indicated for the

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[21]Cited in Verney, Guards A.D. hist. pp. 38-39.

[22]U.K. Official History, P. 334. "To make the Germans think we are going to break out across the Orne between Caen and Amaye."

[23]Keegan, P. 202. One source indicates that the division had lost 75% of its strength (Klapdore, P. 269). Was the 50% figure just the report by British intelligence, or was it the real strength? Need to check the Keegan citation again.

[24]Maule, P. 85.

unit. However, infantry from the division had been engaged southwest of Caen and armor from the unit had also been identified west of the Orne River. Therefore, the intelligence section discounted the possibility of this unit being committed. The 12th Panzer Division was also an unknown. It was thought to be in the woods south of Falaise,[25] but it was considered to be too battered for offensive action. In the judgment of the intelligence section, it would defend its positions, but would not move to counter the British thrust directly. Because of this analysis, intelligence concluded that, although the British might face as many as 230 tanks in the breakthrough sector, it was more likely that the German force would only include 120 tanks and 30-40 anti-tank guns.[26]

The British plan called for the use of three corps. Each corps would have a different function during each of two phases--the breakthrough phase and the exploitation phase. The heart of the plan involved the activities of the VIII Corps (Armored). During the breakthrough phase, this corps was to smash the weakest link in the German chain, the 16th GAF. VIII Corps three armored divisions, including 860 tanks, would attack through three narrow tracks in the minefields east of the Orne. They would fan out near Cagny, racing for different points on the Bourguebus ridge between Rocquancourt and Vimont. Meanwhile, two divisions of the British I Corps would secure the left flank, capturing towns as far east as Troarn, while the Canadian II Corps pushed out the right shoulder by capturing the southern suburbs of Caen and then moving up the western portion of the Bourguebus ridge towards Verrieres. During the exploitation phase, the plan called for the VIII Corps to advance towards the crossings at Falaise and Argentan, while the infantry secured the intervening ground.

Breaking with standard practice, bombs, rather than infantry, would lead the attack. About 1500 heavy Halifax, Lancaster, Fortress, and Liberator aircraft would drop 7,000 tons of bombs.[27] Substantial cratering would slow the armored advance, so only 100 and 250 pound bombs were to be dropped in the

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[25]Reports from various locations might be understandable. On XX July, Hitler had personally ordered the 12th to be moved to Lisieux in anticipation of another Allied landing in the Calais area. On the morning of the 18th, one battle group was moving eastward toward Lisieux.

[26]Carlo d'Este, P. 367. Citing 2nd Army Intelligence Summary. John Keegan (P. 202) for anti-tank strength.

[27]Mitcham, P. 153.

path of the armor. The larger 500 and 1,000 pound bombs were to be dropped on towns flanking the VIIIth Corps' route of march. If there was a flaw in this bombing plan, it was simply that few bombs were targeted on the Bourguebus Ridge and none behind it.[28]

Despite the complexity of the operation, there was cause for optimism. The bombers would obliterate any unit within their target boxes, and while Dempsey did expect that the armored corps would take large losses,[29] there were enough tanks and men to spare. Having taken the Bourguebus Ridge, he expected that only the seventy odd tanks of the 12th SS Panzer Division would stand between his armored corps and Argentan.

**GERMAN INTELLIGENCE AND THE PLAN OF DEFENSE**

Strategically, German dispositions were hampered by Hitler's belief that the Allies would make a second powerful landing at Calais. Both General Von Kluge, Commander-in-Chief West, and General Rommel, the commander of Army Group B,[30] had long since decided that no amphibious attack on Calais was likely. At least, they argued, priority should be given to the forces in Normandy, since the situation was already critical, rather than to the Fifteenth Army in Calais, where no attack had materialized. Hitler felt otherwise and shortly before Goodwood ordered another panzer division moved from Normandy to Calais.[31] Without this backdrop, had the bulk of the Fifteenth Army been moved from Calais to Normandy in mid-July, it is likely that sufficient armored reserves could have been maintained in both the American and British sectors for some time.

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[28]See Ellis, P. 337 for bomb types and target zones. See McKee, P. 274 for tonnage.

[29]He apparently estimated that the British would lose as many as two or three hundred tanks in gaining the ridge. (Carlo d'Este, P. ?)

[30]Army Group B included the Seventh Army, facing the Americans, Panzer Group West, facing the British, and the Fifteenth Army, holding positions in Calais.

[31]Hitler had ordered the 12th SS Panzer Division moved east. Sepp Dietrich resisted this directive just strongly enough, however, to win a temporary reprieve. Only one battle group from the division was sent, and it was sent only as far as Lisieux, thirty kilometers from Caen. There, it was in a perfect reserve position had the British broken through at Goodwood.

Operationally, the Germans had focused on the Caen area as the most likely area for an Allied breakthrough effort. Not only was the terrain in this area better than that facing the Americans, but most of the Allied armor was marshaled under the British. Since early July, the Germans had felt the threat to that area was imminent.[32] Consequently, seven of the nine panzer divisions available to the Germans had been maintained in the east.

The British understood that they would not fool the Germans about the general location of the attack, but nevertheless hoped to surprise the Germans by the timing and precise nature of the attack. Indeed, the success of the attack depended upon surprise. Without artillery or infantry support, the British armor would be entirely vulnerably once it passed beyond the bombing zone. Here, as Max Hastings argues in his history of the Normandy Campaign, was the central contradiction of the operation. The British were to launch an operation that depended upon tactical surprise and intricate timing and that utilized a huge mass of men and material in an attack from a small bridgehead that was itself under observation from higher ground.

The Germans were able to gather sufficient indicators from various sources to pinpoint with fair precision the location, time, and direction of attack. The Commander of Panzer Group West, General Heinrich Eberback, apparently got some information of the impending attack from prisoner interrogations.[33] The best information, however, came from an unexpected source, the German Luftwaffe. On the night of the 16th, a photo reconnaissance dropped flares over the Orne bridges and recorded the movement of trucks and supplies into the Orne bridgehead. Field Marshal Sperrle of Luftlotte 3 issued a intelligence report predicting a large attack "to take place south-eastwards from Caen about the night of 17th-18th."[34] On the 17th, Rommel reported to Von Kluge that "the local attacks on July 15th between Maltot and Vendes may be the prelude to the large-scale attack which is expected from

[32]Source. The Germans did, however, get wind of the Cobra offensive as well. Source.

[33]U.S. Official History, P. 191.

[34]Hastings, P. 233. Cited in...

the evening of the 17th for making a break-through across the Orne."[35] The commander of the I S.S. Panzer Corps, General Sepp Dietrich, purportedly confirmed the type and scale of the attack by pressing his ear to the ground and listening to the movement of tracked vehicles.[36] British artillery, firing concentrations beyond the Orne bridgeheads to mask the noise of moving armor, unwittingly put the question beyond doubt.[37]

On the 17th Rommel visited Sepp Dietrich's headquarters and the two of them plotted the German response. The defense was arranged in depth, with five barriers between the British and Falaise. An infantry screen, deployed in the towns and suburbs abutting the Allied positions, provided the first layer. On the German right, infantry of the decimated 16th G.A.F. division held forward positions.[38] On the left, the 272nd Infantry Division moved into positions within Vaucelles and to the west of Caen. The division, which was at that time, unbeknownst to the British, arriving from southern France, allowed the Dietrich to pull the 1st S.S. Panzer Division out of the line and to shift the 21st Panzer Division into deeper defensive positions. The 21st Panzer Division, reinforced by two other new units, the 200th Assault Gun Battalion and the 503rd Heavy Tank Battalion then comprised the second line of defense. The division was deployed into battalion sized strong points. The third part of the German defense was a line of 78 high velocity 88mm Anti-aircraft guns, the bulk of the III Flak Corps, deployed along Bourguebus ridge and north-south from Frenouville to Sannerville. These positions put the guns some six to eight kilometers from British start points. In a tactical reserve, the 1st S.S. Panzer Division sat, ready to deliver counter-blows where needed. Finally, one battle group of the 12th S.S. Panzer Division sat on the Caen-Falaise road some miles closer than expected.

Additional preparations included the deployment of corps and divisional artillery units on the reverse slope of the Bourguebus Ridge and the gradual disengagement of portions of the 2nd Panzer

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[35]Wilmot, P. 357.

[36]The story of Dietrich's "Indian trick" appears in several sources. Apparently, he told his interrogators after the war that he had first detected the attack in this manner. McKee, P. 277. Hastings, P. 232.

[37]McKee, P. 277.

[38]Elements of the 346th Infantry Division also held a portion of this front.

Division which had been fighting west of the Orne. German defensive positions ran about twelve kilometers deep, with the 12th S.S. Panzers waiting still further back.

Since none of the German units were at TO&E strength, judging their holdings is more difficult in the German case than the British. Within the available estimates of the forces present, the estimates of tanks are best documented and the number of personnel is the least. Table 1 estimates the holdings of the various units.

In all, these positions and reserves held 270 tanks and assault guns, 150 anti-tank guns, and 350 artillery tubes and mortars. This force yielded a much more satisfactory force ratio than the British would have guessed. Nevertheless, the British armor held a three-to-one advantage over the combined force of German tanks and anti-tank guns. In artillery, the British held a two-to-one edge. Moreover, on the eve of battle, the Allied bombs had yet to fall.

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Table 1. Force Ratios: Caen-Argentan Road. P.M. 17 July 1944.

| | British | German | Ratio |
|---|---|---|---|
| Battalion Equivalents@ | | | |
| Infantry | 65 | 21 | 3.0:1 |
| Tank/A.G. | 18 | 8 | 2.3:1 |
| Total Maneuver | (83) | (29) | 2.9:1 |
| Artillery | 30 | 16 | 1.9:1 |
| Equipment Items | | | |
| Tk/A.G. | 1,300 | 380 | 3.4:1 |
| A.T. Guns | 1,214 | 148 | 8.2:1 |
| Field Guns | 720 | 197 | 3.7:1 |
| Personnel | 160,000 | 70,000 | 2.3:1 |

*Sources: See Appendix A (Forces and Force Ratios).

@Battalion equivalents are total TOE battalions weighted for % strength.

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**THE BOMBING**

The Allied aerial bombardment began promptly as scheduled at 0530 on 18 July and lasted until approximately 0730. It was, by all accounts, devastating. The weather was good, and the two heavy concentrations on the flanks and on Cagny were delivered as planned. The loads of smaller, non-cratering bombs were also delivered successfully to the center of the "box." However, the aircraft assigned to target Bourguebus Ridge were hampered by smoke over the entire area, and many returned with their ordinance. Nevertheless, the great majority of bombs were delivered to recognizable targets.

In addition to 7,000 tons of bombs, the Germans were subjected to an intensive artillery preparation by 700 guns.[39] Four hundred guns supported the main attack, half firing preprogrammed fire plans on suspected enemy strong points and half on call to the leading elements of the VIII Corps.[40] In all, 250,000 shells were delivered to gun batteries in preparation for the offensive[41], and about 80,000 shells (approximately 1,000 tons) were fired on the first day alone.[42] Much of this total was fired in the early morning, immediately after the bombing raid.[43]

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[39]McKee, P. 273; Carlo D'Este, P. 358. This number includes all divisional artillery, not just tubes supporting the thrust of the VIIIth Corps. The artillery probably included 21 Field Regiments, 6 Medium Regiments, and 3 Heavy Regiments (Total, 29 regiments). Other sources list different artillery compositions by regiment (see for example, Scarfe, P. 117), but I believe this breakdown is probably the most accurate since it accords with TO&E dispositions, the total number of guns, and to breakdowns provided by historical sources.

[40]Ellis, P. 340.

[41]McKee, P. 273.

[42]Blumenson (P. 64) notes that the British expended 80,000 rounds of artillery ammunition in one day near Caen. Unfortunately, Blumenson does not mention the particular date associated with that event. Given all the circumstantial evidence, however, we may be reasonably sure that the date was in fact 18 July. The only other candidate, the capture of northern Caen on July 7, was a much smaller operation, involving only three infantry division. By firing about hundred rounds each, however, the 700 guns associated with Goodwood could more reasonably account for the one day total. We do know that the scale of the artillery barrage was considered exceptional and that some guns fired as many as 400 rounds each. McKee, P. ?.

[43]The armored force outran its artillery support by about 1030, after which time the guns supporting those units fired no rounds until they were in new positions some twelve hours later.

The heavy bombing and shelling north of the Caen-Vimont railway had two distinct effects on the course of the battle. First, it destroyed troops and equipment. Secondly, it disoriented the survivors and limited their effectiveness in the hours following the bombing attack.

In terms of outright destruction, the bombing appears to have had more severe effects upon guns and armor than upon infantry and personnel. Within the bombing zones were 110 tanks and assault guns. Of these 53 (48%) were knocked out.[44] The 200th Assault Gun Battalion, deployed in the center of the target box, where lighter bombs were dropped, suffered proportionally the least. The battalion had one company of ten vehicles each in Giberville and Demouville and two companies in Le Mesnil Frementel. A fifth company was deployed in Grentheville, outside of the target area.[45] Of the forty vehicles in the target area, one complete company of ten vehicles in Demouville, the sturdiest town and consequently the most heavily hit by bombs, was destroyed. Only one of the other thirty suffered that fate. Of the forty Mark IV tanks fielded by the 22nd Panzer Regiment of the 21st Panzer Division, thirty two were destroyed outright in their positions around Cagny. The other eight, however, were, after their experience, less than combat ready. In his account, John Keegan summarizes their condition:

> The Mark IV's were bounced up and down by the roll of concussion and later, when the storm had passed on to engulf the panzer battalions on the floor of the corridor, the surviving tanks had to be dug out with bare hands from the mounds of soil which had been thrown up round them. Every opening in the hulls had been clogged with earth--gun muzzles, air filters, engine grids, exhausts. The sighting telescopes had been thrown out of alignment and the engines, when they caught, ran roughly....[46]

The eight surviving Mark IV's entered the battle as they were recovered by their crews. The thirty Mark VI "Tiger" tanks of the 503rd Heavy Battalion, deployed in the woods between Cagny and Emieville,

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[44]Losses discussed in the main body of this paper refer to tanks that were put out of action for at least 24 hours. They do not refer to totally destroyed tanks, which were some fraction (around one third) of the former. This difference, and the effects on real losses during the battle, will be discussed in the section on aggregate gains and losses.

[45]Deployments taken from McKee, P. 292.

[46]Keegan, P. 202.

survived somewhat better. It should be observed that while Emieville and Cagny were both heavy bombing targets, the ground between was, technically speaking, not targeted. Of the thirty tanks in the 503rd, only ten were completely lost. The losses of each tank unit, in this case, correlate extremely well to the weight of bombs intended for the units location on the ground.[47]

The number of casualties inflicted on personnel is much harder to assess. The starting personnel strengths of the various units is less well known, the overall casualty data is sketchy, and certainly, the cause of injury or death is, after the fact, difficult to unravel. Having said that, the evidence we do have suggests that losses to men were less severe than losses to materiel.

The German command arrangement was very flexible. Within the German defensive scheme, battle group commanders controlled the deployment of the forces assigned within their sector. Most of the infantry forces within the target area, those belonging to the 16th G.A.F. and the 21st Panzer Division, fell under the command of two battle groups under the 21st Panzer Division. These forces probably included a total of 4,000 riflemen and tankers, with an 1,000 riflemen, more or less, from the 346th Infantry Division also present within the bomber target area. These forces were deployed as under-strength battalions to most of the fourteen towns within the target area. The largest single concentration was in Colombelles, where about nine hundred infantry were deployed, and in Demouville, where some 500 were probably present. One or two of the eastern towns, such as Campaign or Manneville, may have been unoccupied, or only lightly occupied at the start of the bombing. Most, however, contained battalions of about 200 to 400 riflemen.

The effectiveness of the bombing again varied widely. In Demouville, a panzergrenadier battalion of the 21st Pz Division was said to be completely destroyed.[48] Even here, however, many did survive and ultimately offered organized resistance. Probably, no more than 60% of the occupants were physical casualties. One source claims that in Cuverville, more defenders were killed or injured in the bombing

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[47]By contrast, the material damage done to armored units was not directly proportional to the weight of the tanks held by each unit.

[48]1st Battalion/ 125th Pz Gr Rgt/ 21st Pz Div. said by several sources to have been completely destroyed. Mckee. P. 283. Probably 400 casualties, if we assume 500 man battalions for the 21st.

than survived to be captured. In the east, Sannerville and Banneville la Campagne were "well hit." [U.K. history, P. 343] Yet units in other areas seemed to suffer very light material damage. The industrial suburbs of Colombelles offered reasonable protection to its occupants. Elements of the 16th G.A.F. and 21st Pz Div managed to fight through the 18th from positions in that area and make a successful withdrawal on the following night. Le mesnil Frementel was untouched by bombs.[49] Units of the 346th Infantry Division, accustomed to artillery duels, stayed a thousand meters east of Troarn until the bombardment ended.

It appears that five (Cuverville, Demouville, Sannerville, le Campagn, and Cagny) of the fourteen towns in the target area suffered "heavy" casualties--perhaps between thirty and sixty percent casualties. Units in other towns suffered "light" casualties, averaging perhaps 5-10%. This very rough and entirely schematic approach yields approximately 20% personnel casualties in the target area. This would yield about 700 casualties.

Perhaps more important than the material damage caused by the Allied bombing was the psychological effect it had on enemy troops and the disruption it caused within the enemy command and control system. For some duration after the bombing raid, very little organized resistance was offered. This allowed British forces along the front to capture key terrain features and large bodies of prisoners without paying the blood price normally associated with such tasks. It also allowed the British armored units, which did not stop to collect prisoners or seize ground, to move unhindered into the German defenses. Unfortunately for the British, the paralysis lasted only some two hours, after which German forces appear to have recovered rapidly and--at the lower tactical echelons--fully.

It is difficult to ascertain precisely how large the prisoner "dividend" was, but probably included perhaps half (1,250) of the total bag of 2,500 prisoners taken during the first two days of fighting.[50] The

[49]It was not targeted for some reason, despite being in the path of the VIII Corps.

[50]The official history of the VIII Corps lists 2,500 prisoners taken by all forces involved in the battle during the first two days. Cited in Verney, P. 45. This account accords well with the fact that 2,000 prisoners passed through the holding area established east of the Orne by the British 51 Highland Infantry Division. Morse, View from the Bridge, P. ?. Presumably, the other prisoners were bagged by Canadian forces west of the Orne River.

fragments of the 16th G.A.F. which had survived both the previous battles for Caen and the morning's bombardment were, according to an account by John Keegan,

> found in the reploughed ruins of Colombelles shaking uncontrollably from the noise, blast, and internal terror which they had suffered. Many were unable to coordinate their limbs and, when collected to be marched off to prisoner-of-war cages, had to be allowed by sit by the roadside until sufficiently recovered to walk in a straight line.[51]

It appears that one of the four panzer grenadier battalions of the 21 Panzer Division, was also hit so hard that its survivors simply surrendered. Major Brownlie of the Ayrshire Yeomanry described the prisoners captured by his battalion as "all but unconscious on their feet."[52] This condition must surely account for the large number of prisoners taken during the first day of the operation.[53]

The psychological effects of the bombing appears lasted about two hours. As one history of the 8th Battalion of the Rifle Brigade (11th Armored Division) records, "for five miles the only Germans who showed themselves were dead or too dazed by the bombing to resist."[54] At 0930 the 11th Armored Division passed Cagny on its way to over the Caen-Paris railway. At that time, the defenders of Cagny, on the north side of the line were too stunned to fire on the passing British Armor. By 1030, however, as the Guards Armored Division approached Cagny, the battery of 88mm guns and the single tanks defending the town had come alive. Against the Guards, the defenders of the town held until evening, inflicting some 60 armored kills on the attackers. Although this is a particularly noteworthy case of resiliency, resistance stiffened steadily throughout the area as the morning progressed. Nevertheless, the bombing allowed the 29th Armored Brigade to pass directly into the second layer of defense without significant combat, and it allowed the Guards Armored Division to move as far as Cagny.

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[51]Keegan, P. 202.

[52]Brownlie, P. 374.

[53]Of the prisoners which can be positively placed by the available sources as having been captured at a particular place and time (50% of the total number of prisoners taken during the operation), some 70% were taken on the first day of battle.

[54]Hastings, P. ??.

**THE GROUND ATTACK: JULY 18**

THE MAIN ATTACK (VIII Corps): With large elements of the 3rd Infantry Division (Br), the 51st Infantry Division (Highland), and the 6th Parachute Division all deployed on the nine square secure kilometers east of the Orne, there was little room for armor. The plan was for the 11th Armored Division to cross the Orne on the evening of July 17 and for the other two division to shuttle over the river in sequence as each armored division cleared the assembly area. Once east of the Orne, however, the difficulties were not ended. The 51 Division had placed a hasty minefield earlier in the month. They had only been ordered to clear the minefield on July 16[55], and since they had no maps of the mine locations, the task could not be adequately performed. In the end, only three lanes, each wide enough for one tank to pass, were cleared.[56] Beyond the minefield, the corridor into which the tanks would pass was so narrow that for the first six kilometers, only a single armored brigade could deploy abreast (two battalions up, one back). Delays by any one unit would impede the progress of every subsequent unit.

The VIII Corps, comprised of the 11th, Guards, and 7th Armored Divisions, was the main effort.[57] The 11th Armored Division, under General "Pip" Roberts, widely acknowledged to be the most skillful and imaginative British armored commander, was to lead the attack. After clearing the minefield, the 11th Division's armored brigade, the 29th, would head almost due south, staying east of Cuverville and Demouville. Just north of Cagny, the pivot point for each of the divisions, the brigade would head southwest, towards its objectives of Bras, Verrieres, and Rocquancourt.[58] Meanwhile the infantry brigade was to clear Cuverville and Demouville, securing the route for further traffic. General Roberts protested this division of his force, which left his armor bereft of infantry support from the very start, but was overruled by General O'Connor, the VIIIth Corps commander. The Guards Armored Division was

[55]Minefield discussed in McKee, P. 276.

[56]McKee says there were only three gaps cleared (P. 276). Where did I get 14 from??

[57]The following discussion of divisional objectives is largely drawn from Sweet (pp. 71-73), who has the most lucid and careful discussion of the immediate British objectives.

[58]If Cagny itself was occupied in force, the division was to leave a screening force. Otherwise, the town was to be bypassed completely.

tasked with taking Cagny and then moving southeast to capture Vimont. Again, the armored and infantry brigades were assigned different roles. The armor was to dash ahead and secure Cagny. The infantry was to move behind, take control of Cagny from the armor, and provide a new base of operations for the armor when it moved to Vimont. Finally, the 7th Armored Division was to follow the Guards out of the beachhead, moving between the two lead divisions and exploiting any opportunities created by them.

At 0745, the first units of the 29th Armored Brigade advanced. Preceded by a rolling barrage by 200 guns, the 3rd Royal Tank Regiment[59] led the attack, followed by the 2nd Fife and Forfar Yeomanry, and finally, the 23rd Hussars. To each battalion was attached a company of motorized infantry from the 8th Rifle Brigade[60], a battery of self propelled 25 Pound guns, and a small contingent of engineers and other support units. Each unit was slower than expected in clearing the minefield, and a gap of over one mile developed between the first two battalions and the third.[61] By the time the Caen-Troarn railway was crossed at about 0945,[62] the advance by this brigade was an hour behind schedule.

The delay cost the brigade some thirty tanks. Up until the 3rd R.T.R. crossed the Caen-Vimont railway, the battalion had faced no meaningful anti-tank opposition and had instead experienced only smooth sailing and, in the words of one participant, "good M.G. [machine-gun] shooting at targets that kept appearing in the hedgerows and villages."[63] However, Von Luck, commander of the battle group responsible for Cagny was, at the time the 3rd R.T.R. passed, frantically reorganizing his defenses. The four 88 mm anti-aircraft guns were deployed just in time to catch the C Squadron of the 2 FFY--the trail

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[59]Note that there is an unusual shorthand associated with British units. When preceded by a number, the regimental nomenclature actually refers to a battalion of the given regiment. Hence, the 3rd Royal Tank Regiment refers to the 3rd Battalion of the Royal Tank Regiment.

[60]"Motorized infantry" refers to troops trained to fight from and equipped with half tracks. They were the equivalent of the German panzer grenadiers or today's mechanized infantry. The Rifle Brigade, was, in 19XX, given responsible for training and supplying such forces to the British Army.

[61]Sweet, P. 81.

[62]There is some disagreement about the timing of specific events. For example, Sweet's time estimates for most events run later than those provided by Keegan.

[63]Cited in Hart, The Tanks, P. 366.

squadron of the second battalion[64]--in the flank. Twelve tanks of C Squadron were destroyed.[65] Apparently, the smoke and flame caused the 23rd Hussars (the third battalion) to slow their advance, giving the twenty Tiger tanks of the 503rd Heavy Brigade an opportunity to strike at this unit. At cost to the Tigers, a counterattack was launched against the Hussars near Manneville, destroying 19 of its Shermans.

Regardless of the delays, however, the leading battalions of the 29th Brigade crossed the Caen-Vimont railway with relatively light losses. If, as intelligence had predicted, the rail line represented the limit of the German defensive belt, there was reason for optimism. Having passed through what was thought to be the main defensive belt, five intact British squadrons were within striking distance of the day's immediate objectives along the Borguebus Ridge.

Having dropped off the attached companies of the 8th Rifle Brigade, together with the 2nd Northampton Yeomanry (a tank bn) to deal with an unexpected assault gun company in le Mesnil Frementel, squadrons of the 3rd RTR and the 2 FFY probed for, found, and moved beyond gaps in the railway embankments. Even as they did so, German 88 mm anti-aircraft guns, assault guns, and artillery belied British intelligence, sending the first units to cross scattering for cover along railway embankments or behind towns and woods.

Batteries of 88 mm anti-aircraft guns ringed the ridge line and sniped at the tanks from above.[66] The 3rd battery of the 200th Assault Gun Battalion, located in Grentheville was well sited to pour shot into the rear of a British attack up Borguebus.[67] Three battalions of artillery from the 21st Panzer Division, located on the reverse slopes of the hill, were also on hand to lend their weight. Early in the morning, after the bombing raid confirmed British intentions, this ring of weapons systems was reinforced

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[64]Keegan, P. 207.

[65]McKee, P. 290; Sweet, P. 82.

[66]While there were 78 guns in all, it is difficult to tell exactly how many looked down onto this particular portion of the battlefield.

[67]McKee, P. 292 on location. This was Becker's battery which blasted A Squadron, 3 RTR as it emerged from a railway cut, Keegan, P. 209.

by the deployment of the engineers and support troops of the 21st Panzer Division, rifles in hand, to act as infantry soldiers in the towns on the Borguebus slopes.[68] Now, as British armor reached the Caen-Vimont line, Sepp Dietrich ordered the Panthers and panzer grenadiers of the 1st SS Panzer Division to redeploy from the southern outskirts of Caen to the Borguebus ridge. In position by late morning, the 1st SS added punch to an otherwise static defense.

After meeting their initial reception, the 11th Armored Division made several concerted attempts to take the day's immediate objectives. The first was launched at approximately 1100. The 3 RTR was to seize objectives west of the Caen-Paris line, including the towns of Bras and Hubert-Folie. Meanwhile, the 2 FFY would take the town Bourguebus itself, lying east of the Caen-Paris line. Unfortunately, of the three potential sources of support--infantry, artillery, or air--only the latter, in a highly attenuated form, was available. The 159th Infantry Brigade, assigned against the division commander's wishes to clear Cuverville and Demouville, did not complete those tasks until 1445, and was therefore unavailable.[69] The 8th Rifle Brigade (battalion), the only mechanized infantry available to the armored brigade, had been left to clear le Mesnil Frementel, and was now also missing from the scene of decisive action. By 0920, the advance had outstripped the support of the field artillery regiments, which were then relocating over the Orne. They were not be ready to fire until late in the evening. Consequently, only the battalion of the self-propelled guns, together with insufficient fire from medium and heavy regiments, was available for support.

With 2,000 fighter-bomber sorties flown in support of the operation on 18 July, there should at least have been sufficient "flying artillery" to maintain the advance. Even here, however, there were major problems. Although there were liaison officers at brigade, division, and corps levels, only one individual on the battlefield, traveling with the 29th Brigade, had a very high frequency radio, required to

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[68]Keegan, P. 211.

[69]The infantry brigade did not link up with the armor until nightfall. The length of time between the completion of all infantry missions and the linkup between the two forces is partly explained by the fact that the infantry brigadier was not explicitly told what to do after the completion of his primary tasks. He therefore waited for further instructions before moving his force--two hours later than it might have moved.

talk with the fighters overhead. Since his command vehicle was destroyed during the first two hours of the battle, coordination was weak.[70] Although the fighters were instrumental in blunting counterattacks by the 1st SS Panzer Division, they were unable to eliminate stationary pockets of resistance which could only be observed from the ground.

With no support, the tank attack, delivered cavalry style with line ahead, never had a chance of success. The 2nd FFY, which reached the open ground between Soliers and Four, was all but annihilated.[71] The 3 RTR, which reached the more sheltered ground between Soliers and Bras, was able to maintain its positions for slightly longer. The 23rd Hussars, dispatched to support the 2 FFY, arrived too late to be of assistance and quickly withdrew back towards the safety of the rail line. As it did so, its C squadron was destroyed by anti-tank fire from Four. In summarizing the afternoon, the Hussar's regimental history records:

> Everywhere wounded or burning figures ran or struggled painfully for cover, while a remorseless rain of armour-piercing shot riddled the already helpless Shermans. All too clearly, we were not going to "break through" that day....Out of the great array of armour that had moved forward to battle, one hundred and six tanks now lay crippled or out of action in the corn fields.[72]

A second attack was launched at approximately 1430 with results similar to the first. At 1700 a final lunge was attempted, this time using only the Cromwells of the relatively fresh Northamptonshire Yeomanry. This attack was aimed at Bras, and it advanced to within 1,000 meters of that target before being turned away by anti-tank fires. Sixteen of its tanks were destroyed. In all, the 11th Armored Division lost 126 tanks--about half its strength--on the first day of the battle. Although two-thirds of these were repairable, they were lost to the attack.[73]

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[70]Keegan, P. 212.

[71]One officer ran out of the blazing circle of tanks to announce to the 23rd Hussars that only four tanks remained (Keegan, P. 214). In actuality, 18 tanks survived of the original 60 (McKee, P. 294)

[72]Cited in Keegan, P. 214.

[73]Footnote source. Note that this ratio was entirely usual for armored forces. Two third repairable, one third totally lost.

During the evening, the division reassembled. The tanks withdrew to laager and were joined by the 159th Brigade.[74] Finally, the supporting artillery, which had been out of range for about twelve hours, also established firing positions east of the Orne.[75]

The British plan called for the Guards Armored Division to take Cagny and press on to Vimont during the first day of the operation. Instead, the division, which had not been "blooded" prior to the Goodwood operation, spent a confused day trying to take and secure Cagny. Only at night were probes sent beyond Cagny to Frenouville, and even these were decidedly half hearted moves.

The Guards suffered from command indecision and inexperience.[76] By 0945, the 5th Armored Brigade (Guards A.D.) had caught up to the tail of the 11th Armored Division some 3,000 meters north of Cagny.[77] At that point, the brigade began to take fire from Cagny, whose defenders had by now fully recovered. As the brigade advanced further, it began to take some additional fire from tanks and guns hidden in the woods around Emieville, le Prieure, and Demouville. During the following hours, the actions of the individual battalions and squadrons appears to have been barely coordinated. The Armoured Reconnaissance Battalion of the Welsh Guards, equipped with Cromwell tanks, screened the woods opposite Emieville according to plan. All else, was improvisation. The lead battalion of the 5th Armored Brigade, the 2nd Grenadier Guards, probed Cagny, and, discovering it was too strongly held, tried to pass to the east. This drew heavier fire from the woods on its left, and the battalion then appears to have assumed static positions north of Cagny. Seeing this, the 2nd Squadron of the 1st Coldstream Guards veered west of Cagny, attempting to flank the town and attack from the rear. This move was also thwarted, in this case by infantry and anti-tank guns occupying the orchards which abut the western side of Cagny. Taking cover by the railway embankment, the 2nd Squadron was out of action (and on the

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[74]Hastings, P. 235. (Why wasn't the infantry brigade thrown into an attack against the ridge?)

[75]See, for example, Brownlie, P. 372.

[76]The British "regimental system" introduced rigidities into their command arrangements. The Guards Armored Divisions, a newly formed unit, had to be constructed from existing Guard Regiments (e.g. the Coldstream Guards, etc.), none of which had armored experience. Similarly, the Guards had to be commanded by a Guard officer. The selection, Major General Adair, had little experience with mechanized warfare. Sweet, P. 59.

[77]Sweet, P. 93.

wrong side of Cagny) until evening. Meanwhile, the rest of the 2nd Coldstream Guards fell in on the to the left of the Grenadier Guards.[78] The 2nd Irish Guards appears to have done somewhat better, passing east of Cagny and penetrating to the Caen-Vimont highway, east of Frenouville before being driven back by elements of the 12th SS Panzer Division.[79] In all, the 5th Brigade lost 60 tanks during the first day.

At 1600, the 32nd Brigade (Guards) arrived, and Cagny was quickly taken by an assault conducted by the 1st Welsh Guards (infantry). On the evening of the 18th, the tanks of the 5th Brigade were withdrawn northwards to laager, and the 3rd Irish Guards (infantry) regiment was dispatched towards Frenouville. After encountering opposition, the unit's commander decided to wait until morning to renew the attack. On the evening of the 18th, one raid was also conducted in the opposite direction. The 12th SS sent a party to Cagny to remove damaged equipment. Since the defending infantry had assumed their positions in darkness without the advantage of light, the raid was successful.

The 7th Armored Division, the famed "Desert Rats," were the least heavily engaged division during the first day of battle. Their inaction was a function of three factors. First, they were the last of the armored divisions through the minefield. Consequently, they were delayed by infantry formations to their front and could not even deploy into battle formation near Cuverville (immediately beyond the minefield) until 1600.[80] Secondly, their commander, Erskine, was purportedly very discontented with the plan to start with and wanted to avoid wasting his division in a forlorn hope.[81] Finally, there is more truth than is frequently granted to Erskine's claim that there was simply not room to deploy where requested. Between le Mesnil Frementel, which the 8th Bn Rifle Brigade of the 11th Armored Division occupied and the orchards of Cagny, where the Guards Armored Division was employed, lay less than 800 meters of ground.

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[78]It is unclear why the 2nd Squadron detached itself or whether it was authorized to do so.

[79]The failure to capture Cagny cannot be entirely blamed on the lack of infantry. Battlefield rumors, to the effect that the town was "strongly held," circulated from the 11th to the Guards Armored Division. When these were passed to O'Connor, he ordered the Guards to bypass Cagny and move straight to Vimont. In leaving defenders in Cagny, however, this maneuver placed the brigade squarely in a "fire sack." Sweet, P. 93 on O'Connor's orders.

[80]Need source on time of deployment.

[81]Wilmot, P. 96.

Because of these problems, only the 5th RTR engaged on 18 July. In a brief engagement near Grentheville AT 1700, the battalion lost 12 men and six tanks.[82] The other armored battalions of the 22nd Armored Brigade spent the evening between Grentheville and Cagny.

All told, the VIII Corps lost 192 medium tanks on July 18 (126 from the 11th, 60 from the Guards, and 6 from the 7th). These losses represented 26% of the corps' total. According to British strength returns 521 casualties were sustained.[83]

SUPPORTING ATTACKS. On the right and the left of the VIII Corps, Commonwealth forces attacked to support and expand the shoulders of any potential breakthrough. These attacks gained most of their immediate objectives and must be considered successful. Had a breakthrough occurred, these forces would have given the British a firm base from which to exploit. Short of a breakthrough by the main effort, however, the action on the flanks was not, and could not have been, decisive (or even particularly useful).

The Goodwood plan called for the I Corps to secure the left flank of the attack. It was to secure the towns and woods as far west as Troarn and as far south as Cuillerville (800 meters north of Emieville). The 27th Armored Brigade was attached to the Corps, which in turn assigned one of its three battalions to the support each of the 3rd Divisions brigades. Each brigade was given a different town or set of towns as its objective. The 8th Brigade was to seize Touffreville and Sannerville, closest to the original front. The 185th Brigade was assigned le Quai and Cuillerville to the southeast. And the 9th Brigade was assigned Troarn. In addition to the 3rd Division, the 152nd Brigade of the 51st Highland Division was also utilized by I Corps.[84] Its objectives included woods of the Bois de Bavent to the east. Most of the corps' objectives were met. The 8th Brigade and the 185th Brigade occupied or partially occupied all of their objectives. The 9th Brigade, however, faced reserves which had been rushed to the

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[82]Hastings, P. 235 for time of action. Who took Grentheville. I believe the 8th R.B. spent the night in the town. Had it been captured by the time the 5 RTR engaged?

[83]Wilmot, P. 362.

[84]Ellis, P. 343.

scene from the coast and an improvised force from the 21st Panzer Division, could only approach to within a mile of Troarn.

For these efforts, I Corps, and the 3rd Division in particular, paid dearly in casualties. On July 18th, 651 casualties were lost to I Corps, more than the number suffered by the VIIIth Corps.[85] Eighteen tanks were also lost.

**II Corps (Canadian)**. While the VIIIth Corps was making its charge up Bourguebus Ridge and the I Corps was seizing towns east of the salient, the Canadian II Corps was engaged in classic urban combat in the industrial suburbs of southern Caen. Within this corps, the Canadian 3rd Infantry Division was tasked with the most difficult initial tasks, the capture of Colombelles, Faubourg de Vaucelles, and Cormelles. Two independent armored brigades, the Canadian 2nd and the 3rd[86], were attached to assist in the mission. The Canadian 2nd Infantry Division, which had not yet seen combat in Normandy, was given a more limited objective. Deployed to the west of the Canadian 3rd Infantry Division, they were to take the town of Louvigny.[87] The final objective for the corps was the western side of the Bourguebus Ridge.

The Canadian 3rd Infantry Division attacked with the 8th Brigade up front. By noon the brigade had a battalion (the Queen's Own), reinforced with tanks, in Giberville. It took the rest of the day for the battalion to clear the town, though it did so with minimal casualties.[88] Immediately to the right, things did not go as smoothly. The 8th Brigades other two battalions ran into unexpectedly strong opposition in a chateau just to the north of the steelworks area of Colombelles. The lead battalion suffered 25% casualties.[89] Finally, after R.A.F. Typhoons and divisional artillery struck the chateau, and the reserve brigade's battalion stormed the building, clearing the way for the 9th Brigade to attack and capture the

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[85]Wilmot, P. 362.

[86]See Karte from Meyer book on 12th SS. Need more sources on Canadian armor. Have no loss figures for these two brigades for any of their days of activity.

[87]Objectives taken from a description of the action by Reginald Roy, pp. 68-74.

[88]Roy, P. 72. When the town fell, 600 prisoners were left in the Queen's hands.

[89]Roy, P. 72. The Chaudieres took 25% casualties.

steelworks in Colombelles. By nightfall, two battalions of 9th Brigade had reached the outskirts of Vaucelles.[90] By that time, one battalion of the 7th Brigade, which, unlike the other two brigades, had begun the battle on the west side of the Orne, had crossed the river into northern Vaucelles and was busy clearing buildings, while the engineers worked to establish a Bailey bridge.[91]

The Canadian 2nd Division was tasked with capturing Louvigny, lying just west of the Orne River and a quarter of a mile from the Canadian start line. The Royal Regiment of Canada attacked the town, with support from the Fort Gary Horse (tank battalion). The stone construction of the town and its surrounding walls made it a tough nut to crack, and the Canadians lost another 111 casualties in capturing the town.[92]

**XV Corps**. On the extreme right flank, the 43rd (Wessex) Division (XV Corps) was also due to launch an attack. Their task appears to have been to clear the area between the Odon and Orne Rivers as far south as Bully. This attack is not discussed in the general histories, which tend to focus on the armored action, and I neglected to gather any regimental histories on this unit during my initial data collection. It is unclear whether their task involved heavy fighting or not. I will have to fill this information in at a later date.

**THE GROUND ATTACK: JULY 19.**

The British tendency towards set-piece battles, and their lack of serious night training manifested itself fully in the events which transpired during the night of July 18 and during the following day.[93] Although several of the infantry battalions continued slogging towards first day objectives, most of the force remained stationary during the night. No thought appears to have been given to mounting a major effort during the hours of darkness. In fact, many of the armored units were withdrawn into "night

[90]Roy, P. 73.

[91]Roy, P. 74.

[92]Roy, P. 76.

[93]Contrast with policy of U.S. army on night training.

laager," a tactic common in the desert but unpracticed by any army besides the British on continental terrain.[94] The situation was further aggravated by General Dempsey's growing feeling of ambivalence about the operation. As the extent of British losses and the extent of remaining German opposition became clearer to him during the first evening, he appears to have lost interest in prosecuting the battle to its utmost. The attack was not resumed at first light on 19 July. Rather, the morning was spent in reorganizing the force. No major attack was mounted until that afternoon.[95] Although some hope for a breakthrough remained, the climax of the armored battle was reached on the first day.

THE MAIN ATTACK (VIII Corps). The three divisional commanders of the VIII Corps met with General O'Connor at midday on the 19th to discuss the situation and receive revised orders.[96] The objectives of the first day were provided as second day objectives, with the only major revision being that units were directed not to exploit success by moving towards secondary objectives. The orders thus reestablished Bras and Hubert-Folie as 11th A.D. objectives; Le Poirier and Frenouville as Guards A.D. objectives; and Soliers, Four, and Bourguebus as 7th A.D. objectives.

Unlike the attacks mounted on the afternoon of the first day, mixed forces of infantry and tanks, supported by artillery, were used to overcome opposition. The 11th A.D. again proved the most innovative and aggressive. When the Northamptonshires were held up in front of Bras, the 3rd Royal Tank Regiment was diverted from its attack on Hubert-Folie and struck the German flank at Bras.[97] A fresh infantry battalion of the 1 SS Panzer Division was captured almost intact. The 11th was also the only division to take all of its objectives on the 19th. The 7th A.D. took Soliers and Four, but although

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[94]The laager was useful in reducing the force's vulnerability to surprise mobile attacks, but left armor more vulnerable to artillery fire in the more static battles of Europe. The laager also resulted in ground loss--essentially irrelevant in the desert, but not in Europe.

[95]Hart, P. 367, offers an alternative explanation for the morning delay. He writes that the 1st SS Panzer Division disrupted a planned attack in the morning by launching an early counterattack of their own. No other source mentions this incident, though it is plausible.

[96]The late hour of this meeting is very strange. Granted the units had some reorganizing to do, but the manner in which they would most efficiently reorganize and regroup would be profoundly effected by their mission for the day. It seems inconceivable that no direction was given at or before first light--particularly given that the British only fight during the day, making daylight hours that much more precious.

[97]Sweet, P. 104.

they virtually surrounded Bourguebus by evening, they failed to take the town until the next day. The Guards took le Poirier but delayed attacking Frenouville until the 20th.

Once the artillery and infantry moved forward on the evening of the first day, the VIIIth Corps was able to use fire and maneuver tactics more effectively and avoid excessive losses. At the same time, all hope was effectively given up of making rapid or dramatic gains. Moreover, a new form of attrition became significant as the Germans, still in possession of the high ground, were able to direct harassing artillery fire very effectively during the day and night hours. A surprisingly high proportion of tank division personnel losses were suffered in this fashion during the 19th and 20th of July.

THE SUPPORTING ATTACKS. The main British armored attack was launched at an oblique angle to the original front line. This fact had a major impact on the nature of the fighting on the flanks during the second day. The British I Corps, on the exposed left of the main attack, worked its way towards positions which would provide a secure anchor against counterattack. These moves were made in the face of German forces which were heavily reinforced by armor and infantry from the relatively secure eastern end of the German line. In the meantime, German units still located to the northwest of the maximum British penetration were left dangerously exposed. Leaving skeletal forces behind, most of these units were in the process of withdrawing from those positions to reestablish contiguous lines to the rear. Hence, the Canadians encountered relatively light opposition during the day.

Two of the three brigades of the 3rd I.D. (British) were engaged during the day. The 9th Brigade, supported by a battalion of tanks from the 27th Armored Brigade, attacked towards Troarn, the linchpin of the eastern shoulder. Unfortunately for the British, its defenders had been barely effected by the bombing of the previous day. (They had in fact withdrawn from the town to wait out the inevitable preliminary bombardment.) Moreover, a dozen or so heavy tanks and a battalion of infantry had been rushed up from the coast by the evening of the 18th and committed to the town's defense. All three of the attacking infantry battalions took heavy casualties in their attempts to take the town, and nowhere did they approach closer than 1,000 meters to the town's center. The 185th Brigade occupied Manneville and

Cuillerville and successfully defended them against counterattack.[98] The 8th Brigade spent the day consolidating its positions and reorganizing.

On the British right flank, the Canadian II Corps was busy completing the clearance of Caen suburbs and moving towards higher ground to the south. The Canadian 3rd Division (8th Brigade) consolidated its position in Vaucelles and occupied Cormelles (9th Brigade). Meanwhile, the 2nd Canadian Division, which had been only minimally engaged on the 18th, pushed forward to some of the most advanced positions, taking Fleury-sur Orne, Ifs, and the lower slopes of the Verrieres Ridge.[99]

**THE GROUND ATTACK: JULY 20**

During July 20, the focus of British attention shifted to the Canadian sector, where a major attack up the Verrieres ridge was planned.[100] This attack was primarily a function of three considerations. First, the Allied high command (Eisenhower) wished to maintain pressure on the German forces around Caen, thereby keeping German armor away from the planned American breakthrough sector. Secondly, Commonwealth forces had met with least resistance in the western portion of the attack sector, and it therefore appeared to be the most promising area in which to mount a threat. In fact, there was a sufficient feeling of optimism to prepare an armored exploitation force for the renewed attack. Finally, at the tactical level, German artillery observation from the top of the ridge was permitting great execution against the packed British formations on the forward slopes of the ridge. It was hoped that at least the summit could be gained and the British positions in the low ground around Caen made more tenable.

In preparation for the assault, the 2nd I.D. (Canadian) extended itself to the east, taking over a portion of the front from the British 7th Armored Division.[101] The passage of line resulted in yet another

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[98]All information in paragraph from Scarfe, P. 118.

[99]The major relevant terrain in this battle included only one ridge. The British called it the Bourguebus ridge, since Bourguebus was the town in their sector located on the crest. The Canadians called the ridge Verrieres ridge for the same reason. Unit activities from Roy, pp. 76-77.

[100]The best overall discussion of the Canadian attack (and July 20) is found in Maule.

[101]The 7th Armored Division had itself taken over the right side of the VIIIth Corps lines, displacing the 11th Armored Division and allowing the latter to move into operational reserve.

delayed attack, this time until early afternoon. It also incidentally kept the infantry of the Canadian 2nd Infantry Division up all night. The attack was planned as a conventional infantry assault, with two brigades up, one back, and support provided by the tanks of the Canadian 2nd Armored Brigade. The British 7th Armored Division was withdrawn to form the exploitation force. As events unfolded, the 7th Armored Division became useful not in exploitation, but in backstopping the hard pressed Canadian force.

What awaited the single Canadian infantry division was no less than what had awaited the entire weight of the British VIIIth Corps two days earlier. The towns, orchards, and crest line of the Verrieres Ridge were occupied by the 1st and 9th SS Panzer Divisions, together with the infantrymen of the 272nd Infantry Division. Corps and divisional artillery fired concentrations from behind the hill, and all forms of weapons took a heavy toll. Most of the nine Canadian infantry battalions lost between 150 and 250 soldiers in the attack. The Black Watch of Canada, reduced to 15 men by the time it reached the crest, lost 325. While small units clung to the slopes and crest, German armored counterattacks ranged far down the hill, slowed by the attacks of rocket firing typhoons and finally stopped by the tanks of the 2nd Canadian Armored Brigade and the 7th Armored Division. In all, the Canadians and British lost 1,500 men and 56 tanks attacking towards Verrieres on July 20.[102] The only other action of the day was the capture of the town of Bourguebus by the 7th A.D. and the capture of Frenouville by the Guards A.D.

Towards evening, heavy rains soaked the ground, and made the prospects for rapid armored movement, even if tactically feasible, impossible. The armor began to withdraw that night, and, despite continued fighting in the area, particularly on Verrieres ridge, the operation was over.

[102]Maule, P. 113.

## ANALYSIS OF GOODWOOD

The following section attempts to answer nine of the questions outlined in the introductory chapter. The analysis focuses on the first day of action, though I think most of the points hold for succeeding days as well.

**Question 1: What were the effects of force-to-force ratios?**

**Question 2: What were the effects of force-to-space densities?**

**Question 3: What advantages, if any, accrue to the defender?**

It is often said that defense relies primarily on firepower, while offense relies primarily on maneuver. Who wins becomes a partial function of the degree to which each of the two types of fighting--maneuver or fire--are practicable. Can the defender populate the ground densely enough to see and engage (fire on) the attacker as he maneuvers? Conversely, can the attacker maneuver around defensive positions without being observed, engaged, and halted? The actual definition or adequacy of force-to-space densities is itself a function of three factors: terrain (type and area), troop numbers, and equipment.

The reason for spinning out this mini-theory is that Goodwood seems to be an ideal type, that is, a battle where maneuver was simply impracticable as a form of warfare. Of the thirty odd towns taken by the British during the battle, probably less than five fell to maneuver.[103] The remainder were stormed frontally. The results therefore provide a kind of baseline for exchange ratios and other outcome metrics in cases where attackers must engage defenders in frontal clashes.

The numbers provided below indicate the following things:

1. The Germans had very good force-to-space ratios.

[103]Tactically, the British 11th A.D. managed to take Bras by quickly changing an axis of attack for one of its armored regiments, thereby taking a battalion of 1st SS infantry from the flank. Operationally, the Germans withdrew most of their forces from several towns on the Canadian front because the armored spearhead had penetrated behind, or almost behind, them. Even in these latter cases, however, enough of a force was left to cause the Canadians some trouble.

2. The British had high aggregate force-to-force ratios.

3. The British also managed to achieve high force-to-force ratios at the point of attack.

4. The outcome (measured in personnel, equipment, and terrain losses and gains) suggest that the effects of high force-to-force ratios did not offset the effects of force-to-space ratios.

Although the British brought a large force to the battle, they could not bring it to bear effectively against the German defense. Under such circumstances, the defender had tremendous advantages (in tactical and operational terms).

AGGREGATE FORCE-TO-SPACE DENSITIES. The attack occurred across 20 kilometers of front. In all, the Germans had 41 maneuver battalions (including 10 panzer and 31 infantry battalions) either in the line or in operational reserve. These were backed by 25 battalions of artillery. If one uses the percent strength of the units to assign "battalion equivalents," there were 29 maneuver BE's (battalions equivalents), including 8 tank or assault gun units, and 16 artillery battalions available. (I will use only battalion equivalents from here on.)

Compared to other Normandy battles, the Germans had high force-to-space ratios. Their forces in sector included 1.5 maneuver battalion equivalents per kilometer of front. Their defenses were prepared in depth, stretching some 10 kilometers from the front, with large reserve formations even farther back.

For their part, the British maintained a force of 75 full strength maneuver battalions ready to be committed into or through the attack sector, representing 3 battalions of available force for every kilometer.

ENGAGED FORCE-TO-SPACE DENSITIES. The British succeeded in maneuvering a huge mass of materiel into the 25 kilometer attack sector. They engaged with 46 battalions, including 13 armored, on the first day. This represented close to 2 maneuver battalions per kilometer. This was accomplished by engaging the defense in virtually its entire depth. The preliminary bombing raid allowed British armored formations to race through the first echelon of the defense (which was in deep shock) and engage enemy reserves. Infantry forces mopped up the front. With a penetration of about eight

kilometers at the furthest point of advance, engagements were taking place across about 50 square kilometers (about one battalion per square kilometer).

On the German side, 21 battalion equivalents, including 5 armored BE's, engaged the attackers. This represented about one battalion equivalent per kilometer of front (or about .4 BE per square kilometer in the 50 square kilometer engagement area).

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TABLE 1: Force-to Space Ratios. (Maneuver Bn Equivalents/KM) Day 1.

| | BE's | Front (Km's) | Ratio |
|---|---|---|---|
| Defender | | | |
| Available Force | 29 | 20 | 1.5:1 |
| Engaged Force | 21 | 20 | 1.1:1 |
| Attacker | | | |
| Available Force | 82 | 20 | 4.1:1 |
| Engaged Force | 53 | 20 | 2.7:1 |

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FORCE-TO-FORCE RATIOS. In terms of engaged battalions (BE's), the British maintained an advantage of 2:1. At the same time, however, the Germans maintained a reserve force of eight battalions, which presumably could have been committed if needed.[104] The same cannot be said of British reserves. The British reached a spatial limit on engaged maneuver forces, and the limit could not be overcome.

[104]Also, as Allied intelligence observed, columns were spotted moving in the direction of Caen from all directions. It appears that the Germans were moving large formations to buttress their defenses. The sources also suggest that many of the British fighter-bombers were actually engaged in interdicting these forces, not in providing close air support.

The use of battalion equivalents is of course an abstraction. Nevertheless, the numerical ratio of individual types of equipment, such as tanks or artillery pieces, are similar or higher than the ratio of battalion equivalents. Engaged British tanks, for example, outnumbered the combined number of engaged German tanks and assault guns by about 3.6:1.

Some types of military equipment are relatively more valuable in the attack than in the defense, some in the defense than in the offense. Towed anti-tank guns, for example, have considerable value in the defense and negligible worth in the attack. Even if German anti-tank guns (75 mm or larger), tanks and assault guns are compared to the total number of available British tanks, however, the British still maintained a 2.4:1 advantage in this "weighted" category of useful direct fire ground systems.

Moreover, German ammunition shortages impacted seriously on their ability to use each system to its capability. British artillery outnumbered German by 4.5:1 in terms of tubes or 2.3:1 in terms of battalions. However, on the first day of combat, the British had the luxury of spending 15 times as much artillery ammunition as the Germans.[105]

Finally, there are some numbers which cannot meaningfully be measured using ratios. The British used 4,500 aircraft on the first day of the battle. The Germans engaged with perhaps one hundred. It seems clear from the more detailed equipment counts that the comparisons of battalion equivalents state the actual British advantages in conservative terms. Yet the 2.5:1 force ratio yielded results which should make an attacker very circumspect about attacking well defended ground (and about attacking into suburban areas--a point I will get to later.)

[105]The British fired 80,000 shells. The Germans responded with 4,500 shells.

TABLE 2: Forces Engaged and in Reserve (in battalion equivalents).

| | Attacker | Defender | Ratio |
|---|---|---|---|
| Engaged | | | |
| Armor/A.G. | 13 | 5 | 2.6:1 |
| Infantry | 33 | 16 | 2.0:1 |
| (Tot. maneuver) | (46) | (21) | (2.2:1) |
| Artillery | 30 | 13 | 2.3:1 |
| Reserve | | | |
| Armor/A.G. | 5 | 3 | 1.6:1 |
| Infantry | 24 | 5 | 4.8:1 |
| (Tot. maneuver) | (29) | (8) | (3.6:1) |
| Artillery | 0 | 3 | -3 |
| TOTAL | 105 | 45 | 2.3:1 |

RESULTS: The British lost about 230 tanks and 1,600 men on the first day of the battle. In all three days, they lost 400 tanks and about 5,000 men. The Germans lost 110 tanks (including 50 knocked out by the preliminary aerial bombing), 2,500 prisoners (including at least half who were rounded up after the bombing--in deep shock), and an undetermined number of casualties (estimate: 1,500--including 700 by aerial bombing). If the bombing casualties are excluded, exchange ratios for tanks ran at over 6:1 (ratio of British tanks to German tanks, A.G.'s, and A.T. guns was 3:1) and for infantry at (very roughly)

2.5:1. The British extended their salient about 8 kilometers forward on the first day and about 2 kilometers during the next two days.

**Question 4: What were the effects of preparation time?**

**Question 5: What were the effects of terrain? Terrain improvement?**

Some have argued that the defense dominance illustrated at Goodwood is atypical of what one should expect in a majority of cases. Charles Dick, for example, writes that "the Germans, who had had several weeks to prepare, had strongly fortified key positions and covered them with extensive minefields...They knew from which direction an attack must come and they had weeks to prepare for it. In the next war, by the time infantry reinforcements have reached the Corps area from the UK, there may be hours rather than days in which to prepare."

Dick's assessment is a misreading of the actual circumstances. The Germans did predict that the most likely avenue for a major armored thrust would be in the Caen area. But this was only a situational assessment. They did not have any specific intelligence indicators of an impending attack, much less its precise timing, nature, or direction, until about 30 hours before H-hour. Prior to receiving their aerial intelligence, the Germans could not afford the luxury of preparing a large defense in any single area. Hence, many of the actual German divisions and battalions involved in the July 18 defense had only been in place for a few hours. The 272nd Division had literally been detrained from southern France only hours before H-hour. The 1st SS Panzer Division was being disengaged from positions west of the Orne even as the opening barrage began. In fact, the layered defense was only conceived on 17 July. Moreover, in contradiction to Dick's assertion, the Germans did not have any mines deployed. Their mines had been delayed in Paris. Rather, the British had done them the favor of mining the approaches out of the bridgehead. This left the Germans with a forward screen of mines, but little protection for their interior positions. (It was German doctrine to mine interior positions quite heavily.)

Preparation time was invaluable to the German defense, but a single day of advance notice was sufficient, and the effects had less to do with terrain improvement than with the disposition of forces. In

this battle, the nature of the initial terrain was more important than terrain improvement. Specifically, much of the German tactical advantage derived from the very even spacing of suburban towns, which served as the strong points of the main battle area. Each, located one to two kilometers from the next, provided mutual support for its neighbor. The guns on the ridge did most of the material damage to British forces, but the strong points prevented appropriate forces from moving forward to clear the ridge. They also contributed to the general attrition of the British force and to the confusion within the British command. This battle would seem to carry many lessons about the defensive advantages bestowed by suburban sprawl. While most modern construction is not as sturdy as the farmhouses of Northern France, most buildings do nevertheless provide concealment for defenders, as well as cover from many types of weapons.

**Question 6: What is the relative value of armor? infantry? artillery?**

It is not clear to me what Goodwood suggests about the relative value of the different combat arms. It does not seem to suggest, for example, that one tank is worth three infantrymen or that one artillery tube is worth two tanks.

Nevertheless, the battle does demonstrate that forces should be well integrated. In case after case, the British were found with an embarrassment of riches of one type (usually tanks), while wanting terribly for others (infantry and artillery). For their part, the Germans used combined arms admirably. Infantry occupied strong points, which were in turn covered and protected by the fires of large anti-tank guns.

Another lesson might be that artillery serves a variety of uses in the defense and seems to have caused much of the damage wrought on British units. Despite the disparity of ammunition expenditure, German artillery seems to have been a constant concern to the British. In addition to killing and wounding a great number of resting British troops throughout the battle area, artillery was useful in stopping tank and infantry attacks.

**Question 7: Are second echelon units useful?**

On the defensive, second echelon units are always useful. If the enemy penetrates the forward defense, they may be used to give extra defensive depth or to counterattack the point of attack. The 1st SS Panzer Division played both of these roles.

On the offense, second echelon units could theoretically be useful in exploitation. However, Goodwood does demonstrate the difficulty in using second echelon units to reinforce an attack in an attempt to achieve the breakthrough itself. On the first day, the 7th Armored Division tried to squeeze through the two preceding divisions but found no space to deploy. Despite the fact that the 11th Armored Division lost a majority of its tanks, the 7th could still not move through to reinforce. A formal passage of lines, moreover, entails costs. The movement and delay caused by the passage of the 2nd Canadian Infantry Division through positions of the 7th Armored Division telegraphed the location, strength, and timing of the Canadian attack with great precision.

**Question 8: What were the effects of tactical aviation on the defense? offense?**

There was almost no tactical aviation available to the defender, so Goodwood says little about the potential contribution of air to the defense.

Regarding the value to the attacker, evidence is mixed. In my research I did not run across a single case of tactical air units clearing obstacles holding up the British advance. In no narrative do we have aircraft sweeping down to blast German anti-tank gunners out of a wood line or village. The reason for this appears to be that the only tactical air controller capable of communicating directly with the aircraft overhead was destroyed in the first hour of the ground assault. Hence, targets invisible from above could not be attacked at all. Targets could not be marked or targeted by those best able to observe defensive fires.

Despite this, however, tactical aviation played three roles at Goodwood:

1. Tactical aircraft blunted armored counterattacks. The difference between this type of role and the obstacle busting role seems to be that armored counterattacks were plainly visible from the air.

2. It does appear that the German 88's on Bourguebus were engaged by tactical aviation, though I am unsure how effective the air attacks were.

3. Finally, British aircraft apparently conducted an extensive battlefield air interdiction campaign, which at least one source tells us was the primary task undertaken by a majority of the engaged fighter-bombers. Here again, I have no evidence confirming or disconfirming the utility of these attacks.

I believe that the British might have scored some sort of breakthrough, if they had better used airpower. Specifically, had coordination between front line ground units and tactical air units been better and a second wave of bombing attacks on the afternoon of July 18th been undertaken, the British might have broken through. The bombers might have been directed against the anti-tank guns on top of Bourguebus ridge and against the artillery sited behind the ridge. The exploitation would have still relied on the British willingness to press ahead through all hours and all weather and their coordination of all arms (neither one of which would have actually occurred), but better use of airpower might have enabled them to achieve at least a limited breakthrough.

**Source List**


Barnard, Lieutenant-Colonel W.T., The Queen's Own Rifles of Canada, 1860-1960: One Hundred Years of Canada, (Don Mills: The Ontario Publishing Company Ltd, 1960). [Q.O.R.C./ 8th Bde/ Canadian 3rd I.D.]

Baynes, John, The Forgotten Victor: General Sir Richard O'Connor, (London: Brassey's, 1989).

Bird, Will, North Shore (New Brunswick) Regiment, (XXX: Brunswick Press, 1963). [N.Shore Regt/ 8th Bde/ 3rd Canadian Division]

Blumenson, Martin, The Duel for France 1944, (Boston: Houghton Mifflin Company, 1963). [General History]

Blumenson, Martin, Breakout and Pursuit: United States Army in World War II: The European Theater of Operations, (Washington, D.C.: Office of the Chief of Military History, Department of the army, 1961).

Brown, Kingsley, Semper Paratus: The History of the Royal Hamilton Light Infantry (Wentworth Regiment) 1862-1977, (XXX: XXX, 1977). [R.H.L.I./ 4th Bde/ Canadian 2nd I.D.]

Brownlie, Major W. Steel, The Proud Trooper: The History of the Ayrshire (Earl of Carrick's Own) Yeomanry from its rising in the Eighteenth Century Till 1964, (London: Collins, 1964). [Ayrshire Yeomanry (Regiment of guns/ British 11th A.D.]

Bryant, Arthur, Jackets of Green: A Study of the History, Philosophy, and Character of the Rifle Brigade, (London: Collins, 1972). [1st Bn (motor) R.B./ 22nd A.Bde/ 7th A.D. and 8th Bn (motor) R.B./ 29th A.Bde/ 11th A.D.]

Carell, Paul, Invasion--They're Coming! The German Account of the Allied Landings and the 80 Days' Battle for France, (New York: E.P. Dutton & Co., 1963). [General History]

Churchill, Winston, The Second World War, Volume VI, Triumph and Tragedy (New York: Bantam Books, 1962).

Craven, Wesley Frank and James Lea Cate, The Army Air Forces in World War II, Volume 3, Europe: Argument to V-E Day January 1944-May 1945, (XXX: XXX, 1983 inprint). [General history]

Ellis, Major L.F., Victory in the West, Volume 1: The Battle of Normandy, (London: Her Majesty's Stationery Office, 1962).

Ellis, Major L.F., Welsh Guards at War, (Aldershot: Gale and Polden Ltd, 1946). [1st Bn W.G./ 32nd Gds Bde/ Gds A.D. and 2nd Armored Recon. Bn W.G./ Gds A.D.]

Erskine, David, The Scots Guards, 1919-1955, (London: William Clowes and Sons, Ltd., 1956). [X Co. Scots Gds/3rd Bn Irish Gds/ 32nd Gds Bde/ Gds A.D.] H.R.

d'Este, Carlo, Decision in Normandy: The Unwritten Story of Montgomery and the Allied Campaign, (London: Collins, 1983). [General History]

Fitzroy, Olivia, Men of Valour: The Third Volume of the History of the VIII King's Royal Irish Hussars, 1927-1958, (Liverpool: XXX, 1961). [Divisional Recce/ 7th A.D.]

Fuller, J.F.C., A Military History of the Western World, Volume 3: From the American Civil War to the End of World War II, (New York: Da Capo Press, Inc., 1956). [Info on German Aircraft Attacks]

Graham, Andrew, Sharpshooters At War: 4th County of London Yeomanry, (London: The Sharpshooters Regimental Association, 1964). [4th CLY, 22nd A.Bde, 7th A.D.]

Granatstein, J.L and Desmond Morton, Bloody Victory: Canadians and the D-Day Campaign 1944, (Toronto: Lester & Orpen Dennys, 1984). [Canadian 2nd and 3rd I.D.]

Handbook on German Military Forces, U.S. War Department, 15 March 1945, Repring (Baton Rouge: Louisiana State University Press, 1990).

Hart, Captain B.H. Liddell, The Tanks: The History of the Royal Tank Regiment, 1914-1945, Vol. II (London: Cassell) [3th RTR, 29th A.BDE, 11th A.D.; and 5th RTR, 22nd A.BDE, 7th A.D.]

Hart, Captain B.H. Liddell, Editor, The Rommel Papers (New York: Da Capo Press, Inc., 1952).

Hastings, Max, Overlord: D-Day and the Battle for Normandy, (London: Michael Joseph, 1984). [General History]

Hastings, Robin Hood W.S., The Rifle Brigade in the Second World War, 1939-1945. (Aldershot: Gale & Polden Ltd, 1950) [8th Bn R.B., 29th A.Bde./ 11th A.D. and 1st Bn R.B./ 22nd A.Bde/ 7th A.D.]

Historical Records of the Queen's Own Cameron Highlanders, 1932-1948, no author, (London, William Blackwood and Sons, Ltd, 1952). [Cameron Highlanders of Ottawa (Machine Gun Bn)/ Divisional troops, 3rd Cdn Div]

**Invasion 1944, Translation by Theo R Crevenna, (Chicago: Henry Regnery Company, 1950). [General History--Germany]

Johnson, Brigadier R.F., Regimental Fire! The Honourable Artillery Company in World War II, 1939-1945, (no publishing info). [G, H, I Btries, 13th BN, HAC Regt/ 11th A.D.]

Keegan, John, Six Armies in Normandy: From D-Day to the Liberation of Paris, June 6th-August 25th, 1944, (London: Johnathan Cape, 1982). [General History]

* Kemp, Lieut-Commander Peter K, The History of the 4th Battalion, King's Shropshire Light Infantry, 1745-1945. [11th A.D.]

Kemp, Lieut-Commander Peter K., History of the Royal Norfolk Regiment, 1919-1951, Vol. 3., (Norwich: The Soman-Wherry Press Ltd., 1953). [1st Bn, R.N.R./ 185th BDE/ British 3rd I.D.]

Kemp, Peter K., The Middlesex Regiment (Duke of Cambridge's Own), 1919-1952, (Aldershot: Gale and Polden, Ltd., 1956). [2nd BN, M.R./3rd I.D.]

Kerry, Colonel A.J. and Major W.A. McDill, The History of the Corps of Royal Canadian Engineers, Vol. 2, 1936-1946, (XXX: XXX, 1966). [2nd Canadian Corps troops]

Knight, Colonel C.R.B., Historical Records of the Buffs: Royal East Kent Regiment (3rd Foot) Formerly Designated the Holland Regiment and Prince George of Denmark's Regiment, (London: The Medici Society, Ltd, no date). [OPCON to 51st Highland Infantry Division]

**Kortenhaus, Werner, Die Geschichte der 21. Panzerdivision 1943-1945

von Luck, Hans, Panzer Commander: The Memoirs of Colonel Hans von Luck (New York: Dell Publishing, 1989).

Maule, Henry, Caen: The Brutal Battle and Break-out from Normandy, (London: David & Charles, 1976). [General History]

McKee, Alexander, Caen: Anvil of Victory, (London: White Lion Publishers Limited), [General History]

McNish, Robin, Iron Division: The History of the 3rd Division, (Surrey: Ian Allan, Ltd, 1978). [British 3rd I.D.]

Meyer, Hubert, Kriegsgeschichte der 12.SS-Panzerdivision "Hitlerjugend", Vol. 1, (Osnabruck: Munin Verlag GmbH, 1982). [German 12 SS Pz Div]

Mitcham, Samuel W., Jr., Rommel's Last Battle: The Desert Fox and the Normandy Campaign, (New York: Stein and Day, Inc., 1983)

Morse, S.A.E., A View from the Bridge: the Story of the 191st Field Regiment of the Royal Artillery, Essex Yeomanry, 1942-1944, (Enfield: Pika Press Ltd).

Murray, Williamson, "British Military Effectiveness in the Second World War," in Military Effectiveness, Allan Millett and Williamson Murray, Editors, (London: Allen & Unwin, 1989).

Nicolson, Captain Nigel, and Patrick Forbes, The Grenadier Guards in the War of 1939-1945, Vol. 1: The Campaigns in North-West Europe, (Aldershot: Gale and Polden Ltd., 1949). [2nd Bn (armor) Grn Gds/ 5th Gds A.Bde/ Gds A.D. and 1st Bn (motor) Grn Gds/ 5th Gds A.Bde/ Gds A.D..]

Orde, Roden, The Household Cavalry at War: Second Household Cavalry Regiment, (Aldershot: Gale and Polden Ltd., 1953). [VII Corps Recce]

Retallack, John, The Welsh Guards, (XXX: Frederick Warne, 1981). [1st Bn and 2nd A. Recce Welsh Gds/ Guards A.D.]

Rosse, Captain Laurence Michael and Colonel E.R. Hill, The Story of the Guards Armoured Division, (London: Geoffrey Bles, 1956). [British Gds Armoured Division]

Roy, Reginald, 1944: The Canadians in Normandy, (XXX: Macmillan of Canada, 1984). [Canadian 2nd and 3rd I.D.]

Roy, Reginald, Ready for the Fray: The History of the Canadian Scottish Regiment (Princess Mary's) 1920-1955, (XXX: XXX, 1958). [1st Bn, Can Scot Rgt/ 7th I.Bde./ Canadian 3rd I.D.]

Ruge, Friedrich, Rommel in Normandy (San Rafael: Prisidio Press, 1979).

Scarfe, Norman, Assault Division: A History of the 3rd Division from the Invasion of Normandy to the Surrender of Germany, (London: Collins, 1947). [British 3rd Infantry Division]

* Sellar, Robert James Batcher, The Fife and Forfar Yeomanry, 1919-1956,(Edinburgh: William Blackwood and Sons Ltd.). [29th A.Bde, 11th A.D.]

Stacey, Colonel, C.P., The Canadian Army, 1939-1945: An Official Historical Summary, (Ottawa: King's Printer, 1948). [General History]

Stanley, George F.G., Canada's Soldiers: The Military History of an Unmilitary People, (Toronto: Macmillan of Canada, 1954). [Canadian Units]

Survey of Allied Tank Casualties in World War II, by Alvin D. Coox and L. Van Loan Naisawald, Operations Research Office under contract with Department of the Army, Technical Memorandum, ORO-T-117, March 1, 1951.

A Survey of Tank Casualties, by the Department of the Scientific Adviser to the Army Council, Military Operational Research Report, Battle Study Number 82, Report Number 19, March 1947.

A Survey of Tank Warfare in Europe from D-Day to 12th August 1944, Army Operational Research Group, Memorandum No C.6, May 1952.

Sweet, John J.T., Mounting the Threat: The Battle of Bourguebus Ridge, 18-23 July 1944, (San Rafael: Presidio Press, 1977). [General History]

Tascona, Bruce and Eric Wells, Little Black Devils: A History of the Royal Winnipeg Rifles, (Winnipeg: Frye Publishing, 1983). [R.W.R./ 7th Bde/ Canadian 3rd Division]

Taurus Pursuant, A History of the 11th Armoured Division (no author/ no publishing info.). [British 11th Armoured Division]

Verney, Major-General Gerald Lloyd, The Desert Rats: The History of the 7th Armoured Division, 1938 to 1945, (London: Hutchinson, 1954). [7th A.D.]

Verney, Major-General Gerald Lloyd, The Guards Armoured Division: A Short History, (London: Hutchinson, 1955). [Gds A.D.]

Warren, Arnold, Wait for the Waggon: The Story of the Royal Canadian Army Service Corps, (XXX: Mcclelland and Stewart Ltd., 1961). [2nd Canadian Corps]

Walker, Maj. G. Goold, The Honourable Artillery Company, 1537-1947, (Aldershot: Gale and Polden, Ltd, 1954). [13th HAC, RHA, 11th A.D.]

Weigley, Russel F., Eisenhower's Lieutenants: The Campaign of France and Germany, 1944-1945, (Bloomington: Indiana University Press, XXX).

Wilmot, Chester, The Struggle for Europe, (London: Collins, 1952). [General History]

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* Those sources which have not yet been secured in full. (I.E. I just have the title page.

** Need more bibliographical information.

@ Sources which have not yet been secured.

H.R. Honor Roll

# THE COBRA BREAKTHROUGH

Nick Beldecos

## Introduction

US forces launched Operation Cobra in late July 1944. Their aim was to punch through German defenses that had contained the Allied invasion force in the Normandy lodgment since the June 6 D-Day landings. Cobra was resoundingly successful. The long sought breakthrough was achieved rapidly and exploited forthwith. German defenses in Normandy were unhinged and shattered. Cobra paved the way for a spectacular breakout that led to the Falaise encirclement and the pursuit of German forces to the Rhine.

The first section of this paper provides a synoptic account of Operation Cobra and discusses several analytic issues that arise in the course of the narrative. The second section treats a variety of analytic issues in a more focused way, with specific reference to the framework that has guided the Working Group's comparative study. An appendix sets forth quantitative measures of battlefield conditions and force-on-force comparisons for the Group's database.

## I. BATTLE SYNOPSIS AND DISCUSSION

### Origins of Cobra

In the weeks following the Allied landings, efforts to expand the beachhead proved costly and slow. At the tactical level, engagements took the form of brutal, close-in combat among the hedgerows of the Norman *bocage*. General Omar Bradley, then commander of the US First Army, characterized this struggle as "tough and costly . . . a slugger's match."[1] He feared that this sort of fighting could lapse into a replay of World War I trench warfare.[2] At the operational

[1]Cited in Blumenson, pp. 213, 214. In addition to the material cited in footnotes, a number of works have been consulted as general references in assembling this account. These sources are included in the bibliography. The narrative relies most heavily on the Army official history by Blumenson.

[2]Bradley, pp. 317-318.

level, attacks by the First Army were characterized by dispersion of effort along a broad front. Clear success remained elusive. To be sure, the Allied foothold on the continent was growing; nonetheless, the "slugger's match" was as unpromising as it was unpleasant. Casualties throughout this campaign were heavy. In twelve days of sustained combat, for example, the 90th Division's infantry and infantry officer replacements numbered approximately 100 and 150 per cent of authorized strength respectively.[3] Over the seventeen days of the July offensive from the Carentan plain to St.-Lô, the First Army sustained 40,000 casualties to gain but eleven kilometers and a less than satisfactory position at that.[4] As the Allied effort bogged down, the situation grew ripe for an alternative approach. Operation Cobra arose from the need to break the bloody stalemate.

The requirement for a breakout had become paramount by early July. Allied commanders sought two strategic objectives in such a breakout: acquisition of maneuver room and seizure of the Breton ports. Because the Germans had been able to keep the invasion forces bottled up on the Cotentin Peninsula, the Allies were denied freedom of movement and, hence, the opportunity to wage maneuver warfare. Bradley was convinced that an open war of movement would play to US advantage.[5] Gaining access to French ports had long been a major concern of Allied commanders, figuring prominently in the planning for Overlord. The perceived urgency of acquiring the Breton ports was reinforced by the expectation that September gales would prohibit beach reinforcement and restrict resupply to Cherbourg, then estimated capable of supporting fourteen divisions.[6] Although Cherbourg became operational

[3]Blumenson, p. 201.

[4]Blumenson, p. 175. Weigley notes of the consequent strain on replacement capacity that, "By mid-July, infantry replacements were so scarce in the European theater that 25,000 had to be requested from the United States by the fastest transportation possible (p. 143)."

[5]Bradley, p. 318.

[6]Bradley, p. 317.

starting July 16, its activity was not to become important until the end of the month.[7] By July 20, the Allies had landed some 36 divisions, filling the lodgment area "to the bursting point."[8]

**The Operational Plan and the Disposition of Forces**

Allied commanders pondered a variety of options prior to settling on Cobra. Recommendations for additional amphibious or airborne landings were ultimately rejected in favor of plans to break out from the Allied enclave directly, with massive aerial bombardment paving the way. This approach saw its first incarnation in the form of the ill-fated British Goodwood assault of July 18-20. As conceived by General Bradley, Cobra was to open with a far more destructive aerial and artillery bombardment, to be followed rapidly by a breakthrough and exploitation by units of the First Army.[9] In a departure from the character of earlier US operations in Normandy, overwhelming combat power was to be concentrated on a narrow sector. Bradley had worked out the basic plan and discussed it with senior officers by July 10.[10] Army planning was complete by July 18.[11]

The main efforts were to occur along the front extending from St. Lô to Lessay on the west coast of the Cotentin (see maps). At Bradley's disposal were 15 divisions in four corps deployed along some 50 km. From the First Army's right to left (west to east) were VIII, VII, XIX, and V Corps. Principal responsibility for Cobra fell upon Collins' VII Corps, which was

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[7]Blumenson, p. 209.

[8]Wilmot, p. 388.

[9]"Bradley's plan followed the advice of SHAEF planners, who had concluded long before that the best way to break a stalemate was by marshaling airpower in support of a land offensive mounted from within the stabilized beachhead." (Blumenson, p. 187.) Although the Cobra bombardment was to be heavier than that for Goodwood, Bradley wanted smaller bombs used so as to minimize such cratering as impeded movement in Goodwood. On the weight of this attack, Bradley remarked, "I've been wanting to do this since we landed. When we pull it, I want it to be the biggest thing in the world. We want to smash right through." *Hansen Diaries* cited in Weigley, p. 138.

[10]Bradley, p. 330.

[11]Bradley, p. 339.

charged with the breakthrough proper. The Périers_St.-Lô highway (henceforth "Périers road") marked VII Corps' jump-off line. Massive aerial bombardment, augmented by artillery fires, was to saturate a 2300 m by 6500 m box immediately in front of VII Corps' staging area and covering the entire breadth of its sector. With six divisions--the better part of an army--VII Corps was to breach German defenses along its narrow sector (6.5 km) immediately west of St.-Lô and then exploit to Coutances. In so doing, VII Corps was to slash across the rear of German forces along the Cotentin west coast opposing Middleton's VIII Corps. Secondary responsibility fell to VIII Corps (six divisions on 25 km), which was to serve as a "pressure force" against the said Germans. Corlett's XIX and Gerow's V Corps were to play a tertiary role, conducting supporting attacks to the east of the VII Corps effort. These corps controlled one and two divisions, respectively, along a total frontage of 20 km. At a minimum, Cobra was expected to advance US forces some 15 km, roughly to the line joining Coutances and Caumont. From there, US forces would be better poised to launch operations to turn the corner into Brittany.

This paper restricts its attention principally to the breakthrough effort proper, in particular the operations of VII Corps. Accordingly, the focus is on the first three days of the operation, July 25-27. A breakthrough was achieved on the 26th. Cobra was formally completed on the 27th. The fronts of VII and VIII Corps rejoined in the general vicinity of Coutances on the 28th.

VII Corps' attack entailed two phases.[12] First, infantry was to break into German defenses, seize critical road junctures, and secure the shoulders of the breach to establish a corridor for the passage of mechanized reserves. Second, mechanized reserves were to exploit the breakthrough. West to east, the 9th, 4th, and 30th Infantry Divisions were charged with the initial penetration, 1st Infantry (motorized),[13] 3d and 2nd Armored Divisions with the

[12]For details , see Blumenson, pp. 215ff, upon which the following discussion draws.

[13]The motorized infantry division was "equipped to move all of its elements simultaneously by motor" and was "somewhat more liberally provided with auxiliary elements than the infantry division. (Greenfield et. al., pp. 277-278). It had an organic strength of 16,000 and at TOE strength had almost 3000 vehicles. This compares to roughly

exploitation. Although the 9th and 30th had been exhausted by previous fighting, the 4th and particularly the 1st were well rested.[14] Both armored divisions were "old-type"--1942 TOE--and therefore heavy, packing 232 medium tanks each, versus 186 for the then-current TOE.[15] To carry out the exploitation, Collins had four mobile assault groups centered around the four combat commands in his two armored divisions. Each combat command packed a considerable punch, consisting of an armored regiment with over 100 medium tanks, an infantry regiment (either the division's organic regiment of armored infantry[16] or one attached from an infantry division), and self-propelled howitzers. The combat commands can fairly be considered "mini-divisions." On the west and east flanks respectively, infantry was to seize the road junctions at Marigny and St. Gilles, about 5 km deep, and then establish blocking positions. Aircraft were to attack bridges to help seal off the flanks. The four combat commands were to follow up the infantry through the Marigny-St. Gilles gap in three columns. In the west, the 1st Infantry with Combat Command B of the 3d Armored Division (CCB/3) was to thrust directly toward Coutances by way of Marigny and the excellent St.-Lô_Coutances highway (see map). In the center-west, the remainder of 3d Armored was to make a wider envelopment. In the east, the 2d Armored Division was to establish blocking positions to the east and to the south, thus screening the sweeps by the 1st Infantry and 3d Armored. The 22d Regimental Combat Team of the 4th Infantry Division was attached to CCA/2, while CCB/2 included the division's organic 41st Armored Infantry Regiment.[17]

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14,000 men and about 2000 vehicles in a regular infantry division, for which all elements were motorized *except* the infantry. (Greenfield et al., pp. 337, 338, and 274-275.)

[14]Blumenson, p. 217, and Bradley, p. 332.

[15]Greenfield et. al., pp. 320-321.

[16]In contrast with motorized infantry, which moved by truck, armored infantry moved by half-track, of which there were 733 in "old-type" armored divisions. (Greenfield et. al., pp. 277 and 321.)

[17]Houston, pp. 211-212.

Although the main source of preparatory fires was to be the aerial bombardment, VII Corps was to be heavily supported by artillery. The opening barrage would extend somewhat further south than the bombing box (2700 m vs. 2300 m into German lines). Collins could call on over 1000 guns total[18] from well over fifty battalions. Although the number of tubes supporting VII Corps' effort was very large, US artillery was said to be operating subject to an ammunition shortage.[19] "In the entire eleven months of operations on the Continent no supply problem plagued U.S. forces more persistently or constricted their operations more seriously than the shortage of field artillery ammunition. Restrictions on expenditures were imposed shortly after the Normandy landings because of unloading difficulties at the beaches. Such restrictions continued with little relaxation until the end of hostilities because resupply from the United States was uncertain."[20] The character of this shortage on the eve of Cobra and its possible impact on the operation are rather unclear, however. In particular, it is unclear whether in Cobra the "shortage" was in fact a shortage that compromised operational effectiveness or whether US commanders simply wished they had more ammunition. The Appendix to this chapter includes both a detailed accounting of US artillery and a treatment of the ammunition availability issue.

Cobra was originally intended to be a breakthrough and exploitation. The breakout as it actually occurred was not a centerpiece of Bradley's original plan. That plan did, however, intend for forces to seize any opportunities that presented themselves.[21] The opportunity-seeking tone of the plan was captured in a letter from Eisenhower to Bradley on the eve of Cobra:

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[18]Bradley, 341; Weigley, p. 151.

[19]Weigley, p. 151, and Blumenson, p. 219.

[20]Ruppenthal, p. 247.

[21]Blumenson, p. 215.

" . . . I assure you that . . . a breakthrough at this juncture will minimize the total cost [ of victory]. . . . Pursue every advantage with an ardor verging on recklessness and with all your troops without fear of major counter offensive from the forces the enemy now has on his front. . . . The results will be incalculable."[22]

Cobra, then, had two basic objectives at the operational level: (1) pierce the German line with a massive blow by VII Corps and exploit to Coutances, (2) unhinge German defenses opposing VIII Corps along the Cotentin west coast, then cut off and eliminate them through VII Corps' exploitation across the German rear and VIII Corps' pursuit. Beyond those objectives, US forces were to capitalize on any opportunities thereby created.

A potential problem in otherwise sound US planning at the operational level appears to have arisen from a tension between the two mutually exclusive goals of entrapment and pursuit of German forces to the west of the breakthrough proper. The original Army plan envisioned a complete entrapment by VII Corps--slamming the door shut--while VIII Corps crushed the enemy pocket. Collins revised this plan to leave a small coastal corridor open to allow for pursuit by VIII Corps and avoid a collision of the two US forces.[23] To make some sense of this revision one must assume that Collins' aim was to achieve both goals; if VIII Corps could advance down the coast, a small corridor could permit friendly access while being too constricted to serve as an enemy escape route.[24] In general, however, it seems that pursuit of either goal forces some degree of trade-off. Keeping the door open increases the risk of defenders escaping by leaving the defense less well anchored, thus compromising the entrapment

[22]Cited in Blumenson, p. 331.

[23]See Blumenson, p. 215 on the original plan, pp. 217-218, on Collins' revisions, and pp. 266 and 330 on ongoing assumption of encirclement. It should be noted that Collins made a number of other important revisions as well.

[24]One assumes that "pursuit" in this context refers to German forces other than those that would have been the object of a pure encirclement.

goal. Buying time for an encirclement means that the pressure force must engage the defenders in such a way as to fix them across the front, thus compromising the sort of swift and compressed advance that would facilitate pursuit.[25] What exactly was the US objective here? To the extent that unfolding circumstances might necessitate trade-offs, which goal was to have priority--to bag or to chase? None of the accounts suggests that there was a potential conflict here. Weigley, in any event, seems to view Collins' plan as giving priority to the chase. While this issue may have been as clearly and soundly resolved as were others in Bradley's and Collins' plan, historical accounts do not convey this sense.[26]

Bradley's 15 divisions faced 10 German division formations constituting Hausser's Seventh Army.[27] Many division flags controlled an assemblage of remnants formerly from other divisions, as most German units had been depleted by the hedgerow fighting to well below authorized strength. Shortages of manpower, heavy equipment, repair parts, ammunition, and especially of oil compromised combat effectiveness.[28] Seventh Army comprised LXXXIV (84th) and II Parachute Corps (see map). LXXXIV Corps' sector extended from the Cotentin west coast to about 5 km west of St.-Lô. The seam between LXXXIV and II Parachute Corps lay just inside the eastern edge of the US VII Corps attack sector. LXXXIV Corps controlled seven divisions, six on line (four infantry, two panzer) and one (infantry) in reserve. II Parachute Corps controlled two infantry divisions, without a corps reserve. Seventh Army reserve comprised one infantry division and two infantry and two tank companies of the 2d SS Panzer Division,[29] the remainder of which was on line in LXXXIV Corps' sector. That division

[25]Assuming that at least some degree of encirclement was sought, one is hard pressed to come up with any reason for delaying VIII Corps' attack (see narrative), given the need to fix at least part of the defense.

[26]Unfortunately, Bradley's memoir sheds no light on this issue either.

[27]The subsequent discussion draws from Blumenson, 224ff.

[28]Blumenson, p. 225, and Houston, p. 210.

[29]Blumenson, p. 227.

had 57 operational tanks.[30] To the east of Seventh Army, Eberbach's Panzer Group West opposed the British Second Army. The superior formation for both armies was Army Group B under the command of Field Marshall von Kluge.

General Fritz Bayerlein's understrength Panzer Lehr Division and attached units manned the line directly opposite VII Corps.[31] Augmenting the organic assets of Panzer Lehr were the "badly damaged" Kampfgruppe Heinz of the 275th Division with 450 combat troops, an inexperienced regiment of the 5th Parachute Division with 500 partially trained combat troops, and some elements of the 2d SS Panzer Division.[32] Of some 30,000 total troops opposing VII

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[30]Wilmot, p. 389. Distribution between line and reserve positions unspecified.

[31]Based principally on information in its divisional history (Ritgen, pp. 163-173, 316-319, 343), Panzer Lehr appears to have included the following nominal units and derived *estimates* of tank strength at the time of Cobra:

| | | | |
|---|---|---|---|
| <u>Organic units:</u> | | | |
| Panzer-Lehr-Regiment 130 | 2 bns | Mk IV/Mk V | 12/10 |
| Panzer-Grenadier-Lehr Regiment 901 | 2 bns | | |
| Panzer-Grenadier-Lehr Regiment 902 | 2 bns | | |
| Panzer-Artillerie-Regiment 130 | 3 bns (1 SP, 2 T) | | |
| Panzerjäger-Lehr-Abteilung 130 (AT) | 1 bn | JgdPz IV/Stug III | 13/10 |
| <u>Attached units:</u> | | | |
| I./Panzer-Regiment 6 (3d Pz Div) | 1 bn | Mk V | 16 |
| KG Heinz/Gren Rgt 984 (275 Inf Div) | 2 bns? | | |
| Fschjg-Rgt 14 (5th Prcht Div) | 1 bn? | | |
| s.Artl-Abt 992 (Army unit) | 1 bn | (heavy arty) | |
| s.Artl-Abt 628 (Army unit) | 1 bn | (heavy arty) | |

While infantry held the front line, the anti-tank battalion and I./6/3 tank battalion were immediately behind on the left and right respectively. The II./130/Lehr tank battalion was in reserve. The tanks of I/130/Lehr might have been distributed among various defensive positions.

[32]These numbers and ones immediately following in the text are from Blumenson, p. 228.

Corps, combat effectives numbered about 3200. Approximately 2200 combat troops and 45 serviceable armored vehicles were in the main line of resistance. The division had several infantry outposts deployed north of the Périers road. Most troops were deployed south of the road, where a number of strongpoints and roadblocks had been established astride the advance routes to Marigny and St. Gilles,[33] to a depth of about 5 km.[34] Finally, the 275th Division, in army reserve, was deployed to the rear of Panzer Lehr, roughly 6 km from the front.

There were at least four problems with the German defenses opposing First Army. First, as already noted, the brutal hedgerow fighting had, in Montgomery's words, "eaten the guts out of the German defense."[35] Although US forces had also been depleted by the hedgerow campaign, they were generally back up to strength by the eve of Cobra. Some US units were actually above strength, having been permitted an overage to cover casualties.[36]

Second, largely because of its better offensive terrain, Kluge had focused his attention principally on the eastern part of the Allied enclave, in the zone defended by Panzer Group West. He was convinced that the main Allied effort would resume in the area around Caen, in large part because the terrain there was more conducive to armored advance.[37] Accordingly, priority

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[33]Blumenson, p. 228. South of the road, the attached regiment from the 5th Parachute Division held the left, organic Panzer Lehr troops the center, and Kampfgruppe Heinz the right. The parachute regiment "had formed a strongpoint and roadblock near the road to Marigny. . . . Kampfgruppe Heinz, near the village of Hébécrevon, had organized five strongpoints, each in the strength of a reinforced infantry platoon with a few tanks or tank destroyers and light anti-tank guns. In the center, organic infantry and tanks had erected three strongpoints, each in battalion strength, between Marigny and St. Gilles, and three smaller roadblocks to cover the highway to St. Gilles and secondary roads near the village of la Chapelle-en-Juger." Bayerlein's regimental reserves consisted of "several companies of infantry and a few tanks located along a country road just south of and parallel to the main highway."

[34]The figure of 5 km is inferred from the deployment description offered by Blumenson, p. 228, and from the map "German Troop Dispositions" in the same. Wilmot, p. 390, is consistent, specifying that efforts were made to hold road junctions to a depth of "three or four miles behind the front." The description of regimental reserves deployment would put them about 5 ± 1 km behind the front. Accordingly, it is unclear whether actual combat positions were manned to a depth of less than 5 km or whether some of the combat positions and reserve deployments were coextensive.

[35]Wilmot, p. 388.

[36]Houston, p. 209.

[37]Blumenson, p. 226.

was given to the forces in this area, especially in the allocation of panzer divisions. On the eve of Cobra, the Germans had in the US sector 85 infantry battalions versus 92 in the British,[38] but only about 100 tanks in the US sector versus 600 in the British.[39] Also illustrative, the three *nebelwerfer* brigades in Normandy were committed to the Caen sector, despite Hausser's requests for them.[40] Insofar as Hausser expected a major offensive in the US sector, he thought it more likely to be launched east of the Vire River, as the terrain to the west was unfavorable for armored advance.[41] Hausser consequently failed to perceive the US buildup there. Seventh Army continued to dismiss the possibility of an attack west of the Vire even after Choltitz reported a "concentration of strong armored forces" near the Cotentin west coast on July 23.[42]

Third, and partly in consequence of the first and second problems, the Germans lacked a sizable mobile reserve in the Cobra sector. Hausser had decided that his defenses were better served by putting his two armored formations in the line, instead assigning infantry to the operational reserve, which was thin at that. The 353d and 275th Divisions--both understrength--constituted the LXXXIV Corps and Seventh Army reserves respectively. Kluge admonished Hausser to put the infantry in the line and withdraw both panzer divisions into reserve. For reasons that elude this writer, Hausser took no such action. Obviously, a defender will benefit from tanks in the line only if the attack comes in the tank-reinforced sector. In this case, the two

[38]Presumably these are nominal figures reflecting the number of battalion flags up.

[39]Infantry battalion figures are from Belchem, p. 162. Tank figure of 600 is from Wilmot, p. 389, which specifies a German total of 110 as reflecting "57 tanks" in the 2d SS Panzer Division and "about 50 tanks and assault guns in Panzer Lehr. Blumenson, p. 228, provides a figure of 45 armored vehicles in Panzer Lehr , for a total of 102. It is unclear whether the figures of 57 "tanks" in 2d SS Panzer and 600 in the British sector reflect assault guns as well. Belchem, p. 162, counts 190 "tanks" in the US sector and 645 in the British, also without explicitly addressing the issue of assault gun accounting.

[40]Wilmot, p. 389. *Nebelwerfer* refers to a family of multi-barrelled mortars (6 x 150 mm or 5 x 210 mm). (Davies, p. 113.)

[41]Blumenson, p. 226.

[42]Blumenson, p. 227.

German panzer divisions covered only a small portion of the front. Had there been enough tanks to support the entire front line, forward deployment of all armor would still have been imprudent for reasons having to do with economy of force, flexibility of deployment, and the potential weight of defensive counter-concentration.

Related to the third, and again partly in consequence of the first and second, was a fourth problem: the German defense lacked depth, with fighting positions extending no more than about 5 km behind the front line. To Hausser's credit, the local deployment scheme for infantry reflected an economical use of very limited forces. "Hausser decided to man his main infantry line very lightly and to concentrate upon holding the road junctions for a depth of three or four miles behind the front. The past month's fighting in the bocage had shown that tanks could not move far or fast across country, and that, if the road junctions were held, the speed of the American advance could be cut down to the pace of the infantry."[43]

Finally, the German front was somewhat overextended. The western part of LXXXIV Corps' sector was forward of where it should have been if freeing reserves was a paramount concern.[44] This claim is borne out by Kluge's suggestion to Hausser on July 25 that he shorten the line to disengage the entire 2d SS Panzer division for a counterattack.[45]

**Terrain and Conditions**

The terrain in Normandy, while passable, tended to impede movement. Accordingly, it strongly hindered mechanized warfare. The distinctive feature of the Norman terrain was the *bocage*, a network of hedgerows traversing the countryside that restricted and compartmentalized the battlefield. Bradley's description is apt:

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[43]Wilmot, p. 390.

[44]Even if the terrain covered by a shorter line were less defensible, this disadvantage would have to be weighed against the advantage of expanding the reserve.

[45]Blumenson, p. 248.

> " . . . the hedgerows formed a natural line of defense more formidable than any even Rommel could have contrived. For centuries the broad, rich flatlands had been divided and subdivided into tiny pastures whose earthen walls had grown into ramparts. Often the height and thickness of a tank, these hedgerows were crowned with a thorny growth of trees and brambles. Their roots had bound the packed earth as steel mesh reinforces concrete. Many were backed by deep drainage ditches and these the enemy utilized as a built-in system of communications trenches. To advance from pasture to pasture it became necessary for us to break a path through those ramparts in the face of savage and well-concealed enemy fire. Not even in Tunisia had we found more exasperating defensive terrain. Collins called it no less formidable than the jungles of Guadalcanal.[46]

Accordingly, the terrain sharply restricted observation and fields of fire. Among the hedgerows, "most fighting was at close quarters. Tanks dueled at negligible range, and infantry fought it out with small arms and grenades."[47]

By the time Cobra was launched, a countermeasure to the hedgerows had been developed and deployed: the hedgecutter. A set of tusk like prongs was welded to the front of selected Shermans. These "Rhino tanks" could impale and uproot sections of hedgerow. As the blades sliced through the ground and hedge, they held the nose of the tank down, thus avoiding exposure of the tank's relatively thin-skinned underbelly. On the eve of Cobra, three of every five tanks in the First Army were equipped with the hedgecutter. Bradley wanted to capitalize on the surprise effect of the new device and accordingly forbade its use until Cobra.[48] As events

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[46]Bradley, p. 296.

[47]*Spearhead in the West*, p. 71.

[48]Blumenson, pp. 206-7.

in Cobra unfolded, the hedgecutter was to have little tactical value because the tanks advanced on roads.[49]

Swamps were also characteristic of the Norman terrain, although Normandy was drying around the time of Cobra."[50] Far more importantly, however, the Cobra battle zone was situated just beyond the Carentan marshes--and not by inadvertence. The First Army conducted preparatory attacks to ensure that the higher and drier ground just north of the St. Lô-Périers road could be used as a staging ground. Blumenson describes the battle zone proper:

> "The Cobra battleground--the Coutances-St. Lô plateau--was to be south of the highway. It was a region of typical *bocage*, an area of small woods and small hills, land bounded on the west by the ocean, on the east by the Vire river. The sombre hedgerowed lowland gave way to rolling and cheerful terrain, the swamps disappeared, arable land was more plentiful and fertile, the farms more prosperous, the hedgerowed fields larger. Pastoral hillsides replaced the desolation of the *prairies* and the over-luxuriant foliage of the Carentan lowlands. Roads were plentiful, for the most part tarred two-lane routes. There were several wider highways--four main roads leading south and three principal east-west roads across the Cotentin. Road centers such as Coutances, St. Gilles, le Mesnil-Herman, and Notre-Dame-de-Cenilly assured an adequate communications network. Streams were relatively small.
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> A jumble of small ridge lines at first glance, the Coutances_St. Lô plateau contains a series of east-west ridges that rise toward the south for about eight miles from the Lessay_St. Lô highway. Forming cross-compartments that would

[49]Blumenson, p. 332.

[50]Spearhead in the West, p. 71.

hinder an advance to the south, the ridges favored lateral movement across the First Army front.[51]

The largest of these ridges screened the east-west St. Lô_Coutances highway, which hugs its southern slope. As this road was to be the advance route for the exploitation to Coutances, the terrain both protected the advance route and constituted an excellent blocking position astride the withdrawal route of the Germans opposing VIII Corps.[52]

A final aspect of the conditions in Normandy was the weather. The days leading up to Cobra were persistently overcast. Given the role to be played by airpower in the initial bombardment, satisfactory weather was critically important. Poor weather forced postponement of the jump-off, originally scheduled for July 21.[53] The weather was still to play one last trick.

**Opening Rounds: The Short Bombings of July 24 and the Initial Air and Artillery Bombardment of July 25**

The meteorological forecast estimated Cobra to have an even chance of coming off on the 24th, "but at the very last moment the weather died on us."[54] With cloud cover still obscuring the target area at 11:30 AM on the 24th, the bombers were radioed at 11:40 to abort, just 20 minutes before H-Hour for the heavies.[55] Unfortunately, the signal did not reach all the bombers in time. Some 340 aircraft dropped their loads. A release error by the lead aircraft in one formation resulted in sixteen bombers dropping their loads 2000 m shy of the Périers road bomb line.[56] Effects were compounded by the bombers' perpendicular approach to that line,

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[51]Blumenson, p. 214.

[52]Blumenson, p. 257.

[53]Bradley, p. 343.

[54]Air Chief Marshal Leigh-Mallory quoted in d'Este, pp. 400-401.

[55]Bradley, p. 346.

[56]Blumenson, p. 229.

contrary to an earlier understanding between Bradley and the air planners.[57] While Bradley wanted a parallel approach to minimize friendly casualties on the ground, the air planners wanted a perpendicular approach to minimize exposure to anti-aircraft fire. Tragically, the July 24 short bombings killed 25 men and wounded 131 from the 30th Division.[58] Told that preparing for a parallel run would require more than 24 hours' delay, Bradley felt he had "no choice but to consent" to a perpendicular run to precede another jump-off attempt the next day.[59] Panzer Lehr lost perhaps 350 men and about 10 tanks and tank destroyers.[60] Obviously the attack tipped off the Germans, resulting in some redeployments such as the withdrawal of heavy artillery to Marigny.[61] Yet there was no choice but to proceed with Cobra.

With good weather on the morning of July 25, the air attack commenced at 0938. Some 1800 heavy and 400 medium bombers from VII and IX Bomber Commands with 700 fighter-bombers from IX TAC delivered over 4100 tons of high-explosive, fragmentation, and incendiary bombs into the 2300 m x 6500 m target zone, supplemented by the fires of over 1000 artillery tubes.[62] Sadly, there were more short bombings, taking the lives of 111 Americans and injuring another 490. Affected US units took time to recover and restore disrupted communications, and in some cases had to replace command and control sections wholesale.[63]

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[57]Because it provided an easily identifiable boundary for attacking aircraft, the Périers road was one of the features that first drew Bradley's attention to this area as a potential attack sector. Bradley, p. 330.

[58]Blumenson, p. 331.

[59]Bradley, p. 347-8.

[60]Weigley, p. 238.

[61]Craven and Cate, p. 231. Wilmot, p. 390, notes that the small mobile reserve of 2d SS Panzer units began to move from St. Sauveur Lendelin, south of Périers.

[62]Aircraft and ordnance delivery figures from Weigley, pp. 151-153.

[63]Blumenson, pp. 236-7.

Various sources portray the effects of the bombardment on the Germans as ranging from disrupting to devastating. Surprisingly, the Army Air Force official history takes a moderated view--that, given the weight of attack, casualties were surprisingly low. This has been attributed both to the Germans' use of deep communication trenches and individual shelters and to the Allies' use of a high proportion of fragmentation weapons along with HE so as to minimize cratering.[64] To be sure, heavy casualties were inflicted. At least 1000 men were killed. About one third of the combat effectives in the main line were killed or wounded. Perhaps a dozen tanks or tank destroyers remained operational. Three battalion CPs were destroyed. And the attached parachute regiment "virtually vanished. . . . Kampfgruppe Heinz on the Panzer Lehr right was the sole unit larger than a battalion that was capable of effective combat."[65]

It appears that the disruption, shock, and demoralization wrought by the bombardment were even more consequential. The attack disorganized the front and left the defense reeling. Communications were cut and units fell out of control. Of course, the saturation bombing was not uniform, thus leaving scattered islands of survivors.[66] Some of the defenders manning isolated pockets seemed largely unaffected.[67] Isolation broke the morale of others, as did the shock of the bombing itself.[68] The Army Air Force official history subscribes to the view that disruption and shock were the most important effects of the bombing.[69] This assessment is corroborated by numerous PW interrogations. Lieutenant-General Brereton offered one of this view's more favorable variants:

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[64]Craven and Cate, p. 234.

[65]Blumenson, p. 240.

[66]Blumenson, p. 245.

[67]Blumenson, p. 243.

[68]Craven and Cate, p. 235.

[69]Craven and Cate. Blumenson takes the same view (p. 329).

> Results of the air attack were more effective than was realized. the first reaction was disappointment because of the short bombing. Later interrogation of prisoners and examination of the area after its capture showed that the aerial bombardment was a complete success. The area was saturated with bombs and practically everything above ground was damaged. Steel fragments from bombs shredded light vehicles, perforated heavier equipment, cut tank treads, and splintered large trees. All communications were shattered. In some cases the enemy had to resort to runners to get messages back and forth. . . . The morale of the men was badly shattered. . . . Several PWs reported that their officers deserted. One German officer who was outside the main area of attack , said units all around him began pulling out and his men joined in, leaving him with only one NCO and five men out of 50 or 60. *Many PWs could not understand why we did not begin our attack sooner because of the chaotic condition existing behind the German lines. They were in a completely hopeless state for 12-18 hours after the air attack.*[70]

General Bayerlein's personal account of the experience follows:

> . . . artillery positions were wiped out, tanks overturned and buried, infantry positions flattened and all roads and tracks destroyed. By midday the entire area resembled a moon landscape, with the bomb craters touching rim to rim . . . *All signal communications had been cut and no command was possible. The shock effect on the troops was indescribable. Several of my men went mad and rushed around in the open until they were cut down by splinters.*[71]

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[70]Brereton, p. 316. Emphasis added.

[71]Cited in Keegan, p. 231. Emphasis added. "Bomb craters" presumably refer as well to artillery effects.

The defense would now be hard pressed to absorb the coming blows of VII Corps' infantry attack.

**The Ground Attack, July 25**

Ground forces jumped off at 1100, with supporting air attacks continuing apace.[72] Some units were delayed slightly as they recovered from the second short bombing. The first echelon included infantry from the three lead divisions supported by tanks from independent battalions.[73] Principal objectives for the first day were Marigny and St. Gilles, about 5 km deep. The day was to be a disappointment, as the deepest penetrations were only about 2 km by evening--beyond the Périers road, but not by much. Pockets of surviving Germans resisted with unexpected tenacity. Most German artillery was apparently left unscathed by the bombardment and was able to put heavy fire in front of advancing US troops.[74] Finally, troop congestion and cratering impeded movement of some units. Nonetheless, unbeknownst to Allied commanders, the infantry was able to eliminate most of the remaining resistance.[75]

On the western end of the main attack sector the 330th Infantry Regiment (detached from the 83d Division in VIII Corps) began Cobra with VII Corps, although it was still formally under the control of VIII Corps. Its objective was to seize a section of the Périers road and establish a westward-facing blocking position to secure the right flank. The attack proceeded smoothly as long as the bombardment was still underway. Although outside the target box, the Germans of the 5th Parachute Division (one regiment) remained hunkered down. When the bombardment

[72]This day-by-day account of the operation relies most heavily on Blumenson. Where specific figures, unit designations, or actions are not attributed, the source is Blumenson. Again, I restrict my focus to the VII Corps effort and to the first three days of ground combat. By that point, the VII and VIII Corps fronts rejoined and Cobra proper was over in any event.

[73]Typically one General Headquarters (GHQ) independent tank battalion was attached to each infantry division. See Doubler, pp. 4-6 and Hewitt, pp. 274-277.

[74]d'Este, p. 403.

[75]Blumenson, p. 246.

ceased, the Germans emerged and established a coordinated defense that halted the 330th. For unspecified reasons, US counterbattery fire was unable to stop the rain of German artillery that had began to pour in from Marchésieux.[76]

Immediately to the east of the 330th, the 9th Division's objective was Marigny. Advancing along the highway, the 9th had to pass difficult terrain consisting of low ridges and small marshes. Having successfully bypassed several forward outposts, the assault units of the 9th ran into stubborn pockets of German resistance that had survived the bombardment. The lead battalions were ordered to halt largely out of caution engendered by this surprise.

In the VII Corps center, the 8th Regiment of the 4th Division advanced two battalions abreast on a 2 km front on good offensive terrain. One advanced rapidly, bypassing a German strongpoint north of the highway and advancing over 2 km against scattered opposition. The other ran into a German position with fields of fire so effective as to preclude sideslipping. Not until two hours later, when temporarily separated supporting tanks were brought up, could the defenders be dislodged. Upon meeting further resistance, the German position was again impassable until supporting tanks, temporarily separated once more, could be brought to bear. Receiving an order to change direction and seize la Chapelle-en-Juger, the battalion reached the town outskirts but halted to avoid incoming American artillery fire.

On the VII Corps east, the 30th Division's missions were to secure St. Gilles and establish eastward-facing blocking positions on the Vire, thus paving the way for the 2d Armored Division to advance down the main road to St. Gilles with a secure flank. The minimum objective for the first day was the capture of Hébécrevon, astride the road to St. Gilles. The division attacked with two regiments abreast--the 120th on the right (west), 119th on the left (east), and 117th in reserve. The 120th was to attack along the axis of the road to St. Gilles. The

[76]Blumenson, p. 242. The defense in this sector might have benefited considerably from heavy mortars, weapons which the Germans had come to employ with great proficiency. (See Ellis, Appendix IV.) German Parachute Divisions were in principle more liberally endowed with heavy mortars (120 mm) than most other types of division. (See TM-E 30-451, pp. 94, 104, 106, and 108.)

119th was charged with the capture of Hébécrevon. The 117th, which had loaned two battalions to the attacking regiments was intended eventually to move east and clear out the loop of the Vire river.[77] Beyond the Périers road, both lead regiments of the 30th met stiff resistance. Advancing troops found the enemy "doing business at the same old stand with the same old merchandise--dug-in tanks and infantry. Enemy artillery was splattering on the main routes of approach."[78] The 120th, advancing in a column of battalions along a ridge line, ran immediately into a roadblock of three Mark V tanks supported by infantry. It is noteworthy that such a small force was able to cause as much difficulty for an entire regiment as it did--the key point being that the US regiment was highly space-constrained. In the face of congestion and enemy fire, the two follow-on battalions (1st and 3d) of the 120th sideslipped the German strongpoint to the left and to the right respectively and then proceeded. The lead battalion (2d) bested the defenders later in the day through aggressive reconnaissance and a bold advance. In operations through the rest of the day, "Infantry-tank cooperation was excellent."[79]

Advancing in a column of battalions, the 119th's attack on Hébécrevon was first held up by two companies from Kampfgruppe Kentner supported by artillery fire and dug-in tanks.[80] As with the 120th's attack further west, the defense was surmounted by dispatching both follow-on battalions to sideslip the enemy positions on both flanks. The follow-on battalions undertook the mission in the face of heavy artillery fire, especially mortars. The left flanking attack was "notably assisted" by a rolling barrage and counterbattery fire. The divisional history notes that "artillery remained the most reliable of the supporting arms."[81] The attack on Hébécrevon itself

[77]All preceding regimental information on the 30th Division is from Hewitt, p. 35. The following account of regimental and battalion actions of the 30th is also based on Hewitt, pp. 37-41.

[78]Hewitt, p. 37.

[79]Hewitt, p. 38.

[80]The attack on Hébécrevon is recounted in Blumenson, p. 244, and Hewitt, pp. 39-41.

[81]Hewitt, p. 39.

was made particularly difficult by commanding terrain favorable to the defense and by the need to travel a mined road. German fire kept US engineers off the road, thereby precluding tank support for advancing infantry. Congestion precluded maneuver. Only when darkness fell were tanks able to join the infantry.[82] A coordinated assault put the town in US hands shortly after midnight. By the end of July 25, Kampfgruppe Heinz--again, the only coherent combat unit in the main line larger than a battalion--had been annihilated, apparently a victim of the ground action near Hébécrevon."

Russell Weigley observes of the first day that the attack "would not have progressed as well as it did had it not been for the lack of a connected enemy line. There were enough gaps in the German positions to permit sideslipping and flanking operations. . . . Collins took careful note that the resistance, while disappointingly stubborn, was scattered in pockets susceptible to flanking."[83] This meant either that the short bombings had prompted the Germans to move their main defensive line to the south--meaning that only the screening elements had been encountered--or that the main line of resistance had already been shattered. Collins gambled on a critical decision: although the infantry objectives had not yet been secured, he would commit two mobile reserve columns. Part of the gamble was also the risk that these forces might congest the battlefield. The columns would move that night and launch their attacks the following day, with the initial task of simply deepening the first day's disappointing penetration.

Hausser and Choltitz did not appreciate the gravity of the situation. Though Hausser counted seven distinct penetrations of the line, both commanders were unaware of the extent of German losses and of the progress of the advance--limited as it may have been from the American perspective. In particular, they were unaware of the loss of Hébécrevon on the approach route to St. Gilles (eastern third of sector). Both commanders threw available assets

[82]Both Blumenson, p. 244, and Hewitt, p. 41, note the importance of tank-infantry cooperation for the basic task of facilitating armored advance at night, especially given the cratering of the road.

[83]Weigley, pp. 154, 155.

into the breach. Choltitz committed the reinforced 941st Grenadier Regiment[84]--part of the 353d Division in corps reserve--from a position southeast of Périers toward la Chapelle-en-Juger (center third of attack sector). Hausser committed the 985th Grenadier Regiment[85]--part of the 275th Division in army reserve--from Canisy toward la Chapelle-en-Juger.[86] The unit was essentially destroyed en route by tactical airpower. In the morning of the 26th, Choltitz was to commit the remainder of the 353d Division toward the Montreuil-Marigny line (western third of attack sector). Additionally, Hausser was to commit the remaining tank and infantry companies (one each) of the 2d SS Panzer Division (14 tanks)[87] to a counterattack.

**The Ground Attack, July 26**

The infantry continued to press its attacks, meeting with uneven success. On the west, German paratroopers continued to deny the 330th Regiment its blocking position objective. The 9th division advanced to a depth of about 4 km, but had yet to capture Marigny. In the center, the 8th Regiment of the 4th Division had greater success, capturing la Chapelle-en-Juger early in the morning, and advancing to a depth of about 8 km by the end of the day. In so doing, it overran part of the 353d Division, outflanked Panzer Lehr artillery, and "the remaining reserves of the regiment of the 275th Division at Marigny."[88] On the east, German artillery stymied the advance of the 30th Division until corps and divisional counterbattery fires took effect. The 30th crossed the St.-Lô_Coutances highway and advanced to a depth of about 5 km by the end of the day. By that point, there was virtually no organized resistance between the 352d and 5th

[84]Ritgen, p. 167.

[85]Ritgen, p. 167.

[86]The 353d and 275th Divisions each controlled two regiments. The 275th had one each at Marigny and Canisy.

[87]Ritgen, p. 170.

[88]Blumenson, pp. 249, 251. It is unclear how much of Panzer Lehr's artillery was overrun by this move. Blumenson writes that the 8th Regiment outflanked "the" Panzer Lehr artillery. At least one battalion (I./Artillerie Regiment 130), however, was deployed northwest of Marigny. (Ritgen, p. 168.)

Parachute Divisions, the two divisions straddling the VII Corps sector on its eastern and western ends. The 352d had already been outflanked, and withdrew hoping to reestablish contact with Panzer Lehr.

July 26 saw the first commitment of mechanized reserves--to minimize congestion, only three of four combat commands in two columns. Since commitment of mobile forces was initially intended to restore momentum to the advance rather than begin the exploitation, Collins assigned Marigny and St. Gilles as objectives. On the VII Corps west, the First Infantry Division (motorized) and the attached CCB/3 advanced along the Marigny road as follow-on forces to the 9th Division. CCB/3 advanced on the road, 1st Infantry in a column of regiments to the east with a Rhino in front. The most significant impediment to this advance was cratering. Near Marigny this force ran into opposition from committed German reserves--the 353d Division and two companies of the 2d SS Panzer Division. An extended firefight was inconclusive. German resistance had thwarted the first column's effort.

On the VII Corps east, the 2d Armored Division and attached 22 RCT/4 advanced toward St. Gilles in a single column as follow-on forces to the 30th Division. This second column consisted of CCA/2 with 22 RCT followed by CCB/2, which was eventually to split off. Again, cratering proved a greater impediment to the advance than enemy fire. Combat engineers "practically had to rebuild the roads."[89] In contrast to the first column's effort, however, 2d Armored Division's advance was remarkably successful. This is attributable to the excellent clearing operations of the 30th, to the single-minded leadership of CCA's commander, General Maurice Rose, and to the successful coordination of CCA's combined arms team. "CCA's combined training with the attached 22d Infantry Regiment paid off richly; at every cluster of resistance, the infantry would dismount from their vehicles, fix the enemy positions, and lead the tanks in to finish them off.[90] By mid-afternoon, CCA/2 rolled through St. Gilles, thus signifying

[89]Houston, p. 215.

[90]Weigley, p. 156.

the success of the breakthrough and the initiation of the exploitation. CCA/2's initial exploitation objective was high ground 8 km beyond St. Gilles, around St. Samson-de-Bonfossé, le Mesnil-Herman, and Hill 183. This complex would afford an excellent blocking position to protect the salient against counterattack from the east. Between St. Gilles and the objective lay Canisy. As the column rolled forward on the Canisy road, it encountered heavier mortar, antitank, and artillery fire. Cratering, minefields, and hedgerows were still the more imposing obstacles. Against some resistance, CCA/2 rolled through Canisy. Rose pressed his unit onward into the darkness toward the objectives at St. Samson-de-Bonfossé and le Mesnil-Herman, which were seized by midnight and 3 AM respectively.

July 26 also saw the first attacks by Middleton's VIII Corps, with the 8th and 90th divisions leading. German units in this sector slipped away, however, leaving a dense swath of mines in the path of VIII Corps' advance. Whether an earlier jump-off could have better fixed the German forces in VIII Corps' sector to preclude their escape remains an open question. In any event, the actions of VIII Corps did impede German efforts to shorten their front in order to disengage the 2d SS Panzer Division for a counterattack against VII Corps' effort. By evening, Hausser was able only to extricate one tank battalion and one infantry battalion and move them toward the breakthrough sector.[91]

THE GROUND ATTACK , JULY 27 AND 28

By the 27th, Cobra had become primarily a mechanized show. Developments early on the 27th indicated that the infantry had neared the completion of its Cobra objectives and could move with little restriction. German resistance was to be found in scattered pockets. The 12th Regiment of the 4th Division and the 120th Regiment (which had passed into reserve when the 117th entered the fray)[92] of the 30th Division were each committed from reserve, and each

[91]Blumenson, p. 248.

[92]Hewitt, pp. 39, 40.

advanced to positions roughly 10 km from the jump-off line. On the 28th, the 330th Regiment was finally able to move unimpeded and rejoin its parent division and corps. The 9th division passed into reserve, the 4th conducted mopping-up operations and moved south, and the 30th passed from VII Corps control.

CCA/2 secured all its objectives on July 27. As Rose prepared for further operations, he was notified on the morning of the 28th that CCA/2's mission in Cobra was over. 1st Infantry and CCB/3 in the west, by contrast, were hung up at Marigny. Moving beyond that point was essential to the plan; this force had to exploit to Coutances to set up positions blocking the retreat of German units under pressure from VIII Corps. Even though Marigny was not yet secured, CCB/3 was ordered to begin its exploitation. While CCB/3 bypassed the resistance, the 18th Regiment of the First Division was to attack Marigny to secure the road network in support of the exploitation. By the morning of the 27th, Marigny was cleared and CCB/3 was speeding down the Coutances highway. CCB/3 and the 16th and 20th Regiments of the 1st Division raced to secure the ridge line above the Coutances road. Against scattered and disorganized German resistance, the attack carried some 8 km west of Marigny. Near Camprond, resistance stiffened because of the defensive line established to cover the German withdrawal and consisting of elements from the 2d SS Panzer and 17th SS Panzer Grenadier divisions. Also in the morning of the 27th, Collins committed CCA/3 (with an attached infantry battalion) to exploit through the middle of the Marigny-St. Gilles gap toward Coutances by way of Cerisy-la-Salle. CCA/3 was to be prepared for either of two tasks, depending on how operations unfolded: screen the 1st Infantry from possible German counter-attack from the south or block retreating Germans coming from the north.[93] By noon, CCB/2 in the east was dispatched from Canisy to move south and take up north-facing blocking positions against LXXXIV Corps. This action, necessitated by circumstances, represented a considerable departure from the original plan;

[93]Blumenson, p. 264. This does not illuminate the question of the priority of encirclement or pursuit.

CCB/2 was intended to be part of the screening force rather than to take a lead role in the entrapment sweep. By nightfall, CCB/2 had covered 11 km from Canisy to Notre Dame-de-Cenilly, half way to its new objective: Lengronne. This dash continued on the 28th.

Cobra proper was completed July 27. The exploitation and breakout, however, continued well beyond that point. By the 28th, the advancing VII and VIII Corps fronts joined (see maps). The VII Corps was unable to cut off all the retreating Germans. Whatever the original or subsequent intent, the developing encirclement by VII Corps had taken on more the character of a pursuit by VIII Corps. The 4th and 6th Armored Divisions, VIII Corps' mobile reserves, jumped off on July 28, took Coutances, and headed for Granville. German forces counterattacked from II Parachute Corps' Sector on the 29th, but were repulsed. By July 31, Granville and Avranches were captured, and on August 1 Patton's Third Army headquarters became operational, ready to turn the corner into Brittany.[94] With German defenses in Normandy broken and US forces ready to wheel east, Cobra had yielded a windfall far exceeding expectation.

[94]Belchem, p. 162.

## II. STRUCTURED ANALYSIS OF BREAKTHROUGH

This section analyzes Operation Cobra with specific reference to the Working Group's framework of questions about the determinants of success and failure in breakthrough battles. The discussion proceeds seriatim.

### Explaining the Breakthrough

American forces enjoyed enormous advantages going in to Operation Cobra. Rarely does an army enter a breakthrough battle with so much weighing in its favor. In this sense, aspects of Cobra were overdetermined. To be sure, there are plausible failure modes for the overall operation.[95] In the face of nearly overwhelming odds, however, it is difficult to imagine the Germans preventing at least an initial breach of the line--even if the Americans had to pay with much higher casualties. And under most plausible counterfactual scenarios the Germans would also have been hard pressed to prevent a successful exploitation. One way or another, the Americans were likely to win this battle. Cobra followed a particular course, however, and not all of the US advantages turned out to shape the actual course of battle.[96] Which factors did matter and which explain the particular course the battle took?

In rough outline, Cobra followed a sequence in which the initial bombardment destroyed part of the defense and disrupted much of the remainder, infantry battered the unbalanced survivors, and mobile reserves exploited swiftly thereafter, skillfully employing combined arms and bypassing enemy defenses where necessary. An explanation of Cobra's successful outcome turns on six factors. The three most important factors working in favor of the Americans were (1) the weight of the initial bombardment, (2) operational tempo, and (3) highly effective

[95]In particular, the Germans would have had to start the battle with a sizable armored reserve (which, as already discussed, they could have done) and commit it in a timely manner. Such reserves, of course, would still have had to survive air attack while en route, and might have been inadequate to stem the US tide in any event.

[96]The preponderant strength of US maneuver units was never called upon fully because of force-to-space constraints. In higher-casualty scenarios, however, one could imagine this factor weighing much more heavily, particularly if depleted units had to be pulled out of the line and replaced.

combined arms coordination at the tactical level. The three most important factors working against the Germans were (1) the lack of a mobile, operational reserve of armor, (2) a porous defense in breadth combined with (3) a shallow defense in depth.

The initial bombardment was powerful enough to materially weaken an already understrength defense. Casualties were substantial, although most sources agree that by far the more important effect appears to have been disruption. Above the small-unit level, the German defense appears to have been fairly uncoordinated, presumably in consequence of disruption wrought by the bombardment. In the instances where the German defense was effective, it was so at the tactical level in small-unit engagements. Secondary accounts make clear--and the foregoing narrative should illustrate--that advancing forces were halted in a number of cases when they happened upon small, isolated groups of Germans supported variously by tanks, indirect-fire weapons, or anti-tank guns with effective fields of fire and at times commanding a restricted access route. Considering the remarkable effectiveness of such numerically inferior forces, coherence and coordination above the small-unit level would have rendered the defense all the more difficult to cut through.

US commanders, Collins and Rose in particular, grasped the importance of maintaining operational tempo in order to keep defenders unbalanced and to prevent them from regrouping. This is demonstrated by Collins' early commitment of reserves and by Rose's persistence in pressing CCA/2's attack on the US left. Both actions appear to have been critical for the rapid transition to exploitation. Both actions further demonstrate operational flexibility, by which I mean the ability to shift attacks in time and space. As Heginbotham aptly notes of the skill level of US forces at this time, they "showed a willingness to attack with persistence on little sleep and short supply; they showed great flexibility in choosing and, if need be, altering axes of attack; they mounted armored attacks at night; and their organization for combat combined the advantages of mass with the synergism of mixed combat arms."[97]

[97]Heginbotham, 1991, p. 36.

While US maneuver units possessed an enormous preponderance of force, this factor did not appear to weigh in decisively. Space constraints imposed by the narrow attack corridor, restrictive terrain, and cratering resulted in congestion for US forces and limited the firepower that maneuver units could bring to bear. As will be discussed below, US forces were able to engage only a small fraction of their available capability. They did not solve the problem of German small-unit strongpoints using preponderant force of maneuver units or of artillery for that matter. US units took one of two approaches: they either bypassed the defenders or defeated them through a skillfully executed combined arms assault. As will also be discussed below, there are numerous instances in which the progress of an attack turned unambiguously on combined arms coordination. Consideration of the other approach, going around the defenders, brings us to the issue of porosity in the German defense.

Lack of continuity in the German defense was unequivocally consequential. In many cases, some important ones in particular, the forward momentum of Cobra depended on opportunities to sideslip or bypass German resistance. More generally, porosity allowed early commitment of armor, since such action could be expected to--and did--require bypassing. Collins' critical decision to commit early was influenced strongly by this very aspect of German defenses. Because the German defense also lacked depth, US forces were rapidly able to achieve initial penetrations; they had but a thin crust to punch through. The absence of a significant mobile reserve spared US forces from serious counterattacks and removed the largest potential impediment to successful exploitation.

Surely the lack of a sizable, mobile reserve of armor was a deficiency in the German defense. Two points deserve note here. First, considering the overwhelming force on the American side, such a reserve would have to have been quite large to turn the outcome rather than just make the Americans pay a higher blood price. Second, whatever its size, such a reserve would have had great difficulty moving in daylight in the face of Allied airpower, as evidenced by the experience of an ill-fated regiment of the 275th Division.

**Force-to Force and Force-to-Space**

(See Table 6 for various measures of force and space.)

The importance of low force density in the German defense has already been discussed. Posen's study of offensive force-to-space ratios in Cobra examines in detail the important issue of space constraints.[98] Its principal conclusions are excerpted here:[99]

1. Very high offensive force-to-space ratios for engaged *mechanized* forces were not achieved. Such concentrations were limited by road capacity, damage to roads from US bombs and artillery, German mines and demolitions, and destroyed vehicles.

2. On the other hand, many combat units were located in a small corps sector, and ultimately moved through a very narrow corridor. Thus, vehicles (and people) can be positioned and moved in "commuter densities" if one is unconcerned about area fire.

3. US commanders in Cobra were largely unconcerned about area fire, and justifiably so. The Allies had command of the air and artillery superiority. The two occasions on which US troops were accidentally struck by Allied aircraft would have been counted as important tactical successes by the Luftwaffe had they been launched deliberately.

Even though total and engaged forces are distinguished in the present study, two factors overstate the US concentration capacity that might be inferred from Table 6. The first is that, on a number of occasions, entire US battalions sideslipped one another to engage German forces from the flanks.[100] Thus, on a given day, US forces might have been able to engage a considerably larger number of battalions than the day-end linear FEBA measure--which is a basis for the force-to-space statistic--would suggest likely or actually permit. The second is an artifact of the Working Group's counting rules for the study. The battalion is our basic unit of

[98]Posen, 1989b.

[99]Posen, 1989b, p. 30.

[100]The operations of the 30th Division provide a number of such instances.

account, and the engagement of any fraction of a battalion's strength suffices to enter the entire battalion in the force-on-force accounting for that day.[101] Assume a single nominal battalion at full strength (one battalion equivalent). Even if only one company of the battalion actually engaged the enemy on a given day, the whole battalion equivalent enters the accounting. While the effect is to overstate either side's concentration capacity, the effect should be more pronounced for the Americans, who have full strength battalions. Thus, for example, each side might actually have engaged an equivalent company. If that's all there is to the German parent battalion whereas the US battalion is at full strength, then US forces "get credit" for roughly three times the combat power engaged.

**Tactical Advantages Accruing to the Defender**

"Classic" defender's advantages are seen in many Cobra engagements. However, Cobra also illustrates the situation dependence of terrain advantage. Hedgerowed terrain generally favors the defender for the traditional reasons. While this was true in the Normandy campaign, the *bocage* also neutralized one of the defender's advantages--notably German armor and anti-tank gun superiority in range duels with American armor. (In this connection, note the difference between Cobra and Goodwood.) "The hedgerowed terrain had neutralized to a great extent the ability of the Tiger's 88-mm. gun and the Panther's 75-mm. gun to penetrate an American tank at 2,500 yards. Tanks generally engaged at distances between 150 and 400 yards, ranges at which the maneuverable Sherman enjoyed a distinct superiority."[102] The terrain also facilitated access by anti-tank teams with short-range weapons. In any event, other things being equal, the hedgerows would still favor the defender--of course, other things rarely are.

**Effects of Preparation**

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[101]Thus, for example, the engagement of a single nominal company (1/3 or 1/4 of a single nominal battalion) will show as the engagement of the entire nominal battalion. If the nominal company has an effective strength of 0.15 battalion equivalents and its parent nominal battalion has a strength of 0.6 battalion equivalents, then 0.6 will enter the total for engaged forces.

[102]Blumenson, p. 205. "Distinct superiority" is perhaps overly generous to the Sherman.

Most U.S. units in Cobra had a battle-tested cadre, while a number of German units were inexperienced. For example, Hausser regarded the 5th Parachute Division as "completely untrained."[103] It is noteworthy in the present context, however, that a regiment of this division mustered some of the stiffest resistance against the US advance as it repeatedly thwarted the 330th Regiment's efforts. It is also noteworthy that this unit was outside the bomb box.

Combined-arms teams benefited considerably from combat experience and training together in the period leading up to Cobra.[104] We know that CCA/2 and 22 RCT/4 trained together just prior to Cobra in order to practice infantry-armor coordination. At least one account notes specifically that the combined training of these two units paid rich dividends.[105]

**Effects of Terrain Improvement**

With one notable exception, there is little evidence in the historical accounts that terrain improvement was especially consequential in Cobra. It is probably worth recalling that the natural terrain characteristics already conferred considerable advantages upon the defender. The exceptional case was where communications ditches and individual shelters afforded protection against the initial air and artillery bombardment.[106] The Germans "had the advantage of shelters deep enough to withstand the uniformly heavy concentrations which seemed to characterize American artillery tactics."[107]

**Contribution of Combined Arms**

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[103]Wilmot, p. 389. Recall that one regiment, still under the division flag, opposed the 330th Infantry. The other, while adjacent, was under operational control of Panzer Lehr. This latter regiment was essentially destroyed in the initial bombardment, so its lack of training and experience is moot.

[104]Blumenson, p. 207, and Houston, p. 208.

[105]Weigley, p. 166.

[106]Craven and Cate, p. 234.

[107]Hewitt, p. 37.

The importance of combined arms to the success of Operation Cobra is indisputable. In various instances, an advance was stymied until a missing element of the combined arms team could be brought to bear. In particular, a number of important and even critical engagements appear to have been decided by infantry-armor coordination.[108] The following examples are recounted in the battle synopsis:

July 25 Restoration of 8/4th's advance in two instances

120/30th's advance toward St. Gilles

119/30th's seizure of Hébécrevon

July 26 Rapid advance of CCA/2 with 22 RCT/4

While there are various specific references to successful US artillery missions, artillery did not appear to play a decisive role in shaping the course of battle--except possibly in its contribution to the initial bombardment. It is unclear to what extent US non-divisional artillery displaced, if at all. Beyond some point, "Only the armored batteries accompanying the advance units had been called upon to eliminate the occasional resistance that small German groups had hurriedly organized. . . . The question of adequate artillery ammunition supplies had vanished, and even though rationing had remained in effect throughout the month, it had no effect on the small expenditures that had been necessary."[109]

German combined arms coordination was also very effective, as evidenced by the success of small strongpoints built around infantry, a few tanks, and supporting weapons. While obviously unable to turn the course of the battle, German artillery appears to have worked rather well during Cobra.[110] This was true of both mortars and guns/howitzers. In a number of engagements, German artillery weighed in significantly with a surprising volume of fire. A

[108]See Doubler for an excellent treatment of the evolution of US combined arms tactics for fighting in the bocage.

[109]Blumenson, p. 332.

[110]See examples in Hewitt, pp. 39-40, including note 1.

sizable fraction of the Germans' indirect fire assets survived the initial bombardment, particularly as a number of positions were located outside the bomb box.[111]

While their efforts receive comparatively modest attention in the secondary literature, some 15,000 combat engineers participated in Cobra and successfully performed their primary and critical task of keeping main routes open.[112] In particular, engineers had to effectively rebuild roads destroyed in the initial bombardment. For the present discussion, however, maintaining advance routes is not really an employment of engineers in a combined arms role. In that capacity, we again find in the accounts only isolated examples, as with the clearing of the mined road leading into Hébécrevon.

Viewed in the context of combined-arms cooperation, the successful coordination of the air-tank team in Cobra was an important development and will be discussed below.

**Role of Second-Echelon Forces**

Second-echelon forces played an absolutely indispensable in Cobra, as is necessarily so in any successful breakthrough. What is significant about the present case is that second-echelon forces were important not only because they were needed to conduct the exploitation. In order to restore momentum to the breakthrough effort proper--which had stalled on the first day--Collins committed part of the second echelon well before the situation was ripe for exploitation.

**Contribution of Airpower**

One of the outstanding features of Operation Cobra was, of course, the initial aerial bombardment. It is noteworthy both for its intended purpose of facilitating a breakthrough and for its unprecedented magnitude in the said application. As the important consequences of this

[111]I have, for example, been able to locate some positions at Marchésieux (Blumenson, p. 242), Marigny (Blumenson, p. 249, and Ritgen, p. 168.) and St. Gilles (Hewitt, p. 41), and to infer the location of others based on their having been overrun (Blumenson, Hewitt). Of course, being outside the bomb box did not give an exemption from air attack.

[112]Blumenson, p. 332. See also Houston, pp. 215 and 219.

bombardment have already been discussed in some detail, the present discussion will focus on other applications of airpower.

While tactical airpower did not play a decisive role in Cobra, it made significant contributions nonetheless.[113] Cobra saw the first operational employment of armored column cover techniques. In the period leading up to Cobra, coordination between ground and air forces improved considerably. The allocation of airpower to direct support of ground forces was substantial, with IX Tactical Air Command typically devoting some 70% of its effort to direct support of the First US and Second British Armies.[114] General Quesada, IX TAC commander, had led tanks equipped with radios prior to Cobra so they could cooperate closely with supporting aircraft. The air-tank team met with considerable success in its debut. IX TAC flew 72 such cover missions on the first day ACC was employed, and sustained that rate through the end of July.[115] Although employed successfully in Cobra, these techniques were to bear full fruit in August.[116]

Tactical airpower played a significant role beyond direct support, as with attacks on bridges to protect advance routes and attacks on forces deployed to the rear of the battle area--especially as they attempted to move in daylight. For example, "Continued Allied air activity in Panzer Lehr rear areas during the afternoon of 25 July thwarted efforts to reorganize and build up a new line of defense. One regiment of the 275th Division, ordered to move up from Marigny

[113]Because one is so habituated to seeing Allied air superiority and because one looks for highly visible indicators of airpower's contribution, it is easy to lose perspective on the "virtual" contribution of Allied airpower. Counterfactually, consider what could have happened if the Germans had been able to contest or achieve air superiority or if they had been able to conduct large close air support operations themselves?

[114]Blumenson, p. 207. Averages given are 40% for First Army, 30% for Second Army, 20% against rail lines and communications some 80-100 km behind the front, 20% for offensive counterair and ground assault area cover.

[115]Craven and Cate, p. 240.

[116]Blumenson, p. 208.

and counterattack through la Chapelle-en-Juger, lost all semblance of organization and counted only 200 survivors at the end of the day."[117]

The Luftwaffe actually made a number of appearances during Cobra, though they were apparently of little consequence to the battle. On July 27, the advancing 117th Regiment of the 30th Division came under "heavy attack" from the Luftwaffe. "Enemy planes were active over the Division area 16 out of 31 days in July, and some 10-20 planes bombed the Division several times during each of the last four nights of the month."[118] Also on the 27th, CCB/3 had to fend off an attack by 30 rocket-firing FW-190s.[119] Illustrative of Luftwaffe activity, IX TAC claimed 67 German aircraft destroyed between July 25 and 31 while losing 10 (of 78 total aircraft lost) to air combat.[120]

**Defensive Withdrawal**

One can posit a number of reasons for defensive withdrawal, many of which one is likely to observe in the course of a given battle:

1. Anticipation of attrition
2. Actual attrition
3. Withdrawal to better defensive positions (of necessity or as part of planned retrograde)
4. Withdrawal to fight a battle of maneuver (of necessity or by design)
5. Withdrawal to shorten or reestablish the continuity and coherence of a defensive line
6. Anticipation of being outflanked or overrun

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[117]Blumenson, p. 240.

[118]Hewitt, p. 43.

[119]*Spearhead in the West*, p. 71.

[120]Craven and Cate, pp. 242-243.

7. Actual outflanking or overrunning

Again, some combination of explanations will generally be appropriate. It should be noted with reference to the first two explanations that a withdrawal undertaken to reduce or avoid attrition can have the opposite effect. The very circumstance that might necessitate a withdrawal--enemy fire--can make such action extremely difficult. As prepared positions are vacated, concealment, favorable orientation, and planned fields of fire are diminished. Successful withdrawal under fire is extraordinarily demanding.

No particular explanation for withdrawal in Cobra stands out as noteworthy. Most were observed, often several in one case--as with LXXXIV Corps' flight from its positions opposite VIII Corps.

## Bibliography


Bernage, Georges and Georges Cadel. *Cobra: La Bataille Décisive*. Alençon: Heimdal, 1984.

Belchem, David. *Victory in Normandy*. London: Chatto and Windus, 1981.

Blumenson, Martin. *Breakout and Pursuit*. United States Army in World War II, European Theater of Operations. Washington, D.C.: Office of the Chief of Military History, 1961.

Bradley, Omar N. *A Soldier's Story*. New York: Henry Holt and Company, 1951.

Brereton, Lewis H. *The Brereton Diaries: The War in the Air in the Pacific, Middle East, and Europe, 3 October 1941_8 May 1945*. New York: William Morrow and Company, 1946.

Craven, Wesley Frank and James Lea Cate, eds. *The Army Air Forces in World War II*, volume III, *Europe: Argument to V-E Day, January 1944 to May 1945*. Washington, D.C.: Office of Air Force History, 1983.

Davies, W.J.K. *German Army Handbook 1939-1945*. New York: Arco, 1977.

Doubler, Michael D. *Busting the Bocage: American Combined Arms Operations in France, 6 June 31 July 1944*. Fort Leavenworth, Kansas: US Army Command and General Staff College, 1988.

Ellis, L. F. *Victory in the West*, volume I, *The Battle of Normandy*. London: Her Majesty's Stationery Office, 1962.

d'Este, Carlo. *Decision in Normandy: The Unwritten Story of Montgomery and the Allied Campaign*. London: Collins, 1983.

von Gersdorff, Freiherr. "Normandy, Cobra, and Mortain." Manuscript provided in response to questions posed by Cobra group of ETO historical section, St. Germain, 1945.)

Greenfield, Kent Roberts, Robert R. Palmer, and Bell I. Wiley. *The Organization of Ground Combat Troops*. United States Army in World War II. Washington, D.C.: Historical Division, Department of the Army, 1947.

*Handbook on German Military Forces*, TM-E 30-451, 15 March 1945. War Department Technical Manual. Washington, D.C.: US GPO, 1945.

Hastings, Max. *Overlord: D-Day and the Battle for Normandy*. London: Michael Joseph, 1984.

Heginbotham, Eric. "The Ties that Bind: Organizations and Large-Scale Learning." Unpublished paper, 1991.

Hewitt, Robert L. *Work Horse of the Western Front: The Story of the 30th Infantry Division*. Washington: Infantry Journal Press, 1946.

House, Jonathan M. *Towards Combined Arms Warfare: A Survey of 20th-Century Tactics, Doctrine, and Organization.* Fort Leavenworth, Kansas: Combat Studies Institute, 1984.

Houston, Donald E. *Hell on Wheels: The 2d Armored Division*. San Rafael, California: Presidio Press, 1977.

Keegan, John. *Six Armies in Normandy: From D-Day to the Liberation of Paris, June 6th_August 25th, 1944*. London: Jonathan Cape, 1982.

MacDonald, Charles B. A Time for Trumpets: The Untold Story of the Battle of the Bulge. New York: Bantam, 1985

Posen, Barry R. "NATO's Reinforcement Capability." *Defense Analysis*, vol. 5, no. 4, pp. 327-339.

————. "Offensive Force to Space Ratios in Breakthrough Operations--The Lessons of Cobra, July 24-29, 1944." Unpublished paper, 1989.

Ritgen, Helmut. *Die Geschichte der Panzer-Lehr-Division im Westen 1944-45*. Stuttgart: Motorbuch Verlag, 1979.

Ruppenthal, Roland G. *Logistical Support of the Armies*, volume II, September 1944-May 1945. United States Army in World War II, European Theater of Operations. Washington, D.C.: Office of the Chief of Military History, 1959.

*Spearhead in the West 1941-1945: The Third Armored Division*. Publisher and date of publication unknown.

Weigley, Russel F. *Eisenhower's Lieutenants: The Campaign of France and Germany 1944-1945*. Bloomington: Indiana University Press, 1981.

————. "From the Normandy Beaches to the Falaise-Argentan Pocket." *Military Review*, September 1990.

Wilmot, Chester. *The Struggle for Europe*. London: Collins, 1952.

**US ARTILLERY IN COBRA**

Over 1000 guns were to support the VII Corps attack.[121] First Army allocated nine heavy, five medium, and seven light artillery battalions to VII Corps.[122] The nine heavy and five medium battalions are taken here to correspond to the 174 heavy and medium pieces VII Corps was said to control;[123] assuming 12 tubes per battalion, we arrive at 168 tubes for fourteen battalions.[124] All seven light battalions from First Army were attached to divisions, with each of the two armored divisions receiving two self-propelled battalions and the 9th and 30th Infantry Divisions receiving two and one towed battalions respectively.[125] An organizational table for First Army on July 24 in Bradley's memoir indicates 20 artillery battalions under VII Corps artillery.[126] Since First Army alone allocated 21, the 20 are taken to be divisionally unattached battalions and, therefore, to exclude the seven light battalions from First Army. Fourteen medium and heavy battalions of 20 total imply six Corps-owned light battalions, which is a reasonable number.[127] At 12 guns per battalion, 20 battalions would account for some 240 tubes. VII Corps Artillery was also to control the artillery from divisions initially in reserve, and was to be supported by adjacent corps artillery units.[128] US infantry divisions had 66 organic

[121]Bradley, 341; Weigley, p. 151.

[122]Blumenson, p. 219.

[123]Blumenson, p. 220.

[124]Blumenson's statement (p. 219) that "Non-divisional artillery pieces of all types under corps control totaled 258" appears to refer to the 21 battalions from First Army. This is consistent with the assumption that 174 heavy and medium pieces refer to the Army-allocated heavy and medium battalions, since 258 _ 174 = 84, the number of pieces we would expect in the 7 light battalions at 12 pieces each.

[125]Blumenson, p. 219, note 67.

[126]Bradley, pp. 562-3.

[127]In a table for the composition of Third Army in November 1943, offered as "illustrative" of army and corps organization, the four constituent corps have the following numbers for light battalions out of total battalions: 5/10, 2/14, 4/8, 0/6. (Greenfield et. al., p. 368.)

[128]Blumenson, p. 220.

artillery pieces in one medium (1 x 12 155 T) and three light (3 x 12 105 T) battalions plus three cannon companies (3 x 6 105 T) associated with each of three infantry regiments.[129] US armored divisions had 54 pieces in three medium battalions (3 x 18 105 SP).[130] Accordingly, four infantry and two armored divisions account for 372 tubes. Thus--in 22 divisional and 27 non-divisional battalion--we have 372 divisional, 72 corps-owned, and 258 army-allocated tubes totaling 702, or about 300 tubes shy of the roughly one thousand guns supporting the VII Corps effort. An unspecified portion of the balance consists of pieces belonging to the adjacent VIII and XIX Corps. While it is plausible that adjacent corps were able to support with 300 pieces, it is perhaps more likely that part of the balance consists of tank destroyers or anti-aircraft guns used in an artillery support role. VII Corps had some 252 tank destroyers in seven battalions.[131] With no more than three attached to first-echelon divisions, as many as 144 might have been available for indirect fire missions.[132] Finally, the balance could also include 4.2-inch (107 mm) mortars.[133]

While many sources are at pains to note the severity of artillery ammunition shortages for US forces, it is unclear what the character and consequences of shortages may have been in Cobra. First Army allocated VII Corps almost 140,000 rounds to support five days of operations.[134] If this was the total number of rounds for VII Corps, and these rounds were

[129]Doubler, pp. 3-5; Ellis, p. 540; Greenfield et. al., pp. 274-5.

[130]House, p. 109; Greenfield et. al., p. 320-21.

[131]Number of battalions from Bradley, pp. 562-3. Figure of 36 pieces per tank destroyer battalion is from the TOE for an M10 (90 mm) battalion. (MacDonald, p. 629.)

[132]This value is used in the overall force accounting, where the following assumptions are made for the opening barrage: 49 artillery battalions (702 pieces) and 4 TD battalions (144 pieces) in VII Corps, totaling 846, plus 13 battalions (156 pieces) from adjacent corps to put the total over 1000 (1002).

[133]Information on VII Corps' inventory, deployment, and employment of 4.2-inch mortars is scarce. The 92d Chemical Battalion, less one company, was assigned to the 30th Division. Blumenson, p. 219, note 67. The only employment noted in any of the accounts is a mortar preparation for the 30th on July 26. (Blumenson, p. 250, and Bernage, photo and caption, pp. 128-9.)

[134]Blumenson, p. 219, note 66.

distributed to some 700 VII Corps tubes, then each tube could fire 40 rounds per day on average. This number is in fact small, all the more so in consideration of the type of operation at hand and VII Corps' lead role in it. Such a daily expenditure rate would bespeak a serious ammunition shortage. For comparison, ammunition consumption on the first day of Operation Goodwood was about 100 rounds per tube.[135] Posen has estimated an average consumption rate of 100 rounds per tube per day for US artillery units fighting in a European conventional war against the erstwhile Warsaw Pact.[136] Ruppenthal notes a "desired expenditure rate of 60" in reference to Third Army operations in mid-October.[137] An important question here is whether the ordnance distributed by First Army might have been an augmentation of existing stocks. If so, the figure of 140,000 appears in a different light, with some 40 rounds per tube per day a considerable addition. It would be unsurprising, however, if this figure was indeed the total stock available to First Army; in October, during the worst period of ammunition scarcity, firing rates of a few rounds per day were not uncommon.[138] The Army official history notes that in Cobra, "Because ammunition restrictions made all-inclusive prearranged fires difficult, the VII Corps Artillery . . . did not draw up an overall fire plan."[139] The 30th Division history notes in connection with that unit's attack that, "Unfortunately, even with both VII and XIX Corps artillery batteries active, there was not enough ammunition available for a really heavy counterbattery program."[140]

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[135]See the Heginbotham chapter in this volume.

[136]Posen, 1989a, p. 338, note 15.

[137]Ruppenthal, p. 255

[138]Ruppenthal, pp. 255-256.

[139]Blumenson, p. 219.

[140]Hewitt, p. 40. Without knowing what the counterbattery program actually was--and what a "really heavy" one would be--it is difficult to put this assessment in useful perspective.

## COBRA DATA

### I. Battlefield Survey

IA. Terrain

| | | | |
|---|---|---|---|
| 1. | Forest/orchard: | 28% | principally orchard |
| 2. | Forest/orchard type: | passable | but surrounded by hedgerows |
| 3. | Foliage: | heavy | hedgerows |
| 4. | Towns/km$^2$: | 0.68 | i.e., approx. 1 town/1.5 km$^2$ |
| 5. | Area urbanized: | 0% | |
| 6. | Paved road density: | 0.82 km/km$^2$ | |
| 7. | Waterways: | 0 km | note definition |
| 8. | Standing water: | none | |
| 9. | Average slope: | 3.1% | |

IC. Preliminary Bombardment

1. Sorties: see Table 1
2. POWs: unknown

ID. Air Superiority: Attacker

### II. Snapshots in Time

IIA. Force Comparisons: see Table 1

IIB. Combatant and Battlefield Conditions: see Table 2

IIC. FEBA Measurements: see Table 3

# BLUECOAT

Kevin Oliveau

## I. INTRODUCTION

Since the successful D-day invasion in June of 1944, the allied armies had been contained in Normandy. The British effort to break out, Operation Goodwood, had been a failure. But by the 27th of July, things were beginning to change. It was clear that the Americans had achieved a major success with operation Cobra. The allies were breaking out of the Normandy beachhead.

When Cobra began, U.S. forces in western Normandy faced only two panzer divisions, the 2nd SS and the Panzer Lehr. Both were in the line, leaving no panzer divisions in reserve. In contrast, British forces to the east were facing seven panzer divisions, three of which were in reserve.[1] Two of these panzer divisions, the 2nd and 116th, were sent west on the 27th and the 28th of July to deal with the American breakout.[2]

This left five panzer divisions in the British sector, all clustered in the east around Caen. This is where Operation Goodwood had taken place. Montgomery felt that another attack from Caen was "definitely unlikely to succeed."[3] But along the western end of the British line, where the 2nd Panzer Division had been, there were now no panzer divisions. Montgomery felt this was an opportunity not to be missed. Eisenhower agreed: "I feel very strongly that a three-

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[1] Running west to east, these were the 2nd, the 10th SS, the 9th SS, the 1st SS, the 12th SS, the 116th, and the 21st. See maps in Ellis, pp. 379, 387.

[2] Ellis, p. 384.

[3] Ellis, p. 386.

division attack now on Second Army's right flank will be worth more than [a] six-divisions attack in five days' time ... now as never before opportunity is staring us in the face ... let us not waste an hour in getting the whole affair started."[4]

Perhaps stung by accusations of excessive caution,[5] Montgomery pushed the Bluecoat launch date forward three days to July 30th . He told General Dempsey of the Second Army to "step on the gas for Vire,"[6] and to "Throw caution to the winds! - Ignore Casualties."[7] Vire was a key junction where six major highways and a railway came together. It was vital to the supply of the German Seventh Army. It was also 32 km from the British front line.

Operation Cobra, Operation Bluecoat, and the Mortain counter attack all followed each other in quick succession. Operation Bluecoat began on July 30th, 1944, five days after Operation Cobra started. Many of the British units which had fought earlier in Operation Goodwood were used in Bluecoat. This analysis ends on August 6th, covering a total of eight days. During the closing days of Bluecoat, the Mortain counter attack was launched against U.S. forces in the west near Avranches.

Montgomery was able to shift his forces quickly and secretly from Caen at the eastern end of the British line, to Caumont at the western end of the British line. The British surprised the Germans and punched a hole in the German line, but not in the intended location. In contrast with the American attack, the British failed to exploit the breakthrough, attempting instead to widen the eastern shoulder of the salient, which was where the planned break out was supposed

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[4]Ellis, p. 386.

[5]How, p. 23.

[6]Ellis, p. 386.

[7]How, p. 23.

to be. This is also where the Germans reinforced. Half way through the battle, British HQ relieved a corps commander, his armored division commander, and his armored brigade commander, for failing to make sufficient progress.

There is no doubt that Bluecoat was an attempt by the British to break out. In many ways the British were more successful in Bluecoat than in Goodwood, but ultimately they failed. Because the Americans achieved a sweeping breakout with Operation Cobra, Bluecoat objectives are often downplayed by British historians as simply an effort to further American operations.[8] They point out that the three and a half panzer divisions diverted to halt Bluecoat were prevented from checking the Americans at Mortain, allowing the Americans to exploit their success more fully.

It is true that much of the German armored reserve forces in Normandy-intended for the Mortain counter attack to stop the U.S.-were used to stop Bluecoat instead. But this is an effort to cover up a second British failure (after Goodwood) occurring on the heels of a U.S. success. At Caumont, a breakout was intended and achieved, but not exploited. While Goodwood was simply a failure, Bluecoat was a missed opportunity.

**British Starting Forces**

The British offensive force consisted of two corps. To the east of Caumont, the XXX Corps consisted of the XXX Corps Army Group of Royal Artillery (AGRA),[9] the 43rd and 50th Infantry Divisions, the 56th Infantry Brigade, the 8th Armoured Brigade, and the 7th Armoured

[8]Ellis, p. 386.

[9]In other words, the Corps artillery.

Division. In all, 24 infantry battalions, 2 motor infantry battalions, 7 armored battalions, and 13 artillery regiments.

Running from west to east, the units in XXX Corps' front line were: the 43rd Infantry Division supported by the 8th Tank Brigade, the 56th Infantry Brigade, and the 50th Infantry Division. The 7th Armoured Division, deployed behind the western half of the Corps was to be the exploiting force.

To the west, the VIII consisted of the VIII AGRA, the 15th Scottish Infantry Division, the 6th Guards Tank Brigade, the 11th Armoured Division, and the Guards Armoured Division.

Running from West to East, the units in VIII Corps' front line were: the 11th Armoured Division, and the 15th Scottish Infantry Division supported by the 6th Guards Tank Brigade. The Guards Armoured Division deployed behind the eastern half of the Corps, was to be the exploiting force.

In all, the two British Corps fielded 115,018 men, 1,104 tanks, and 536 artillery tubes. The 11th Armoured Division was put into the western end of the British line because no infantry division was available. This would prove to be a fortunate expedient. The 11th Armoured would prove to be the most aggressive and flexible division in the British force, and it was placed opposite the weakest point in the German line. The U.S. 5th Infantry Division was to the west of the 11th Armoured. This U.S./British boundary coincided with an army boundary on the German side, between the Seventh Army in front of the Americans, and Panzer Group West facing the British. To the west of the 326th Infantry was the 3rd Paratroop Division (3rd Para) which was part of the German Seventh Army. Communication between the 3rd Parachute of Seventh Army and the 326th Infantry Division of Panzer Group West were not good. This was a weak seam which the British were to tear open.

**German Starting Forces**

Opposed to the British were one and two thirds infantry divisions along an 18 km front. To the west the 326th Infantry Division's front ran from the boundary between the German 7th Army and Panzer Group West, for 10 km eastward, to a point 2 km west of Orbois.[10] The 326th had two companies of tanks and a Heavy AT Battalion[11] in addition to its normal equipment. The 326th was a new division at full strength, but it was inexperienced and included conscripts from captured eastern front territories (Ukrainians and Poles) within its ranks.

East of the 326th, the 276th Infantry Division's front began, running eastward to Noyers. Only the western portion of the 276th's front was attacked by the British, so it was able to counter attack with its reserve brigade on the first day. Thus, we assume that two thirds of the 276th was involved in the first day's fighting.[12]

Total starting German forces were 18,023 men, 49 tanks and assault guns, and 102 artillery tubes. But these forces were not distributed evenly. Roughly 40% of these German forces (two regiments of the 276th) were concentrated around Orbois, along a 4.7 km front.

**German and U.S. Forces in the West**

The eastern edge of the German 7th Army was held by the II Parachute Corps; the eastern edge of the II Parachute Corps was held by the 3rd Parachute Division. The 3rd Parachute Division fought in this battle, but largely against the American 5th Infantry Division.

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[10]The German divisional boundary ran to the east of St Germain d'Ectot. T315-2040-278, src:54.

[11]These "anti-tank" weapons consisted of 88mm guns mounted on a tank chassis, creating an enormously powerful self-propelled gun called the Jagdpanther.

[12]The two brigades of the division to be engaged later on in the defense of Mt. Pincon.

The German army and U.S./U.K. boundaries were closely aligned throughout the battle. This kept the struggle between the 3rd Parachute and the 5th Infantry largely isolated from operation Bluecoat. Only rarely did forces from one side of this boundary come in contact with forces on the other. For this reason, these forces are not included in my totals.

The German/U.K battle did affect the German/U.S. struggle. The German 3rd Parachute was unable to contact the 376th Infantry Division for several days, and was forced to withdraw southward to try and re-establish contact as the British drove south between them. The U.S. 5th Infantry Division advanced south to attempt to catch and attack them.

**Terrain**

Bluecoat took place in some of the hilliest and thickest parts of Normandy's bocage country.[13] It was, however, much drier than the muddy plains of lower elevations. Bocage refers to the high hedges which grow atop mounds of earth. These hedge lines separate fields in this part of France. The bocage was grown to block the strong ocean winds in order to increase agricultural yields. Tactically, bocage blocks line of sight, presents a formidable obstacle to tracked vehicles, and provides a natural defensive position for defenders.[14]

Streams and rivers cut into the hilly country, creating high points and forested ridges. Three large ridge lines crossed the British line of advance. To the north, the largest ridge ran from Hill 309 eastwards to Mt. Pincon. Hill 309 and the summit of Mt. Pincon were considered key objectives as they provided observation of movement below. The second ridge ran roughly south-west from Estry, and the third ridge ran east-west just north of the Vire-Vassy highway. In

[13]Russel F. Weigley, *Eisenhower's Lieutenants*, (Bloomington: Indiana University Press, 1990), p. 168.

[14]U.S. Army pamphlet.

addition, the Souleuvre river also crossed the British line of advance. The river could be bypassed to the east or crossed at two points: west of le Beny Bocage or at Catheolles.

The country was heavily forested. Paved roads were rare. Many roads were lined on both sides with bocage, creating sunken lanes. Entrances to fields (breaks in the bocage boundaries) were natural points to concentrate defensive fire. Thus, terrain was very unfavorable to rapid movement. Many natural obstacles existed along with good defensive positions. One advantage for the British was that lines of sight were short, so that with few exceptions tank battle occurred at close range, where German gun range, gun power and armor thickness advantages were diminished.

## II. BATTLE SUMMARY

This battle summary looks at eight days of combat. The British offensive opened on July 30th. The British punched through the German lines and drove south through August 2nd. After the 2nd, forward British forces are halted for fear that their forward positions were too vulnerable. The Germans counter attacked the forward forces while giving ground to other British forces. These Germans counter attacks were unsuccessful. Adjacent to this salient, other British and U.S. units were pushing their fronts forward. Four days (August 2nd to August 6th) are included in the analysis to demonstrate that the British forward positions were not tenuous, and that further advance had been possible. After August 6th, British units continued to push forward, but along a broad front while German forces withdrew. American forces to the far west were executing a south-eastward drive which would eventually result in the Falaise Pocket defeat for the German forces in Normandy.

In other words, by August 6th, the British breakout had been halted and contained. After August 6th, events elsewhere in Normandy resulted in a general German withdrawal. Since we

are interested in the British attempt to breakout, August 6th is the natural ending point for Operation Bluecoat. Each day from July 30th through August 6th is described below.

**Day One: July 30th**

The first day is one of shock and surprise for the German forces. Contact between the German 7th Army and Panzer Group West is lost as the British drive between them. Despite difficulties with mines, British forces in the east (VIII Corps) make significant progress, but British forces in the west (XXX Corps) meet stubborn resistance.

As with operations Goodwood and Cobra, the battle begins with a large air bombardment. 1,200 medium and heavy bombers are sent to bomb the start line. Bad weather forces 300 planes to abort their missions but the remaining 900 (about half medium, half heavy) reach their targets. The British advance is preceded by a rolling artillery barrage.

The Germans had not detected the shift of British forces from Caen to Caumont. For the Germans, surprise is total. The 326th divisional HQ is put out of action for the first day of the battle.[15]

Mines cause difficulties and casualties for the British on the first day. The German 326th Infantry Division had inherited this front from the 2nd Panzer Division, which had a large supply of mines. Thus, German units had laid many mines as a standard precaution long before the attack began. The British had inherited this sector from U.S. units which had also laid mines in now unknown locations. One tank battalion loses seven tanks to mines in the first hours of the attack.

[15]Ellis, p. 388 and Ward, p. 374.

Once through the mines, British progress is very uneven. Forces to the west (VIII Corps) are much more successful than forces to the east (XXX Corps).

In VIII Corps, the Guards Armoured Division is held in reserve to the north of Caumont. The 11th Armoured Division (11th Armoured) reaches the outskirts of St. Martin des Besaces (See Map 1).[16] The 11th encounters disorganized resistance, with troops willing to surrender. The British tanks race ahead of the infantry, fighting encounter battles on the roads.

To the north-east of the 11th Armoured Division, the 15th Infantry Division advances with the 6th Guards Tank Brigade in support. Leading tanks bypass German forces north of St. Martin[17] and reach the top of Hill 309. Later the infantry reaches Hill 309.

Tanks from the 6th Guards Tank Brigade reach the top of Hill 226.[18] The tanks just north of Hill 226 are then attacked from an unexpected direction. Three Jagdpanthers emerge from the forest to the northeast (that is from their left rear) and drive over the hill, destroying eight British tanks in the process.[19] These forces are on the boundary between VIII Corps and XXX Corps. Lack of XXX Corps progress has left the eastern flank of VIII Corps exposed to attack.

XXX Corps progress is not good. On the western edge of XXX Corps (the border with VIII Corps) is the 43rd Infantry Division. Jagdpanthers and two battalions of German infantry hold the 43rd Infantry Division to the outskirts of Cahanges.[20] To the east, the 50th Infantry

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[16]How, p. 40.

[17]In la Morishesse les Mares.

[18]And les Loges.

[19]Ellis, p. 391.

[20]How, p. 38.

Division, supported by the 8th Armoured Brigade and the 56th Infantry Brigade, advances only 2000 yards west of Orbois.[21] The 7th Armoured Division is held in reserve.

The lack of XXX Corps progress might be explained by stronger German forces in front of it. Certainly the 50th Infantry Division's task was made more difficult by having to face two coordinated regiments of the 276th Infantry while other British forces were fighting the inexperienced 326th Infantry with no central coordination. The Jagdpanthers appear to have been based at Cahanges, which hindered the 43rd Division's progress. This seems a plausible explanation for this day. But as we shall see, slow progress becomes a hallmark of XXX Corps operations.

Faced with success in the east rather than in the center, the British change their plans:

> VIII Corps was stuck out alone in enemy territory. XXX Corps, the spearhead of the offensive, had hardly moved from the start line. That night General Dempsey [VIII Corps commander] ordered O'Connor [11th Armoured commander] to take over the main offensive role. 11th Armoured Division, allocated a subsidiary task because of previous heavy casualties and only in the attack because no infantry division was available, was to be the new spearhead.[22]

The Germans respond that afternoon by ordering the 21st Panzer Division, the 503rd Heavy Tank Battalion, and other units to the Bluecoat battlefield to shore up the defenses. This addition of 6,537 men, 59 tanks, and 22 artillery tubes gives the Germans a total of 24,383 men, 106 tanks, and 124 guns. Lead elements of the 21st Panzer are 4 km short of Cahanges by 10pm

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[21]Between St. Germain d'Ectot and Orbois, Ellis, p. 389.

[22]How, p. 40.

that evening.[23] The 21st Panzer is ordered to counter attack Hill 309 with the 326th Infantry Division the next day.

Meanwhile, to the west across the German 7th Army boundary, the 3rd Paratroop Division has lost contact with the 326th Infantry Division to the east. The 3rd Paratroop Division is forced to withdraw southward to a new defensive line running west of St Martin des Besaces. It is agreed that the new point of contact between the two German armies (and between the 3rd Parachute and the 326th Infantry divisions) is 3.2 km due west of St Martin.[24] But the 326th Infantry does not make contact with the 3rd Parachute Division. The 326th Infantry has been torn apart west of Hill 309.[25] Its divisional HQ is out of action because of the air bombardment, and two of its regimental headquarters are surrounded by British tanks.[26]

**Day Two: July 31st**

The 11th Armoured manages to cross the Soulerve river, driving a deeper wedge between the German 7th Army and Panzer Group West. German efforts to re-take Hill 309 are a bloody failure. With the exception of the 43rd Infantry Division, the British fail to advance elsewhere. British positions at the end of this day are shown by arrows on Map 1.

At 10:30 in the morning, armored cars capture a bridge over the Souleuvre river (west of le Beny Bocage) from two sentries. This bridge is located in a gap between the two German armies. The armored cars' faint radio report is received by VIII Corps and tanks of the 11th

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[23]Ellis, p. 392.

[24]How, p. 44.

[25]How, p. 34.

[26]Ellis, p. 392.

Armoured Division are sent to reinforce the armored cars. They drive south, fight a brief engagement with two assault guns north of the bridge.[27] By 2pm, tanks of the 11th Armoured are across the bridge.[28] There the 11th Division runs into a panzer grenadier battalion of the 21st Panzer which is en route to join with the rest of the 21st Panzer Division to the north-east.[29]

The 15th Infantry takes over St Martin and holds Hill 309 against a German counter attack.[30] VIII reserve exploitation force, the Guards Armoured Division, is ordered forward. The division spends all day organizing tank/infantry groups and driving through traffic jams.

> As soon as the 11th Armoured Division had taken St. Martin - and evidently before Terence O'Neil had finished his tea - the Divisional Commander ordered the 2nd Irish [an armored battalion] and the 5th Coldstream [an infantry battalion] to advance together as a battle group. ...This was the first word they had of any change in organization. Lieut.-Colonel Michael Adeane, of the Coldstream battalion, being senior to Colonel Finlay, automatically took command of the group. It took the two Colonels and three hundred officers and non-commissioned officers an hour and a half to rearrange the two battalions. Out of the scrambling confusion of men, tanks and trucks, guns, carriers and motor-cycles, shouting officers, desperate Sergeants and patient Guardsmen, there emerged the Irish-Coldstream group, neatly formed up along the main road.[31]

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[27]South of Foret l'Eveque.

[28]They move southeast to capture Hill 205 on the Beny Bocage ridge. See Ellis, p. 394.

[29]How, pp. 54,64.

[30]How, p. 59.

[31]Fitzgerald, p. 398.

By late evening they are finally able to attack down the road from St. Martin toward le Tourneur. They are stopped 2km south-west of St. Martin[32] by a combined force from the 326th Infantry and the 21st Panzer.[33]

XXX Corps progress is slow. The most successful unit is the 43rd Infantry Division, which takes Cahanges and pushes south.[34] The 50th Infantry pushes forward only a few hundred yards to take Orbois.[35] The 7th Armoured Division remains in reserve.

The 326th Infantry Division is ordered to re-take Hill 309. They are caught assembling in the forest east of Hill 309[36] and are devastated by artillery and air attack. When they do attack Hill 309, artillery breaks up the assaulting forces and the British hold Hill 309.[37] The commander of the 326th Infantry, General Drabich-Waechter, is killed.

The 21st Panzer Division commander elects not to participate in the Hill 309 counter attack as ordered. Instead, he moves into defensive positions. The 21st Panzer is ordered to re-take Hill 309 the next day. Its commander, threatened with relief and court-martial, reluctantly agrees.[38]

Meanwhile, in the west, the 3rd Paratroop Division realizes that they are again out flanked by the British to the east and begin moving to positions south of the Vire River (the Vire

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[32]Just north of Hill 192.

[33]How, p. 62.

[34]They reach to St. Pierre du Fresne by evening. See Ellis, p. 392.

[35]Graham, p. 89.

[36]The Bois du Homme.

[37]Ellis, p. 393.

[38]How, p. 63.

runs east-west until it meets the Souleuvre, then it turns south).[39] In addition to fending off the Americans to the north, the 3rd Paratroop Division must set up a defensive line running north-south to defend against the British to the east.

**Day Three: August 1st**

The bulk of the 11th Armoured Division moves across the Souleuvre, causing both the 3rd Parachute and the 21st Panzer divisions to withdraw. Little advance is made by the British. An opportunity to take Vire almost unopposed is ignored. A second German effort to take Hill 309 is a bloody failure.

The 11th Armoured Division slows its southward drive to wait for the rest of the division to catch up. They take le Beny Bocage and occupy the crossroad with the Vire-Villers Bocage highway to the south-east. A small force then turns north-east, crossing back over the Souleuvre river at Catheolles. After capturing the turn-off to Le Tourneur (Catheones) they are halted by strong German resistance. The small force is unaware that 1000 yards to the north-east is the headquarters of the 21st Panzer Division. The headquarters narrowly avoids capture when the small force turns south to join the rest of the 11th Armoured Division moving south-east to the south of the Souleuvre River.[40]

To the north, the Guards Armoured Division is told to cross the Souleuvre at le Tourneur and Catheolles to open a second route across the river. They don't get to Catheolles,[41] and their entry into le Tourneur is cautious:

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[39]How, p. 58.

[40]How, pp. 73-75.

[41]They take Hills 192 and 238, see Ellis, p. 394.

> The opening of a second route forward was vital. A sense of urgency seems to have been lacking. When, during the evening, a motorized company of the Guards reached the hill overlooking the village of le Tourneur and reported it crowded with Germans moving through in retreat, no immediate action was taken. It was already dark when an officer walked down into the village and found it empty except for an abandoned Mark IV tank. The Germans has left in panic and had failed to blow up the Souleuvre bridge.
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> With llth Armoured Division two miles in their rear and across all the escape routes south elements of 21st Panzer Division holding up the Guards had been forced to get out of le Tourneur while there was still a route open to the southeast. It is the great tactical advantage of breakthroughs that they threaten the enemy rear as a whole. The enemy does not know in which direction the intruder will move. The sudden advance of the British to the Beny-Bocage ridge was seen by General Eugene Meindl as a threat to the rear of his parachute division and had brought them tumbling back to avoid being cut off. In fact 11th Armoured swung not west but east, into the rear of 21 Panzer Division, put its battle headquarters to flight and forced a hurried and costly withdrawal.[42]

Further north, the 15th Infantry with the 6th Guards Tank Brigade on Hill 309 repulses a three pronged attack by the 21st Panzer Division from the north-east, the east, and the south.[43] Corps artillery is used to break up the German attacks. As its commander anticipated, the 21st Panzer suffers heavy casualties and gains nothing. The British are then able to push forward to take ground around Hill 309 by evening.[44]

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[42]How, p. 79.

[43]From Galet, the Bois du Homme, and la Ferriere au Doyen.

[44]They capture la Ferriere au Doyen and Galet, see Ellis, p. 393.

Again, XXX Corps progress is slow. Again, the 43rd Infantry Division makes the most progress. The 43rd Infantry beats off a German counter attack and takes Hill 361.[45] The 7th Armoured Division is ordered forward to take Aunay.[46] But the 7th Armoured must negotiate the traffic jams in Caumont and along the Caumont Aunay road to reach the battlefield. By evening they are west of Breuil, encountering very little resistance.[47] The 50th Infantry pushes forward only 1000 yards.[48]

In the west, the 3rd Paratroop Division, after an exhausting retreat to the Vire River, begins to establish a front running north-south in order to defend against British Tanks.[49] This is the third consecutive day without contact with German forces to the east. A gap remains between the two German armies.

The 3rd Parachute Division is unable to retreat fast enough to defend Vire, a key road junction for the entire German 7th Army. Vire is now open to British capture, with only some 88mm AA batteries to defend it. That night, British armored cars report the weak defenses in Vire.[50] But the Allies place the U.S./U.K. boundary east of Vire. Vire is to be taken by the U.S. 5th Infantry Division,[51] but between Vire and the U.S. 5th Infantry Division is the German 3rd

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[45]Ellis, p. 392.

[46]Aunay is also known as Aunay sur Odon.

[47]Ellis, p. 393.

[48]Graham, p. 89.

[49]How, p. 80.

[50]Weigley, p. 169.

[51]Ellis, p. 395.

Paratroop Division. Nothing is between the 11th Armoured Division and Vire. The 11th Armoured is forbidden to move into Vire and is told to strike south-east instead.[52]

The Germans send the 9th SS Panzer Division, 10th SS Panzer Division, the 102nd Heavy Tank Battalion, and other units to contain the British breakthrough. This brings the German forces up to a total of 58,913 men, 304 tanks, and 185 artillery pieces. The 9th SS Panzer moves into Montchamp area before midnight. The 10th SS Panzer Division is south-west of Breuil by night fall.[53]

**Day Four: August 2nd**

The British miss their opportunity to capture Vire, but the 11th Armoured gains significant ground to the south-east, cutting the Vire-Vassy highway. The rest of the British line advances only slowly, leaving the 11th Armoured Division unsupported in a salient.

The 11th Armoured resumes its rapid advance. The division ends up strung out on two ridges. The first runs south-west from Estry, the Estry Ridge. The second heads north of the Vire-Vassy road, the Perrier Ridge. Units of the 11th Armoured are 1.5 km north-west of Chenedolle.[54] The 11th Armoured and the 9th SS Panzer Division battle for control of Chenedolle.[55]

A few tanks and some infantry move south unopposed and set up a roadblock on the Vire-Vassy road 6.5 km east of Vire. The Vire-Vassy road is a vital supply line to the German

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[52]How, p. 92.

[53]It arrives in Jurques, see How, p. 84.

[54]They take le Bas Perrier.

[55]How, p. 95.

7th Army. The Germans react quickly. A group from the 12 SS "Hitler Youth" Panzer Division (Battle Group Olboeter: 731 men, 14 tanks, and 3 SP artillery pieces), is sent to clear the British roadblock.[56] In addition a Werfer (rocket launcher) Brigade (1,800 men, 54 launchers) is sent. The 9th SS Panzer Division moves to engage the 11th Armoured from the east and west. Tiger tanks bypass the 11th Armoured on the Vire-Vassy highway via a southern route to defend Vire. No German forces are stationed along the 11th Armoured's southern front.

11th Armoured tanks also halt 3.2 km north-east of Vire, as ordered, and do not attack Vire. To the west, the German 3rd Paratroop Division moves south into Etouvy (6.5 km north of Vire), but still cannot spare troops to defend Vire. That evening Tiger tanks of the 102nd Heavy Tank Battalion arrive in Vire.[57] The chance to take Vire unopposed is gone.

The Guards Armoured Division moves to take Catheolles just as the 21st Panzer Division moves into Catheolles. The night before, the 11th Armoured had held Catheolles, but had abandoned it to move south.[58] Now the Guards Armoured must fight to re-capture it. The entire division is held up with the exception of one infantry/tank group which is able to drive through the fighting in Catheolles - only to be held up by two Jagdpanthers:

> [The armored/infantry battle group of the Guards Armoured] turned left to take a secondary road which led south-east to ... Montchamp and Estry. ...[German] shells fell regularly. . . an 11th Division scout car came tearing down the road from Corteil. In Maisoncelles he [had seen] two 88-mm self-propelled guns. ... [they] thanked the man kindly and advanced towards Maisoncelles. The 88's immediately opened fire, blowing

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[56]How, p. 112.

[57]How, pp. 92, 114.

[58]How, p. 94.

> large bits off the houses round the crossroads to the alarm of No. 2 Squadron who were just coming round it. No. 3 Squadron and their company [of infantry] considered by-passing Maisoncelles and Corteil, while No. 2 Squadron and another company [of infantry] prepared to clear the road. The hours passed in deliberation. At eight o'clock in the evening the Brigadier came up to see what was happening. He was justifiably angry when he discovered that two guns had held up the two battalions for nearly four hours. He ordered the group to get a move on and establish themselves on the high ground at Estry by nightfall.[59]

These lead elements of the Guards Armoured end up in Marvindiere (3.2 km due west of Estry).[60] The 15th Infantry Division and the Guards Armoured Tank Brigade[61] take a day of rest. Some units advance slowly without opposition.

Again, XXX Corps progress is slow. Again, the 43rd Infantry Division is the most successful. It attacks east from the Bois du Homme forest, taking Jurques (3 km south-west of Breuil). The 43rd Infantry makes little progress against the 21st Panzer Division to the south.[62] The 7th Armoured Division's attack on Aunay fails.[63] The 50th Infantry advances another 1000 yards toward Villers Bocage.[64] XXX Corps is now facing the 10th SS Panzer Division, which might explain its lack of progress, but the British Army commanders feel the fault lies with XXX

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[59]Fitzgerald, p. 410.

[60]How, p. 91.

[61]This is an independent armored brigade not associated with the Guards Armoured Division.

[62]They fail to take Hill 301, see Essame, pp. 59-61.

[63]Ellis, p. 402.

[64]Graham, p. 89.

Corps command. The XXX Corps commander, Lt. Gen G. C. Bucknail, is relieved of command. Lt-Gen G. G. Horrocks assumes command of XXX Corps.[65] Apparently, the Army Commander (Dempsey) had been concerned with Bucknail's performance in previous bocage battles, but had waited until this new failure to relieve him.[66]

One author writes of the British Army command:

> At the beginning of Bluecoat the British Second Army had shown it readiness to adapt the plan to suit the circumstances. The main effort had been switched from XXX to VIII Corps. Now its very success was making it nervous. This was a very untidy and dangerous battle, with 11th Armoured Division sticking out alone in enemy territory. The effort would have to be switched back to XXX Corps. Success would have to manage on its own until the others caught up.
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> Nevertheless, Bluecoat was accomplishing its main purpose. The VIII Corps breakout had pulled in three of the five panzer divisions with Panzer Group West, and had attracted elements from the other two. A considerable proportion of the German panzer strength in Normandy was now tied down on this central front.[67]

While taking solace in the fact that they had tied down German armor in Normandy, the British were missing a great opportunity. Instead of driving further south with armored forces, the British halted the 11th Armoured and brought up infantry. This obsession with the "tidiness" of a battle field is amazing. Rather than focus on offensive opportunities, the British command seemed overly concerned with defensive vulnerabilities. They also seemed to re-enforce failure.

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[65]How, p. 138 and Ellis, p. 402.

[66]D'Este, p. 289.

[67]How, p. 116.

The 11th Armoured, the most successful unit in the best position to continue to drive into enemy territory, was halted and put into defensive positions.

A serious problem was that the Guards Armoured Division was not coming up to help the 11th Armoured press on. As Liddell Hart states:

> This trouble on the flank arose from the slow progress of the Guards Armoured Division, which should have passed through Estry early in the day, but never reached it -- thus leaving the 11th once again in a narrow salient. The Guards had been checked by enemy packets which infiltrated between its columns, harassing and threatening their flanks. The bocage country was ideal for such 'in-and-out' tactics mixed with 'hide-and-seek.' But the German packets were so small and unsupported that such tactics could not have succeeded if the British forces, with their immense superiority of strength, had been equally forceful and resourceful in pressing their advance.[68]

Meanwhile XXX Corps, facing large German forces, and unsuccessful thus far in the battle, was told to push harder. It seems that the British were determined to attack into the teeth of the German defenses rather than bypass and encircle them. A breakthrough, in the true sense, was simply too untidy.

**Day Five: August 3rd**

The British fail to gain ground anywhere. The 9th SS Panzer tries to pinch off the 11th Armoured salient, but fails.

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[68]Hart, p. 378.

The 185th brigade of the British 3rd Infantry Division begins to reinforce the 11th Armoured Division positions along the ridge running southwest from Estry.[69] The 11th Armoured adopts a defensive role, attempting to hang on to the territory it has gained. In the south, the 11th Armoured is driven back: the roadblock on the Vire-Vassy road is destroyed by Battle Group Olboeter.[70]

Further north, the German 9th SS Panzer Division attempts to cut off the 11th Armoured by attacking from three directions: northeast from Vire, west from Montchamp, and west from Estry. The attempt to cut off the 11th Armoured fails. The 11th Armoured strong points hold, but supply becomes unreliable as truck convoys come under fire. In the thick hilly bocage country, a series of hide and seek battles occur almost at random as forces bump into each other. The 11th Armoured Division headquarters narrowly escapes destruction in le Reculey (7.5 km north-east of Vire along the Vire-Viners Bocage highway).

> The fear of the harassed staff officer at VIII Corps that attacks in the British rear might bring collapse and the loss of the ground that had been won was well founded. It was 11th Armoured Division's good fortune that Bittrich had not concentrated 9th SS Panzer Division further north and attacked west in strength through to the Seventh Army at la Graverie. They would have found undefended country with only a few gunners to offer token resistance. In every major British attack in Normandy there had been talk of a breakthrough. Now that one had been achieved the British high command had turned its back on exploitation. There had been no immediate follow up with troops to hold what had been won. Instead of the British creating havoc in the German rear, the Germans,

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[69]How, p. 138.

[70]How, pp. 117-120, 128-130.

weak and under pressure as they were, were marauding unhindered across the British lines of communications.[71]

To the North, the Guards Armoured Division and the 15th Infantry Division attack west from Catheolles into the 21st Panzer Division; gains are minimal.

The 10th SS Panzer, in combination with elements of the 276th Infantry and the 326th Infantry holds off XXX Corps. The 43rd Infantry attack on Odefontaine is repulsed.[72] The 7th Armoured attacks Aunay again. They are driven back almost to Breuil, where they started two days ago.[73] The 50th Infantry Division is the only unit in XXX Corps to make any gains. They take Hill 174, east of Viners Bocage and capture a 326th Infantry regimental headquarters with its commander.[74]

XXX Corps was still lagging far behind. 7th Armoured Division, thrown into battle with such high hopes was still bogged down on the road to Aunay. They might have done better had they been armed with something better than Cromwells. The "promise" of this British tank was dying in the hedgerows of the bocage, like many of the young men that made up the tank crews. They were no match for the Jagdpanthers they were meeting on this front. General Dempsey was in no mood for excuses: the day before he had dismissed the corps commander; he now dismissed the commander of the 7th Armoured Division.[75]

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[71]How, pp. 137-8.

[72]Essame, p. 61.

[73]Ellis, p. 402.

[74]How, p. 402.

[75]How, p. 138.

The quote suggests that the Cromwell tank might be to blame for XXX Corps' failure, but the 11th Armoured was equipped with Cromwells (and Shermans), yet they managed to make progress.

The 10th SS Panzer Division has held or driven back most of the British XXX Corps, but now it is needed elsewhere. The 10th SS Panzer is ordered to disengage from XXX Corps and move to Vassy. It is scheduled to participate in the German 7th Army counter attack at Mortain.[76]

**Day Six: August 4th**

The Germans fail to cut off the 11th Armoured which begins to receive reinforcements and relief. The British continue to advance along the rest of the front.

The hide and seek battle in the bocage between the 11th Armoured and the 9th SS Panzer continues. Another attempt to cut off the British forces on Estry and Perrier ridges fails.[77] The 9th Brigade of the 3rd Infantry with tanks[78] arrives in le Beny Bocage.[79] The 185th brigade of the 3rd Infantry Division moves onto Estry and Perrier ridge strong points to relieve 11th Armoured infantry units. Some relief units arrive just as a German attack begins, doubling the strength of the defenders.[80]

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[76]How, p. 139.

[77]How, pp. 154-160.

[78]From the 44th Bn of the 4th Independent Brigade.

[79]Ward, p. 378. and Kenrick, p. 146.

[80]How, pp. 150-4.

The 9th SS Panzer Division evacuates Monchauvet[81] (2 km south-west of Arclais) before the 21st Panzer Division can move in. This allows elements of the Guards Armoured Division and the 15th Infantry Division to slip into Monchauvet unopposed. The Guards Armoured turns south from Monchauvet and attacks the 9th SS Panzer in Montchamp, but are driven back.[82]

In XXX Corps to the northeast, things improve slightly now that the 10th SS Panzer Division is gone. The 43rd Infantry continues to attack Odefontaine, but is held to the outskirts of the town. The 7th Armoured Division moves in to Aunay, finding it evacuated. The 50th Infantry, having been in the line continuously since D-day, goes into reserve.[83]

**Day Seven: August 5th**

The 9th SS Panzer extricates itself from the 11th Armoured. The British continue to advance along the rest of the front.

Elements of the 9th SS Panzer fight their way eastward after the previous day's failed attack to cut off the 11th Armoured. The Germans continue to bombard the 11th Armoured strong points with shells and rockets (see Map 7). Two battalions of tanks of the 11th Armoured are withdrawn under fire into reserve.

The Guards Armoured Division moves into Montchamp without a fight.[84] Most battalions of the Guards Armoured take a day of rest. The 15th Infantry Division moves into positions west, north, and northeast of Estry.[85]

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[81]Monchauvet is spelled Montcharivel on some maps.

[82]How, p. 160.

[83]Ellis, p. 409.

[84]Ellis, **Welsh Guards or War**, p. 189.

In XXX Corps, the 43rd Infantry Division finally succeeds in taking Ondefontaine. Next, they move to the south, and the division begins an assault of Mt Pincon from the west. Encountering stiff resistance,[86] they are halted about 1.6 km short of their objective.[87]

The 10th SS Panzer assembles in Vassy.[88] Instead of moving off to participate in the Mortain counterattack, the 10th SS Panzer Division is ordered to drive the British off the ridge line to the north of the Vire-Vassy highway.

**Day Eight: August 6th**

The 10th SS Panzer counter attack fails to drive the 11th Armoured off the Estry and Perrier ridges. The British continue to advance elsewhere.

The 10th SS attacks strong points manned by the 11th Armoured and 3rd Infantry divisions. The attack comes from three sides, taking and inflicting heavy casualties, but accomplishing nothing.[89]

The 15th Infantry Division, with the Guards Armoured Division, attack Estry and Lassy, but fail to capture them.

The 43rd Infantry Division, in a bloody assault from the north and west, takes Mt. Pincon.[90]

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[85]How, pp. 164-6, 180.

[86]Eight battalions of infantry from the 326th and 276the infantry divisions. I believe that this consisted of two brigades (the Germon TOEs call them regiments) of the 276th division and what was left of the 326th.

[87]Ellis, p. 409.

[88]How, p. 167.

[89]How, pp. 186-206.

## III. ANALYSIS

What lessons can we draw from this battle? The first lesson is that it is possible to achieve a breakthrough in bad terrain. The British certainly came very close to breaking out as the Americans did in Operation Cobra. But the British failed. Why?

In order to break through, an attacker must have more than just sufficient forces. Aggressiveness, flexibility, and combined arms skills are also required. These three elements were largely missing from the British forces during Operation Bluecoat. Those units which were more successful (VIII Corps and the 11th Armoured Division in particular) seemed to have a better grasp of these elements than the rest of the British units. Let's examine each of these elements in turn. We begin with aggressiveness.

### Aggressiveness

If there is one single explanation for the British failure, it is a lack of aggressiveness. Those forces which advanced farthest seemed to be fighting the most. The VIII Corps commander was particularly aggressive, pushing units stopped for the night to press on without food or sleep into the dark, and again the next day.

I believe that the British had only one division that was very aggressive in pushing forward, the 11th Armoured. The rest of the force's ability to push forward and take advantage of opportunities seems to have been lacking.

Particularly bad were the veterans of the desert, the 7th Armoured and the 50th Infantry. Carlo D'Este notes that the 7th Armoured was the worst of the two, having an arrogant attitude

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[90]Ellis, p. 409.

toward the Germans after their victories in the desert.[91] They did not train for the new terrain of the bocage, and did not expect the Germans to hold their ground.

The 50th Infantry, although better, suffered from morale problems. They felt it was unfair that they had to bear the brunt of fighting in Normandy.[92] As of June 21st, they had suffered the highest casualties of any Division in Normandy. This resulted in a timidity and lack of initiative at all levels. Officers were forced to lead troops into battle because NCO's were not doing their jobs. Consequently, casualties among junior officers were very high.

Not as bad, but still definitely not aggressive were the Guards Armoured, the 15th Scottish and the 43rd Infantry. To a lesser degree, they too suffered from training and initiative problems.[93] Had the Guards Armoured Division be more aggressive in coming forward, they would not have had to fight for the crossings over the Souleuvre River. The 11th Armoured captured both crossings but was unable to wait for the Guards Armoured to arrive.

More importantly, this lack of aggressiveness applied at the Army level as well. The 11th Armoured and Guards Armoured were halted north of the Vire-Vassy highway to wait for infantry (the 3rd Infantry and the 15th Infantry) to be brought up. It seems to me that had they pressed forward another day, or if the Guards Armoured had been with them to advance, the British could have created a major disruption in Seventh Army's supplies. Liddell Hart argues that the British Army commanders were fooled by the 9th SS Panzer's use of small forces

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[91]D'Este, pp. 272-3.

[92]D'Este, pp. 278-9.

[93]De'ste, chapter 16, but p. 282 points out problems with the 15th Scottish Infantry, and we have noted in the daily histories above problems with the 43rd Infantry and the Guards Armoured.

distributed thinly across the entire front. British Army commanders felt they were facing a large force which would require infantry to defend against.

Some might argue that the 11th Armoured was just luckier than other units. They were placed along the weak German Army seam, allowing them to advance quickly; also, the Germans did not destroy the bridges across the Souleuvre, allowing the 11th Armoured to capture them intact.

But the 11th Armoured made its own luck. It got across the Souleuvre because it advanced and bypassed German resistance. llth Armoured tanks managed to get to the bridge despite an encounter with two German assault guns. In contrast, two days later, a group of Guards Armoured tanks allowed themselves to be held up for four hours by two large assault guns. It was the aggressiveness of the 11th Armoured Division that got it across the Souleuvre, that caused the 3rd Paratroop Division to withdraw in front of the Americans, that caused the 21st Panzer to withdraw in front of the Guards Armoured, and that gave them the opportunity to take Vire.

**Flexibility**

This brings us to flexibility. It was flexibility which allowed the British the chance to break out and it was a lack of flexibility which prevented them from harvesting the benefits of a breakout. The 11th Armoured's progress was unexpected, but by pressing where forces were making the most progress, VIII Corps was able to get across the Souleuvre River. However, having achieved this success, the British commanders seem to have felt that this was untidy. Instead of funneling forces through the breach, they continued to press where the original plan said the breakout was supposed to be. The result was a slow slogging forward along a broad front, with the Germans giving ground in an orderly fashion.

This rigidity on the offense seems to have been endemic to the British armed forces. British commanders did not like sudden unplanned attacks, especially at night. The British relied too heavily on set-piece attacks, rather than seizing opportunities as they emerged. The British fought on a tidy battlefield. This bias at the strategic level kept them from obtaining a breakthrough during Operation Bluecoat.

This bias seems to have been inherent in the British army, right down to the tactical level. One historian contrasts British and German infantry assaults:

> In set-piece attacks the British infantry advanced in open formation towards the enemy, relying on the accuracy of the supporting artillery to neutralize the enemy and keep casualties low. These were the tactics of the first world war, greatly improved, however, by the development of radio and the mobility of the artillery officer directing the guns. The Germans also used artillery in support, but the infantry advanced in small groups, using natural cover and camouflage to infiltrate the defense and pick off and panic the defenders. These tactics often succeeded. In this instance they had failed against resolute troops well dug in.[94]

It seems that in the bocage country, the Germans were able to move about and infiltrate at will, while British units were generally cautious and tended to take terrain and hold it. This fixation with terrain tended to result in bloody assaults into well defended position. On the other hand, units which easily took terrain remained fixed and did not move on to exploit additional opportunities.

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[94]How, p. 124.

British troops were much more comfortable with set-piece, daylight attacks with artillery in support. An 11th Armoured Division infantry battalion officer describes his reaction when ordered forward for a night attack:

> I am afraid that I 'bellyached' to my Brigadier and he agreed with me that it was not a promising operation. The Divisional Commander got on to the Corps Commander, General O'Connor, who said quite firmly that it must be carried out. Furthermore, he said that from the information he had he thought that the enemy had gone.
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> There were really three main problems: (a) how to find the way; (b) how to control the Battalion, and (c) what action to take if we met the enemy. ... I was pondering over these problems rather unhappily for some ten minutes during which time I was asked twice by Brigade H.Q. whether I had moved. ... All officers and men were tired out and we were not particularly happy about the outcome. It took a considerable time to issue orders and to get the tired men out of their positions and ready to move. During this period I was much pressed by Bde. Commander, who wanted to know whether we had started.
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> ... due to first class steering by our two officers, and also due to luck, we slipped through the enemy, and reached our objective by first light ... Firstly, it was a very unpleasant operation to have to carry out at short notice in the dark, with men who had been fighting all day, and secondly, the Corps Commander was absolutely right in insisting that we carry it out, in the face of quite considerable opposition from his subordinate commanders.[95]

[95]Kemp, pp. 97-98.

Here we have a Corps commander telling an infantry battalion commander what is in front of him! Moreover, both the battalion and brigade commanders seem to have lacked the instinctive respect for sustained momentum that is so important to successful armored attacks.

**Combined Arms Training**

Finally, the British seemed to lack combined arms skills and training. The British learned the costs of separating infantry from armor during Goodwood, only a few days before Bluecoat. Efforts were made to change this. Infantry and armor battalions were put together for initial assaults. But the lessons had not really been learned. Many infantry/armor groups were put together only hours before the battle began, leaving little time for mutual training, familiarity, and trust so essential to combined arms operations. In many cases during Bluecoat, armor groups moved away from infantry into "lager" for the night. This left them vulnerable to German infantry equipped with the anti-tank panzerfaust weapon. One armored battalion, after racing ahead of the infantry, spent two days alone without infantry support, at the mercy of panzerfaust parties during the night.

One historian notes a case where tankers refused infantry support from an armored car battalion headquarters, and paid a heavy price:

> They chose a quiet field near la Bistiere and prepared for all-round detence. They surrounded themselves with barbed concertina wire and decided on a fifty percent stand-to during the night. Two Cromwell tanks of the Northamptonshire Yeomanry in a nearby lane declined the offer to join in for mutual protection. ... At dawn a patrol of troopers went out. Where the two Cromwell tanks had been were two still-hot glowing metal

carcasses. A few sad personal belongings lay scattered in the scorched grass. Of the crews there was no sign.[96]

One can cite numerous examples of a lack of combined arms coordination on the part of the British. One history of an armored battalion from the 7th Armoured Division reflects the bias of armor units against working with infantry:

> ... a message came through [from an infantry battalion] to say that they were being attacked and wanted tank support. *Although it seemed as though infantry rather than tanks were needed*, 'C' Squadron moved off to their rescue. It appeared that the [infantry battalion] had been attacked and had two companies overrun by shouting and screaming S.S. infantry supported by twelve tanks and mortar and artillery fire. Six 17-pounders ... had also been knocked out during the afternoon. Major Huth brought 'C' squadron up at speed, but with their arrival the enemy counter-attack disappeared. ... Ten deserters ... surrendered to Captain Hepburn shortly after the Squadron arrived.[97] [Emphasis added]

Thus, although the Germans were using combined arms to attack the infantry, and although the attack stopped and prisoners were taken as soon as the tanks showed up, the author feels that more infantry was called for rather than tanks.

Infantry and armored battalions were not trained to work together. The Guards Armoured Division commanders saw fit to assign infantry battalions to armor battalions to form armor/infantry groups on the day they were committed to battle. The leader of the group was chosen on the basis of which battalion commander was senior. One should not be surprised if

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[96]How, p. 146.

[97]Kemp, p. 161.

this group did not display the mutual trust, understanding, and efficiency that months of training and experience can provide.

**Final Observations**

We can make some additional observations about this battle. One is that coalition warfare even generates tactical problems. When Vire was placed in the American sector the 11th Armoured was prevented from taking Vire. The town was a major road junction for the German Seventh Army. The speed with which the 11th Armoured Division roadblock on the Vire-Vassy highway was destroyed indicates how important Vire was to the Germans. U.S. forces were subsequently forced to take Vire at great cost.

The bocage was good defensive country. The British never seemed to gain a success when the Germans were determined to defend a position. Most of their gains were obtained by moving where the Germans were not, or after the Germans withdrew. With the exception of the Vire-Vassy road block and the battle at la Bistiere, not a single German counter attack succeeded either. Only along long straight roads, were German tanks able to take advantage of their superior range and penetration and drive the British back.

The heavier German tank armor and tank gun proved significant. British tanks required a side or rear shot at close range to kill German tanks, especially Tigers. Otherwise, artillery was the only answer to German tanks. One Tiger operator describes getting stuck in a ditch and being hit repeatedly by British antitank fire. Eventually, another Tiger towed it out of the ditch, and the Tiger remained operational.

The effects of air power seemed to be of little importance in this battle, although there are still many questions on this score. The point of contention is how many German tanks were killed by air as opposed to ground forces. One author wrote a book in order to prove that air

power did little and that ground forces did much, but his casualty data are not complete, and he doesn't present any air force statistics.[98]

There was a lack of coordination between the ground and close air support (CAS) fighters. The battle histories mention calling for air, but just as often they talk about being bombed by their own planes. Artillery seems to have been the source of firepower British units relied on, especially when on the defensive, as they were toward the end of the battle.

Nevertheless, CAS appeared to be of limited utility against armor. In four places in the narrative, British forces describe being attacked by U.S. or U.K. fighter-bombers with bombs and rockets. In all four cases, no equipment was damaged and no casualties resulted.[99] In another case, tiger tanks on a hill under observation by a reconnaissance battalion are attacked by Typhoons, with no visible effect.[100] And yet, it is widely reported that panzer divisions did not move in daylight. Perhaps the fighter-bomber threat was really to the soft transport of the panzer division. Perhaps air attacks resulted in mobility kills which prevented forces from reaching the front.

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[98]See How.

[99]In one instance, some German POWs were killed. See How, p. 107, Baker and Rust, p. 82, and Joslen, pp. 70-1.

[100]Joslen, pp. 70-1.

## Bibliography


[1] Ellis, L. F., with R. F. Allen, A. E. Warhurst, and James Robb. *VICTORY IN THE WEST, VOLUME I, The Battle of Normandy,* Her Majesty's Stationery Office, London, 1962.

[2] How, Major J. J., Normandy: *the British Breakout,* William Kinber, London, 1981.

[3] Rissik, David. *The Durham Light Infantry at War.*

[41 Fitzgerald, Desmond J. L. *History of the Irish Guards in the Second World War* Aldershot: Gale & Polden Ltd., 1949.

[5] Howard, Michael and John Sparrow. The *Coldstream Guards 1920-1946* Oxford University Press, London, 1951.

[6] Orde, Roden. *The Household Cavalry at War: SECOND HOUSEHOLD CAVALRY REGIMENT* Aldershot Gale & Polden Ltd., 1953.

[7] Kemp, Peter Kemp *The History of the 4th Battalion King's Shropshire Light Infantry 1745-1945* Wilding & Son Ltd., Shrewsbury, 1955.

[81 Cunliffe, Marcus *History of the Royal Warwikshire Regiment* William Clowes and Sons, Limited, London, 1956.

[9] Kemp, Peter Kemp *The Middlesex Regiment (Duke of Cambridge's Own) 1919-1952* Aldershot Gale & Polden Ltd., 1956.

[10] Ellis, Lionel Fredrich *Welsh Guards at War* Aldershot: Gale and Polden Limited, 1946.

[11] Synge, William Alfred Thackery *The Story of the Green Howards 1939-1945* The Green Howards, Richmond and Yorkshire, 1952.

[12] Hastings, Robin Hood William Stewart *The Rifle Brigade* in *the Second World War 1939-1945* Aldershot Gale & Polden Ltd., 1950.

[13] Rissik, David *The D.L.L at War, the History of the Durham Light Infantry 1939-1945* The Depot: the Durham Light Infantry, Brancepeth Castle, Co. Durham.

[14] Darby, Hugh and Marcus Cunliffe *A Short Story of 21 Army Group*
Aldershot Gale
Polden Limited, 1949.

[15] Martin, Hugh Gray *The History of the Fifteenth Scottish Division 1939-1945* Willia Blackwood & Sons, Ltd., Edinburgh and London, 1948.

[16] Parsons, Laurence Michael Harvy (a.k.a. Captain the Earl of Rosse) and E. R. Hill. *The Story of the Guards Armoured Division* Geoffrey Bles, London.

[17] Verney, Gerald Lloyd *The Desert Rats, The History of the 7th Armoured Division 1938-1945* Hutchinson, Stratford Place, London.

[18] Taurus Pursuant, *A History of the llth Armoured Division*

[19] *The 1st and 2nd Horthamptonshire Yeomanry 1939-1946 1946.*

[20] Essame, Hubert *The 43rd Wessex Division at War 1944-1945* William Clowes and Sons limited, London.

[21] Erskine, David *The Scots Guards* William Clowes and Sons, Limited, London, 1956.

[22] Miles, Wilfrid *The Gordon Highlanders 1919-1945, the Life of a Regiment* Volume V Aberdeen the University Press.

[23] Fitzroy, Olivia. Men *of Valour, The Third Volume of the History of the VIII King's Royal Irish Hussars 1927-1958* Liverpool, 1961.

[24] Kemp, J. C. *The History of the Royal Scots Fusitiers 1919-1959* Robert Maclehose and Co., Ltd., the University Press, Glasgow.

[25] Barclay, C. *N. The History of the Cameronians (Scottish Rifles), Volume III 1933-1946,* Sifton Praed, London.

[26] Kemp, Peter Kemp *History of the Royal Norfolk Regiment 1919-1951, Volume III* The Soman-Wherry Press, Ltd., Norwich, 1953.

[27] Hopkinson A *History of the 44th Royal Tank Regiment in the War of 1939-1945; Part III, North-West Europe, 1944-1945*

[28] Hart, B. H. Liddell *The Tanks, The History of the Royal Tank Regiment 1914-1945, Volume Two, 1939-1945*

[29] Vale, W. L. *History of the South Staffordshire Regiment* Aldershot, Gale & Polden Ltd.7 1969.

[30] Kenrick, *N. The Story of the Wiltshire Regiment, the 62nd and 99th Foot (1756-1959)* Aldershot, Gale & Polden Ltd., 1963.

[31] Ward, S. G. P. *The Story of the Durham Light Infantry* Thomas Nelson & Sons Ltd.

[32] Brownlie, W. *The Proud Trooper, The History of the Ayrshire (Earl of Carrick's Own) Yeomanry from its raising in the Eighteenth Century till 1964* Collins, London.

[33] Retallack, John *The Welsh Guards* Fredrick Warne.

[34] Forbes, Patrick *The Grenadier Guards in the War of 1939-1945, Volume 1, The Campaigns in Worth- West Europe* Aldershot, Gale & Polden Limited, 1949.

[35] Forbes, Patrick *6th Guards Tank Brigade, The Story of Guardsmen in Churchill Tanks* Sampson Low, Marston & Co., Ltd.

[36] Bredin, Lt-Col., A. E. C. *Three Assault Landings; the Story of the 1st Bn. The Dorsetshire Regiment in Sicily, Italy, and N. W. Europe* Gale & Polden Ltd., The Wellington Press, Aldershot, 1946.

[37] Scarfe, Norman *Assault Division, A History of the 3rd Division from the Invasion of Normandy to the Surrender of Germany* Colhns, London, 1947.

[38] *Record of a Reconnaissance Regiment, A History of the 43rd Reconnaissance Regiment (The Gioucestershire Regiment) 1939-1945* The White Swan Press, Bristol.

[39] Baker, A. H. R., and B. Rust A *Short History of the 50th Northumbrian Division*

[40] Parsons, A. D., D. I. M. Robbins, and D. C. Gilson *The Maroon* Square, *A History of the 4th Battalion The Wiltshire Regiment (Duke of Edinburgh's) in North West Europe 1939-1945* Franey & Co., Ltd., London.

[41] Graham, Andrew *Sharpshooters at War, The 3rd, the 4th and the 3rdl4th County of London Yeomanry 1939-1945* The Sharpshooters Regimental Association, 1964.

[42] Verney, Major-General G. L. *The Guards Armoured Division, A Short History,* Hutchinson, London.

[43] Joslen, H. F. *ORDERS OF BATTLE, VOLUME I, United Kingdom and Colonial Formations and Units in the Second World War 1939-1945,* Her Majesty's Stationery Office, London, 1960.

[44] "Army Operational Research Group Memorandum No. C.G.: a Survey of Tank Warfare in Europe from D-Day to 12 August 1944." ORO USARUER Log No. 4025, ORO-JHU Log No. 69556 937, May 1952, U.S. Army Military History Institute, ORO Library.

[45] *Handbook on German Military Forces, the U.S. War Department, 15th March 1945*, Lousiana State University Press, Baton Roughe, 1990.

[46] Weigley, Russel, Frank. *Eisenhower's Lieutenants: the Campaign of France and Germany, 1944-1945* Indiana University Press, Bloomington 1981.

[47] Captured German World War II Records, U.S. National Archives, Washington D.C.

# THE MORTAIN COUNTERATTACK

Jonathan Ladinsky

After the success of COBRA, the precarious position of the German forces required drastic action. German forces were weak, under pressure across the front. In the north, British and Canadian forces pressed the German lines while American forces advanced in the center and south. To overcome these problems, Hitler ordered a counterattack against the American forces at Mortain, France in the hope that the Allies could be forced out of Normandy. The attack failed, and resulted in major German losses. This chapter will provide a description of the battle to help facilitate an analysis of the factors that lead to successful breakthroughs.

## THE PLAN

On August 2, 1944, Hitler ordered Fieldmarshal von Kluge to launch a counterattack against Avranches.[1] The Germans had suffered a major defeat as a result of the COBRA breakthrough, and their defensive line was crumbling. Hitler believed a massive attack against the Allied forces at Avranches would fix the problem. In the area of Avranches, all American troops and supplies passed through a twenty mile gap. The Germans hoped to take Avranches, thereby, closing the gap, and halting the American attack.

The ultimate goal of this attack, however, was not clear. Hitler had one goal, and Kluge, the commander of the German armies in the west, had another. Hitler considered the counterattack to be the first step to defeat the allies. On August 7, Hitler was quoted as saying "the decision in the Battle of France depends on the success of the [Avranches] attack...The C-in-C West has a unique opportunity, which will never return, to drive into an extremely exposed enemy area and thereby change the situation completely."[2]

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[1]The counterattack is known by various names: the Mortain Counterattack, Operation Luttich, Operation Liege, and the Avranches Counterattack.

[2]Quoted in Martin Blumenson, *Breakout and Pursuit*, (Washington, DC: Center of Military History, US Army, 1984), p. 46.

Hitler believed the goal could be accomplished in two stages. First, the Germans would take Avranches. By taking Avranches, the Germans would divide the First and Third US Armies. The second stage of the counterattack would be to push the Allied forces back to the sea and remove them from Normandy.

Kluge's plan differed from Hitler's. He was not as optimistic as Hitler, and did not believe his armies could accomplish the goal. Instead, he wanted to withdraw the forces in France to a more defensible position without launching a major counterattack. To accomplish this retreat, Kluge intended to use mobile divisions to provide a screen on the southern flank while the remainder of his forces withdrew to positions behind the Seine River.

Hitler's order to counterattack, however, prevented an immediate withdrawal. Since Kluge was not optimistic about the success of a major offensive, he decided to use the counterattack as the first step in a retreat. The goal of the counterattack would be to take Avranches and form a new defensive line. This position would be stronger than the one presently occupied. Once the line was established at Avranches, they could retreat more easily to positions behind the Seine River.

Hitler planned to provide Kluge with six panzer divisions for the attack. These divisions were to be withdrawn from the defensive lines further north. The pressure of the British and American forces, however, limited the number of units the Germans could free to only four divisions: the 116th Panzer Division, the 2nd Panzer Division, the 2nd SS Panzer Division reinforced by the 17th SS Panzer Grenadier Division,[3] and the 1st SS Panzer Division.

The final plan called for the attack to start on August 7 at 2200 hours with three columns. The 2nd Panzer division with two extra tank battalions for support was to lead the main column. One of the extra battalions was to come from the 116th Panzer Division, and the other was to come from the 1st SS Panzer Division. This column would attack along the south bank of the

[3]The 17th Panzer Grenadier Division is a division reduced to regimental strength.

See River on the St Barthelemy-Reffeveille road which goes through le-Mesnil-Tove and le-Mesnil-Adelee. While the main column attacked along the south bank of the See River, the 116th Panzer Division would attack along the north bank of the river in an effort to protect the northern flank of the main column.

The 2nd SS Panzer Division reinforced by the 17th Panzer Grenadier Division formed the third column. The column was to attack in two groups. One group would attack north of Mortain and the other south of Mortain. Then, they would merge west of Mortain, and travel down the road to St Hilaire, and position themselves to protect the southern flank of the main column.

The remaining division, the 1st SS Panzer Division, would be held back to exploit the initial success. Once the main column achieved a breakthrough against the American defenses, the 1st SS would exploit the success and capture Avranches.

In addition to the ground forces, the Luftwaffe promised to provide air support. The Luftwaffe had held a large number of planes in reserve, three hundred of these would support the counterattack if the Allied Air Forces entered the battle.

Why was this plan chosen? Why did Kluge and his staff decide to focus the attack along the southern bank of the See River and not along the road that went southwest toward St. Hilaire? Initially, Kluge preferred to focus the attack through Mortain and down the road toward St. Hilaire. Once the forces reached St. Hilaire, they would turn north and drive to Avranches. The plan the Germans implemented, however, focused the main attack along the south bank of the See River. Kluge chose this route for four reasons. First, German intelligence claimed only one American division was in the area of attack.[4] Kluge's plan, if implemented, held open the possibility of stronger Allied resistance. Second, the terrain favored an attack along the See River. The river formed a natural barrier along the main column's northern flank and could

[4]The area of attack ranges from the south of the See River to the road just south of Mortain.

hinder an American counterattack. Third, the road to St Hilaire was not as favorable for tanks as the road along the See River. Staff planners believed that traffic congestion would hinder the advance of a column traveling along the southern road. Finally, if the main column attacked through Mortain toward St Hilaire, German forces would not be as concentrated as they would be along the northern road. Focusing the attack in the south would broaden the front. The Germans had limited forces to accomplish a breakthrough. Since a successful breakthrough requires a concentration of forces, attacking along the southern route would spread the forces over a larger area and weaken the attack.

**THE TERRAIN**

The terrain in the area surrounding Mortain is bocage country, like the rest of Normandy, with one significant difference. The Mortain area is not as flat as the rest of Normandy. From Brecey to Mortain, there are many hills and valleys that influence the course of armored warfare.

The town of Mortain, itself, lies in formidable terrain. The area is known as *la suisse normandie* due to its many hills. To the east of Mortain lies Hill 317,[5] which provides an ideal location to observe the area. On a clear day, Domfront, a town fifteen miles to the east, and the bay of Mont-St Michel, twenty miles to the west, are visible from the hill.[6] The town also is important because of the road network that is located there. Aside from the observation provided by Hill 317, seven main roads are centered in the area.

The terrain, therefore, provides the attacker with some difficulties. The hedgerows of Normandy help the defender to prepare defenses in depth. The narrow, twisting roads make tank movement difficult. And, perhaps most importantly, possession of Hill 317 provides a defender

[5]The height of the hill is given in meters. Therefore, Hill 317 is 317 meters high.
[6]Martin Blumenson, *The Duel for France 1944*, (Boston: Houghton Mifflin Company, 1963), p. ??

with an excellent vantage to observe the preparations for an attack or to call for artillery fire against enemy forces.

**THE PRE-BATTLE PICTURE**

**US Forces:** On August 1, the US 1st Infantry Division took Mortain and the surrounding area. The division planned to rest briefly before continuing the attack; therefore, the division did not build defenses capable of withstanding a major attack. They were too far forward and not deeply dug.[7]

At 2130 hours on August 5, the 30th Infantry Division, which was forty miles from Mortain, received orders to replace the 1st Division. At 0130, August 6, it started its journey. Heavy traffic delayed the division's arrival by six hours. Finally, at 2000, General Hobbs, the commander of the 30th Infantry Division, took responsibility for the Mortain area. The 30th Division's mission was to defend the front from St Barthelemy through Mortain to Barenton. This would free the 1st Division to travel south to Mayenne and continue the Allied exploitation to the East.

Unfortunately, the commanders of the 30th Division arrived after dark, and were unable to scout out the area or to fortify the defenses. The 30th, therefore, just occupied the existing, weak defenses that the 1st Division had built.

The 30th Division was not the only division in the area. It was the only division in the sector to be attacked, but as of August 6 elements of at least three other divisions were in the vicinity. The 4th Infantry, 9th Infantry, and elements of the 3rd Armored Divisions were north of the See River. The 4th Infantry was in corps reserve near the town of St Pois. The 9th Division was preparing to attack through Sourdeval and Gathemo. The 3rd Armored Division

[7]Robert L Hewitt, *Workhorse of the Western Front: The Story of the 30th Infantry Division*, (Washington, DC: Infantry Journal Press, 1946), p. 55.

was split into two combat commands. CCA of the 3rd Armored Division was near Barenton, and CCB, which had been attached to the 4th Infantry Division, was south of the See River near the town of Reffuveille.[8] A fourth division, the 2nd Armored Division less its CCA , was heading towards the Mortain area to join the 1st Division in its eastward attack.

Further support was available from the southeast. In response to information obtained through ULTRA intelligence, General Patton held three divisions in reserve near St. Hilaire: the US 80th, the French 2nd Armored Division, and the US 35th Divisions.[9] These divisions were to provide backup if the German breakthrough succeeded.

The 30th Division faced the brunt of the counterattack. It had to defend a small front of eleven kilometers with only seven battalions.[10] One infantry battalion minus one company, plus a company of medium tanks. a reconnaissance platoon and a tank destroyer platoon were detached on a mission to Barenton.[11] The other missing battalion was attached to CCA of the 2nd Armored Division. The remainder of the division formed a line that began in the south at Mortain, went north through St. Barthelemy and west along the southern bank of the See River.[12]

By 2200 hours on August 6, the most important units were in position. The 120th Infantry Regiment minus its 3rd Battalion was responsible for Mortain and the surrounding area.[13] This area included Abbaye Blanche to the northwest of Mortain, Hill 285, and the strategic heights of Hill 317. The 1st Battalion, 120th Infantry Regiment occupied Hill 285.

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[8]Blumenson, *Breakout and Pursuit*, p. 471.

[9]Robert A. Miller, *August 1944*, (Novato, CA: Presidio Press, 1988), p. 66 quotes Patton's diary saying, "We got a rumor last night from a secret source that several Panzer divisions will attack west...from Mortain...on Avranches. Personally, I think it is a German bluff to cover a withdrawal, but I stopped the 80th , French 2nd Armored, and 35th [Divisions] in the vicinity of Saint Hilaire just in case something happens." The secret source has been identified as ULTRA. The fact that Patton held three divisions back suggests that this information was used by the Allied commanders, and it may have been used to do more than just hold back Patton's three divisions.

[10]Hewitt, p. 55.

[11]Ibid, p. 56.

[12]Ibid, pp. 51-52.

[13]The 3rd Battalion, 120th Infantry was sent to Barenton, less a company attached to the 2nd battalion.

The 2nd Battalion had two responsibilities. First, it was to be responsible for the roadblocks. Several platoons with a few of the division's antitank guns set up three roadblocks -- two north of Mortain and one south of Mortain. Second, the battalion occupied Hill 317 with four rifle companies and two observers from the 230th Field Artillery Battalion.[14]

In addition to the 120th Infantry Regiment, the 117th and 119th Infantry Regiments were positioned in the attack sector. The 117th Infantry occupied the high ground around St Barthelemy, two miles north of Mortain, while the 119th Infantry minus one battalion was in divisional reserve three miles west of Juvigny.[15]

Even without the diversion of two battalions, the 30th Division was not at full strength. It was approximately a thousand men short due to heavy fighting.[16] In addition to the 1,000 men lost, 750 replacements had joined the division between August 3 and August 5. These replacements had not had sufficient time to adjust to the division. Furthermore, the division was tired. The 30th Division was a lead unit in the COBRA breakout. After the breakout the division was sent to Mortain without an opportunity to rest.[17]

A question of debate critical for understanding the failure of the German counterattack is the value of intelligence. ULTRA intelligence enabled the Allies to intercept and decode German signals.[18] Questions exist, however, over the timing and value of ULTRA intelligence

[14]Miller, p. 63; Blumenson, *Breakout and Pursuit*, pp. 469-470.
[15]Hewitt, p. 51.
[16]Ibid, p. 55.
[17]Data on the other divisions is quite limited. The information I have found gives casualty figures for the first six days of August. These figures are: 300 for the 3rd Armored Division; 600 for the 4th Division; and, 850 for the 9th Division, Blumenson, *Duel*, p. 201. However, Third Armored Division, *Spearhead in the West 1941-1945: The Third Armored Division*, (?????: HQ US Forces, European Theater, October 1945) suggests that replacements arrived quickly and in large numbers.
[18]On intelligence during the war see Ralph Bennett, *Ultra in the West: The Normandy campaign of 1944-1945*, (London: Hutchinson & Co. LTD, 1979) F.W. Winterbotham, CBE, *The ULTRA Secret*, (New York: Harper & Row, Publishers, 1974), Ronald Lewin, *ULTRA Goes to War*, (New York: Hutchinson & Co., LTD, 1978), pp. 338-359, Thomas Parrish, *The ULTRA Americans*, (New York: Stein and Day, 1986), pp. 226-9, and F.H. Hinsley,

for this battle. Winterbotham claims that ULTRA received the information by August 3, and the Allied generals prepared a defense in depth to defeat the German attack.[19] On the other hand, Ralph Bennett asserts that documents do not support Winterbotham's claim. He believes that ULTRA information was not used to prepare for the German attack.[20] Thus, the importance of intelligence for the defeat of the Germans is unknown.

Two facts, however, support the argument that the Allies prepared a defense in depth. First, Patton stopped three divisions due to information of an impending attack. Patton was not known to stop an advance without good reason; therefore, it seems likely that he had good reason to hold these divisions back. Second, a large number of forces were in the region. It seems reasonable to assume that they were ordered to the battle area.[21]

**German Forces**: Kluge's preparations encountered two major problems. First, Hitler wanted to change the plan at the last moment. On the afternoon of August 6, Hitler informed Kluge that the plan needed changes, including a change of commander to lead the counterattack. General

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*British Intelligence in the Second World War Volume Three Part II*, (London: Her Majesty's Stationery Office, 1988).

[19] *The ULTRA Secret*, pp. 147-152.

[20] See Ralph Bennett, *Ultra in the West: The Normandy campaign of 1944-1945*, (London: Hutchinson & Co. LTD, 1979), pp. 112-124. Richard Hallion, *Strike from the Sky*, (Washington: Smithsonian Institution Press, 1991), pp. 214-218 also argues that ULTRA did not contribute to the Allied victory. He claims air power won the day. He bases this on assertion on two pieces of information. First, General Bradley denied that ULTRA intelligence was used. The problem with this argument is that Bradley's autobiography was written many years before ULTRA was declassified. Even if Bradley wanted to give credit to ULTRA, he could not. Second, Hallion rightfully claims that the information of the German counterattack was not sent to the field until midnight, just before the attack started. The information arrived too late for the 30th Division to use it to prepare its defenses better. While it is true that the 30th Division did not benefit from ULTRA intelligence, other ways to use the information exist. Hallion's view might be correct if the Allied goal was to stop the Germans at Mortain. The Allies, however, hoped to achieve a major victory, which they accomplished at the Falaise Pocket. They, therefore, used the information to prepare a defense in depth. (Winterbotham, p. 150). The exact measures taken as a result of this information remain unclear. But, it is clear that Patton stopped three divisions as a result of ULTRA information. Winterbotham makes the additional claim that the Allied command used the information to prepare defenses in depth.

[21] According to the history of the 2nd Armored Division, battlefield intelligence and ULTRA caused the commander of the VII Corps to ask for the 2nd Armored Division to be assigned to him. Donald E. Houston, *Hell on Wheels: The 2nd Armored Division*, (San Rafael, CA: Presidio Press, 1977), p. 243.

von Funck was to command the attack. For his own reasons, Hitler wanted General Eberbach to lead the attack.

Second, Hitler wanted to increase the size of the attacking force. He gave 140 extra tanks to Kluge. Sixty of these tanks were Panthers that had been held in reserve east of Paris. The remaining eighty tanks were the Mark IVs, along with all the armored vehicles, of the 11th Panzer Division.[22]

Kluge opposed these changes. The changes would require a delay of at least twenty-four hours, and Kluge did not believe the attack could be postponed that long. British success in the northeast, west of Caen and the advances of Patton's Third Army threatened to encircle the German forces. Any delay could weaken the German position. Furthermore, part of the plan for the counterattack called for the Germans to achieve surprise. Delays increased the risk of discovery.

For these reasons, Kluge opposed delaying the attack, and he attempted to persuade Hitler. In the end, they reached a compromise. Hitler agreed to allow the attack to go ahead as planned. Once Avranches was captured, however, Eberbach would be put in command. The German forces, then, would continue the attack to the northeast against the flank and rear of the US First Army.[23]

The second major problem was the movement of the designated attack formations from the XLVII Panzer Army. The 2nd and 2nd SS Panzer Divisions needed to travel to Mortain from their previous positions near Vire. These divisions were able to withdraw from their defensive positions without breaking the front between the See River and Vire, and then move to their positions for the attack. The 1st SS Panzer Division had more trouble than the other divisions. The 89th Infantry Division was supposed to take the 1st SS' position in the defensive

[22]Blumenson, *Breakout and Pursuit*, p. 459; Blumenson, *Duel*, p. 221.
[23]Miller, pp. 64-65.

line. It arrived late, which delayed the departure of the 1st SS. Once the division started its trip to the Mortain area, however, it was delayed further. Traffic congestion and air attacks made travel on the road to Mortain difficult for the 1st SS.

These problems led von Funck to request and obtain approval to delay the attack until midnight. The 1st SS was behind schedule and would not arrive in time to transfer a tank battalion to the 2nd Panzer Division. Also, the 116th Panzer Division, which was supposed to transfer a tank battalion to the 2nd Panzer, had not.

By August 6, German divisions were significantly below strength. 1,400 tanks had been committed to Normandy. As of August 4, only 600 tanks were still available.[24] Allied ground and air fire hindered the movement of units, causing severe damage as they prepared to attack. Blumenson says that the damage before the attack was significantly greater than normal. He writes

> Many units had already taken heavy losses before the attack started. In contrast with the daily personnel losses that averaged 3 percent of those in contact, German casualty reports for 6 August inexplicably attained heights of 30 and 40 percent.[25]

High attrition and the limited number of available divisions limited the forces that the Germans could muster for the attack.

**THE ATTACK**

Around midnight, August 6/7, the German counterattack began. Two armored columns drove towards Avranches, a goal thirty-two kilometers away. One of the columns was composed

[24]Robert Leckie, *Delivered From Evil*, (New York: Harper & Row, Publishers, 1987), p. 748.
[25]Blumenson, *Breakout and Pursuit*, p. 462.

of part of the 2nd Panzer Division and attacked along the south bank of the See River. The remainder of the 2nd Panzer Division waited for the 1st SS Panzer Division to arrive before it attacked. The second column, composed of the 2nd SS Panzer Division and the 17th Panzer Grenadier Division, attacked Mortain in two groups, one from the north and one from the south. The attack took place without an artillery barrage in an attempt to achieve surprise. Tactical surprise was achieved, and combined with the weak positions of the 30th Division, allowed the Germans initially to achieve significant gains.

The 30th Infantry Division did not report the attack to headquarters until 0315. By this hour German forces already controlled the town of Mortain. Only the American forces on Hill 317 remained. Also, by 0315 the 2nd Panzer Division was near le Mesnil-Tove. Despite the apparent German successes, the 30th believed the penetrations would be taken care of by dawn. Since some of the German forces scheduled to attack had not yet entered the battle, the German forces appeared weak; a G-3 at Corps headquarters believed the attack was an unorganized attempt to escape.

By dawn, it was obvious that the Germans had launched a major attack. Quick reactions, the retention of Hill 317, air power, and the abundance of American forces in the area helped to stop the attack. Units such as CCB of the 3rd Armored Division, the 4th Infantry Division, and the 2nd Armored Division (minus its CCA) were in the vicinity and helped contain the German penetration.[26] The presence of these units combined with the quick reaction of their commanders helped defeat the German forces.

Terrain and air power also helped to thwart the German attack. When the day dawned without fog, the possession of Hill 317 and the Allied advantage in air power contributed to the Allied victory. The units trapped on Hill 317 were able to locate the German columns and call

[26]A question that must be addressed more fully is the reason for those forces being in the area. It is possible that it was all part of the Allied strategy.

for artillery to be fired on them. The air forces also helped stop the progress of the German forces through bombing, as well as fear of Allied bombing. When the fog lifted in the morning, the German forces who had experienced the effects of Allied air power sought cover, which helped to stop the advance.

A further impediment to German progress was the inaction of the 116th Panzer Division. The 116th was scheduled to attack when the battle started in order to protect the northern flank from Allied counterattacks. The division, however, did not attack until 1630 hours. This delay left the north flank exposed, and allowed the American forces north of the See River to take advantage of the situation.

On the afternoon of August 7, the German commanders in the battle area admitted that the counterattack was a failure.[27] German forces had traveled a third of the distance to Avranches. All that remained was for the Allies to roll back the German forces.

**The North Column:** The 116th Panzer Division's responsibility was to attack along the north bank of the See River in order to protect the north flank of the main column. When the time came to attack, General Schwerin, the commander of the 116th Panzer Division, did not. He claimed that Allied attacks threatened his forces. In particular, the 9th American Infantry Division, which was attacking toward Gathemo and Cherence, prevented the attack.[28]

The failure to attack may have significantly hurt the German effort. The 4th and 9th Infantry Divisions occupied the north bank of the See River. When the 4th Division learned of the counterattack, it shelled the 2nd Panzer Division and later moved units to the south to aid the US defense. If the 116th had attacked as planned and succeeded, it would have occupied

[27]Blumenson, *Breakout and Pursuit*, p. 465.

[28]Another reason frequently given for the failure to attack was General Schwerin's belief that victory was not achievable.

positions between the US forces and the main column. This may have put enough pressure on these US units to force them to defend themselves instead of attacking the 2nd Panzer.

This weakness concerned General von Funck. He, therefore, requested and obtained approval for the removal of General Schwerin as commander of the 116th. Finally, at 1630, the 116th Panzer attacked, but the 9th Division stopped it promptly.

**The Main Column:** According to the plan, the 2nd Panzer Division, reinforced with two armored battalions, was to constitute the main column. The two extra battalions would come from the 116th Panzer and the 1st SS Panzer Divisions. The column was to attack along the south bank of the See River. The delay in the arrival of the 1st SS required a change of plans. Only part of the force attacked as scheduled, while the remainder waited for the arrival of the 1st SS.

The initial force attacked between Sourdeval and Mortain, advancing eleven kilometers before being stopped. This advance took it through le-Mesnil-Tove up to le Mesnil-Adelee. This advance separated the three battalions of the 39th Infantry regiment, 9th Division from the rest of the division.

Early on the morning of August 7, the column encountered resistance. Once the 4th Division, which was in corps reserve, realized the Germans were attacking, the division quickly reacted. Divisional artillery fired across the river upon the 2nd Panzer Division. Then, General Barton, the commander of the 4th Division, prepared his troops to stop any German attempt to cross the river and attack north.

An attack across the See River concerned the American commanders. If successful, a German attack was believed to be a serious threat. It would allow the German forces to disrupt and destroy Allied supply lines. Fortunately, by dawn, the 4th Division was prepared to repel any attack northwards.

While the 4th Division was ready to stop any northward advance, American forces acted to contain the penetration. This was accomplished by the 119th Infantry regiment, 30th Division and CCB of the 3rd Armored Division. The 119th was in corps reserve, and CCB/3 was assembled south of the river near the 119th. The first step taken against the main German column was to prevent further westward movement. Company B of the 119th Infantry, reinforced by two 57mm antitank guns, was to set up a roadblock at le Mesnil-Adelee. This roadblock combined with the threat of air strikes would try to prevent any further penetration. Company B arrived at le-Mesnil-Adelee at approximately 0630 to find the German forces stopped, and the tanks camouflaged. Upon realizing that the German forces were too strong, the company fired a few shots and pulled further back to build its roadblock.

At 0730, CCB of the 3rd Armored Division entered the battle. General Collins gave the command of CCB/3 to General Hobbs to contain the penetration of the southern column. Hobbs, however, believed the 2nd Panzer Division was a greater concern. He ordered CCB/3 to push back the German column. To accomplish this task, the combat command moved through Company B's roadblock to help halt the German column. Eventually, with the aid of British Typhoon fighters, CCB stopped the German advance and pushed it back.[29]

The remainder of the 119th was to attack the flank and the rear of the German column. Company I attacked the rear between Bellafontaine and le Mesnil-Tove. The goal of this attack was to block the German's escape. Unfortunately, the company was not strong enough to accomplish the task. Therefore, the company fell back and waited.[30]

The 3rd Battalion, 119th Infantry attacked the German column northward from Juvigny. Its goal was to retake le Mesnil-Tove. As with Company I, the 3rd Battalion was not strong enough to accomplish its mission. It did, however, push the German forces north of the town

[29]Hewitt, p. 61.
[30]Ibid, p. 61.

which allowed the 3rd Battalion to form a more continuous defensive front with the CCB of the 3rd Armored Division near le Mesnil-Tove.

The remainder of the 2nd Panzer division reinforced with a tank battalion from the 1st SS Panzer Division attacked at dawn on August 7. This column attacked through St Barthelemy where it pushed the 117th Infantry back approximately two kilometers. Air and ground resistance then stopped it.

In the middle of the morning, General von Funck decided to use the exploitation force--the 1st SS Panzer Division. He hoped the main column would be able to advance further. The 1st SS attacked through the 2nd Panzer Division with almost no success. The restricted road system limited the maneuverability of the attacking force while Allied air power and ground resistance took a high toll in German tanks. These problems led von Funck to halt the attack at noon.

**The Southern Column:** At midnight on August 6/7, the southern column attacked Mortain. It was the only column to attack with all of its forces on schedule. The column attacked in two groups--one north of the town and one south of it. The goal was to capture the town of Mortain, and then proceed down the road toward St. Hilaire in order to protect the southern flank of the main column.

The 2nd Battalion, 120th Regiment had built three roadblocks, two north of Mortain and one south of Mortain. At 0125, the German columns broke through the southern roadblock and one of the northern roadblocks, forcing the survivors to retreat to Hill 317. The other roadblock survived, and remained in action for the next few days.[31]

[31]Blumenson, *Breakout and Pursuit*, p. 469. It is not clear exactly why this roadblock was able to remain in place for so long. One of the reasons seems to be the time constraints faced by the Germans. The German forces needed to reach their goals quickly, which led them to surround some American forces and push on with the main attack.

After breaking through the road blocks, the German forces continued forward. They left the American forces at the north roadblock and on Hill 317 behind. The 17th Panzer Grenadier continued to attack these forces while the 2nd SS Panzer Division proceeded down the road toward St Hilaire. The 2nd SS faced little resistance. The 30th Division was weak in this area, and there were few units between the 2nd SS and Avranches. Because of this weakness the 2nd SS achieved its initial objective with relative ease.

The soldiers on Hill 317 and Allied air power prevented the 2nd SS from reaching Avranches. In addition to the survivors from the two roadblocks, three rifle companies, a heavy weapons company, several antitank pieces, and two artillery observers occupied Hill 317.[32] Hill 317 provided the artillery observers with an ideal view to watch the advancing column and to target artillery against it. When the morning arrived with clear skies, Allied air superiority took advantage of the situation by attacking the German forces with Hurricanes and Typhoons.

Even though this column was stopped, it fulfilled its mission of guarding the southern flank. American forces in the area were too weak to push the column back. General Hobbs sent the 2nd Armored Division minus its CCA to push the 2nd SS Panzer Division back. No progress was made. General Bradley, therefore, ordered the 35th Division, which was near Fourgeres and Vitre, to help push the column back. Until this division arrived, all the 30th could do was wait.

**Air Power:** The Allied air forces played a significant role in stopping the German attack. They flew nearly 300 sorties in the Mortain area. These attacks had two effects.[33] First, they helped to destroy German forces, although it is difficult to estimate how much damage they caused.[34] Second, the air forces caused a great deal of fear among the German forces. When the day

[32]Ibid, p. 470.
[33]*The Army Air Forces in World War II, Volume 3*, (Chicago: University of Chicago Press, 1979), p. 249.
[34]See Gooderson, "Allied Fighter-Bombers" for an explanation.

dawned without the predicted fog, the German soldiers prepared for the inevitable. They knew the power of the Allied air forces; therefore, they drove their tanks off the road and took cover.

**Casualties:** Information on casualties and prisoners is limited for any battle, and this case is no exception. American losses are available for the 30th Division and for the Allied air forces. On August 7, the 30th Division suffered more than 600 dead and wounded soldiers. Air losses were extremely light, only three typhoons and pilots were lost.[35]

The only available information on German casualties are for tanks and prisoners. After the first day of fighting, 40 tanks were not operational and 350 prisoners were taken.[36]

## ANALYSIS OF THE BATTLE

### Question 1: What were the effects of force-to-force and force-to-space ratios?

As a rule of thumb, military analysts have looked at force-to-force and force-to-space ratios to determine which side in a conventional military conflict has the advantage. For force-to-force ratios, it is generally assumed that the attacker needs a three to one advantage over the defender to win.[37] The ratio should be weighted for a variety of factors including weapon and personnel quality. The rule of thumb for force-to-space ratios assumed that one US WWII infantry division could hold 15km.[38]

In this battle, the ratios suggest that the attacker did not have sufficient forces to defeat the defender. The ratios of engaged forces heavily favored the allies. The ratio of attackers to

[35]Ibid, pp. 220-1.

[36]Blumenson, *Duel*, p. 234. The meaning of "not operational" is unclear in Blumenson's account.

[37]This idea has been common in US military thought. See *Operations: FM 100-5*, (Washington, DC: US Army, 1976). For more on the use of the 3:1 rule see John Mearsheimer, "Assessing the Conventional Balance: The 3:1 Rule and Its Critics," *International Security*, Volume 13, Number 4, (Spring 1989), pp. 54-89, and Joshua Epstein, "The 3:1 Rule, the Adaptive Dynamic Model, and the Future of Security Studies," *International Security*, Volume 13, Number 4, (Spring 1989), pp. 90-127.

[38]William P. Mako, *US Ground Forces and the Defense of Central Europe*, (Washington, DC: The Brookings Institute, 1983), p. 36. Mako says that this number comes from the battle of the Bulge.

defenders was 0.42:1, or approximately 1 German soldier for every 2.6 American soldiers. The ratio for tanks to assault guns was better, 0.72:1, but still not enough. Towed artillery also favored the Allied forces with a ratio of 0.41:1. The Germans did have an advantage in three categories: self-propelled artillery, 1.41:1; heavy mortars, 22:1; and armored vehicles,[39] 2.91:1.

The force to space ratio also does not suggest any advantage for the attacker. Both sides were fighting in the same, narrow 11km area. The Germans focused their attack along two narrow sectors. The allies, however, had a defense in depth. The 30th Division spread its units over an area that was 12km deep. Furthermore, other Allied units were in positions from which they could engage the Germans quickly, or fire artillery on the advancing German forces.

**Question 2: What were the effects of terrain?**

The terrain made a significant contribution to the American success in two ways. First, it hindered the ability of the German forces to move their armor. Second, it provided the defender with high ground from which to observe and target the German forces.

The terrain in the area of Mortain was hilly, bocage country. The area had many hedgerows and tactically significant heights. Furthermore, many narrow roads cut through the hedgerows. This terrain was very difficult for tanks to travel through. The hedgerows made it necessary for the armored vehicles to travel along the roads. Otherwise, they would get caught in the mud and bushes. The road network, however, was narrow and limited the movement of the armored columns. Thus, the Germans had difficulty concentrating their forces when faced with resistance.

The high ground in the Mortain area, particularly Hill 317, gave the side that occupied it a significant advantage. From this location, an adversary's forces could be observed and artillery fire could be more easily targeted. Since the Americans occupied Hill 317 before the battle, they

[39]Medium and heavy tanks are not included in this category.

had the advantage. From this location, artillery observers were able to locate and target the advancing German columns.

**Question 3: What were the effects of preparation time?**

Neither side had the opportunity to prepare adequately for the German counterattack. The Germans used weak divisions instead of waiting for additional forces to arrive. Two problems prevented Kluge from delaying the attack. First, the Allies were pressuring the German forces in the north and the south. If the attack were delayed, the danger of encirclement would increase significantly. Second, the Germans hoped to achieve surprise, which explains why the Germans did not have an initial artillery barrage. Each moment the attack was delayed threatened to expose the German plans, which limited the time the German's had to prepare.

Tactically, Allied preparation was also nonexistent. The 30th Division was unable to prepare for the attack. They arrived in the area late and did not have the opportunity to dig in or do any reconnaissance. This division entered the area and occupied the positions of the exiting 1st Division. Furthermore, the division did not learn of an impending attack until twenty minutes before it occurred.

Strategically, the Allies were better prepared. Days before the attack took place, ULTRA intelligence informed the Allies of an impending attack against Avranches. This may have permitted General Bradley to move forces, such as the 4th infantry and the 2nd Armored Division minus its CCA, into the area. These forces, in turn, helped to stop the German columns.

**Question 4: What was the value of armor, infantry and artillery?**

Unfortunately, the information available on this battle does not provide clear information for assessing the relative value of armor, infantry or artillery. Obviously, the Germans believed

that armor was essential to success. Otherwise, Hitler would not have offered extra armor to Kluge. The successes and failures of this battle, however, do not appear to be the result of armor.

The effects of infantry are also unclear. The 30th Infantry Division bore the brunt of the German attack. In the end, the attack halted when other forces supported the 30th and the force to force ratio heavily favored the Allies.

The value of artillery, while not clear, is somewhat clearer than the value of armor and infantry. Artillery contributed to the Allied success in two places. The 4th Infantry Division's artillery slowed the main attack of the German forces. The attack continued, but not as quickly. Artillery fire also helped to stop the German's as a result of the view afforded the Americans on Hill 317.

**Question 5: What were the advantages of air power?**

Air power played a significant role in this battle. General von Gersdorff credited the Allied success to air power. Allied air power prevented any of the Luftwaffe's 300 planes from supporting the counterattack. Allied air power also flew many sorties in the Mortain area. These sorties contributed to the successful defense both by bombing and by threatening to bomb the German columns. The experienced German soldiers knew the threat posed by air power. When clear skies appeared on August 7th, German forces prepared for the impending air attack by taking cover. Alone, this fear helped to slow the attack, but air attacks also helped to defeat the attack through the destruction inflicted on the German forces.

## BIBLIOGRAPHY

*Army Air Forces In World War II, Volume 3*, Chicago: University of Chicago Press, 1979.

Blumenson, Martin, *Breakout and Pursuit*, Washington, DC: Center of Military History, US Army, 1984.

----------, *The Duel For France 1944*, Boston: Houghton, Mifflin Company, 1963.

d'Este, Carlo, *Decision in Normandy*, Toronto: William Collins Sons and Co Ltd, 1983.

Gersdorff, General Major Freiher V, *Normandy, Cobra and Mortain*, Washington, DC, Department of the Army, Historical Division, July 1949.

Gooderson, "Allied Fighter-bombers Versus German Armour in North-West Europe 1944-1945," *Journal of Strategic Studies*, (June 1991), pp. 210-231.

Greenfield, Kent Roberts, Robert R. Palmer, and Bell I. Wiley, *The Army Ground Forces: The Organization of Ground Combat Troops*, Washington, DC: Historical Division, US Department of the Army, 1947.

Hallion, Richard, *Strike From the Sky*, Washington, DC: Smithsonian Institution Press, 1991.

Hewitt, Robert L, *Workhorse of the Western Front: The Story of the 30th Infantry Division*, Washington, DC: Infantry Journal Inc., 1946.

Hinsley, F.H., *British Intelligence in the Second World War Volume Three Part II*, London: Her Majesty's Stationery Office, 1988.

Houston, Donald, *Hell on Wheels: History of the 2nd Armored Division*, ????:?????, 1977.

Howard, Major John D, "Decision at Mortain: 1-8 August 1944," *Military History Anthology*, (September 1984), pp. 109-122.

Keegan, John, *Six Armies in Normandy*, New York: Viking Press, 1982.

Leckie, Robert, *Delivered From Evil*, New York: Harper and Row Publishers, 1987.

Lewin, Ronald, *ULTRA Goes to War*, New York: Stein and Day, 1986

Mako, William P., *US Ground Forces and the Defense of Central Europe*, Washington, DC: The Brookings Institute, 1983.

Mearsheimer, John J, *Conventional Deterrence*, Ithaca, NY: Cornell University Press, 1981.

Miller, Robert A, *August 1944*, Novato, CA: Presidio Press, 1988.

Parrish, Thomas, *The ULTRA Americans*, New York: Stein and Day, 1986.

Perret, Bryan, *A History of the Blitzkrieg*, London: Robert Hale Limited, 1983.

Staff Group 4B, CGSOC Class of 1986-87, "OPERATION COBRA and the Mortain Counterattack," *Military Review*, (July 1988), pp. 57-66.

Third Armored Division, *Spearhead in the West 1941-1945: The Third Armored Division*, ?????: HQ US Forces, European Theatre, October 1945.

United States War Department, *Handbook on German Military Forces*, Baton Rouge, Louisiana: Louisiana State University Press, 1990.

Weigley, Russell F, *Eisenhower's Lieutenants*, Bloomington, Indiana: University Press, 1981.

----------, "From the Normandy Beaches to the Falaise-Argentan Pocket," *Military Review*, (September 1990), pp. 45-64.

Wilmot, Chester, *The Struggle for Europe*, New York: Harper & Brothers Publishers, 1952.

Winterbotham, F.W., *The ULTRA Secret*, New York: Harper & Row, Publishers, 1974.

# THE BATTLE OF THE BULGE

Brian Nichiporuk

## THE SETTING

The abortive December 1944 German winter counteroffensive in the West against the Schnee Eifel/Ardennes region (commonly known as The Battle of the Bulge) was the last full-scale German offensive effort of World War II. Hitler used up his last significant grouping of full strength armored divisions, which had been built up especially for the Ardennes offensive, and also the Luftwaffe's best remaining squadrons in this effort. Perhaps just as important, Nazi Germany expended a large proportion of its carefully husbanded gasoline reserves in this operation. The defeat that the German forces suffered in this campaign, despite the huge expenditure in scarce German resources that had been made, ensured that the Third Reich would be unable to conclude the Second World War on any terms other than unconditional surrender.

In mid-December 1944 the Western Front had become locked into a kind of stalemate. This was very surprising to the Allies in view of the favorable course of events that had transpired in the West in the late summer and early fall. In late July and early August, the Allied armies had succeeded in breaking out of their confined position in Normandy with a very powerful American combined arms offensive called Operation Cobra.[1] Following the breakout, the Anglo-American armies smashed a large portion of German strength in the West in The Battle of the Falaise Gap. During August and early September the Allied armies overran most of France and Belgium in a fast moving pursuit operation. However, by late September a number of factors had combined to halt the forward movement of the Anglo-Americans.[2] Logistical bottlenecks, command squabbles, and a fresh infusion of German Volksgrenadier divisions all combined to freeze the battlefront on a line running through the Roer River Valley, the Schnee

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[1] Wilmot, Chester. The Struggle for Europe: World War II in Western Europe, Harper and Row, 1952, pp. 380-387.

[2] Bradley, Omar N. A Soldier's Story, Holt and Co., 1951, pp. 407-450.

Eifel, the Ardennes, southern Luxembourg, Saarlautern, Strasbourg, and finally the city of Basel on the Swiss frontier.[3] The front line was roughly 320 miles long; along the entire line the Allies had 65 divisions deployed.[4] In mid-December 1944, the Germans would also have 65 divisions on the line, however, one must not forget that the average German 1944 division was smaller than the average Anglo-American division, so the Allies still enjoyed an overall numerical advantage.[5]

Through the months of October and November, the U.S. First Army under General Courtney Hodges made some forward progress in the Aachen area while the U.S. Third Army under General George Patton gained ground in the Saar region. The British and Canadians picked up some territory south of Rotterdam as well. Nevertheless, no major breakthroughs were scored and, by mid-December, the Western Front had settled down into a campaign of attrition.[6] Part of the Allies' problem in the fall of 1944 was that the terrain over which they were attacking (heavily forested and cut up by rivers and dry gorges) was conducive to the low tech defensive tactics then being employed by the German infantry. Even a tired and worn out German infantry division (of which there were many in Autumn 1944) could inflict heavy casualties on a fresh, full strength Allied division if it used the available terrain wisely.

The purpose of the German offensive against the Ardennes region was to seize the crucial Belgian port of Antwerp, thus splitting General Omar Bradley's 12th U.S. Army Group from Field Marshal Bernard Montgomery's British and Canadian dominated 21st Army Group.[7] Adolf Hitler's hope was that the split between the British/Canadian forces and the American forces would create a political crisis in the Western Alliance that could cause the threat to Germany from the West to disintegrate. Hitler apparently believed that, because of the vast distances involved, it would be very difficult to strike a knockout blow of the same magnitude on

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[3] Cole, Hugh M. The Ardennes: The Battle of the Bulge, Department of the Army, 1965, p. 52.
[4] Weigley, Russell. Eisenhower's Lieutenants, pp. 288-297.
[5] Kugler, Richard L. NATO's Future Conventional Defense Strategy in Central Europe, R-4084-A, The Rand Corp., 1991, p. 145.
[6] Eisenhower, John S.D. The Bitter Woods, Putnam's Sons, 1969, pp. 85-102.
[7] MacDonald, Charles B. A Time for Trumpets, Morrow and Co., 1985, pp. 17-38.

the Eastern Front against the Soviets. The commander of German Army Group B, which was in control of the Ardennes Offensive, Field Marshal Walter Model, proposed to Hitler a more limited offensive with the goal of just capturing the Meuse crossings in the Belgian city of Liege.[8] Model was overruled by the German dictator. Most of the German military planners involved in preparing the Ardennes operation believed that even a brilliant success for their side would only postpone an Allied victory for a few months; the consensus of Wehrmacht opinion at the time was that the attacking force allocated to the Ardennes by Hitler was about ten divisions smaller than it needed to be in order to mount a knockout blow.[9] The supreme German military commander on the Western Front (Marshal Model's superior) was Field Marshal Gerd von Rundstedt, an aged, highly experienced senior commander who was a member of the traditional Prussian General Staff elite and was expected to lend stability and calm to the German command apparatus in the West during the crucial Ardennes offensive.

German Army Group B gathered together three full armies for the Ardennes attack. From north to south they were: Sixth Panzer Army (General Sepp Dietrich), Fifth Panzer Army (General Hasso von Manteuffel), and Seventh Army (General Brandenberger).[10] These three armies contained a total of 25 divisions, 10 of which were armored.[11] There has been a tremendous amount of speculation about the reasons why Allied intelligence was unable to warn the Allied commander in chief, General Dwight D. Eisenhower, and his SHAEF (Supreme Headquarters Allied Expeditionary Force) staff of the impending German attack in the Ardennes sector. It has been conclusively shown that a large amount of good raw intelligence about the German buildup was provided to the appropriate staff officers at both the U.S. First Army and SHAEF by aerial reconnaissance missions over the Rhineland and the Belgian-German frontier area.[12] For example, during the first two weeks of December, U.S. reconnaissance flights

[8] Wilmot, p. 576.
[9] Kugler, p. 152.
[10] Cole, p. 22.
[11] Kugler, p. 144.
[12] Craven and Cate, The U.S. Army Air Force in World War II, Vol., pp. 673-681.

reported very heavy road and rail traffic on all the main roads and rail lines moving east and west across the Rhine River. This activity continued unabated at night. This type of intense movement was observed on all the dates in early December when the weather was good enough to fly reconnaissance. Also, photographic reconnaissance revealed that several German divisions had been pulled out of the line in the area between Aachen and the Saar.[13]

There was additional intelligence information however, which provided more evidence that the Germans were thinking seriously about a major offensive operation in the West in the late fall or early winter. U.S. intelligence had cracked Japanese diplomatic codes early in the war and in 1944 the Americans were intercepting and decoding virtually all important messages between the Japanese Embassy in Berlin and Tokyo. In early September, the Japanese Embassy was sending out messages to the effect that German Foreign Minister Ribbentrop was talking about the possibility of a large German offensive in the West in November/December. In mid-November, another report by the Japanese Ambassador commented on a subsequent audience with Ribbentrop. According to the transmission, the German Foreign Minister had said that Hitler had decided that a purely defensive military strategy could not win the war for the Reich and that Germany had the oil reserves to conduct one last large offensive, most likely on the Western Front.[14] However, Ribbentrop had hedged in the meeting and had stated that the attack could take place on the Eastern Front, if that proved to be necessary. This last minute vacillation prompted Allied intelligence to basically disregard the Japanese Ambassador's report. The earlier September transmissions were completely forgotten. Apparently, U.S. Army intelligence analysts saw no correlation between German troop movements around the Ardennes in early and mid-December and the information contained in the earlier intercepts of Japanese diplomatic traffic. This intellectual failure is puzzling to the outside observer and raises the possibility that some real sloppiness existed in certain areas of U.S. Army intelligence at the time.

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[13] Craven and Cate, p. 680.

[14] Hinsley, F.H. British Intelligence in the Second World War, Vol. III, No. 2, pp. 419-420.

Besides the intensive rail and road movements and the Japanese Ambassador's messages, there was evidence pointing to a large scale movement of German close air support aircraft to the Western Front.[15] In the first week of November, Allied COMINT intercepted an order from Luftwaffe commander in chief Hermann Goring "that provision must be made for fitting out all fighters as fighter-bombers at 24 hours' notice;....."[16] The same dispatch ordered the movement to the Western Front of 24 fighter squadrons; a movement order of this magnitude for the Luftwaffe in the West had not been seen by Anglo-American intelligence since summer. Still, this information did not greatly perturb Allied intelligence because the move was interpreted as being designed to guard the Ruhr against a possible American breakthrough in the Roer River Valley.

SHAEF's skepticism about the possibility of a full-scale German counterattack in the West was reinforced by a lack of human intelligence data. The OSS had placed no agents in the Eifel area, presumably because it was German territory and thus secured by the Gestapo, and interviews with German prisoners of war and refugees yielded no clues about the coming Ardennes offensive until the last few days before it actually began.[17] American intelligence officials apparently believed that any imminent German attack on the Western Front would produce a large-scale tide of HUMINT data long before the assault began.

Raw data was certainly available to SHAEF intelligence to the effect that a large new German buildup was occurring. However, this data did not conclusively point to a specific geographic sector and basically served to reinforce a belief at SHAEF that the Germans were preparing either a limited counterattack toward Aachen or a strong defensive stand in front of the Roer River dams. The Allied High Command took a calculated risk in not reinforcing the Ardennes so that they could concentrate on mounting new attacks to the north toward Cologne.[18] The SHAEF intelligence staff should not be overly castigated for drawing the conclusions they

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[15] Hinsley, pp. 406-415.
[16] Hinsley, p. 410.
[17] Hinsley, pp. 418-419.
[18] Eisenhower, Dwight D. Crusade in Europe, Doubleday, 1948, p. 344.

did from the reconnaissance data that was available. This is especially true in light of the fact that Allied COMINT did not pick up the changes in the German order of battle that were occurring in the Ardennes area in early December as the Fifth and Sixth Panzer Armies took over the bulk of that sector of the front. Both panzer army headquarters operated under code names that fooled all Allied intelligence collection agencies. If SHAEF and/or 12th U.S. Army Group had learned of these order of battle changes by the Germans in the Ardennes region, that evidence would probably have provided the missing piece of the puzzle that would have shown the true intentions of Field Marshal Model's Army Group B. However, without this evidence the data on rail movements, Ribbentrop's speculations in the presence of Japanese diplomats, and new Luftwaffe fighter-bomber deployments was simply not enough to conclusively prove that an attack in the Ardennes was imminent, especially when major American offensives were in progress in the Saar and Roer River regions. SHAEF could not have stopped either of these operations to bolster the Ardennes front on the basis of the intelligence information then available.

However, the previous paragraph notwithstanding, the intelligence information that was in the Allies' hands should have been enough to alert SHAEF that "something was up" in the Schnee Eifel/Ardennes area. This indication should have been enough to compel the U.S. First Army to take precautions in that region, such as laying some extra mines, building additional fortified bunker complexes, and not rotating green troops into the Ardennes during the month of December. These types of precautions need not have disrupted either the Roer or the Saar offensives ---- they simply would have provided a bit of extra insurance to the First Army along the weakest part of its line. Such cautionary measures were not taken by the local U.S. commanders. The American failure to respond adequately to the warning signs that were evident is somewhat disturbing. Dwight Eisenhower wrote after the war that both he and 12th Army Group commander Omar Bradley were confident that any German attack in the Ardennes could be stopped by pulling units out of the line both from the north and the south of the Ardennes and

sending them into the breach.[19] Both Eisenhower and Bradley felt that there were more than enough U.S. divisions on either flank of the Ardennes to plug any gap that might emerge. They were probably correct in this assessment, but their failure to add to the defensive fortifications already present on the Schnee Eifel/Ardennes front during the first half of December placed the 12th U.S. Army Group at more risk than was necessary, given the intelligence then available.

In addition to the opportunities available on the flanks for quick reinforcement, Eisenhower had a handful of divisions in strategic reserve in either England or France which could be used as emergency fire brigades if necessary. There were two airborne divisions, two armored divisions, and an infantry division ---- all of them American ---- in SHAEF's strategic reserve.[20] Overall, the Allied command had a concept about how it would deal with a German assault in the weakly held Ardennes area, but it failed to take those precautions that would have better guarded it against the unexpected in the Schnee Eifel/Ardennes region.

**THE PLAN**

All of the separate German attacks which together comprised the opening phase of The Battle of the Bulge occurred in the 75 mile long sector between Monschau in the north and Echternach in the south. This front was weakly held by the rough equivalent of only four U.S. infantry divisions. The 12th Army Group had decided to guard the Ardennes front with only weak forces for two principal reasons. First of all, the terrain in the Ardennes region favored the defender with its dense forests, sharp ridges, and narrow roads. The Germans had demonstrated in May 1940 that the Ardennes were not impenetrable for an armored force, but at the same time the Americans were correct in believing that the local terrain offered advantages to a smart, hard fighting defender. Second, by thinning out the Ardennes region, the Americans were able to mass forces in the two areas where they wanted to achieve breakthroughs in the fall of 1944 ----

[19] D. Eisenhower, p. 344.
[20] D. Eisenhower, p. 344.

the Roer River area and the Saar. By stripping the Ardennes defenses to the bone, 12th Army Group was able to assemble favorable force ratios over the Germans at the points of attack in those regions. According to U.S. Army World War II doctrine, four infantry divisions should not have held much more than a 40 mile front.[21]

Three German armies were arrayed against these four divisions. The Sixth Panzer Army operated on the northern 20 miles of this sector, the Fifth Panzer Army would attack on the central 35 miles of front, while the Seventh Army was responsible for the last 20 miles in the south.[22]

Marshal Model's plan called for five separate breakthrough attempts; each with a very specific purpose. The breakthroughs were all expected to occur on Day 1 of the offensive. By Day 2, the Army Group B command fully anticipated that the exploitation phase would have begun.

In the far north, the Sixth Panzer Army, with nine divisions, would attempt a single breakthrough against the far north and south of the 99th Division's front.[23] After the Volksgrenadier divisions broke through, the four SS Panzer divisions allotted to Sixth Panzer Army would exploit the hole, seize the Elsenborn Ridge and then pivot north to capture the crossings on the lower Meuse between Namur and Liege.

On the front of the Fifth Panzer Army (which contained seven divisions) three breakthroughs were assigned. The two U.S. divisions opposite the Fifth both belonged to the U.S. VIII Corps (General Troy Middleton), which was a part of the U.S. First Army. The first breakthrough attempt was to be an encirclement of the northern two regiments of the 106th U.S. Infantry Division by one infantry corps, followed by the capture of the road junction of St.Vith, which was 8-9 miles behind the front. Second, a panzer corps would break through the weakly held front of the northernmost regiment of the 28th U.S. Infantry Division and capture

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[21] Kugler, p. 145.
[22] Elstob, Peter. Hitler's Last Offensive, pp. 62, 64, 96.
[23] Elstob, p. 70.

Houffalize, located about 10-11 miles behind the front line. Just to the south, another panzer corps was to destroy the center regiment of the 28th Infantry Division and drive on to the critical road junction of Bastogne, which was approximately 13-14 miles behind the December 16 front line. All three corps were supposed to cross the Meuse River around Namur before turning northwest to attack in the direction of Antwerp.

The last of the five breakthroughs was to be handled by the Seventh Army, which had no armor and only a smattering of assault guns. The Seventh was by far the weakest of the three German armies used in The Battle of the Bulge. Two of the Seventh's infantry divisions, backed by assault guns, were assigned to crack the line of the southernmost regiment of the 28th U.S. Infantry Division in the Hoscheid area and then swing north to guard the left flank of the two panzer corps of the Fifth Panzer Army.

In total, Germany's Army Group B devoted at least 970 tanks and assault guns to the initial assault on the Americans in the Ardennes, and also brought 1900 artillery pieces, including rocket launchers, into the fray.[24] The German offensive was code named Herbstnebel.

On the surface, these German tactical plans were sensible. However, they contained two flaws. The first was that the most powerful of the three armies (the Sixth Panzer) was given a breakthrough sector in the most difficult terrain along the front. The Sixth Panzer Army's breakthrough sector carried it through the winding ridge roads and jagged gorges of the Elsenborn Ridge area and the Ambleve River valley. The Sixth was apparently handed this sector because it lay on the shortest route to Antwerp. Despite the relative proximity of the Elsenborn Ridge area to Antwerp, the Sixth Panzer Army probably would have fared better if it had been given the Fifth Panzer Army's sector of more open country and a better road net. Since the Sixth carried more of an armored punch than did the Fifth, the German chances for a successful outcome to the Ardennes offensive would have been greater if the Sixth Panzer Army had been placed in the central breakthrough sector that was occupied by the Fifth Panzer Army.

[24] MacDonald, Charles B. The Mighty Endeavor, Oxford U. Press, 1969, p. 362.

The second flaw was that the German attack plan did not call for any "pinning attacks" to be launched against the powerful American forces arrayed to the north and south of the Schnee Eifel/Ardennes region. Without pinning these forces down early on with spoiling attacks, the Germans ran the risk that many new American divisions could redeploy into the critical Ardennes region and steadily shift the theater force ratio against them. This prospect would become especially menacing if the offensive fell behind schedule ---- if a quick and easy breakthrough could be achieved before the American defense could coalesce, the threat of redeployments from the north and south would be reduced since the whole central portion of the Allied front would be coming unglued.

Specifically, to the north of the Schnee Eifel/Ardennes region, in the area stretching up past the Roer Dam region, 20 Allied divisions were concentrated on a 47 mile long front.[25] Most of these were units of the US First and Ninth Armies, which were preparing for a set of attacks through the Roer River region. These attacks were aimed at securing a breakthrough toward the city of Cologne on the Rhine River. To the south of the Ardennes, the US Third Army under General George Patton had nine US divisions at its disposal along a 50 mile front to the south of Luxembourg City.[26] Patton was trying to batter his way into the Saar region on the eve of The Battle of the Bulge. The German assault plan made no provision for taking serious offensive action against these large masses on either side of the Schnee Eifel/Ardennes, leaving General Eisenhower potentially free to feed many new units into the Ardennes. One cannot criticize the German commanders in the West too heavily for this situation because they simply did not have enough fresh divisions with which to keep the Americans north of the Roer Dams and south of Luxembourg City fully engaged while at the same time achieving highly favorable force ratios against the thin US VIII Corps line in the Ardennes. They took a calculated gamble here and, as it finally turned out, they lost the gamble. The reader must duly note that, as The Battle of the Bulge began, the overall pattern of strategic deployments along the central 200 miles of the

[25] Kugler, p. 144.
[26] Kugler, p. 144.

Western Front gave the Allies a latent advantage that could only be nullified if the U.S. VIII Corps completely collapsed in the first 48 hours of the German offensive. The pressure on the Fifth and Sixth Panzer Armies to stay on schedule in the early days of the attack was immense.

## THE BATTLE

The Battle of the Bulge can best be studied by dividing it into four phases. Phase I, or the breakthrough phase, took place during December 16-17 and included the initial German attacks and penetrations. Phase II is labeled the Delay Phase because this is the period when the U.S. forces tried to delay the German advance until the gap in the front could be plugged by a massive infusion of reinforcements. It stretched from December 18-21. Phase III lasted from December 22 until December 26 and was dominated by the American effort to contain the German penetration that had been created in the Schnee Eifel/Ardennes region. Phase III is entitled the containment phase. Lastly, from December 27 until mid-January, there was the counterattack phase in which a preponderance of American force was brought to bear on the German salient and slowly but surely pushed the Germans back to the original front line of December 16. This was accomplished by a series of local attacks from the north and the south. This paper will only study the first three phases because they are the portions of the battle in which the outcome was in doubt and also the days during which the clearest breakthrough operations occurred. Furthermore, the operational data for the first three phases is much better than that which is available on the fourth phase.

## PHASE I: THE BREAKTHROUGH PHASE

Before discussing the ground combat of the first two days, it is worthwhile to briefly review the activity of the rival air forces during that period.

December 16 was a day of foul winter weather on which the U.S. Army Air Force flew 100 sorties.[27] Most of these were routine missions against villages where German troops were thought to be hiding. The Luftwaffe was quiet that day too, flying only 150 sorties over the Ardennes.[28] On the following day, the Luftwaffe flew 700 sorties and seemed to try to support the German attacks toward St. Vith. The AAF flew 647 sorties, most of them CAS (close air support) oriented.[29] This was a relatively small number of sorties for the AAF at this stage of the European campaign. Many of these sorties could not complete their bomb runs because of harassment by German fighters on anti-air missions. In these cases, American fighter bombers had to jettison their bombs in order to dogfight. These dogfights resulted in 68 downed German planes and 16 downed U.S. planes.[30] This represented a 10% loss rate for the Luftwaffe, which was very high, and a 2.9% loss rate for the U.S., which was also fairly high for this point in the war. During the breakthrough phase, air power was not decisive for either side during any of the ground force engagements that occurred in the Schnee Eifel/Ardennes theater. Despite making a real effort to defeat the American Air Force on the 17th, the Luftwaffe never came close to challenging overall U.S. air superiority.

**The Elsenborn Ridge**

The German breakthrough attempt against the 99th U.S. Infantry Division in the north was a failure and this failure laid the foundation for the ultimate German defeat in The Battle of the Bulge. The 99th Division was part of the U.S. V Corps (General Gerow) which belonged to the U.S. First Army. V Corps was the corps immediately to the north of General Middleton's VIII Corps, which bore the brunt of the German attacks during the early phases of the Bulge campaign.

Sepp Dietrich's Sixth Panzer Army made its first mistake in the artillery preparation. Instead of concentrating all his artillery fires upon a specific part of the 99th's front, Dietrich

[27] Craven and Cate, p. 686.
[28] Craven and Cate, p.687.
[29] Craven and Cate, p. 687.
[30] Craven and Cate, p. 687.

distributed his fires evenly and thus dissipated the force of the preliminary bombardment. Additionally, Dietrich's opening artillery barrage on the morning of the 16th was so heavy that it tipped off the 99th's headquarters that a major attack was coming. Lastly, German targeting was sloppy because strict secrecy requirements imposed by Hitler had prevented Sixth Panzer Army from sending out reconnaissance patrols to find the precise locations of major targets.[31] Therefore, the barrage was ineffective; it did not completely paralyze the communications network of General Walter Lauer's 99th Division and it also allowed Lauer's division to make some quick preparations to meet the first waves of attacking German infantry. One must also remember that the 99th Infantry Division had been ensconced in the Elsenborn Ridge area for quite a while and was thus well settled in and fully prepared to repel an attack. This was in sharp contrast to the 106th U.S. Infantry Division to the south, which had just moved into its positions when the Germans unleashed Operation Herbstnebel.

Two full German Volksgrenadier divisions, the 277th and the 12th, hit four battalions of the 99th Division that were guarding the towns of Rocherath-Krinkelt, Elsenborn, and Bullingen.[32] Twelve German battalions were fully engaged against four American battalions. The 1st SS and 12th SS Panzer Divisions stood by to exploit the breakthrough.

Despite an advantage in numbers that was probably quite close to 3:1, the Sixth Panzer Army did not crack the American line. The 99th Infantry Division was pushed back a couple of miles but it did not break.[33] This was due mainly to very effective U.S. mortar fire from extra 4.2 inch weapons that the division had gathered together as an insurance policy.[34] Narrative accounts mention how numerous German infantry charges were broken up by mortar barrages. U.S. casualties were heavy; the two battalions of the 393rd Regiment that were engaged each took 40-50% casualties (dead, wounded, and missing) in manpower. In the afternoon, a column of tanks from the 12th SS Panzer Division tried to batter through the U.S. 394th Infantry

[31] Staudinger interview, p.
[32] Elstob, p. 70.
[33] Weigley, p. 470.
[34] Elstob, p. 72.

Regiment, which was also part of the 99th Division, but were forced back by fire from the divisional artillery.[35] German losses in this engagement were heavy as well.[36] As night fell, the American situation improved as the 23rd U.S. Infantry Regiment from the 2nd U.S. Infantry Division deployed all three of its battalions along the 99th's line. The 2nd Division had been close by because it was getting ready for an attack just to the north of the 99th Division on December 15-16. The German timetable in the far north had already been delayed.

On December 17, the 99th Division held on to its coherent defensive position by the thinnest of margins.[37] The first threat was that posed by Kampfgruppe Peiper of the 1st SS Panzer Division, which drove around the south flank of the 99th at Bullingen. However, instead of turning north to envelop Lauer's division, Peiper headed west toward Stavelot and Stoumont.[38] On the morning of the 17th, the commander of the I SS Panzer Corps, General Hermann Priess, sent the 12th SS Panzer Division against the stubborn 394th Regiment in a full force attack.[39] The SS Panzers were supported by several air attacks by Messerschmidt 109 fighter planes. This German push compelled the 394th Regiment of the 99th Infantry Division to give up the town of Losheimergraben. For a few hours after the loss of Losheimergraben, it seemed as if the 99th Division was about to fold up completely.

Luckily for the Americans, the deployment of the 2nd Division's 23rd Infantry Regiment was enough to stabilize the situation.[40] By the evening of the 17th, the other two regiments of the 2nd Infantry Division were moving into the Rocherath-Krinkelt area, on the 99th's left flank. They brought with them the 741st Tank Battalion and two companies of self-propelled tank destroyers.[41] This infusion of armor saved the Elsenborn Ridge and firmed up the northern hinge of the American position in the Ardennes. Throughout the evening of the 17th, these tank

[35] Elstob, p. 73.
[36] Weigley, p. 470.
[37] MacDonald, 1985, pp. 370-374.
[38] Cole, pp. 100-104.
[39] Weigley, p. 471.
[40] Weigley, p. 471.
[41] MacDonald, 1985, p. 373.

units fought a running battle with the 12th SS Panzer Division and more than held their own; this permitted V Corps to hold on to Rocherath-Krinkelt for a couple more days. This nighttime tank battle resulted in 27 German tanks destroyed and 11 knocked out Shermans.[42] At least 5 of the German tank casualties were heavy Tiger tanks. The 12th SS had already lost at least 15% of its tank strength. By midnight on December 17-18, the situation was good in the Elsenborn Ridge area. The 12th SS Panzer Division had been bloodied and the elite 1st U.S. Infantry Division was being moved down to the Elsenborn Ridge sector from the north on the orders of First Army commander General Hodges, meaning that soon 3 U.S. divisions would be guarding the area originally assigned solely to the 99th Division. Perhaps most encouraging of all to the Americans was the fact that General Gerow was concentrating the bulk of V Corps artillery on and around the Elsenborn Ridge. The big 155 mm. corps guns would hamper all local German movements from their perch on the commanding heights of Elsenborn Ridge. The northern hinge of the German theater penetration was holding up, frustrating the plans of the Sixth Panzer Army.

**The 106th U.S. Infantry Division's Front**

To the south, the situation for the U.S. side was bleaker. The U.S. VIII Corps was having large gaps torn into its front line in each of the Fifth Panzer Army's breakthrough sectors. By the end of Phase I both Bastogne and St. Vith would be in danger.

On the northern part of the VIII Corps' front, the bulk of the 106th U.S. Infantry Division was enveloped and neutralized as its inexperienced commander, General Alan Jones, failed to order a quick withdrawal when his flanks gave way.

The focus of German attention here fell upon the 422nd and 423rd Infantry Regiments, the northernmost two regiments of the 106th U.S. Infantry Division. These two regiments were located on a Schnee Eifel plateau flanked by gorges to the north and south. To the north, in the Losheim Gap, the 800 man 18th U.S. Cavalry Squadron was the defending force. The 18th was

[42] Weigley, p. 473.

part of the larger 14th U.S. Cavalry Group, which was under the command of Colonel Mark Devine. Needless to say, the 18th Squadron was thinly spread along the 5 mile length of front which it was assigned to cover. Devine's unit was equipped with only a meager allotment of equipment: the normal squadron complement of armored cars, 12 3 inch towed antitank guns, 2 additional platoons of armored cars from a tank destroyer unit, a handful of tank destroyers (both SP and towed) and 12 SP 105 mm. howitzers.[43]

On December 16, after a short early morning artillery barrage, the Fifth Panzer Army used the 18th Volksgrenadier Division to execute a skillful envelopment move. A few platoon sized diversionary attacks were launched by the 18th VGD directly against the heavily fortified center of the two regiments of the 106th Infantry Division on the plateau. These were all defeated easily and this engendered a false sense of confidence at Jones' headquarters. Meanwhile, the 18th Cavalry Squadron was being thrown back by two regiments of the 18th VGD and 1 regiment of the 3rd Parachute Division which were backed by eighty assault guns.

The German attack in the Losheim Gap opened with a 1/2 hour artillery bombardment by 202 guns. The American cavalry squadron had only about 655 of its men up front on the 5 mile long line, and, because of the low force to space ratio, the cavalrymen were deployed in scattered strongpoints that were usually backed up by a few antitank guns and tank destroyers.[44] The initial German bombardment was not very effective and the early morning infantry assaults launched by the 18th VGD and the 3rd Parachute Division were thrown back with heavy losses while U.S. casualties were minimal. Close to 300 Germans were killed in the morning attacks.[45] These high losses were caused by inexperience; these units contained a large number of green troops. Also, the first German attacks were carried out in a human wave fashion that was very easy to defeat.

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[43] MacDonald, 1985, p. 104.
[44] Weigley, pp. 449-451.
[45] Cole, pp. 145-150.

By late morning though, the Germans had reorganized and begun to use more sophisticated infiltration tactics that used small attack teams to bypass the separated U.S. strongpoints. Colonel Devine's situation was made worse by the fact that his communications were being disrupted by German jamming as well as a few artillery hits on phone lines. Seven full German battalions were now pressing on him, and had no prospect of major reinforcement.[46] One of his strongpoints had fallen, causing 86 cavalrymen to be captured, and German assault guns were starting to weigh in to the engagement.[47]

Around noon, Devine ordered a withdrawal. The 14th Cavalry Group, still basically intact, pulled back to the Manderfeld Ridge, which is about 2 1/2 miles to the west of the original defensive line. Devine's withdrawal uncovered the left flank of the two regiments of the 106th Division that were positioned on the Schnee Eifel; unfortunately, communications between Devine and the commander of the 106th U.S. Infantry Division, General Jones, were poor. This fact meant that Jones was not fully aware of the implications of Devine's action. Jones apparently did not know that, as of the afternoon of the 16th, his left flank was open to German penetration. If Jones had been made aware of the significance of Devine's pullback there would have been a chance that he would have begun to move his two vulnerable northernmost regiments to the west, away from the threat of encirclement. As the afternoon wore on, the 18th VGD began infiltrating infantry to the south, toward the town of Andler on the east bank of the Our River. The Our was an important terrain feature in this area because it prevented the northern two regiments of the 106th from making an easy withdrawal from the Schnee Eifel in the event of an emergency. If the Germans could seize the Our crossings, those two regiments would be trapped in a tight vise.

In mid-afternoon, after a reserve company of U.S. light tanks had failed in a counterattack bid against the 18th VGD, Devine ordered the 14th Cav. to fall back yet another 2

[46] Elstob, pp. 129-133.
[47] MacDonald, 1985, pp. 110-111.

1/2 miles.[48] On December 17, with the force ratios against him having grown even more, Devine withdrew another 10 1/2 miles, taking the 14th Cavalry Group completely out of the picture in this sector. One could ask, why didn't Devine swing south to cover the 106th's left flank on the 17th? This is a good question and it does portray Devine in an unfavorable light, but one should not be quick to blame Devine for his decision to take his unit to the north because there was little that his light unit could do to cover the flank of the 106th. If the 14th Cav. had become heavily engaged with the local German forces, it is virtually certain that it would have been annihilated. On the 17th, Devine saw the Germans send a battalion of SS Tigers against his lightly armed cavalrymen. If Devine had not pulled back at this juncture, his unit would have been crushed for no good reason. As it was, the 18th Cavalry Squadron suffered remarkably few casualties in this operation. Only 40-60 men were either killed or wounded and 4 towed antitank guns were destroyed. The cavalrymen had inflicted about 1000 dead and wounded upon the Germans and had also destroyed 3 German assault guns.[49]

To the south, the third regiment of the 18th Volksgrenadiers met heavy resistance from the 424th U.S. Infantry Regiment at Bleialf and was stalled. As night fell, the northern two regiments of the 18th VGD were closing in on Schoenberg, which was four miles directly behind the 106th's main positions on the Schnee Eifel. By using tactics of small group infiltration here, the Germans confused the green 106th Division greatly. Jones and his staff simply did not understand the gravity of their situation late on the 16th; they had no idea of how close the German northern pincer was to Schoenberg. The Our River was directly behind the main positions of the 106th, making any withdrawal a very lengthy and dangerous process. On the evening of the 16th, the divisional and corps artillery units that were posted behind the two threatened regiments were withdrawn across the Our because their commander did not want to be trapped on the east side of the river.[50] This was a crippling blow to Jones, for this meant that

[48] J. Eisenhower, p. 200.
[49] Cole, pp. 145-150.
[50] MacDonald, 1985, pp. 314-317.

there would be no artillery support for his green soldiers throughout the day on the 17th. Since the 106th had fewer heavy infantry weapons (heavy machine guns, BARs, and mortars) than the veteran U.S. infantry divisions in Europe, which had learned to scavenge additional weapons whenever they could, it was at a disadvantage to begin with. Without artillery support, Jones' situation turned from serious into critical.

If Jones and his staff had been more seasoned, they may have seen that the Germans held the front to their east only lightly and counterattacked in this direction to throw the Fifth Panzer Army off balance. Indeed, if the 106th had counterattacked due east on the 16th the German advance on St. Vith would have had to have stopped because the critical rail junction of Prum lay only a few miles from Jones' forward outposts.

The morning of the 17th saw the southern regiment of the 18th VGD finally reach Schoenberg and the northern two regiments of that division were already there to link up with it. The Fuhrer Begleit Panzer Brigade was committed to the area and drove toward Schoenberg, further worsening Jones' position.[51] Fuhrer Begleit was Manteuffel's main operational reserve and the fact that he committed it so quickly to this sector shows how intent he was on the early capture of St. Vith. The 422nd and 423rd Regiments were caught in a German pocket on the east side of the Our and the road to St.Vith lay open to the Germans. Several haphazardly organized breakout attempts by the two besieged regiments failed because the Germans had the armor of Fuhrer Begleit guarding the pocket. The Americans soon ran low on ammunition and the two regimental commanders became confused and were unable to rally their dispirited troops.[52] On December 19, 8,000 soldiers of the 106th surrendered to the Germans, completing the virtual destruction of Jones' division.[53] By the 19th, VIII Corps headquarters was aware that the northern 2/3 of the 106th Infantry Division had essentially been destroyed and General Middleton was already deeply occupied with the task of trying to use bits and pieces of rear

[51] MacDonald, 1985, p. 343.
[52] ibid, pp. 338-342.
[53] Cole, pp. 161-171.

echelon units as well as early reinforcements to plug the large hole that had appeared in his front as a result of the demise of the northern 2/3 of the 106th Division.

By the late afternoon of December 17, the road to St. Vith was open and a race was on for that town. The race was between the German units that had just enveloped the 106th and those American operational reserves that could be scraped together from rear areas in southern Holland and Belgium. If the Germans were to win the race, the whole northern shoulder of the Americans' regional defense could give way.

**The 28th U.S. Infantry Division's Front**

Just to the south of the collapsing 106th, General Norman Cota's 28th U.S. Infantry Division was also in trouble. Each of its northern two regiments was attacked by a full panzer corps. The Germans scored breakthroughs against each of these regiments.

The 112th Infantry Regiment was struck by the 58th Panzer Corps, which was commanded by General Krueger, while the 110th Infantry Regiment bore the brunt of the assault of the 47th Panzer Corps, which was led by General Luttwitz.[54] Luttwitz was probably the most gifted of the German corps commanders in The Battle of the Bulge. The 58th Panzer Corps was not at full strength as its 560th VGD was only at 2/3 strength.[55] The 58th's other division was the experienced 116th Panzer Division, "The Greyhound Division," which was battle hardened after having spent much time on the Eastern Front. The 47th Panzer Corps to the south was made up of three divisions: the 2nd Panzer, Panzer Lehr, and the 26th VGD.[56] The 47th's commander, Luttwitz, was far more aggressive and competent than was Krueger. General Cota's sector was known as Skyline Drive because of the ridgeline highway behind the 28th's positions.

On December 16, the 112th Regiment of the 28th Division held its own against the attacks of the rookie 560th VGD and the 116th Panzer Division.[57] The 112th prevented any

[54] Elstob, p. 56.
[55] Elstob, p. 93.
[56] Weigley, p. 454.
[57] Weigley, p. 453.

major crossings of the Our River and used its well positioned foxholes to catch the attacking Volksgrenadiers in interlocking fields of fire.[58]

Krueger chose to start his assault without any preliminary bombardment at all. His infantry had penetrated the 112th's line before the first shell was fired. This approach may have been tried because of a shortage of artillery ammunition. Just as in the case of the 110th Regiment further to the south, the commander of the 112th, Colonel Gustin Nelson, had two of his battalions in the line while the third was kept in operational reserve. Nelson had one artillery battalion behind his unit and was further bolstered by the presence of six towed tank destroyers.[59] The 112th Infantry's positions were well fortified and antitank mines were distributed in front of them. Nelson's regiment was defending a 6 mile front. Nelson had the best set of prepared defenses in the whole 28th U.S. Infantry Division.

River crossings posed a major problem throughout the first day for the 58th Panzer Corps; U.S. artillery regularly harassed the German engineer units that were laboring to build pontoon bridges on which tanks and heavy weapons could cross the Our River. At least 13 of the German tanks that did make the crossing were knocked out by either the towed tank destroyers or by a group of 4 self-propelled U.S. tank destroyers that appeared on the scene during the day.[60] The only concrete success for the 58th Panzer Corps on the first day of combat was a small bridgehead across the Our to the south of the town of Ouren. However, U.S. mines on the west bank of the river made it unsuitable for a rapid exploitation move. December 16 was a day of failure for Krueger and his men.

The 110th Regiment of the 28th Division, under Colonel Hurley Fuller, was not able to contain the Germans. It was simply overwhelmed by a local force ratio that favored the Germans on the order of 10:1. Guarding an 8.7 mile front, the 110th had to defend against all three divisions of the 47th Panzer Corps.[61] 142 tanks were in the 47th Panzer Corps.[62] The 26th

[58] Weigley, p. 453.
[59] Cole, p. 194.
[60] Cole, pp. 199-202.
[61] Weigley, p. 454.

VGD was universally regarded as one of the finest infantry divisions in the 1944 Wehrmacht. Fuller had two battalions forward in the line (which ran along the west bank of the Our River) and one battalion held in reserve.[63] The 110th's reserve battalion had been designated as a divisional reserve unit, however, and therefore Fuller could not deploy it without the express permission of the division commander, General Cota. This cumbersome command arrangement would prove to be damaging to the American cause in this region of the front.

Colonel Fuller's regiment defended the west bank of the Our with a series of squad sized strongpoints and patrolled the area vigorously. The 110th Regiment was supported by the 109th Field Artillery Battalion, which had widely separated its three firing batteries in order to fully cover the entire length of the regimental front.[64] There was an additional battery of towed artillery in the area, giving Fuller's battalions a total of 16 towed 105 mm. guns for fire support. Although the 110th Regiment was technically a seasoned formation, its heavy losses in the Hurtgen Forest campaign meant that its ranks were full of rookie troops. The two most critical towns in the 110th Regiment's sector were Clervaux (4 miles behind the front line) and Wiltz (roughly 7 miles behind the front line).

On the 16th, the Germans opened with a brief 1/2 hour artillery preparation with about 300 artillery pieces and rocket launchers that caused few U.S. casualties but did have the effect of disrupting the 110th Infantry Regiment's communications system, making Fuller's job very difficult on this first day. Surprisingly, the German infantry had little difficulty getting across the Our River and hit the forward two U.S. battalions very hard in the early hours of the attack. There were two major prongs in the 47th Panzer Corps assault; to the north, aiming at the town of Marnach, was the 2nd Panzer Division while in the south, aiming at Holzthum, were the 26th VGD and the Panzer Lehr Division.[65] The morning was foggy and this aided the attackers greatly because the small U.S. outposts simply could not see the scattered groups of German

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[62] Weigley, p. 454.
[63] MacDonald, 1985, p. 135.
[64] MacDonald, 1985, p. 136.
[65] Elstob, chs. 8,9.

infantry that were infiltrating around them and bypassing all resistance. Where the Germans ran into U.S. forces, the Americans fought hard and inflicted heavy losses. In one case, almost 100 Germans were killed by a single U.S. half-track mounted with quad .50 anti-aircraft machine guns.[66]

By the end of the day, the Germans were sending tanks across the Our on pontoon bridges at a rapid rate and threatening the town of Clervaux. A counterattack by two American medium tank companies that had been taken from the divisional reserve once it became obvious that Fuller's regiment was in trouble failed to ease the pressure on the 110th. On December 17, German tanks from the Panzer Lehr Division reached Clervaux, but were delayed by heavy American resistance in the narrow streets of the old town from elements of one of the 110th's retreating line battalions as well as from some rear echelon regimental support troops who had been pressed into emergency service as infantrymen. U.S. infantry teams turned many of the old buildings into fortresses that could not be easily taken. Individual American soldiers with bazookas proved very effective against German Panther medium tanks in the confines of this small urban area. The rear armor of the Panther was vulnerable to short range bazooka shots. At Hosingen, another of the 110th's strongpoints delayed the Germans through the 17th. In these first two days of combat, the German 47th Panzer Corps lost 30 tanks. American tank units were not spared heavy losses either. At least 13 American Stuart light tanks and 12 Shermans were destroyed by the Germans during U.S. counterattacks. By the end of Phase I the Germans had a clear breakthrough here as their spearheads were threatening the town of Wiltz, which was located about 7 miles behind the December 16 front. Nevertheless, the 110th had delayed the 47th Corps for two days, saving Bastogne from a quick capture.[67] That having been said, one must concede that the 47th Panzer Corps did a relatively effective job of smashing the 110th Regiment and opening a gap in the U.S. front.

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[66] MacDonald, 1985, p. 139.
[67] Phillips, Robert. To Save Bastogne, pp. 26-130.

By the end of the day on December 18, the German 47th Corps had moved 9.9 miles past the original U.S. outpost line on the Our River. After three full days of nonstop fighting, the 110th U.S. Regiment was no longer a coherent unit as it had taken 2750 casualties and Colonel Fuller himself had since been captured by the Germans.[68] Accurate figures are not available on exactly how many members of the 110th Regiment were captured during the first three days of The Battle of the Bulge. Total German casualties were about 3000.

To the north the 112th Regt. was having its right flank turned by the 116th Panzer Division, which had shifted its axis of attack to the south, and was starting a very orderly retreat to the northwest. It suffered remarkably few losses in the breakthrough phase and would thus be able to function effectively in Phase II of the battle. None of this, however, would be able to overcome the stark fact that the northern two thirds of Cota's front had been ripped wide open.

Perhaps the most important legacy of the tough three day stand by the 112th was the attrition it inflicted on the armor of the elite 116th Panzer Division. 45 German tanks and assault guns were knocked out by Colonel Nelson's forces and these losses would make the 58th Panzer Corps a much less formidable force as it proceeded on toward its main objective of Houffalize. The 112th knocked out German tanks with a mix of weapons, including antitank mines, artillery fire, antitank guns, and bazookas. The strong fortifications which Nelson had erected in his sector played a key role in the regiment's good antitank performance.

By the afternoon of the 18th, the 112th accelerated its withdrawal to the line Trois Verges ---- Weiswampach, which was 6-7 miles northwest of the original defensive positions on the east bank of the Our River.[69] On the 19th, Nelson would swing his unit yet further to the northwest where it would join up with the remnants of the battered 106th U.S. Infantry Division.

The available literature on this engagement credits the good performance of the 112th Regiment mainly to its strong fortifications from which it fought the first 24 hours of the battle. Nelson had his troops firmly ensconced in pillboxes that were only vulnerable to direct fire from

[68] Cole, p. 192.
[69] MacDonald, 1985, pp. 266-267.

tanks. Also, Nelson's artillery had been sited so as to cover all the probable routes of a German advance. Finally, Nelson had excellent counterattack plans ready for just such a contingency as occurred. In the end, the 58th Panzer Corps did break through, but at a high cost in armor and only after 48 hours of being delayed. Fifth Panzer Army headquarters saw its timetable slowed significantly by the actions of Colonel Nelson's regiment.

**The Southern Shoulder**

Further still to the south, the German Seventh Army attached 21 assault guns to its 5th Parachute Division and 352nd Volksgrenadier Division and sent this infantry force against the 109th Infantry Regiment of the 28th U.S. Infantry Division.[70]

General Brandenberger, the commander of the Seventh Army, wished to break through the 109th and then use the 5th Parachute Division as a flank guard for the Fifth Panzer Army. Ultimately, he hoped to position the 5th Parachute due south of Bastogne. With only 21 assault guns in his whole army, Brandenberger lacked punch. OKW (German Central Armed Forces Headquarters) had tried to remedy this by assigning a liberal dose of artillery and rocket launchers to Seventh Army, but most of this was horse drawn and would not be able to keep up with any fast advance.[71]

Lt. Col. James Rudder's 109th U.S. Infantry Regiment had several advantages as fighting began. First of all, it had 2 1/3 battalions of artillery in support of its defense, including one battalion of towed 155 mm. guns.[72] This gave the 109th more firepower than either of its sister regiments to the north. Furthermore, Rudder had a sturdy little cluster of reserves that he could use to blunt any early German penetrations. These included: 1 company of combat engineers, 1 company of Shermans, 1 company of towed 3 inch tank destroyers, his own regimental antitank company, and his own reserve battalion of infantry. Although the Americans here were

[70] Cole, pp. 212-227.
[71] Pallud, Jean Paul. The Battle of the Bulge: Then and Now, p. 55.
[72] MacDonald, 1985, p. 148.

defending a long front of 9 miles, they were also up against a fundamentally slow and unwieldy German attacking force.

The paratroopers and Volksgrenadiers began their attack on December 16 and promptly tried to bypass most of the 109th's strongpoints. This followed a short and ineffectual artillery barrage in which the Seventh Army artillery fired by the map, using outdated intelligence.[73] Since the 109th was not holding a continuous line of defense the German use of infiltration tactics was appropriate and wise. The northern part of the 5th Parachute Division was able to slip along the boundary between the 110th and 109th Regiments without meeting much opposition. The heaviest fighting occurred around the village of Hoscheid, which the Americans evacuated at the end of the day. The Americans had a platoon of Shermans in this area but could not hold the town even with the aid of these tanks. After this early reverse, Rudder began to pull his regiment straight back slowly to the west.

Further south on the 109th Infantry Regiment's front, the German Seventh Army had some problems. The 15th Regiment of the 5th Parachute moved to the town of Walsdorf, two miles to the west of the Our River.[74] However, the German regimental commander seems to have become confused at this point because he was ahead of the rest of the division. He halted. The 15th Regiment's advance trapped one U.S. infantry company in the town of Fuhren, and the first German assaults on Fuhren were turned back. Yet further south, the 352nd VGD was moving towards Bettendorf, where Rudder sent a platoon of tanks and a company of infantry to counterattack. The counterattack enjoyed early success but petered out on the morning of December 17.

Early on the 17th, the headquarters of the 28th Division was surprised to learn that the northernmost regiment of the 5th Parachute Division was now crossing the Skyline Drive. General Cota ordered Rudder to send some of his reserves north to meet the threat. Throughout the day of the 17th, the 109th tried hard to relieve the besieged company at Fuhren with tanks

[73] Cole, p. 216.
[74] Cole, p. 217.

and infantry, but failed. On the 18th, the 5th Parachute finally took Fuhren and totally wiped out the American defending force. There are no reports of any American survivors from the battle at Fuhren. The loss of the Fuhren crossroads allowed the whole 5th Parachute Division to break free of the American 109th Regiment.

By the end of Phase I the 5th German Parachute Division had broken through and was acting as the left flank guard for the Fifth Panzer Army. The 352nd VGD pushed the 109th back more slowly, but it managed to clear out the 109th's defense zone by the 19th. To the very far south, two more German Volksgrenadier divisions slowly pushed back elements of the 9th Armored and 4th Infantry Divisions, gaining four miles but achieving no breakthrough. The German Seventh Army had not really planned to make a classical breakthrough here on the far southern part of the attack front, but instead set out with the more modest goal of establishing a strong southern shoulder that could deal with the expected future counterattacks from the south that would be delivered by General Patton's Third U.S. Army.

The German Seventh Army lost 6 of its precious assault guns in the breakthrough operation and also took 875 human casualties. The Americans suffered 200 dead and 300 wounded in the fighting in Rudder's sector. The 109th Regiment appears to have performed credibly but it did not prove to be as adept at dealing with infiltration tactics as the 112th Regiment to the north had been. U.S. artillery was not very effective against the German 5th Parachute Division. What is also surprising is that, after the morning of the 17th, Colonel Rudder had 34 Sherman tanks at his disposal, giving him an edge over the Germans in armor. These tanks seem to have come from an independent medium tank battalion that happened to be in the area when the German Seventh Army attacked. None of the Shermans was knocked out, yet they do not seem to have done much to blunt the German attacks when they were used. The reason for this probably lies in the fact that Rudder was confused enough by the German infiltration tactics that he always deployed the Shermans at the wrong place.

**PHASE II: THE DELAY PHASE**

During the December 18-21 period bad weather prevented the Allied tactical air forces from making much contribution to the ground war. On the 18th, only 300 sorties were made and a total of 214 sorties were flown between the 19th and 21st.[75]

There were three major actions occurring during Phase II: the continued fighting around Elsenborn, the German exploitation of the breakthrough against the 106th U.S. Infantry Division, and the German exploitation of the breakthrough against the 28th U.S. Infantry Division.

**Kampfgruppe Peiper's Futile Drive Toward the Meuse**

One event that diverted the U.S. First Army's attention from the main actions was the deep penetration raid launched by Kampfgruppe Peiper, a battle group which included the bulk of the 1st SS Panzer Division. The battle group commander, SS Colonel Joachim Peiper, slipped his force past the Elsenborn Ridge and into the rear of U.S. V Corps on December 17 with at least 72 Panther tanks, 30 Tiger tanks, and 25 assault guns.[76] Peiper's goal was to reach the crossings on the lower Meuse with a daring deep penetration raid and hold them until the rest of Sixth Panzer Army arrived. Since the bulk of Dietrich's Sixth Panzer Army was permanently stuck in front of the Elsenborn Ridge, Peiper's effort had little real strategic impact on the battle as a whole. Nevertheless, his six day expedition into the rear areas of U.S. V Corps caused much consternation at Eisenhower's headquarters.

By December 18, Kampfgruppe Peiper had moved forward 20 miles and was in the town of Stavelot. But then the Kampfgruppe became hung up in the Ambleve River valley, where American resistance began to stiffen. First, a group of U.S. P-47 Thunderbolt fighter bombers attacked Peiper's long column, hitting several vehicles and causing great confusion. Part of Peiper's column was prevented from moving forward along the narrow road it was on by the immobilized vehicles that had been damaged in the air attack. Next, small groups of U.S. combat engineers blew up several bridges that led out of the Ambleve River valley to the west.

[75] Craven and Cate, p. 688.
[76] MacDonald, 1985, p. 198.

Peiper now found his path to the Meuse blocked and he could not find a fast way out of the narrow, twisting valley.

December 20 saw the U.S. First Army trap Peiper with two fresh divisions ---- the 30th U.S. Infantry Division and the crack 82nd Airborne Division ---- forcing the Kampfgruppe into a bitter two front battle against superior numbers. The American units engaged benefited from extensive air and artillery support. The fighting in the Stoumont-Stavelot area was very intense as Peiper's SS men furiously resisted the American onslaught, often using very cunning tactics to compensate for their inferior numbers. Several key buildings in the towns of Stavelot and Stoumont changed hands many times in close quarter fighting over the December 20-23 period. Finally, however, the discipline and numbers of the veteran American infantrymen of the 30th Division and the elite paratroopers of the 82nd Airborne prevailed. On Christmas Eve, December 24, Peiper's unit was finished as a fighting force. His remaining tanks were low on fuel and the ranks of his battle group had been thinned by heavy combat casualties. Realizing the gravity of his situation, Peiper decided to save what was left of his battle group by disengaging and fleeing back toward Sixth Panzer Army lines. Therefore, the SS colonel ordered his uninjured soldiers to abandon their vehicles and to escape to the east on foot. The remaining undamaged Kampfgruppe Peiper tanks were blown up by the SS men before they fled east so as to prevent their falling into the hands of the Americans. Colonel Peiper and many of his soldiers made it back to German lines but virtually all of the Kampfgruppe's abandoned, undamaged motor vehicles (of which obviously none were tanks) were captured by the Americans.

**The German Push Toward St. Vith**

Behind the crushed 106th U.S. Infantry Division, General Hodges' U.S. First Army mounted a stout delaying action in front of St. Vith between the 18th and the 21st, not allowing the German Fifth Panzer Army to capture the key road junction until the 21st. This fatally delayed the German timetable and caused extensive traffic jams and snarls in the Fifth Panzer Army's supply columns.

The four day defense of St. Vith was carried out by CCB of the U.S. 7th Armored Division (General Bruce Clarke), some elements from the one regiment of the 106th Division that had escaped envelopment, a few battalions of combat engineers, and, from the 19th on, CCB of the 9th U.S. Armored Division. These American units fought against the Fuhrer Begleit Panzer Brigade and the 18th VGD. The rapid deployment of two armored brigades to St. Vith so soon after the collapse of the 106th was testimony to the efficiency of the U.S. logistics system. By the early morning of December 18, CCB/7 had set up a rough horseshoe defense stretching from Hunningen to Burg Reuland.[77] The key to the defense was the Prumberg Heights due east of St. Vith.

In a number of very fierce company sized actions at several crossroads in front of St. Vith, CCB/7 used small unit delay tactics to keep the Germans off balance, preventing them from putting together a decisive attack on the horseshoe position until December 21. CCB/7 suffered significant losses in these skirmishes but it did the job that SHAEF needed to have done in front of St. Vith.

A number of factors delayed Manteuffel during these four days. First, German supply columns, many of them horse drawn, were ensnared in traffic jams in the Schnee Eifel that could not be resolved by the German logistics commanders. Supplies were just not reaching the Fifth Panzer Army's forward units fast enough. Secondly, the main German armored unit in the area, the Fuhrer Begleit Brigade, was partially occupied with containing the remnants of the two encircled American regiments on the Schnee Eifel until December 19. Lastly, American artillery on the Prumberg Heights harassed all German movements in front of St. Vith while CCB/7 was delaying them with a series of small tank meeting engagements.

On December 21, with the horseshoe defense finally crumbling and pressure building to the north of St. Vith, the two combat commands withdrew from the town toward the north as the

[77] ibid, p. 312.

Battle for the Northern Barrier began to develop. The capture of St. Vith opened the way for the Germans to seize Houffalize on the 22nd.

**Bastogne**

Bastogne was never captured by the Germans and this had an even greater effect on the battle than did the delaying action at the approaches to St. Vith. Bastogne was the key that unlocked the whole road network between the Our River and the Meuse crossings around Dinant (which were about 40 miles from Bastogne).

U.S. VIII Corps defended the approaches to Bastogne on December 18 and 19 with the remnants of the 110th Infantry Regiment of the 28th Division, three combat engineer battalions, and CCR of the 9th U.S. Armored Division. CCR/9 was not a full strength unit. Several of its tank destroyer platoons had been diverted to other parts of the Ardennes. Meanwhile, the full 101st U.S. Airborne Division under General McAuliffe was in a truck column, moving toward Bastogne from its rest area in France.

In the towns of Mageret, Arloncourt, and Bourcy, CCR/9 was brutalized by some heavy attacks by Panzer Lehr and the 2nd Panzer Division.[78] Nevertheless, CCR/9 delayed the Germans long enough to permit the 101st to move all of its component elements into Bastogne during the 19th.[79] The early U.S. defense in front of Bastogne forced the 2nd Panzer Division to swing around the town to the north, disrupting the advance of the 116th Panzer Division further north.[80]

On December 21, Bastogne was surrounded, with the 101st Airborne and about 50 Sherman tanks and some tank destroyers inside the perimeter. Manteuffel could not afford to use his fastest moving and strongest units, 2nd Panzer and Panzer Lehr, to surround or take the town. They had to continue west towards the Meuse if the German schedule was to be met even minimally. Therefore, the main burden of attacking the 101st fell upon the tired 26th VGD

[78] Bradley, pp. 470-473.
[79] Wilmot, pp. 598-599.
[80] Wilmot, pp. 598-599.

which had been marching nonstop for six days. Manteuffel was now in the worst of both worlds. He had split up his forces, thus weakening the strength of the drive to the Meuse while at the same time not leaving enough strength around Bastogne to capture that key road junction. The latter fact would worsen Manteuffel's logistics problem in the days to come. Without being able to move through Bastogne, the German supply columns would have to take circuitous routes to get to the spearhead units located 40-45 miles to the west of the original front line as the crow flies. The supply arteries for the advanced German units would become dangerously constricted during Phase III.

Bastogne held out with a flexible defense that used the 50 Sherman tanks inside the perimeter as a mobile counterattack force. The 101st's paratroopers set up foxhole networks with good fields of fire that stopped many German infantry attacks without even needing the assistance of the Shermans. The siege of Bastogne would ultimately be broken by units of Patton's Third U.S. Army on December 26.

**The Elsenborn Ridge**

The Elsenborn Ridge line held during Phase II. Dietrich's breakthrough attempt was completely frustrated and the northern hinge of the U.S. line was secured. In front of the Elsenborn Ridge itself the major fighting took place in the twin villages of Rocherath and Krinkelt, where the 99th and 2nd U.S. Divisions fought the 12th SS Panzer Division in the streets for at least two days. Casualties were heavy on both sides, but especially among the SS Panzergrenadiers. The nature of close urban combat allowed the Americans to frequently employ their bazookas and Sherman main guns against the rear armor of the German Panther and Tiger tanks in the narrow streets of the twin villages. These weapons were usually ineffective against the heavy frontal armor of the Panthers and Tigers, but when fired at their thinner rear armor they could inflict severe damage.

On the afternoon of December 19, the U.S. troops pulled out of the twin villages and took up positions on the Elsenborn Ridge. The 12th SS Panzer Division got no further because the awesome U.S. artillery concentration that Gerow had placed on the ridge poured a high volume

of shells into its positions around the clock. Sixteen full battalions of U.S. artillery were on or around Elsenborn at this time.[81] This effort was one of the largest U.S. artillery engagements in Europe during the Second World War.

During December 19-20, the 12th SS tried to attack the ridge from the south, through the village of Dom Butgenbach. This attempt was foiled by the 1st U.S. Infantry Division, backed by the artillery on the Elsenborn Ridge. 782 German soldiers were killed and 47 German tanks were knocked out here.[82] 250 American casualties were reported. The Elsenborn Ridge was very secure on December 21 and Dietrich gave up his attacks there in order to move his armored forces to the west, following Manteuffel's lead units.

In Phase II, by holding the north hinge, delaying at St. Vith, and holding Bastogne the U.S. First Army had fatally disrupted the German timetable. By holding Elsenborn Ridge, the Americans had kept the Sixth Panzer Army from breaking out to the northwest and getting behind the U.S. divisions that were positioned in the Roer River area. If the Sixth had been able to do this, the whole 12th U.S. Army Group front could have ripped wide open. By holding Elsenborn, the Americans channeled the German advance into a very predictable due westward direction. The actions at St. Vith and Bastogne prevented the Germans from taking full advantage of the Ardennes road network, thus creating traffic snarls and delays in their supply columns that reduced the amount of ammunition and fuel that reached the forward Fifth Panzer Army spearheads below the necessary sustainment levels. The stage was now set for the final containment of the German breakthroughs in the Fifth Panzer Army sector.

**PHASE III: THE CONTAINMENT PHASE**

Air power became very important during Phase III. Between December 23-26, good weather covered the battlefield and numerous ground support and battlefield interdiction sorties were flown by American planes, especially those from the IX Tactical Air Command. There was

[81] MacDonald, 1985, p. 409.
[82] ibid, p. 407.

Luftwaffe opposition but it was not effective. On December 23, 696 tactical sorties were flown.[83] Air support helped U.S. forces greatly in the St. Vith area. December 24 saw 1157 Allied tactical sorties flown. By December 26, the German logistics network in the Ardennes had been badly damaged by tactical air power. Bridges were down in many places and many hard surface roadways were cratered badly by American fighter bombers.[84] The flow of supplies to the German spearheads was definitely reduced by the Allied air campaign.

One segment of the American containment effort was the attack to relieve Bastogne by General George Patton's Third U.S. Army. This attack from the south was slow, but it relieved Bastogne on December 26 and punctured the southern section of the German penetration.

On December 22, Patton attacked on a broad front with the III Corps on the left and the XII Corps on the right.[85] The spearpoint here was the 4th Armored Division on the left flank of the III Corps. The XII Corps had a tough fight all the way up to the Sauer River. Its attack repeatedly stalled in steep gorges.

The 4th Armored Division attacked straight up the main Arlon-Bastogne Road. This division's tanks were in poor mechanical condition, making this assignment a difficult one.[86] In some of these tanks the turrets even had to be hand cranked. The German 5th Parchute Division stopped one combat command for the whole afternoon of the 22nd. On the 23rd, muddy terrain slowed the division around Chaumont while Patton fumed. The German paratroopers continued to offer resistance. They carried out several skilled ambushes. Christmas Day saw the 4th finally smash the 5th Parachute Division after receiving two fresh battalions of infantry from another division, allowing for the creation of tank-infantry teams that were capable of clearing Chaumont of the remaining German paratroopers. Almost 700 German prisoners were taken in this engagement.[87] In the late afternoon of December 26, under an umbrella of tactical air

[83] Craven and Cate, p. 692.
[84] Craven and Cate, p. 695.
[85] Weigley, p. 521.
[86] Weigley, p. 524.
[87] Weigley, p. 526.

support, the 4th broke into Bastogne, lifting the siege. Five days had been required for Patton to cover 12 miles.

The second part of the U.S. containment effort was the construction of a solid northern barrier of divisions that stretched from the Salm to the Meuse (about 30 miles). Such a barrier would prevent the Germans from exploding northward toward Namur and Huy. If they could be contained to the south of this barrier, their attack routes would be channeled due west ---- right into the grip of the waiting U.S. 2nd Armored Division. During Phase III, the U.S. First Army successfully built the barrier by deploying the following divisions west to east: 30th Infantry, 82nd Airborne, 7th Armored, 3rd Armored, 84th Infantry, and 2nd Armored.[88]

The Battle of the Northern Barrier was one of the most fluid campaigns on the Western Front and cannot be described in complete detail here because of space constraints. Only the two most important actions shall be touched upon.

At the small crossroads called Baraque de Fraiture, which is located between the Salm River and the Ourthe River, elements of the 2nd SS Panzer Division, which had been transferred from the Elsenborn area to the southwest, broke through the small American defensive force (called Task Force Brewster) on December 24. Moving due north, the SS Division captured the town of Manhay, on the road to Liege, on the 25th. However, fortunately for the Americans, the German commander turned west toward the town of Grandmenil instead of north. There he was cornered between elements of the 3rd U.S. Armored Division and the 82nd Airborne Division and, after a sharp battle in which several German tanks were lost, the 2nd SS pulled back on December 26. This restored the integrity of the Northern Barrier.

In the area of the town of Verdenne, to the west of Baraque de Fraiture, the 116th Panzer Division of the Fifth Panzer Army also made a push toward the north between the 24th and the 26th.[89] This feeble thrust was turned back by the 84th U.S. Infantry Division, which had

[88] Cole, Map 8.
[89] Cole, pp. 574-577.

abundant artillery support. In fact, U.S. artillery broke up at least one concentration of the 116th's armor.

The final part of the U.S. containment strategy was to destroy the 2nd Panzer Division which had reached a point only 3-4 miles from the Meuse crossing of Dinant on the 24th. In many historical accounts of The Battle of the Bulge this threat to Dinant is viewed as the gravest threat which the Germans presented to the U.S. Army during the entire campaign. It was not. Eisenhower was concerned about the 2nd Panzer threat, but not overly so. The 2nd Panzer was receiving so few supplies that it was not potent at all. It was very low on both ammunition and fuel and was confronting the full U.S. 2nd Armored Division, which had more tanks than did the average U.S. armored division.

On December 24, the 2nd Armored Division (General Ernest N. Harmon) began a double pronged encirclement against the 2nd Panzer's assembly area around Celles. Harmon's CCB executed the envelopment of the 2nd Panzer Division.[90] CCB took advantage of the terrain around Celles to launch a simple maneuver that would "bag" the Germans. Celles was located in a valley with ridgelines on either side of it. General White, the CCB commander, divided his unit into two task forces and sent each down one of the ridgelines; the two task forces would meet south of Celles, trapping the Germans in a neat pocket.[91]

Task Force A was on the right. It consisted of the 3rd Battalion of the 67th Armored Infantry Regiment. TF A began its pincer move at 9:30 AM on Christmas Day.[92] Midway along the route it was attacked by a trio of Panther tanks firing from Ferme de Mahenne. TF A pulled back and called on air support to clear the way. The request was eventually answered by 12 American P-38 Lightnings which strafed and bombed the German position until all three of the Panthers had been destroyed. This episode was the toughest test for TF A during its pincer

[90] Houston, Ernest E. Hell on Wheels: The 2nd Armored Division in World War II, Presidio Press, 1977, pp. 342-343.
[91] Houston, p. 342.
[92] Houston, p. 342.

move. Later in the day, TF A seized Soinne, thus completing its mission in the envelopment phase.

On the left, Task Force B had more problems than its sister unit on the opposite ridgeline. TF B was composed of the 1st Battalion of the 67th Armored Infantry Regiment.[93] It had to traverse an area with thick forest and was hit with a German counterattack along the way. The counterattack was carried out by Mark IV tanks and antitank guns and was apparently broken up by the 2nd Armored's divisional artillery, which fired 2080 rounds and knocked out 7 of the Mark IVs.[94]

Christmas Day thus saw Harmon surround the Germans while British Typhoon fighter bombers hammered the encircled, immobilized unit with rockets and bombs. Standing behind Harmon's division as a last ditch Allied reserve on the Meuse was the British 29th Armored Brigade. That unit's tanks were guarding the Meuse bridges. Also on Christmas Day, the 2nd Armored's Reconnaissance Battalion, which was the right flank of CCB, crushed the reconnaissance battalion of the 2nd Panzer Division, capturing 150 Germans and destroying or capturing 19 German vehicles. Now all that remained to be done to eliminate the 2nd Panzer as a coherent unit was the reduction of the Celles pocket.

On December 26, the 2nd Armored attacked the pocket, trapping most of the 2nd Panzer in a wooded area. After some fierce fighting in thick underbrush, large scale German surrenders began as the 2nd Panzer started to run out of ammunition. By the end of the day on the 26th, 1200 German prisoners had been taken and 82 of the 2nd Panzer's 100 tanks destroyed. British air power in the form of repeated Typhoon sorties played a big role in the American victory. The presence of the British 29th Armored Brigade behind Harmon's division was very valuable too, because it allowed the 2nd Armored to risk an early attack on the 2nd Panzer Division. Harmon knew that he had backup in case of an emergency. This action eliminated the only German combat presence that came physically close to the Meuse during the entire battle. Despite the

[93] Houston, p. 343.
[94] Houston, p. 343.

weakness of this German threat to the Meuse, the action around Celles is significant in that it concluded Phase III of the Battle of the Bulge. The Germans had now passed their high water mark; from now on the initiative in the Ardennes would belong to the Americans, who opened a series of counterattacks against the Germans in the area in early January 1945. By late January, most of the territory that the Germans had seized during December 16-26 had been retaken by the Americans.

**LESSONS LEARNED**

The Battle of the Bulge provides lessons for the military analyst in two areas: quantitative measures and operational factors. In both areas, one can find some interesting facts that are illustrative of the state of mobile armored warfare in the World War II era.

In the quantitative category, there seem to be three broad lessons. First, the Bulge campaign tells us something about the subject of force to force ratios. During Phase I, the Germans achieved breakthroughs in those sectors where they had a force ratio advantage of greater than 3:1. Some of these breakthroughs were more decisive than others, but nevertheless the 3:1 rule does seem to apply ,at least roughly, to The Battle of the Bulge. In some breakthrough sectors the German force advantage was huge, sometimes as high as 10:1, so the Bulge case may not be the best test case for the 3:1 rule. Ideally, one would want to test the 3:1 rule in a battle where all the breakthrough sector force ratios were in the 3:1 region so that one could draw some fine distinctions. That being said though, it seems safe to argue that The Battle of the Bulge offers at least mild support to the 3:1 rule.

Secondly, the Bulge campaign offers some insight on the issue of force to space ratios. It validates the World War II U.S. Army rule of thumb that a U.S. infantry division should not hold more than 10 miles of front. Each of the four divisions holding the December 16 line was overextended according to this rule, and each had at least some problems during the early phase of the campaign. One of these divisions was virtually annihilated, while another saw one of its regiments completely shredded. This result indicates that force to space ratios are important for

the defender and should be considered when preparing a defensive line. World War II military technology was such that the U.S. Army doctrine of the time on force to space ratios was valid and justifiable. Surveillance and reconnaissance technology was limited at the time (at least by 1990s standards) and thus infantry divisions could not stretch themselves out beyond a certain threshold without creating dangerous gaps in the line.

Finally, as Richard Kugler has pointed out, the Bulge shows that theater force ratios have some value in allowing the observer to predict how a battle is progressing. As U.S. reinforcements flowed into the Ardennes region in the December 19-23 time period, the theater force ratio began to move toward the 1:1 region. As the overall theater force ratio steadily shifted in favor of the Americans, the tide of battle moved toward the U.S. side as well, even though the Germans still had momentum and still retained some element of surprise. One should not place too much emphasis on such a broad measure as the theater force ratio, but in the Bulge case it does offer insight as to the direction in which the "pendulum of the battle" was swinging.

In the operational issue area, there are four major lessons to be learned from the Bulge campaign. First, The Battle of the Bulge demonstrates that infantry positions that are fortified in depth and set up so as to take full advantage of the local terrain can permit an outnumbered and outgunned infantry force to inflict heavy losses on an armored attacker that has superior numbers. This is not to say that such positions can prevent an ultimate breakthrough, only that the attacker can be made to pay a stiff price for his final success. The case of the U.S. 112th Infantry Regiment proves the point. This unit was in well prepared positions and had made up good artillery fire plans specifically for the scenario of an all out German attack in its sector. The 112th did not prevent a German breakthrough, but it hit the attackers so hard in the first 1-2 days of the battle that they were not able to exploit the breakthrough with as much vigor as they could have. In contrast, the 110th U.S. Infantry Regiment did not have well prepared positions in depth and it was shattered relatively quickly.

Secondly, this battle showed that large quantities of artillery, when given an open field of fire and a solid defensive shield, can halt enemy armored attacks when friendly armor is not

present in large quantities. The actions in front of Elsenborn Ridge and the Prumberg Heights showed that a defender with multiple battalions of artillery can hold off enemy armor even when the actual defensive line is manned mainly by infantry units. If the enemy has air superiority and/or good counterbattery capability then the prospects for the defender will, of course, be poor. In the Ardennes, American artillerymen used sophisticated time on target (TOT) barrage techniques to pummel several large German panzer units into virtual ineffectiveness.

Thirdly, the Bulge demonstrated the importance of logistical mobility on the modern battlefield. In fact, it is not an exaggeration to say that American logistics won the battle. By moving 19 full divisions with accompanying supplies into the battle area from other parts of the theater in the first three phases of combat, the U.S. Army's supply and transport branch turned the overall correlation of forces in the Ardennes against the Germans within a week after the Germans had opened their assault with large numerical advantages in both men and equipment. German logistics was poorly run throughout the battle; supply trains were constantly delayed by traffic jams that were not sorted out quickly. Large portions of the German supply trains were horse drawn and thus unable to keep pace with the totally motorized U.S. logistics service in terms of volume of men and equipment moved per day. The American logistical advantage in the Bulge campaign was the decisive factor in determining the outcome of the contest.

Lastly, this battle reveals that an army with relatively inferior armor (U.S. Shermans) can inflict heavy losses on an army with high quality armor (German Panthers and Tigers) if it can exploit dense urban areas and close terrain to outmaneuver tactically the "high tech" opponent. In open country, American Shermans could only beat German armor if they had heavy air or artillery support. In urban areas, the American tanks could hide in alleys or behind buildings and wait for the opportunity to fire into the side or rear armor of a German tank. The Germans unwisely allowed themselves to be drawn into several urban armor battles and they lost many tanks in each one. The cumulative effect of these engagements was that a few panzer divisions were bled white just before they moved into open country. This compromised their effectiveness at later stages in the battle. This lesson may have some relevance for the future if the United

States decides to commit ground forces to Yugoslavia or similar places. Yugoslavia features many densely packed villages in forested hill country that look somewhat similar to the villages in which American armor bled German armor during the Battle of the Bulge. Heavy American M1 tanks could prove to be very vulnerable to Serbian low-tech tanks and hand held antitank weapons in the urban areas and constricted terrain of Bosnia and Croatia if U.S. ground forces were to intervene in the fighting there. Thus, the Battle of the Bulge sends a cautionary message to today's U.S. military planners as they ponder the possibility of U.S. military involvement in low-to-medium intensity wars in close terrain punctuated by small villages.

Eugene Gholz
Ken Pollack

**Blitzing By Numbers:**
*A Quantitative Analysis of the Armored Breakthrough Battles*

1 June 1994

As a complement to the group's historical assessments, we also conducted a quantitative analysis of the five armored breakthrough battles in France during World War II in the hope that an alternative approach would both broaden and deepen our conclusions. Each author was asked to provide fairly comprehensive quantitative data on his particular battle. This data included detailed orders of battle (normalized to provide comparable measures of strength despite the differences in organization and manning among the different armies), forces engaged on both sides, the depth of the attacker's penetration, the length of the Forward Edge of the Battle Area (FEBA)--all measured at one day intervals--and the terrain over which the battle was fought.

In conducting this quantitative analysis of the battles, we focused on two related topics. First, we sought to test various well-known "rules of thumb" regarding success or failure on the modern battlefield, such as the often invoked "rule" that an attacker needs three times the defender's strength to succeed. Simultaneously, we sought to determine whether the data from these battles would allow us to develop rules of thumb of our own. For example, we sought to establish if a certain mix of forces--armor, artillery, infantry, etc.--was ideal for maximizing success when attempting an armored breakthrough battle.

**Measuring Success**

A battle is an exceedingly difficult event to capture statistically. The participants themselves often have a good idea of who won and who lost, and military analysts scrutinizing the battle after the fact almost invariably can say which side prevailed and which was defeated. Explaining why the victor won and the vanquished lost, however, is often much more

complicated, and attempting to do this using statistics is even more difficult. Because of the impact of psychological factors, the fog of war, and other intangibles that are virtually impossible to capture numerically, the statistician may be at a loss to explain success and failure on the battlefield. For this reason, how one chooses to measure success in battle is a critical feature of what a statistical analysis of a battle can or cannot explain.

In our case, we chose to use the depth of the attacker's penetration into the defender's zone of operations as our measure of success. We refer to this measure as "salient depth" or "salient change" in this chapter because in most armored breakthrough battles, if the attacker is able to penetrate the defender's battle lines, the attacking forces will form a salient pushing into the depth of the defender's positions. In particular, we came to the conclusion that the rate of change in the salient--that is, how far the attacker is able to push into the defender's rear areas on each day of combat--best reflected success or failure in battle. This is because it is generally true that, in a successful armored breakthrough battle, the deeper and faster the attacker can penetrate into the defender's rear areas, the more damage he can do to the defender's forces and the more difficult it will be to contain the attacking units. Consequently, large, rapid increases in salient depth usually reflect a successful breakthrough operation, while small, slow increases (or decreases) in salient depth normally indicate failed breakthrough attempts.[1]

Salient change is not a perfect measure of the success or failure of breakthrough operations, however. Depending on the terrain, the deployment of the defending forces, the organization and leadership of the defending forces, and a host of other factors, a shallow penetration could prove far more damaging in some situations than a deep penetration is in others. For instance, if the defender's forces are deployed far forward, have poor morale, and an extremely rigid command and control system, then even a relatively shallow penetration might cause the defending forces to collapse. By contrast, if the defender's forces are deployed in

[1] The reader should note that, in this section, our examination focusses exclusively on the breakthrough phase of an armored breakthrough battle. We generally do not consider the exploitation and pursuit phases of a breakthrough battles, consequently, while we believe our assumptions regarding the various measures of success are valid for the breakthrough phase, they may not be so for the exploitation and pursuit phases.

depth, with good morale, and a flexible command and control system, then even relatively deep penetrations by the attacker might not cause the disintegration of the defender's position, and eventually the defender may be able to bring in reinforcements to contain and then destroy the attacking units. These examples suggest that while salient change is probably a *reasonable* measure of success in armored breakthrough battles, across various battles fought in different places, at different times, and by different armies, it .probably can only be considered a *crude* measure of success.

While salient change is far from a perfect measure of success or failure, we concluded that it was the best available, in large part because other possible measures of success had more significant problems. In particular, we considered two alternative measures of success: changes in the length of the FEBA and numbers of casualties. Ultimately we discarded both of them because they proved more problematic than salient change as a measure of success in an armored breakthrough battle.

In theory, the length of the FEBA should expand in a successful attack because the salient formed by the attacker's forces will "stretch" it. However, in some successful battles, the attacker's success is so overwhelming that defending forces all across the front are routed. In such cases, the length of the FEBA is likely to remain about the same, because the defender is retreating all across the front and therefore there is no "stretching" effect. Thus by using change in FEBA length as our measure of success, a decisive victory for the attacker might have come out looking like a dramatic defeat. Using changes in salient depth, however, allowed us to handle routs in which a defender's entire front is pushed back because we could still measure how far back the defenders were pushed from their initial lines.

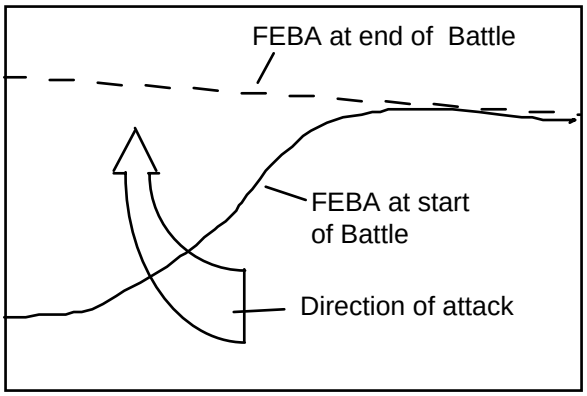


Figure 1

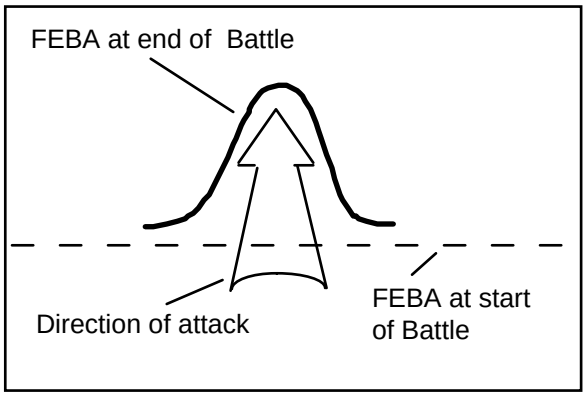


Figure 2

**Text box: Problems with FEBA Measurements**

Most of these problems with using changes in FEBA length as a measure of success are a result of our reliance on "continuous" FEBA measurements. Essentially, there are two ways to measure the FEBA. The first is to measure the FEBA continuously, in which gaps in the defender's forward line of troops (FLOT) are treated as if they did not exist and instead there was a solid line of troops. Alternatively, the FEBA can be measured non-continuously, in which the defender's FLOT is measured as it actually existed, and gaps are not "filled in." For a number of reasons, non-continous FEBA measurements are far more useful than continuous measurements. However, because of the paucity of accurate depictions of the actual sectors occupied by the German and Allied forces in France at each stage of the five battles we examined, it proved impossible to measure the FEBA length non-continuously. This need to rely on continuous FEBA measurements created further problems for using changes in FEBA length as a measure of success. (See Box)

Relying on casualties as a measure of success for armored breakthrough battles proved problematic for a number of reasons. First, as theorists of armored warfare have argued since Fuller's "Plan 1919," the success of an armored breakthrough battle comes from isolating, paralyzing, and panicking the defender's forces. As a result, successful breakthrough operations

do not necessarily cause enormous casualties for the defender. Instead, they may result in the capture of large numbers of prisoners of war or huge amounts of territory, as was the case during the German invasion of Russia in 1941. In addition, in any battle, the number of casualties one side suffers, or the proportion of its total force lost, or even the ratio of either of these two measures for both sides, does not necessarily correlate to victory and defeat. The victor often will take more casualties than the vanquished either in absolute or relative terms. Finally, using numbers of casualties as a measure of success often proved impossible because there was a severe dearth of information on casualties for most of these battles, especially on the German side. For these various reasons, we relied on salient change as our measure of success for most of the statistical analyses we conducted.

**Depth of the Attacker's Penetration (Salient), in kilometers**

| Battle | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 |
|---|---|---|---|---|---|
| Goodwood | 7 | 8 | 8 | - | - |
| Cobra | 2 | 11 | 18 | - | - |
| Bluecoat | 6.9 | 12.9 | 14.4 | 25.8 | 24.9 |
| Mortain | 11 | - | - | - | - |
| Bulge 1 | 4 | 8.1 | 16.1 | - | - |
| Bulge 2 | 2.4 | 4.4 | 8.5 | - | - |
| Bulge 3 | 8.9 | 25 | - | - | - |
| Bulge 4 | N/A | 13 | 14.5 | - | - |

**Force-to-Space**

Every military in the world has a rule of thumb for how much space a given unit can effectively defend or assault. For example, the US army typically assigns an infantry battalion a defensive sector of 1-5 kilometers. The range reflects the importance of the terrain, the enemy forces to be confronted, the defender's mission, and a number of other considerations that can influence exactly how much space the battalion can defend effectively.

While the military uses such force-to-space measures as rough rules of thumb to aid planning, some military analysts have argued that force-to-space considerations are a critical

component of success or failure on the modern battlefield. These analysts assert that, in a given amount of space, there is an optimum number of defenders, against whom an attacker will be incapable of mustering the necessary force-to-force ratio for success.[2] If true, this would mean that if a defender could man his front lines with the optimum number of units, any attack would be useless because it could not succeed. Our analysis of the force-to-space ratios in the various armored breakthrough battles in France during World War II sought to test this theory.

During World War II, German, American and British units all were organized very differently. On top of this, German units were almost invariably well below their authorized strengths for both men and equipment as a result of combat losses. Similarly, American and British units frequently had significantly more or less men and/or weapons than their authorized strength. In short, few if any of the units present were comparable in terms of men and weapons. So that we could more easily compare the forces of the different armies both within each battle and across the battles, we converted all of the armor, mechanized infantry, infantry, engineer, anti-tank, and armored cavalry units present in the battles into "maneuver battalion equivalents," (MBEs).[3] By relying on MBEs, we were able to statistically analyze the different battles for force-to-space considerations.

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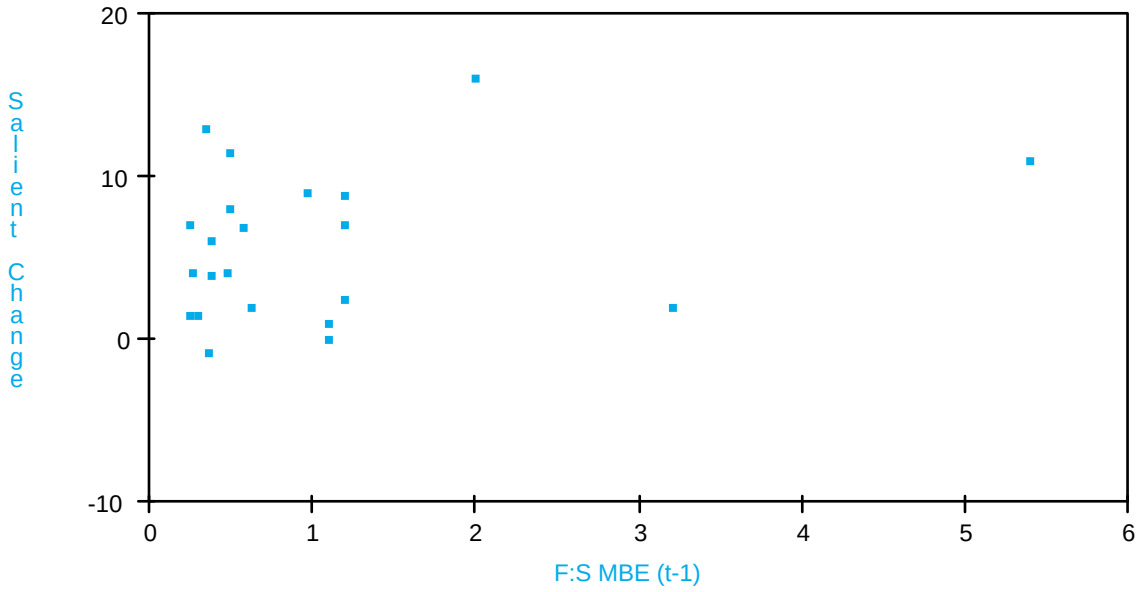
[2] Cite Mearsheimer, Conventional Deterrence.

[3] We need to explain here exactly what an MBE is and how the authors did the converting. Eric H.--or anyone else--please provide us with counting and conversion rules for MBEs so that we can insert them here.




Data File: Force-Space Dependent Variable : Salient Change

| Variable Name | Coefficient | Std. Err. Estimate | t Statistic | Prob > t |
|---|---|---|---|---|
| Constant | 4.75e+0 | 1.27e+0 | 3.73e+0 | 1.34e-3 |
| F:S MBE (t-1) | 9.59e-1 | 8.18e-1 | 1.17e+0 | 2.55e-1 |

Interestingly, our analysis showed no correlation between the defender's force-to-space ratios and success or failure in armored breakthrough battles. We compared the attacker's rate of advance (as measured by salient change) to the defender's force-to-space ratio for all of the battles and found that the attacker's rate of advance was not dependent on how much force the defender deployed per kilometer of front line. Defending forces enjoyed great success in hamstringing attacking forces even when they had force densities much lower than is normally considered necessary.(as low as .25 battalions per kilometer).

**Defender's Force-to-Space Ratio, in Maneuver Battalion Equivalents per Kilometer of the FEBA**

| Battle | Day 0 | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 |
|---|---|---|---|---|---|---|
| Goodwood | 1.2 | 1.1 | 1.1 | - | - | - |
| Cobra | 3.2 | .97 | .24 | .12 | - | - |
| Bluecoat | .58 | .37 | .29 | .49 | .36 | .37 |
| Mortain | 5.4 | - | - | - | - | - |
| Bulge 1 | .38 | .26 | .49 | 1.7 | - | - |

| | | | | | | |
|---|---|---|---|---|---|---|
| Bulge 2 | 1.2 | .6 | .47 | - | - | - |
| Bulge 3 | 1.2 | 2.0 | 3.5 | - | - | - |
| Bulge 4 | .35 | .35 | .25 | .25 | - | - |

When we broke the battles up between those in which the Germans were attacking (the Bulge[4] and Mortain) and those in which the Allies were attacking (Bluecoat, Goodwood, and Cobra) we found some indication that the more Germans defending per km of the front the slower the Allies advanced, but the more Americans defending per km of the front the *faster* the Germans advanced. While this may reflect the differences in the combat effectiveness of German and Allied forces these results were not statistically significant, and therefore may simply be the product of "statistical noise."[5]

**Attacker's Force-to-Space Ratio, in Maneuver Battalion Equivalents per km of the FEBA**

| **Battle** | **Day 1** | **Day 2** | **Day 3** | **Day 4** | **Day 5** |
|---|---|---|---|---|---|
| Goodwood | 2.64 | 2.22 | 2 | - | - |
| Cobra | 7.2 | 5.4 | 1.67 | - | - |
| Bluecoat | 3.97 | 2.1 | 1.6 | 1.6 | 1.19 |
| Mortain | 1 | - | - | - | - |
| Bulge 1 | 1 | 1 | 1.6 | - | - |
| Bulge 2 | 1.4 | 1.4 | 1.6 | - | - |
| Bulge 3 | 1.2 | 2.1 | - | - | - |
| Bulge 4 | NA | 1.4 | 1.1 | - | - |

[4] Because the Battle of the Bulge was far larger than the other four battles we were examining, using it in its entirety was problematic for quantitative comparisons with the other battles. The four battles in Normandy consisted of attacks by 1 or 2 corps, while in the Battle of the Bulge, the Germans attacked with 3 *armies*. So that we could better compare the Bulge to the four battles in Normandy, we isolated four corps-level German attacks that were part of the overall German Bulge offensive, and used them for our statistical analysis. Thus "Bulge 1" refers to the attack by the German 47th Panzer Corps against the US 110th Infantry Regiment, "Bulge 2" refers to the attack by the German 58th Panzer Corps against the US 112th Infantry Regiment, "Bulge 3" refers to the Attack by the German 18th Volksgrenadier Division and the 3rd Parachute Division against the US 14th Cavalry Group at the Losheim Gap, and "Bulge 4" refers to the attack by the German 352nd Volksgrenadier Division and the 5th Parachute Division against the US 109th Infantry Regiment.

[5] Alternatively, it is possible that the reason the Germans appear to have advanced faster when they were opposed by more Americans was the *Wehrmacht's* reliance on fuel captured from the American units during the Battle of the Bulge.

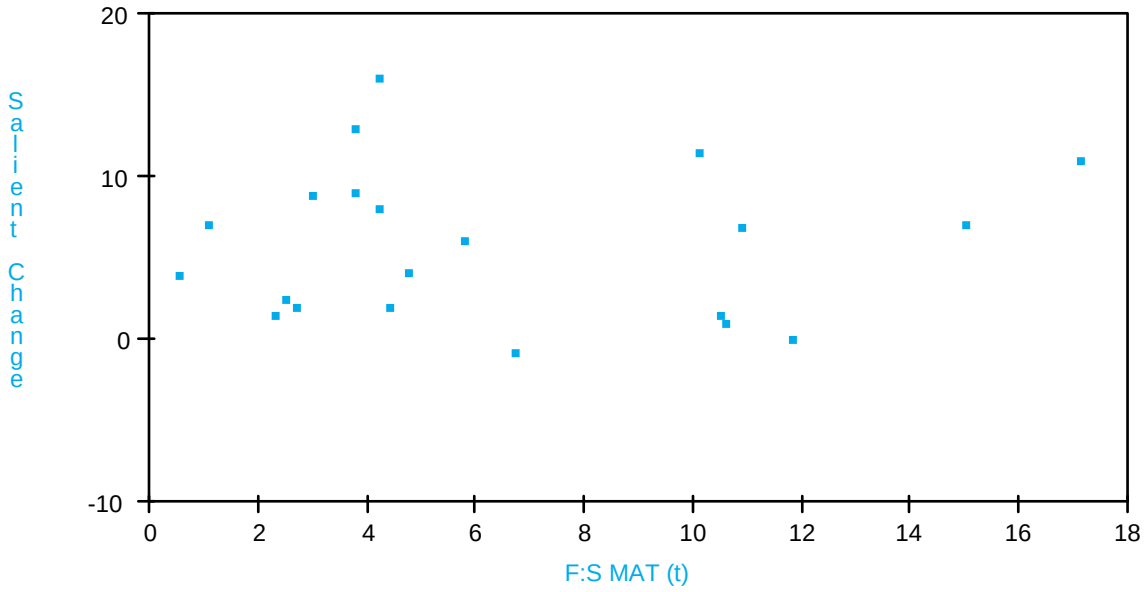
In addition, we also measured the attackers' success against the force-to-space ratio of their own forces. Here again, we found no correlation between the density of the attacking forces and their rate of advance. More densely packed attacking units did not necessarily seem to advance any faster or slower than more widely dispersed attacking units. Indeed, our findings indicated that attacking force densities could be far higher than normally considered practical (as much as 7.2 battalions per kilometer) without suffering a reduction in their rate of advance.

The Soviets rely heavily on force-to-space considerations in planning for both offensive and defensive operations, and one of the principal measures they use is the density of the defender's anti-tank weapons per km of the front. The Soviets reason that the number of anti-tank weapons (including tanks) that the defender can deploy per km of the front will determine how many of the attacker's tanks the defender will be able to destroy. Because of the importance of tanks and other armored fighting vehicles to modern offensive operations, the Soviets believe that if the defender has sufficient anti-tank weapons deployed along the front, an armored breakthrough attempt will be doomed to fail.

**Defender's Force-to-Space Ratio, in Major Anti-Tank Weapons* per km of the FEBA**

| Battle | Day 0 | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 |
|---|---|---|---|---|---|---|
| Goodwood | 20.6 | 16.6 | 15.8 | NA | - | - |
| Cobra | 12.8 | 4.2 | 1.5 | .59 | - | - |
| Bluecoat | 5.4 | 5.8 | 4.4 | 10.5 | 7.1 | 6.9 |
| Mortain | 53.5 | - | - | - | - | - |
| Bulge 1 | 7.8 | NA | 4.8 | 4.2 | - | - |
| Bulge 2 | 10.7 | 2.9 | 3.9 | - | - | - |
| Bulge 3 | 12.1 | 20.4 | 75.7 | - | - | - |
| Bulge 4 | 4.9 | 4.9 | 3.8 | 3.2 | - | - |

* Major Anti-Tank Weapons refers to all towed or self-propelled, flat-trajectory guns capable of firing armor-piercing rounds of 57 mm or greater, including all medium and heavy tanks., and assault guns.




Data File: Force-Space Dependent Variable : Salient Change

| Variable Name | Coefficient | Std. Err. Estimate | t Statistic | Prob > t |
|---|---|---|---|---|
| Constant | 5.58e+0 | 1.80e+0 | 3.10e+0 | 5.90e-3 |
| F:S MAT (t) | 3.40e-2 | 2.28e-1 | 1.49e-1 | 8.83e-1 |

F:S MAT

We tested this theory by comparing defender anti-tank weapons (including tanks) to the attacker's rate of advance as reflected in salient change. Once again, we found no correlation between failure and a high anti-tank weapon-to-space ratio. High rates of advance did not correlate with low densities of defender anti-tank weapons, nor did low rates of advance correlate with high densities of defender anti-tank weapons.

The results of our analysis of force-to-space considerations suggest that force density is not a decisive element in armored breakthrough battles. This conclusion seems to be supported by a number of qualitative arguments. First, how much space a unit of a given size can effectively assault or defend is greatly influenced by the terrain; in poor terrain far fewer defenders are likely to be needed than in good terrain. Second, the quality of the defending and attacking forces also is a critical factor, as highly capable units will better be able to defend a

given sector than poorer units. Indeed, our results imply that the greater effectiveness of German units over their Allied counterparts is in part responsible for the absence of a correlation between successful breakthroughs and lower defender force densities. Moreover, force quality can really only be measured relative to its opponent, thus one also needs to consider how well the forces of the two sides do in combat *with each other* when considering force-to-space ratios. For example, during the 1973 October War, it was generally the case that an Israeli brigade could successfully defend 10-20 kilometers of front against a four-brigade Egyptian division, but the Egyptians generally needed a full four-brigade Egyptian division to defend the same amount of space against an attack by a three-brigade Israeli division. The actual mission of both the defending and attacking forces also influences force-to-space issues. For instance, defending units charged with holding their ground at all costs are more likely to impede the attacker's advance than defending units ordered to minimize their own losses. In addition, leadership, morale, and a variety of other factors also seem to play a role in force-to-space measures.

All of this confirms the findings of our quantitative analysis that force-to-space ratios are a poor determinant of success or failure in an armored breakthrough battle. While it may be that there is an optimum amount of space for a unit of a given size to defend, there are an enormous number of factors that must be taken into account in determining just what that ratio is. For planning and operational purposes, every military commander has to have some idea about how much space a unit of a given size can be expected to defend or assault, but this can only be a foundation for modification based on specific circumstances. We note that in most of the better modern armies--the US, German, and Israeli militaries are good examples--commanders are constantly reminded that there is no hard and fast rule for how much space a unit can defend, and that unit sectors must be determined by a wide range of specific factors.

Conversely, it suggests that the importance of force-to-space measures as a decisive element on the modern battlefield almost certainly has been greatly overstated by many military analysts. The lack of a correlation between the force-to-space ratios of defending forces and the rate of advance of the attacking forces indicates that the ideal number of defender's per kilometer

is highly sensitive to a wide range of military considerations. Similarly, our findings regarding the absence of a correlation between attacking force densities and success indicates that while there probably is an upper limit on how many attacking units can be squeezed into a given area without impairing their effectiveness, this number is probably considerably higher than is commonly believed.[6] Taken together these results indicate that there is no such thing as a universal optimum force-to-space ratio, but that optimum force-to-space ratios are highly situation-dependent. In addition, because there is such a wide range of factors necessary to try to calculate an optimum force-to-space ratio, and because many of these factors are extremely difficult to measure accurately, it is probably impossible to calculate optimum force densities beyond the crude rules of thumb used by military officers.

While these rules of thumb remain indispensable for field commanders attempting to conduct actual military operations and appear reasonable enough for such purposes, they are of very limited utility for military analysts attempting either to explain the outcome of a past battle or to predict with some degree of precision the outcome of a future battle. Although it is safe to say that a battalion defending 10 kilometers of desert terrain is probably overextended, or that ten battalions trying to attack along a one kilometer front are probably overcrowded, going beyond such crude observations to predict success or failure based primarily on more ambiguous force densities is probably stretching the utility of this measure beyond its limitations.

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[6] The reader should be aware that the force-to-space measures for attacking forces reflect *tactical*-level considerations because they take into account only those units participating in the assault on the narrow breakthrough sector. Conversely, the force-to-space measures of the defending forces reflect *operational*-level considerations because they take into account not only the forces defending the narrow breakthrough sector, but also those forces defending immediately to either side of the breakthrough sector (the shoulders) as well as local reserves deployed immediately behind the breakthrough sector.

This distinction is a product of the different analytic uses for force-to-space measures for attacking and defending forces. On the attacker's side, force-to-space is an important consideration because the attacker must determine how he can maximize the number of units he can "cram" into the narrow breakthrough sector without impairing their fighting ability. In this calculation, units along the shoulders and waiting in reserve are irrelevant. Force-to-space serves a very different function when examining the defender's forces, however. For the defender, the question is a matter of how much combat power he can bring to bear anywhere along the sector he has been ordered to defend. Thus the dispersion of his forces across the entire defensive sector--of which the breakthrough sector may only be a part--as well as those forces kept in local reserve that can quickly be brought forward, is critical. Measuring only the forces defending the narrow breakthrough sector would not give an accurate depiction of the actual number of forces that could realistically participate in the fighting, or on the various potential sectors that the attacker might have chosen across the defender's entire front.

**Table X. Force Comparison Summary**

| | En Man Bn Eq | | | Res Man Bn Eq | | | Tot Man Bn Eq | | | En Tanks | | | Tot Tanks | | | Arty Bn Eq | | | Def AT | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Battle | A | D | R | A | D | R | A | D | R | A | D | R | A | D | R | A | D | R | En | Tot |
| Goodwood 0 | - | - | - | - | - | - | 66 | 32 | 2.1 | - | - | - | 1098 | 339 | 3.2 | 27 | 36 | .75 | - | 516 |
| day 1 | 43 | 19 | 2.3 | 23 | 13 | 1.8 | 60 | 30 | 2.0 | 793 | 252 | 3.1 | 867 | 328 | 2.6 | 27 | 38 | .71 | 375 | 449 |
| day 2 | 20 | 17 | 1.2 | 40 | 13 | 3.1 | 57 | 31 | 1.9 | 317 | 191 | 1.7 | 779 | 328 | 2.4 | 25 | 28 | .89 | 285 | 443 |
| day 3 | 15 | 18 | 0.8 | 42 | 11 | 3.8 | | | | 375 | 236 | 1.6 | | | | | | | 329 | |
| Cobra 0 | - | - | - | - | - | - | 65 | 29 | 2.2 | - | - | - | 1340 | 75 | 17.9 | 49 | 13 | 3.8 | - | 115 |
| day 1 | 15 | 4.79 | 3.1 | 50 | 6.9 | 7.2 | 65 | 11.7 | 5.6 | 154 | 0 | □ | 1340 | 26 | 51.5 | 66 | 9 | 7.3 | 24 | 50 |
| day 2 | 23 | 9.1 | 3.2 | 42 | .57 | 73.7 | 65 | 9.69 | 6.7 | 385 | 28 | 13.8 | 1340 | 42 | 31.9 | 26 | 7.7 | 3.4 | 45 | 59 |
| day 3 | 25 | 23 | 1.1 | 40 | 0 | □ | 65 | 9 | 7.2 | 385 | 29 | 13.3 | 1340 | 29 | 46.2 | 10 | 7 | 1.4 | 42 | 42 |
| Bluecoat 0 | - | - | - | - | - | - | 58 | 8.5 | 6.8 | - | - | - | 1104 | 49 | 23 | 25 | 5.7 | 4.4 | - | 79 |
| day 1 | 21 | 8.5 | 2.5 | 37 | 1.9 | 19.5 | 58 | 10.4 | 5.6 | 427 | 106 | 4.0 | 1068 | 106 | 10 | 25 | 5.7 | 4.4 | 159 | 159 |
| day 2 | 12 | 10.4 | 1.2 | 46 | 0 | □ | 58 | 10.4 | 5.6 | 351 | 106 | 3.3 | 1057 | 106 | 10 | 12 | 6.9 | 1.7 | 159 | 159 |
| day 3 | 21 | 10.4 | 2.1 | 37 | 7.2 | 5.1 | 58 | 17.6 | 3.3 | 472 | 304 | 1.6 | 1033 | 304 | 3.4 | 19 | 6.9 | 2.8 | 380 | 380 |
| day 4 | 22 | 17.6 | 1.2 | 39 | 0.6 | 65 | 61 | 18.2 | 3.4 | 441 | 277 | 1.6 | 1001 | 277 | 3.6 | 11 | 12.9 | 0.9 | 365 | 365 |
| day 5 | 25 | 17.6 | 1.4 | 36 | 0.6 | 60 | 61 | 18.2 | 3.4 | 650 | 253 | 2.6 | 955 | 253 | 3.8 | 15 | 12.9 | 1.2 | 341 | 341 |
| Mortain 0 | - | - | - | - | - | - | 11 | 59 | .19 | - | - | - | 207 | 472 | .44 | 7 | 9 | .78 | - | 588 |
| day 1 | 11 | 35 | .31 | 0 | 24 | 0 | ? | ? | ? | 207 | 286 | .72 | 207 | 472 | .44 | 0 | 9 | 0 | 395 | 588 |
| Bulge #1 0 | - | - | - | - | - | - | 24 | 9 | 2.7 | - | - | - | 300 | 64 | 4.7 | 24 | 1.33 | 18 | - | 90 |
| day 1 | 21 | 2 | 10.5 | 3 | 7 | 0.4 | 24 | 6.3 | 3.8 | 230 | 4 | 57.5 | N/A | N/A | N/A | 24 | 1.33 | 18 | 13 | N/A |
| day 2 | 21 | 3.3 | 6.4 | 0 | 3 | 0 | 21 | 6.3 | 6.4 | 280 | 34 | 8.2 | 280 | 34 | 8.2 | 10 | 1.67 | 6 | 61 | 61 |
| day 3 | 21 | 4 | 5.3 | 0 | 18 | 0 | 21 | 22 | .95 | 200 | 40 | 5 | 200 | 40 | 5 | 10 | 1.67 | 6 | 54 | 54 |
| Bulge #2 0 | - | - | - | - | - | - | 14 | 12 | 1.2 | - | - | - | 219 | 86 | 2.5 | 7 | 1 | 7 | - | 104 |
| day 1 | 10 | 2 | 5.0 | 4 | 10 | 0.4 | 14 | 12 | 1.2 | 139 | 6 | 23.2 | 219 | 86 | 2.5 | 7 | 1 | 7 | 24 | 104 |
| day 2 | 10 | 3 | 3.3 | 0 | 3 | 0 | 10 | 6 | 1.7 | 126 | 10 | 12.6 | 126 | 10 | 12.6 | 7 | 1 | 7 | 28 | 28 |
| day 3 | 10 | 3 | 3.3 | 0 | 0 | 0 | 10 | 3 | 3.3 | 94 | 7 | 13.4 | 94 | 7 | 13.4 | 7 | 1 | 7 | 25 | 25 |
| Bulge #3 0 | - | - | - | - | - | - | 10 | 9.75 | 1.02 | - | - | - | 160 | 65 | 2.5 | 10 | 1 | 10 | - | 98 |
| day 1 | 7 | .75 | 9.3 | 3 | 9 | .33 | 10 | 9.75 | 1.02 | 80 | 12 | 6.7 | 157 | 65 | 2.4 | 10 | 1 | 10 | 24 | 98 |
| day 2 | 6.5 | 1.08 | 6 | 0 | 11 | 0 | 6.5 | 12.1 | .54 | 77 | 12 | 6.4 | 77 | 224 | .34 | 10 | 1 | 10 | 20 | 265 |
| Bulge #4 0 | - | - | - | - | - | - | 16.3 | 4 | 4.1 | - | - | - | 31 | 46 | .67 | 15 | 2.33 | 6.4 | - | 55 |
| day 1 | 7 | 2 | 3.5 | 9.3 | 2 | 4.7 | 16.3 | 4 | 4.1 | 21 | 0 | □ | 31 | 46 | .67 | 15 | 2.33 | 6.4 | 0 | 55 |
| day 2 | 16 | 3.67 | 4.4 | 0 | 0 | 0 | 16 | 3.67 | 4.5 | 21 | 34 | .62 | 21 | 46 | .46 | 15 | 2.33 | 6.4 | 43 | 55 |
| day 3 | 14 | 2.67 | 5.2 | 0 | 1 | 0 | 14 | 3.67 | 3.8 | 17 | 34 | .50 | 17 | 46 | .37 | 15 | 2.33 | 6.4 | 34 | 46 |

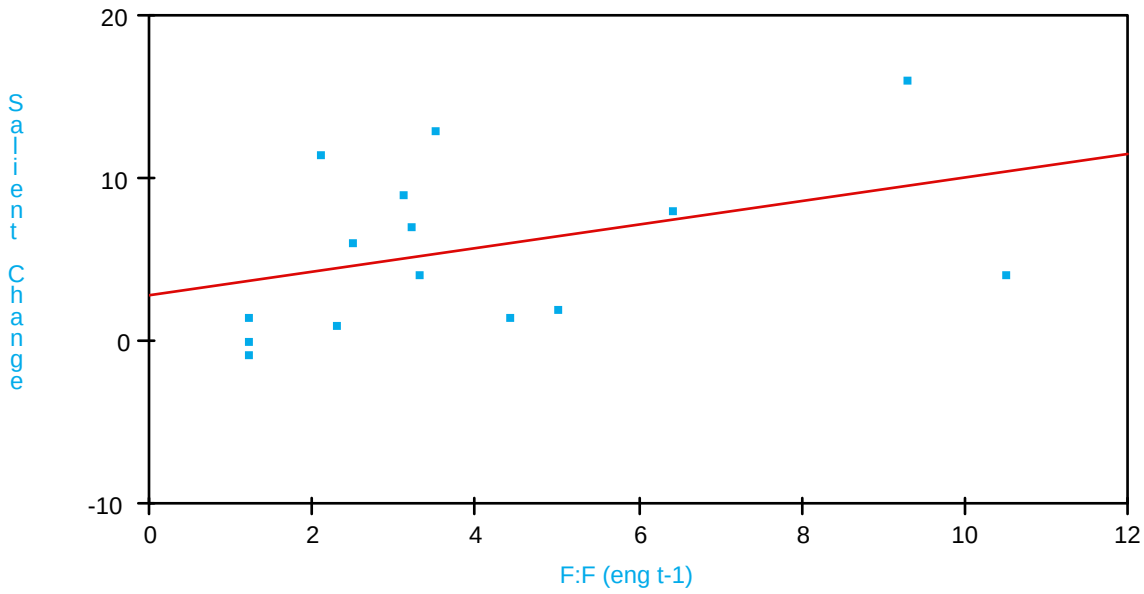
**Force-to-Force**

Probably the most pervasive "rule of thumb" of warfare is that the attacker needs three times the forces of the defender to prevail in combat. Politicians, pundits and military analysts often cite this figure as something approaching a universal law.[7] In our quantitative analysis of

[7] Again, cite Mearsheimer.

the five battles in France during World War II, we attempted to test this theory, and to determine more generally the impact of force-to-force considerations on success or failure in armored breakthrough battles.

We began by comparing the attacker's rate of advance measured by salient change to the ratio of the attacker's forces measured in maneuver battalion equivalents to the defender's forces measured in maneuver battalion equivalents. We conducted these analyses using both the total forces present for both sides, and then only those forces engaged in combat during each day of the battle. While our analyses using the total forces told us little about the battle, we found a fairly strong positive correlation between rate of advance and the ratio of the attacker's *engaged* forces to the defender's *engaged* forces. In general, our results showed the expected result: that the greater the attacker's advantage over the defender in forces engaged in combat, the greater the attacker's subsequent rate of advance.




Data File: Force-Force Dependent Variable : Salient Change

| Variable Name | Coefficient | Std. Err. Estimate | t Statistic | Prob > t |
|---|---|---|---|---|
| Constant | 2.72e+0 | 2.20e+0 | 1.24e+0 | 2.38e-1 |
| F:F (eng t-1) | 7.27e-1 | 4.58e-1 | 1.59e+0 | 1.37e-1 |

Data File: Force-Force

| Source | Sum of Squares | Deg. of Freedom | Mean Squares | F-Ratio | Prob>F |
|---|---|---|---|---|---|
| Model | 5.90e+1 | 1 | 5.90e+1 | 2.51e+0 | 1.21e-1 |
| Error | 3.05e+2 | 13 | 2.35e+1 | | |
| Total | 3.64e+2 | 14 | | | |

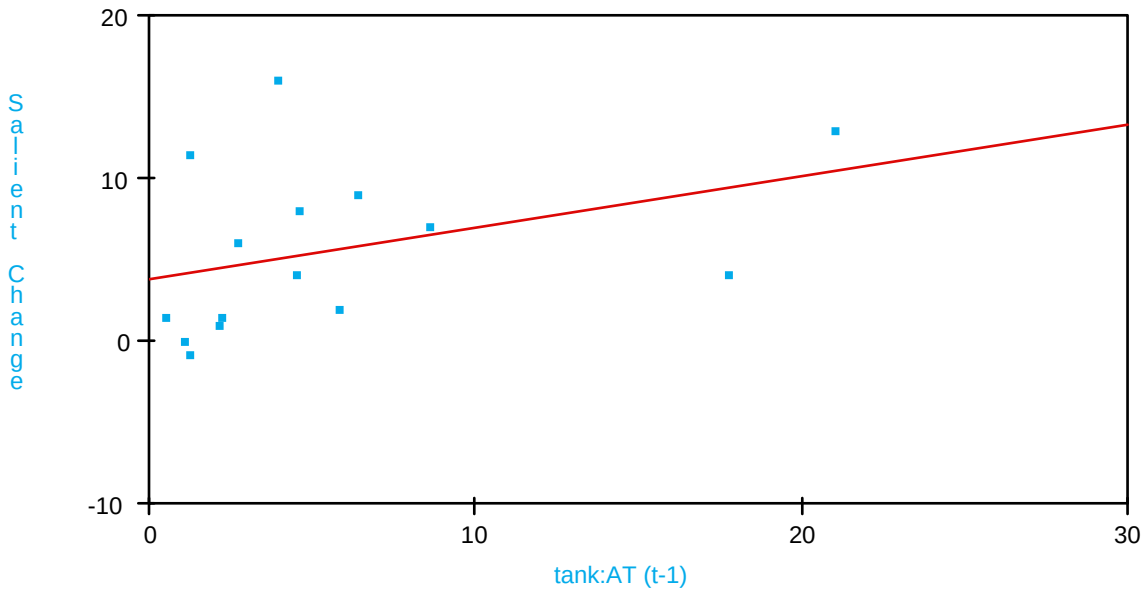
| | |
|---|---|
| Coefficient of Determination (R^2) | 1.62e-1 |
| Adjusted Coefficient (R^2) | 9.75e-2 |
| Coefficient of Correlation (R) | 4.02e-1 |
| Standard Error of Estimate | 4.84e+0 |
| Durbin-Watson Statistic | 2.01e+0 |

## Table X. MBE Composition

| | En Inf Bn Eq | | | En Mech Bn Eq | | | En Armor Bn Eq | | | Tot En MBE | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Battle | A | D | R | A | D | R | A | D | R | A | D | R |
| Goodwood | | | | | | | | | | | | |
| day 1 | 28 | 14 | 2.0 | 2 | 3 | .67 | 13 | 4 | 3.3 | 43 | 19 | 2.3 |
| day 2 | 14 | 13 | 1.1 | 1 | 3 | .33 | 5 | 3 | 1.7 | 20 | 17 | 1.2 |
| day 3 | 9 | 11 | .82 | 0 | 3 | 0 | 6 | 4 | 1.5 | 15 | 18 | .83 |
| Cobra | | | | | | | | | | | | |
| day 1 | 13 | 3.2 | 4.0 | 0 | 1.6 | 0 | 2 | 0 | □ | 15 | 4.8 | 3.1 |
| day 2 | 17 | 7.2 | 2.4 | 1 | 1.4 | .7 | 5 | .55 | 9.1 | 23 | 9.1 | 2.5 |
| day 3 | 15 | 6.8 | 2.2 | 5 | 1.8 | 2.8 | 5 | .41 | 12.2 | 25 | 9.0 | 2.8 |
| Bluecoat | | | | | | | | | | | | |
| day 1 | 13 | 8.5 | 1.5 | 1 | 0 | □ | 7 | 0 | □ | 21 | 8.5 | 2.5 |
| day 2 | 5 | 8.5 | .6 | 1 | .8 | 1.25 | 6 | 1.1 | 5.5 | 12 | 10.4 | 1.2 |
| day 3 | 11 | 8.5 | 1.3 | 2 | .8 | 2.5 | 8 | 1.1 | 7.3 | 21 | 10.4 | 2.1 |
| day 4 | 12 | 8.5 | 1.4 | 2 | 5.6 | .4 | 8 | 3.5 | 2.3 | 22 | 17.6 | 1.2 |
| day 5 | 11 | 8.5 | 1.3 | 2 | 5.6 | .4 | 12 | 3.5 | 3.4 | 25 | 17.6 | 1.4 |
| Mortain | | | | | | | | | | | | |
| day 1 | 0 | 25 | 0 | 6 | 3 | 2 | 5 | 7 | .71 | 11 | 35 | .3 |
| Bulge #1 | | | | | | | | | | | | |
| day 1 | 9 | 0 | □ | 8 | 2 | 4 | 4 | 0 | □ | 21 | 2 | 10.5 |
| day 2 | 9 | 0 | □ | 8 | 2.7 | 3 | 4 | .67 | 6 | 21 | 3.3 | 6.3 |
| day 3 | 9 | 0 | □ | 8 | 3 | 2.7 | 4 | 1 | 4 | 21 | 4 | 5.3 |
| Bulge #2 | | | | | | | | | | | | |
| day 1 | 4 | 2 | 2 | 2 | 0 | □ | 4 | 0 | □ | 10 | 2 | 5 |
| day 2 | 4 | 3 | 1.3 | 2 | 0 | □ | 4 | 0 | □ | 10 | 3 | 3.3 |
| day 3 | 4 | 3 | 1.3 | 2 | 0 | □ | 4 | 0 | □ | 10 | 3 | 3.3 |
| Bulge #3 | | | | | | | | | | | | |
| day 1 | 7 | 0 | □ | 0 | .75 | 0 | 0 | 0 | 0 | 7 | .75 | 9.33 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| day 2 | 5.5 | 0 | □ | 0 | .75 | 0 | 1 | .33 | 3 | 6.5 | 1.08 | 6.02 |
| Bulge #4 | | | | | | | | | | | | |
| day 1 | 3 | 2 | 1.5 | 3 | 0 | □ | 1 | 0 | □ | 7 | 2 | 3.5 |
| day 2 | 12 | 3 | 4 | 3 | 0 | □ | 1 | .67 | 1.5 | 16 | 3.67 | 4.4 |
| day 3 | 10 | 2 | 5 | 3 | 0 | □ | 1 | .67 | 1.5 | 14 | 2.67 | 5.3 |

Next we attempted to probe deeper into this issue by comparing different elements of the attacker's and defender's forces to try to determine whether some elements were more important than others. We broke the maneuver battalion equivalents for both the attackers and defenders up into armored, mechanized, and infantry battalion equivalents and ran regressions measuring the attacker's rate of advance against the ratios of each of the sub-elements. All three comparisons produced a correlation similar to that of the overall maneuver battalion equivalent comparison, implying that no single component of the infantry-mechanized infantry-armor combined arms team is more important than the others. We note, however, that although we are fairly confident in these findings, we cannot be as confident in them as we are for the overall force-to-force comparisons.



Data File: Force-Force Dependent Variable : Salient Change

| Variable Name | Coefficient | Std. Err. Estimate | t Statistic | Prob > t |
|---|---|---|---|---|
| Constant | 3.84e+0 | 1.75e+0 | 2.20e+0 | 4.66e-2 |
| tank:AT (t-1) | 3.13e-1 | 2.16e-1 | 1.45e+0 | 1.71e-1 |

Data File: Force-Force

| Source | Sum of Squares | Deg. of Freedom | Mean Squares | F-Ratio | Prob>F |
|---|---|---|---|---|---|
| Model | 5.06e+1 | 1 | 5.06e+1 | 2.10e+0 | 1.43e-1 |
| Error | 3.13e+2 | 13 | 2.41e+1 | | |
| Total | 3.64e+2 | 14 | | | |

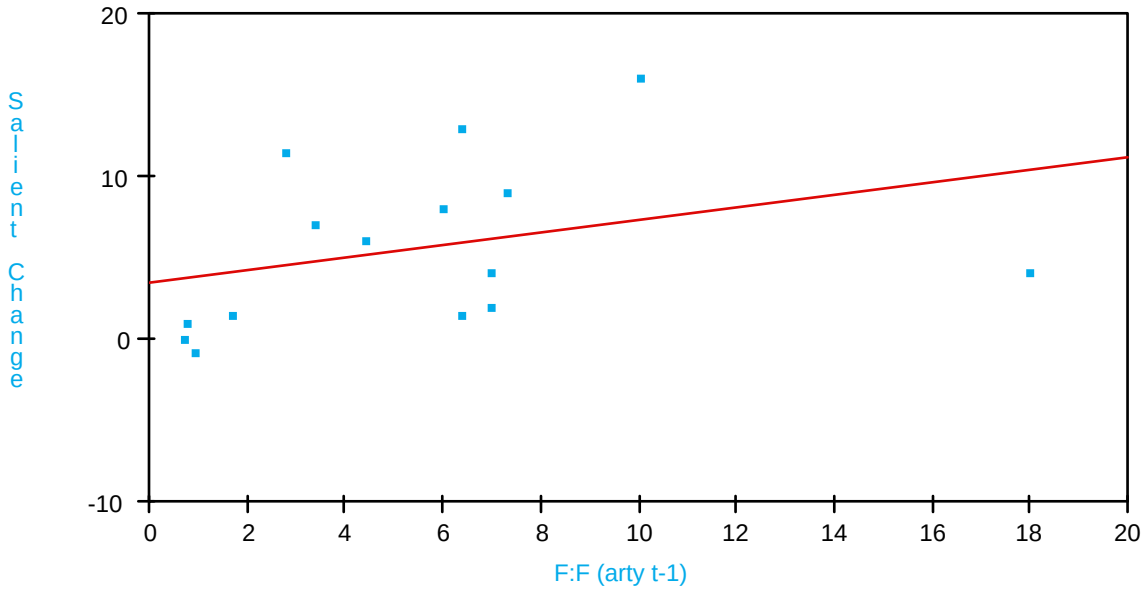
| | |
|---|---|
| Coefficient of Determination (R^2) | 1.39e-1 |
| Adjusted Coefficient (R^2) | 7.27e-2 |
| Coefficient of Correlation (R) | 3.73e-1 |
| Standard Error of Estimate | 4.91e+0 |
| Durbin-Watson Statistic | 2.30e+0 |

We then measured the attacker's rate of advance to the ratio of attacker's tanks to defender's tanks. Because tanks are so critical to modern warfare, it seemed reasonable that the ratio of tanks might be a major factor in success or failure of breakthrough operations, but our findings indicated there was no correlation between this ratio and the attacker's rate of advance. When we compared the attacker's rate of advance to the ratio of the attacker's tanks to all of the defender's anti-tank weapons (including the defender's tanks), however, we did find a positive correlation similar to what we found for the maneuver battalion equivalents ratio.

Interestingly, these various regressions also indicated that the attacker's rate of advance was aided more by adding an additional maneuver battalion equivalent than by adding a comparable increment of pure tank forces. In other words, adding additional tanks to an attack did increase the attacker's rate of advance, but not by as much as adding a more balanced package of forces that included infantry, mechanized infantry, anti-tank forces, and engineers as well. Although the small size of our data set prevented us from determining to what extent each element of a combined-arms team contributed to this additional increase in an attacker's rate of advance, this result appears to confirm the importance of combined arms cooperation in

successful breakthrough operations. Moreover, these results further indicated that while tanks may be the centerpiece of an armored breakthrough battle, they probably should not comprise a disproportionate share of the attacker's force as more balanced armies appear to enjoy greater success than tank-heavy ones.

We also attempted to measure the impact of the balance of artillery between attacker and defender upon success or failure in an armored breakthrough battle. Artillery is a critical component of all ground operations, and has often played a decisive role in breakthrough operations. Under this assumption, we sought to test whether the sheer numeric balance of artillery seemed to be a factor in the success or failure of a breakthrough operation. To do so we compared the ratio of the attacker's artillery to the defender's artillery, once again using only engaged forces. To ease comparisons both from army to army and battle to battle, we developed an artillery battalion equivalent and then grouped all of the Allied and German artillery pieces above 75 mm. into ABEs. We found the expected positive correllation, indicating that the greater the attacker's advantage in artillery over the defender, the faster his rate of advance. However, in comparing the artillery force-to-force results with those from the MBEs, we noted that adding additional artillery units did not increase the attacker's rate of advance as much as adding more maneuver units of tanks, infantry, and mechanized infantry. In addition, while we are fairly confident in the results of the artillery force-to-force relations--in part because they conform to "common wisdom" about the importance of artillery in modern combat--once again we cannot be certain that these findings are not the result of statistical noise.




Data File: Force-Force Dependent Variable : Salient Change

| Variable Name | Coefficient | Std. Err. Estimate | t Statistic | Prob > t |
|---|---|---|---|---|
| Constant | 3.49e+0 | 2.09e+0 | 1.67e+0 | 1.18e-1 |
| F:F (arty t-1) | 3.79e-1 | 2.98e-1 | 1.27e+0 | 2.26e-1 |

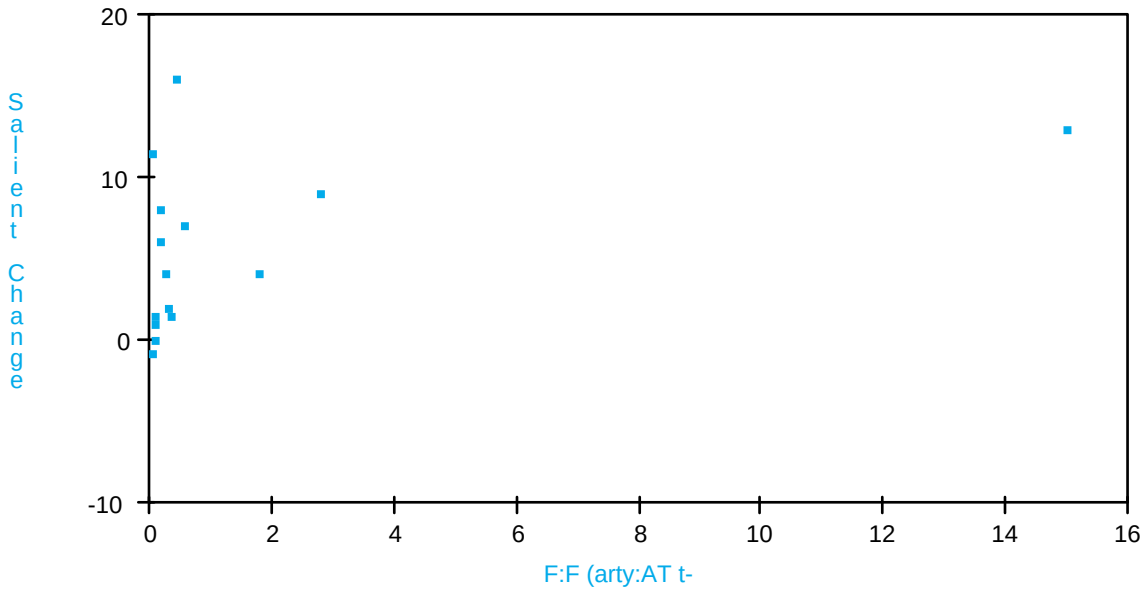
Data File: Force-Force

| Source | Sum of Squares | Deg. of Freedom | Mean Squares | F-Ratio | Prob>F |
|---|---|---|---|---|---|
| Model | 4.03e+1 | 1 | 4.03e+1 | 1.62e+0 | 1.67e-1 |
| Error | 3.24e+2 | 13 | 2.49e+1 | | |
| Total | 3.64e+2 | 14 | | | |

| | |
|---|---|
| Coefficient of Determination (R^2) | 1.11e-1 |
| Adjusted Coefficient (R^2) | 4.23e-2 |
| Coefficient of Correlation (R) | 3.33e-1 |
| Standard Error of Estimate | 4.99e+0 |
| Durbin-Watson Statistic | 2.07e+0 |

Finally, we compared the attacker's artillery forces to the defender's anti-tank forces. Artillery fire is an extremely effective method of suppressing and destroying anti-tank forces that threaten an attacker's armored vehicles. Consequently, we suspected that the greater the ratio of the attacker's artillery battalions to the defender's anti-tank weapons, the more likely the attack would succeed. In this instance as well, we are not as confident in these findings as we are in the

results of the MBE force-to-force comparisons.[8] Because a long list of events from military history have demonstrated the utility of artillery in dealing with anti-tank weapons, we continue to believe that the ability of the attacker to use artillery to prevent a defender's anti-tank forces from mauling the attacker's armor is an important element in a successful armored breakthrough. Therefore, we believe the absence of a correlation in this case is a result either of the inadequacy of our data or our method of comparison. It may simply be that this phenomenon is difficult to capture statistically, or that our statistical method was inappropriate for capturing it.




Data File: Force-Force Dependent Variable : Salient Change

| Variable Name | Coefficient | Std. Err. Estimate | t Statistic | Prob > t |
|---|---|---|---|---|
| Constant | 4.72e+0 | 1.32e+0 | 3.57e+0 | 3.41e-3 |
| F:F (arty:AT t- | 5.87e-1 | 3.33e-1 | 1.76e+0 | 1.01e-1 |

Our analysis of the force ratios in these battles suggests that, in general, force-to-force considerations have a greater impact in determining the success or failure of armored

[8] Looking at the scatter plot which follows, it is clear that much of the measured correlation (t statistic of 1.76) is due to the presence of the single outlying point at the far right of the graph. In addition to being obviously out of character with the other data, the coding of that point (the second day at Bulge #4) is in serious question: the coded ratio of 15 reflects the presence of 15 artillery battalion equivalents and zero defender antitank weapons. Perhaps some other coding of the "infinite" ratio would have been more appropriate.

breakthrough operations than do force-to-space considerations. We found rough correlations between many of the key force-to-force measures and the attacker's rate of advance as measured by salient change. Unfortunately, beyond reaffirming Clausewitz' bold assertion that "The best strategy is to be very strong; first in general, and then at the decisive point," our results cannot provide many specific guidelines regarding the importance of force-to-force ratios in armored breakthrough operations.[9]

The imprecision of our results almost certainly reflect, at least in part, the limits of force-to-force measures in determining success in modern combat. As in the case of force-to-space ratios, a long list of other factors play a critical role in force-to-force analyses. Simple numerical balances rarely portray an accurate picture of the likely outcome of combat between two forces. The capabilities of those forces, their training, leadership, doctrine, morale, etc., invariably play a far greater role in determining their success or failure on the battlefield than do sheer numbers. The consistent ability of small Israeli forces to trounce larger Arab forces is only one well-known example of this fact. Consequently, our results appear to confirm the truism that while it is almost always better to outnumber your adversary, superior numbers alone are only one element of success or failure in battle.

One interesting conclusion that does follow from our inability to define precise thresholds and rules of thumb for force-to-force ratios is that there seems to be little reason to believe in the utility of the 3:1 rule. In none of our force-to-force regressions did we find any sort of "threshold" of success around the 3:1 mark. The rates of advance correlated with force ratios of 3:1 did not necessarily lead to victory on the battlefield at a disproportionately higher rate than those for 2:1 or 3:2 ratios. While our results demonstrated that it is almost invariably better for the attacker to have a 3:1 superiority over the defender than a 2:1 superiority, this advantage followed a normal progression, rather than the sudden increase the "3:1 rule" would predict. In other words, armies attacking with worse than a 3:1 advantage over their adversaries

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[9] Carl von Clauzewitz, *On War*, Edited and Translated by Michael Howard and Peter Paret, (Princeton: Princeton University Press, 1984), p. 204. Emphasis in original.

were not doomed to failure, nor were those armies that were able to secure a 3:1 advantage assured of success. Consequently, the "3:1 rule" appears to have virtually no utility as an analytic tool in attempting to determine the likelihood of success on a modern battlefield, and for military planners there seems to be little reason to aim for a 3:1 advantage over an adversary rather than 2:1, 4:1 or 5:1.[10]

**Force-to-Force per Kilometer of the FEBA**

Ultimately, force-to-space and force-to-force issues are deeply intertwined. Indeed, the theory behind most force-to-space arguments is that there is some optimum force-to-space ratio against which the attacker will be unable to generate a sufficient force-to-force ratio in the space available. This relationship led us to examine force-to-force per kilometer of the FEBA as a means of measuring the interaction of force-to-force and force-to-space issues.

We divided the battles into two groups: those that succeeded and those that failed. The battles we considered failures were Operation Goodwood, Operation Bluecoat, the Mortain counterattack, and the sector of the Bulge assault we call "Bulge 4." The battles we judged to be successful armored breakthroughs were Operation Cobra, and the other three Bulge assaults we examined, and which we have labeled "Bulge 1," "Bulge 2," and "Bulge 3." We then modeled the changing Force-to-force per FEBA kilometer ratios for these two groups separately.

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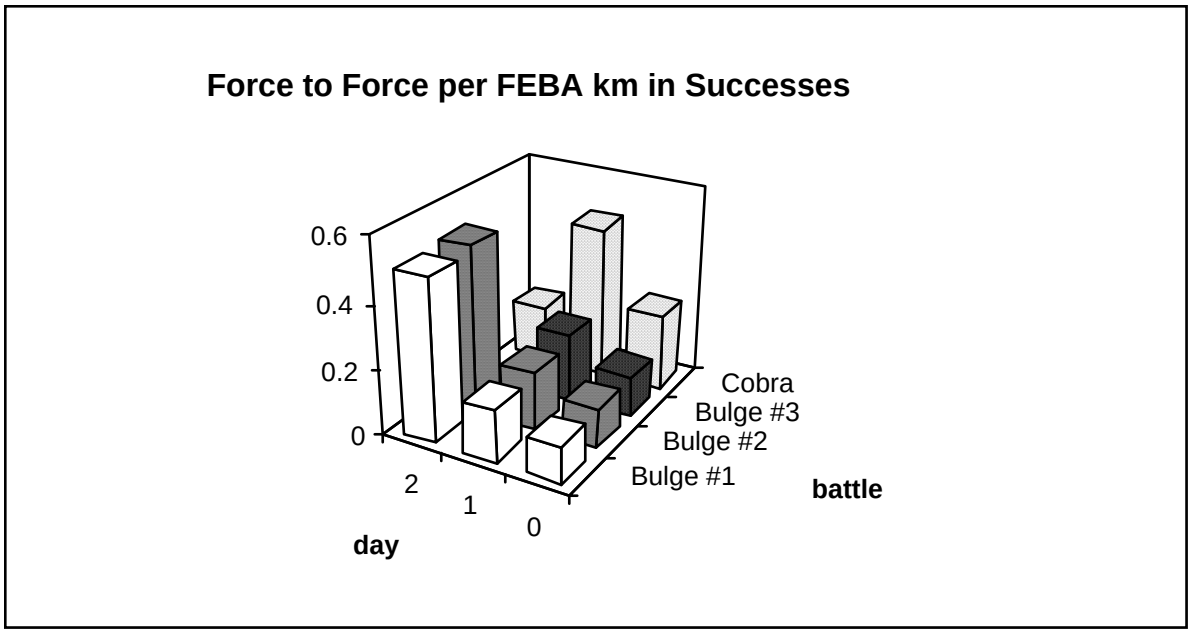
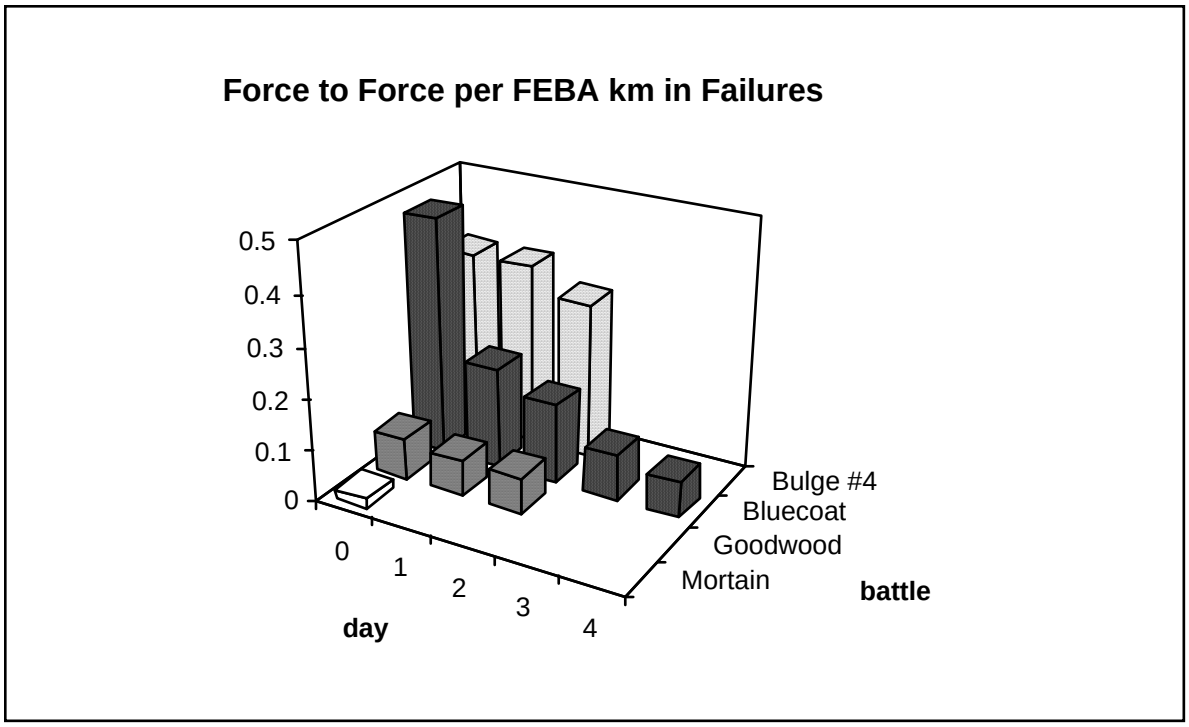
[10] We note that in his book *Conventional Deterrence*, John Mearsheimer effectively demolishes the claim of the "3:1 rule" as a tool for assessing a military balance at the strategic level by citing numerous campaigns won by an attacker with less than a 3:1 theater-wide advantage in forces. However, later in the same book and in subsequent articles, Mearsheimer goes on to use the 3:1 rule as his basic measure of analysis for success at the operational level of combat. Our findings suggest that the 3:1 "rule" has no more value at the operational level than it does at the strategic level.




The results of these efforts are displayed in the graphics above. Note that the X axis for the two graphs--measuring the days of combat--are *reversed* for the two graphs. The fact that the general slopes of the two sets of battles are essentially the same (that is basically sloping

downward from left to right) despite the fact that the X axes have been reversed demonstrates several important differences between successful and unsuccessful armored breakthrough battles.

First, the graphics demonstrate that the initial concentration of forces is not correlated with success. If force-to-force or force-to-space were significant factors in a successful armored breakthrough attack, we should find that the force-to-force per FEBA km ratio for the successful battles was consistently higher than those for the failed attacks. Instead, while the successful armored breakthrough battles began with force-to-force per FEBA km ratios ranging from .1 to .3, the unsuccessful attacks began with force-to-force per FEBA km ranging from .02 (Mortain) to nearly .5 (Bluecoat). Thus not only does our data fail to show the pattern predicted by the theory, but in two cases (Bluecoat and Bulge 4), attacks that ultimately failed began with considerably *higher* force-to-force per FEBA km ratios than any of the attacks that succeeded.

Once again, these results suggest that unit quality, leadership, morale, and other intangibles were more significant in determining the outcome of these battles than pure quantitative measures. Indeed, these results seem to generally conform to the conclusions we reached regarding the capabilities of the various armies from our historical analyses. Essentially, our qualitative assessments generally found that German units performed best, American units fought next best, and the British worst of the three armies we looked at. In the graphics above, we note that the Germans are successful in Bulge battles 1-3 despite having a no more than a .1 force-to-force per FEBA km ratio in each. The Americans succeed at Cobra, but require a higher force-to-force per FEBA km ratio than the Germans. The British fail at Goodwood because they have only a .1 force-to-force per FEBA km ratio--despite the fact that this was more than ample for the Germans in the Bulge--and they fail again at Bluecoat despite a massive .48 force-to-force per FEBA km ratio. The only anomaly is Bulge 4, however, this is easily explained by the fact that it is almost a purely infantry attack, virtually unsupported by armor, and therefore entirely unable to secure the advantages of combined arms cooperation.

These graphics also demonstrate that in successful armored breakthrough battles, the force-to-force per FEBA kilometer ratio basically increases over time, while in unsuccessful

battles it declines over time. This is a result of the very different dynamics of successful and unsuccessful breakthrough attempts. In a successful armored breakthrough effort, the attacker usually is able to puncture the defender's front lines, where defending forces are usually fairly heavily concentrated relative to the defender's rear areas. The successful puncture is usually accompanied by heavy attrition to the defending forces there, immediately shifting the force-to-force ratio in the attacker's favor. Once the breakthrough has occurred, the attacker is confronted by fewer and fewer defender forces as the attacking force exploits into the operational depth of the defender's positions. It is this freedom to move without having to fight enemy operational reserves that allows the attack to succeed. The graphics reflect this fact in that the attacker's force-to-force advantage over the defender increases very quickly--faster even than the increase in the FEBA length caused by the deepening salient because as the attacker pushes farther and farther he encounters fewer and fewer defending units--allowing him to push even farther.

In an unsuccessful armored breakthrough battle, just the opposite occurs, as the attacker either cannot penetrate the front lines or penetrates the front lines only to be immediately confronted by significant defender operational reserves. In either case, the attacker's forces appear to suffer more heavily in unsuccessful breakthrough attempts than in successful attempts, thus the force-to-force ratio may shift toward the defender, or at least not as much toward the attacker as is the case for successful breakthroughs. In addition, the force-to-force ratio continues to drop as the defender adds additional reserves to combat.

Although force-to-force per kilometer is a better quantitative measure than either force-to-force or force-to-space considered separately, it is far from perfect. Notably, it continues to treat space as a one-dimensional line--the FEBA--is a significant problem with force-to-space measures that carries over into the force-to-force per FEBA kilometer measure. A battlefield is a two-dimensional plane (at least when only ground forces are being considered), and reducing it to a one-dimension inhibits fully capturing the important effects of time and distance that are critical elements of a defense-in-depth. A unidimensional measure "collapses" a defense-in-depth into a forward defense or ignores all but the forwardmost line of the defense. Either way,

the results will fail to fully reflect the differences between a defense-in-depth over a forward defense. Consequently, we believe that, where possible, future analyses should attempt to develop and utilize force-to-force per kilometer$^2$ (or "force-to-area") measurements as more accurate depictions of defensive deployments and their impact on combat.

**Time-Lagging and Defensive Deployment**

One other interesting result of our analysis of force-to-force and force-to-force per kilometer ratios was that the attacker's progress generally was more influenced by the balance of forces on the previous day than by the balance on the same day. When we compared the various force-to-force and force-to-space measures to the attacker's rate of advance on the same day we found virtually no correlations. It was only when we staggered the data for salient change so as to compare the force measures with the attacker's progress on the following day that the correlations emerged.

This result indicates that *all* combat is very time-consuming, regardless of the balance of forces between the two sides. We found that even on days where an attacker had a very significant advantage over the defender (sometimes as high as 9:1 or 10:1 in maneuver battalion equivalents) the attacker usually made very little progress in terms of expanding the salient. However, on the day following a day on which the attacker enjoyed overwhelming superiority, we normally found a very significant increase in salient depth (often on the order of 8-20 kilometers). Even when the balance of forces overwhelmingly favored the attacker, and resulted in a virtual rout of the defending forces, the demands of combat were so arduous and time-consuming that they prevented the attacker from driving very far into the defender's positions. In short, even highly successful engagements will greatly slow an attacking force. The ubiquitous pairs of German assault guns that greatly delayed entire British divisions in Operation Bluecoat, and the three Panther tanks that held up the US 120th Regiment in Operation Cobra are only two examples of this phenomenon.

This point illustrates one of the reasons that a defense-in-depth is superior to a forward defense when attempting to prevent an armored breakthrough. An armored breakthrough must take place extremely rapidly. In all of the battles we examined, we found that if an armored breakthrough did not succeed in the first two to three days it almost certainly would fail because the defender would have enough time to bring in reserves and reinforcements and stalemate the assault. Because, as our results demonstrated, lop-sided engagements are only marginally less time consuming than more evenly-matched combats, unless the defender can predict the point of attack and mass so much force there that the attacker is stopped cold right at the start, it is better for the defender to make the attacker fight more combats than less. This is true even if the defender must fight these additional battles at a greater disadvantage than he would if he fought only one battle. Although by concentrating all of his forces in the first line the defender will have a greater chance of stopping the attack in its tracks, if he fails to do so, the attacker is almost guaranteed success as he will be running free in the defender's rear areas with little to oppose him. However, if the defender deploys in depth, by forcing the attacker to take the time to fight through each line of defense, the defender almost invariably will buy himself enough time to redeploy operational reserves to halt the attack. Few defender's will have sufficient forces to deploy a forward defense that is so strong across its entire front that at no point could an attacker concentrate enough forces to secure a sufficient advantage in forces to be able to break through. Instead, the defender probably will only be able to use part of his force along the front lines while holding the rest back as operational reserves to be moved to the point of attack when the attacker betrays his intentions. In these situations, which constitute the vast majority of actual and potential cases, the defender is best served if he deploys his front line forces in a defense-in-depth rather than a forward defense because the greater time required for an attacker to break through a defense-in-depth is critical to concentrate the operational reserves and bring the attack to a halt.

--> Insert terrain features summary table

**Terrain**

The table above summarizes the various terrain measurements compiled by the working group. The quantitative data generally supports the assessment that terrain--at least in the breakthrough zone, although possibly not in the exploitation zone--did not play a major role in the success or failure of an armored breakthrough attempt. The terrain results suggest that the deployment of defending units was of far greater significance. In terms of forested area, numbers of towns, and boccage (the worst terrain features for armored forces) the attacker was generally able to breakthrough in areas of poor terrain (Cobra, Bluecoat, Bulge) and failed to breakthrough in the battle with the best "tank country" of all (Goodwood). The narratives indicate this was because the defenders generally deployed their strongest forces in the best tank country, hoping that the defensive advantages of rough terrain and its corresponding limitations on armor would prevent a breakthrough in the poor-terrain sectors of their line. Ultimately, neither the defensive advantages nor the problems encountered by attacking armored forces in poor terrain precluded a successful breakthrough, while the advantages of good tank terrain to an armored offensive were insufficient to overcome powerful defensive deployments.

This is not to suggest that armored breakthrough operations are more likely to succeed in bad terrain than good terrain. Instead, what it indicates is that poor tank terrain (at least in the breakthrough zone) is not the impediment to an armored assault that many World War II commanders seemed to believe it was. Second, the positioning of defensive forces is more important than terrain considerations when attempting to determine where an armored breakthrough is most likely to succeed. This seems to support an old maxim of Napoleon's that it is better to fight difficult terrain than a powerful enemy army.

**Final Thoughts**

Our historical anaysis of the armored battles in France during World War II led us to the conclusion that the pace at which the attacker is able to execute his operations was an important

factor in success or failure. Essentially, we determined that a rapid pace of operations by the attacker more often led to a successful breakthrough because it allowed the attacker to defeat defending units, secure key terrain, and disrupt command and control before the defender could concentrate sufficient operational reserves to restore the integrity of his defenses. In conducting our quantitative analysis of the battles, we had hoped to examine this element as well.

We hypothesized that by using such factors as the casualty rates on both sides, the rate at which reinforcements were fed into the battlefields, the rate at which reserves were fed into combat, the rate at which battered units were pulled out of combat, and the percentage of each day actually spent in combat by each side, we could develop a reasonable, albeit crude, measure of the pace of operations. We hoped to then compare this measure with the attacker's rate of advance (as reflected in salient change) to gauge the importance of the pace of operations to success or failure in breakthough battles. Unfortunately, much of the necessary data proved impossible to gather. As noted above, information on German casualties was almost non-existent, and information on US and British casualties was not much better. In particular, we had little luck discovering the numbers of casualties suffered on each day of a battle, as opposed to the lump sum total for the entire battle. In addition, information regarding units not actually involved in combat was difficult to obtain, thus determining when a unit arrived on the battlefield and when it was committed to or withdrawn from combat was extremely haphazard. We believe, however, that future analyses of armored breakthrough battles would likely benefit from an assessment of the pace of operations if the necessary data is available.

Another element of armored breakthrough operations we had hoped to explore was the importance of counterattacks in halting an armored assault. As noted above in the section "Time-Lagging and Defensive Deployments," we generally found that forcing the attacker to fight more battles was more effective than forcing him to fight bigger battles in stopping an assault. Another way to test this conclusion would be to measure whether more frequent, but small, counterattacks are better correlated with slow advance rates than fewer, but larger, counterattacks. In addition, we wanted to assess whether it is more useful for a defender to

employ his operational reserves in counterattacks, or to deploy them as blocking forces in front of the main attack. There is some dispute over which of these strategies is better. Specifically, counterattacks can succeed in shocking an attacking force, knocking it off balance, and thereby stopping it. Successful counterattacks also may succeed in recapturing the initiative for the defender. On the other hand, by deploying operational reserves as blocking forces, the defender can take advantage of terrain, fortifications and the other advantages that naturally occur to defending forces. Unfortunately, we lacked adequate data on the timing and size of counterattacks during these battles. We recommend this approach to future analyses of armored breakthroughs.

## Quantitative Problems with the Dependent Variable

Another problem with applying statistical methods to the five breakthrough attempts was presented by the model of breakthrough battles itself: simply put, it is not clear what the dependent variable itself should be. A dichotomous variable for success or failure is one possibility, but even that might be difficult to code as a function of time. For example, Bluecoat appears to have been a successful breakthrough with a failed exploitation effort; but this leaves unanswered whether, overall, it should be considered a success or a failure as a breakthrough battle. Moreover, a dichotomous dependent variable would not offer much variance to correlate with the various force-to-force or force-to-space ratios, making lessons difficult to learn. A second suggestion would use the change in the length of the FEBA, since progress in a breakthrough operation might be defined by stringing out the defender's lines. Unfortunately, the pre-battle contours of the FEBA may not be "straight," and consequently forward progress by the attacker may actually shorten the FEBA length (as seen in the figure). Change in the salient depth, however, effectively measured by a hypothetical odometer traveling with the lead attacking units, seems to account for both of these objections: it does not rely on a subjective judgment of "success," and it is a continuous numerical measure of the attackers' progress. Use of the salient change introduces a further problem, though, because the size of salient should be correlated with the length of the FEBA for simple geometric reasons. In the actual data, there is a statistically significant correlation between the change in the salient depth and the change in the length of the FEBA, although its magnitude is relatively small: each additional kilometer of FEBA length is estimated on average to increase the depth of the salient by .15 km. Any measurements which include FEBA length in the independent variable (notably force-to-space data) will tend therefore to overestimate the relationship between the independent variable and salient change.

Even accounting for these difficulties, the slopes and intercepts estimated by the various regression models seem to hover close enough to each other that we feel safe in concluding that some real relationships are being measured, particularly in the force-to-force data. In essence, we are returned to the realm of qualitative analysis by the efforts to specify the implications of the statistical results -- with a bit more confirmation of the basic relationships already uncovered from the case narratives and the *prima facie* numbers.

## Problems with Coding FEBA Measurements

In addition to the expected problems in locating quantitative data about the five breakthrough battles, there are hard questions to address in coding the data for analysis. The measurements of FEBA length in particular raised significant difficulties.

Should the Forward Edge of the Battle Area be defined by the actual positions of deployed forced (for example, by the extent of prepared defensive positions), recognizing that there are often gaps in the line at unit boundaries? Or should the FEBA measure include a "virtual" line filling in the gaps in troop placement? If the width of an advancing line changes during the formation of a salient (see figure), should

that change be included in the t+1 FEBA length, or should the original geographic boundary of the breakthrough sector be maintained?

Each measure implies something a little bit different about the model of a breakthrough battle. Focusing on the actual unit deployments implicitly assumes that the course of the battle is largely decided by fighting rather than by maneuver or implied threats to undefended areas. Particularly for the defender, whose deployments must in some way prevent the attacker from slipping through the line and flanking prepared positions, an assumed continuous front seems appropriate. On the other hand, this artificial extension of the FEBA ignores any judgment by the defending commander about the passability of the terrain, which any model should expect to interact with the defender's force to space choices. Furthermore, the continuous measurement biases the model of the dynamics of the battle towards a stretching process: breakthroughs will appear to be created when the attacker, pushing into a salient, geometrically extends the FEBA far enough that the defender's force to space ratio falls below a minimum threshold and the line disintegrates. Perhaps some battles proceed this way at the tactical level, but this FEBA expansion description seems more appropriate for the operational level of analysis; as the case histories of most of the successful efforts demonstrate, breakthroughs are often created by the sudden annihilation of a tactical defensive position.

All of the various FEBA measurement issues at some level return to two basic questions about the data itself. Much of the data collected for the breakthrough battles dataset came from unit histories. If a unit which was not part of the original breakthrough effort impinged on the geographic definition of the breakthrough sector later in the battle (maintaining continuity in the attacker's lines as a salient formed, as in the figure above, for example), the dataset may not include information on the new unit in its FEBA measurement. In this sense, FEBA measurements follow the tactical-level progress of the battle rather than the operational geography. On the other hand, it is not certain that the positions reflected on the maps in the official histories of the battles literally match the actual deployment of troops, so a rigorous application of a tactical-level FEBA measurement based on locations of actual fighting would be suspect. The enforced continuity of the "fill-in-the-gaps" measurement approach probably accounts for the level of accuracy more appropriate to the extant record.

## Problems with the Statistical Analysis

Looking at only five Western Front breakthrough battles, our comparisons draw most of their strength from the care with which the cases were selected and from qualitative comparisons among the cases. Many of those qualitative comparisons actually concern quantitative data, however, and it is natural to attempt to apply the tools of statistical analysis as well. If a day of fighting in a breakthrough sector rather than an entire battle is taken as the principal unit of analysis, the five cases yield twenty-three static data points or fifteen data points measuring progress dynamically. This size dataset has a large enough "n" to search for strong correlations with a high confidence level, but would still be unable to distill subtle relationships -- if the data perfectly met the requirements for Ordinary Least Squares (OLS) regression analysis. Unfortunately, there are two important problems with the data which weaken the results of statistical analysis.

The most important barrier to OLS is introduced by the time series nature of the data. Both the independent and dependent variables analyzed are "autocorrelated," meaning that the value at time t is closely related to the value at t-1. The clearest examples are in the independent variables such as number of tanks: on the second day of the battle, the variance in the number of tanks on each side is mostly accounted for by the number of tanks present on the first day -- and is, in fact, exactly accounted for by the number of tanks on the first day minus losses due to fighting plus the net commitment of reserve forces to the fight. The implication is that the second day's data point only contributes a limited amount of information which was not present in the original point, rather than a fully independent observation's worth of information, and therefore the effective n is smaller than the apparent n of fifteen or twenty-three. Autocorrelation does not introduce any particular bias into the correlation results, since it is just as likely to cause overestimates as underestimates of the slope of the relationship tested, but it does increase the variance in the model.

There are several recognized statistical techniques for dealing with autocorrelated data, notably a procedure known as Generalized Least Squares (GLS) regression. By using the difference between values at t-1 and t rather than the values themselves as the independent variable, whatever portion of the information which is shared between the points is subtracted out of the statistics. GLS, however, requires two additional conditions to be satisfied, both of which are absent in the breakthrough battles dataset. The first is that the process which generated the time series data be on-going before the first point was measured so that the first point can legitimately be taken as a baseline for the rest of the data. In the

breakthrough battles project, the cases begin with the first day of particular efforts to puncture the opposing lines, a different process than the otherwise-continuous efforts of the allies to expand their Normandy salient. The second GLS requirement absent in our data is a larger n. The breakthrough battles dataset of fifteen dynamic points is a combination of time series and cross-sectional data comparing the five battles. Because GLS seeks to do autoregressions within each time series, it requires a meaningful n (on the order of fifteen or twenty points) within each breakthrough sector. Given these constraints on the GLS technique, we only attempted analysis using OLS, accepting that the apparent measured confidence intervals were significantly too large. All relationships reported in the text should be appropriately discounted by readers.

This last problem with GLS -- that our n was too small -- was also a problem for multiple regression analysis using OLS. All relationships tested in the statistical analysis were examined pairwise, meaning that interactive effects were not measured directly. Because it seems overwhelmingly likely that the influence of combined arms tactics is greater than simply the number of tanks and infantry battalion equivalents involved (particularly considering the qualitative and indirect quantitative results presented in this appendix), a multiple regression including an interactive term for the simultaneous presence of both tanks and infantry in an attack would have been appropriate. But as the degrees of freedom in the independent variables increase (that is, simply, the number of independent variables hypothesized to influence the value of the dependent variable), a larger n is required to reach the same level of confidence in the relationships measured. With the breakthrough battles dataset, we did not have the luxury of a large enough n for multiple OLS regressions.

## Conclusion

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In the battles that we examined, only the US Cobra operation, and the German "Watch on the Rhine" offensive--the Battle of the Bulge, produce clear breakthroughs. US forces shift first to exploitation and ultimately to pursuit. The Germans shift to exploitation, which is ultimately stalled and countered by the US and the British. The British Bluecoat operation, which closely followed the initiation of the US Cobra operation, produces a very narrow breakthrough followed by an anemic and unsuccessful exploitation. The earlier British Goodwood offensive confronts an alerted German defense in depth, which stops it in its tracks at very high cost to the British after a very modest penetration. Operation Luttich, the German counterattack at Mortain, can scarcely be viewed as even an attempted breakthrough operation; Kluge seems to have conceived it as a spoiling offensive, perhaps even a raid. That said, the Germans achieve two very narrow penetrations in the first line of US defenses. There are, however, so many US reserves waiting for them that their initial penetrations can not be termed a "breakthrough." Ultra seems to have tipped off the Allies, and thus this was virtually an Allied trap. Effectively, defenses in depth were prepared, subject to the constraint of not doing so much as to compromise Ultra.

Our detailed examination of these cases has persuaded us that a successful breakthrough operation, accompanied by a rapid transition to exploitation is a very difficult military operation. In the one clear success of our five cases, the US Cobra operation, US forces had virtually everything going for them. The failure of Goodwood and the limited success of Bluecoat, in spite of great British local material superiority and command of the air, suggest that successful armored offensives require very high quality units, superb planning, and substantial prior success at reducing the defender's initial defenses and eliminating, delaying, or diverting his armored operational reserves. The US delay of the German breakthrough effort in the Ardennes, achieved mainly by the stubborn active resistance of most of the overstretched and unready units in the initial line of resistance, permitted the rapid lateral movement of US forces from

neighboring sectors to establish both a second and ultimately a third line of resistance. Though the US had "command of the air," weather prevented this from being a major factor in the US success. Where defenders know their business and are determined to do it, and have some uncommitted operational reserves, it is likely that those reserves will arrive at the threatened sector before the offender can finish cutting his hole and shifting to rapid exploitation. The Germans had many things going for them in this offensive, but not enough.

## THE ESSENTIALS OF BREAKTHROUGH BATTLES

### The Defender's Perspective

Defenders who expect an adversary breakthrough attempt must solve three problems: provide for an initial defense; ensure the resilience of that defense through the provision of small, mobile, tactical reserves; ensure against catastrophic failure with large, mobile, "operational" reserves.

Defenders must first populate a front --better conceived of as a zone rather than a line-- in sufficient density and depth that the attacker must constantly fight to achieve forward progress. This compels the attacker to concentrate resources to mount a major offensive operation. This process of concentration takes time, and helps account for the oft- noted erratic quality of actual combat in modern warfare. More importantly for the defender, this concentration process may provide valuable warning indicators. The defender can exploit the warning provided to improve his position dramatically. If possible, a substantial percentage of the initial defenses should be beyond the range of the bulk of the attacker's artillery, increasing the number of direct fire engagements against prepared positions that the attacker will have to fight.

The alternative to prepared forward defenses is simply to organize clusters of mobile forces and wait to engage the adversary in a large-scale war of movement. In general this second option is not preferred. Partly this is due to the fact that defenders are often operating in their own country, and do not wish to allow the enemy inside. Sometimes defenders may be impoverished relative to their enemies, and have a lot of infantry units of limited mobility that

can best be employed in positional defenses in any case. This was true of the Germans in 1944, but was also true of both sides is the Iraq-Iran. Finally, it seems plausible that even a well executed mobile defense has a greater tendency to fail catastrophically than an equally well executed forward defense.

The main reason for establishing some kind of positional, forward defense, however, is that there are certain generic advantages to doing so. Tactical defenders usually have superior knowledge of the terrain; prepared obstacles, minefields, fields of fire, and pre-registered artillery concentrations; and actual fortifications--earthworks and bunkers to provide cover and concealment. When competently exploited these permit small forces to extract favorable exchange rates against quantitatively superior attackers. In the right terrain, they even permit infantry units to punish mechanized formations. Fortification also helps the defender survive the massive concentrations of artillery, or sometimes aerial bombing, that attackers employ to thin the defenses before they attack into them.

The defender must also try to organize armored tactical reserves. Where initial defensive positions fail to stop the attacker, they may still slow and weaken him, so that small tactical reserves can mount lethal and disorienting ambushes and counter-attacks. Alternatively, these reserves may plug gaps that the attacker's preliminary air and artillery strikes may blow in the defender's positions. The necessary size and number of such formations will vary with a host of factors--including whether the forces constituting the initial defenses are themselves heavily mechanized forces, or infantry forces. In the battles we examined, which consisted largely of division-sized formations under attack by corps sized formations, anything from roughly a single tank company (15-20 tanks or other armored fighting vehicles (afv's) capable of killing tanks) up to a pair of battalions (50 tanks or afvs's each) proved adequate to slow the progress of much stronger attacking forces.[1]

[1] The Germans could produce disproportionate effects with company sized units; the US and British seemed to require as much as a battalion to produce similar effects. The strikingly superior quality of German tanks and assault guns may be the explanation.

Finally, the prudent defender organizes "operational reserves." In the battles we examined, these were large uncommitted mobile formations at least the size of a modern armored brigade-- roughly 100 tank-killing armored fighting vehicles.[2] If the forward defensive zone, supplemented by tactical reserves, fails to stop the attacker, operational reserves can either counter-attack the penetration, or set up a new line of defense in the rear.[3] This could pit fresh defensive troops, with the tactical defensive advantages outlined above, against tired attackers who may have outrun much of their artillery. If the attacker has a fresh offensive reserve, which will often be the case, he will throw it against the defender's operational reserve. But the attacker is still in an improvisational situation, distant from his supplies, and often beyond the range of much of his own artillery. His intelligence is likely to be much worse than in the original breakthrough. And the process of passing his operational reserve through the tired, disorganized, and dispersed remains of his first echelon often proves time consuming and confusing. Thus, this battle of the "second echelons," or "operational reserves" may still go in favor of the defender, preventing the attacker from converting his initial breakthrough into a successful exploitation. Alternatively, initially available operational reserves may be too weak to actually stop the attacker. The defender must then decide whether to commit them to hasty counterattacks or delaying actions in the hopes of buying sufficient time to bring reserves from elsewhere (if they exist) or to initiate a general withdrawal in the hopes of establishing a new extended front. It is reasonable for the defender to hold at least one powerful armored brigade in

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[2]. In the battles we examined, a single Panzer division sometimes functioned as an operational reserve. But German panzer divisions seldom exceeded an actual strength of 100 tank killing armored fighting vehicles, i.e. tanks and assault guns. On the US side, a single "combat command," roughly one-half an armored division, was about the same size, and functioned similarly. Today a single US, British, or West German brigade would easily be as strong. This is the smallest formation that one might consider to be an operational reserve. Under most circumstances where one was concerned about an enemy offensive, a single brigade would be considered insufficient. Modern division sized formations, two or three heavy brigades, would be preferred, depending on the scale of the battle.

[3]. The recently reissued German Defense Tactics Against Russian Breakthroughs (Washington DC: US Army Center of Military History, 1951?, 1988) provides a summary by World War II German officers of their experiences on the eastern front. They enumerate nine different general tactical choices available to the defender. I have distilled my general discussion from this document.

operational reserve if the enemy can plausibly mount a corps sized breakthrough effort. This is an absolute minimum, merely to stabilize the situation. A single heavy brigade cannot be counted upon to stop a corps in its tracks. This does not mean that a dedicated armored brigade must be held behind every infantry division, just that there should be one "close" enough to reach a threatened division before it is likely to be entirely overrun. This a matter of judgment which will depend on a host of local factors that cannot be calculated in the abstract .[4] When armored forces are scarce, the defender will have to make hard choices about their distribution; it will not always be possible to have both adequate armored tactical and operational reserves. The conventional wisdom is that operational reserves take precedence; we agree.

**The Attacker's Perspective**

Both the preceding description of the process of breakthrough operations, and our own case studies, suggest that the attacker has two major problems to solve if he is to hope for success. If the defender can prevent the attacker from solving these problems, his chances of thwarting a breakthrough, or preventing a transition to a successful exploitation are quite good. Nearly all of the major research questions with which we began our study, bear directly on these two problems.

1.) The attacker wants to either find or create a poorly defended interval somewhere along the enemy's front. The attacker looks for a promising sector that the defender has mistakenly "underdefended." Or, the attacker concentrates massive area fire capability--artillery, airpower or both, to batter the defensive position into incoherence. Breakthroughs are most likely to succeed where the defender cannot constitute a resilient initial defensive zone. A rapid penetration through the forward defenses may make it difficult for the defender to commit his (usually scarce) operational reserves to the right place, or to do so under optimal conditions.

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[4]. We have searched in vain for an empirically supportable rule of thumb on the tactical and operational reserves that will prove adequate to thwart a breakthrough. The only thing we can do is lend our support to the generally understood proposition that they are essential. Tactical reserves smaller than a couple of tank companies, and operational reserves smaller than a brigade will prove insufficient in battles where two or three attacking armored divisions can be expected to hit even a partially armored defending force of division size.

Thus, the front-line defenses should be rendered porous, both laterally and in depth. Porous means that there are multiple paths through the adversary's positions that the defender cannot cover with direct fire weapons--such as anti-tank weapons, tanks, machine guns, and the like, and cannot easily cover with indirect fire by artillery positioned to the rear either because these same zones are unobserved, or the artillery has been silenced through counter-battery fire. Tactical reserves are scarce and slow to react. Put in more technical terms, the offender wants the defender to have a "low force-to-space ratio." How low is low enough will vary with the overall military wealth and skill of the combatants, and the terrain. Some open terrain favors long-range shots (2000-4000 meters) by high-velocity tank or anti-tank guns (or missiles in our own time). Small, well-trained and superbly armed tank forces in good positions can defend very large fronts under these conditions. Rougher terrain, or heavily forested areas, may not permit such broad fields of fire; engagement ranges could shrink to a few hundred meters or even tens of meters. Under such conditions, larger numbers of lighter forces may be more appropriate.

2.) The attacker must delay, divert, or destroy the defender's operational reserves. The attacker does not want to have to engage these reserves in a stand-up fight if this can be avoided. If such reserves are committed very early, and correctly, the defenses become so thick and so effective that the attacker's combat power will be so eroded that a true breakthrough cannot even be achieved. If the operational reserves are committed somewhat later, they may directly counter-attack the offender's advancing columns. Or, as noted above, they can mount delaying actions until more distant reserves can be committed, or until a general withdrawal can be initiated. A breakthrough operation that concentrates mainly on the problem of getting into or through the defender's initial positions, without finding a solution to the defender's operational reserves, will likely fail. Reliance on direct combat to outfight and destroy those reserves after the initial penetration seems to be the least preferable solution. Air attack can delay these reserves, though in 1944 it could not destroy them. (A modern air force probably could destroy such reserves as they moved, in most terrain, but probably not in any weather.) Secondary

ground attacks, combined with deception, may divert them to other parts of the theater. A prior period of destructive attrition warfare may simply degrade them beyond repair, though this is hardly an elegant solution. Only in the Battle of the Bulge was the "direct combat" solution achieved with some success--but at such a cost that the entire operation bogged down.

As is usually the case in warfare, these problems are more simply stated than solved. Nevertheless, it seems to us that some of the practitioners of armored warfare in this period did not fully understand these problems. Or, they may have understood them, but simply had no solutions available, and were forced by political or military circumstance to attack any way. German commanders understood that they lacked the capability for both their Mortain and Ardennes attacks. A charitable interpretation of the planning for Goodwood would argue that the British simply had to attack under highly unfavorable circumstances to induce the Germans to concentrate and expend the bulk of their armor so that the Americans could mount a successful breakout.

Commanders' lack of understanding of the foregoing often contributed to failure. This seems particularly true of the two British offensives that we examined--Goodwood and Bluecoat. A slightly uncharitable interpretation of the US success at Cobra would argue that US commanders understood most of the problems associated with breakthrough, but not all. For example, the armored and motorized infantry division commanders on the right of VII Corps seem a bit slow, and fail to take advantage of their great strength to sidestep centers of resistance, leave them to their own considerable follow-on forces, and thus sustain the forward momentum of the attack. Nevertheless, they "got lucky," insofar as their German opponent, somewhat uncharacteristically, understood less about armored breakthrough operations than they did, and missed an opportunity to constitute a mechanized operational reserve. Had such a reserve existed, the tardiness of these US units might have permitted the Germans to stall the whole operation.

In this chapter we assess the range of techniques employed to solve the problems outlined above across the five cases we examined. We also try to weigh their relative importance. Below

I discuss the critical variables we have identified seriatim. But this introduces an element of artificiality to how they work in actual practice. Many of the variables are related to each other. Thus, the attacker is trying to create a "system" of action, consisting of mutually reinforcing capabilities and tactics that contribute to solving key problems; the defender is trying to do the same.

## PLANS AND PREPARATIONS FOR THE BREAKTHROUGH BATTLE

### Concept of Operations

Success correlates with a clear and ambitious initial concept of operations, which unambiguously conceives of the problem as one of breakthrough and exploitation. Cobra appears to be the most clearly conceived breakthrough operation, with the clearest and most sensible objectives. Goodwood, Bluecoat, and Mortain all suffer from disagreements among senior commanders about the true purposes of the operations. The Bulge is more ambiguous. Hitler's initial concept, especially the political objective of splitting British and US forces in the hopes of causing a political collapse of their alliance is quite speculative from a military point of view. But German commanders translate it into a plausible operational objective, albeit one that they themselves believed was still somewhat beyond their means. While our interpretation of how this variable works is impressionistic, a confused concept of operations substantially reduces the probability that other important problems will be identified and solved.

### Surprise

Surprise of place and time proves to be one of the most critical variables in these cases. It helps ensure thin forward defenses and scarce operational reserves. Where the adversary is tipped off that an attack is coming, even a day's warning permits major improvements in the density and resilience of a defensive system and the repositioning of reserves.

The German offensive in the Ardennes was a complete surprise. The local successes it achieved were a direct result. US infantry divisions in the Ardennes defended frontages that

were at least twice the doctrinal norm.[5] For the most part, divisions worn out in previous combat and replenishing their strength, or green divisions with no combat experience, were sent to the Ardennes. This was considered expedient because the terrain was favorable to the defense, and the Allies needed more powerful troop concentrations elsewhere to continue their offensives. The US Army did have limited operational reserves available in the sector. Because they lacked air power, or the strength to mount significant supporting offensives to draw them off, the Germans would have to engage these US reserves in direct ground combat. A big success would depend on fast progress through the initial defenses and easy, quick victories over local US operational reserves. The Germans had no solution to the problem that their own material poverty would leave the most powerful Allied forces in other sectors virtually untouched. The Allies would ultimately be able to disengage these forces and redeploy them to the Ardennes to create additional, very powerful operational reserves--thus Von Rundstedt's stated belief that the conditions for success in this operation were lacking.

In Cobra, surprise mainly affected the immediate availability of German operational reserves. There were two sources of such reserves, Panzer Group West to the east, and two under-strength panzer divisions controlled by the German Seventh Army, but maldeployed directly on the front lines. At the theater level the Germans were surprised by Cobra because they expected the major Allied effort to come in the British sector, where the terrain was more favorable to armored operations, and where so many such efforts had already occurred, including Goodwood. The difficult and highly defensible terrain opposite the Americans had further convinced the Germans that their scarce armor belonged opposite the British. Bluecoat further fixed their attention and tied down much German armor during the exploitation of the initial Cobra breakthrough.

The German commander opposite the Americans, General Hausser, had committed his two under-strength panzer divisions to the frontline rather than holding them back as operational

[5]. Roughly 15 km seems to have been the norm, and divisions in the Ardennes were defending 30 km or more.

reserves. He possessed uncommitted, relatively immobile infantry divisions that he could have employed to replace the tankers in the line, and this had been suggested to him. Panzer Lehr was deployed on the front line opposite the US VII Corps, tasked for the breakthrough. This was an unfortunate location because the US plan was to divert 1800 strategic bombers from their normal business to blow a hole in the German defenses opposite VII Corps. The air operation had been started and aborted the previous day, warning the German commander that something was up. Ironically, rather than withdraw his panzers, Hausser pressed more of his forces forward in anticipation of a ground attack, with the effect that the actual bombing confronted a richer target array and did more damage to Panzer Lehr.[6] The US attack also successfully bypassed the other panzer division in the area, the 2nd SS, which Hausser had deployed on the front line farther west. As a result of these poor deployments, and the power of the initial US bombardment, Hausser found himself without a capable operational reserve to oppose the US attack.

During the actual battle, relatively weak German armored counterattacks of less than battalion strength (20-40 tanks), substantially delayed the forward progress of the right flank of the US penetration. We therefore hypothesize that had the German commander held his two panzer divisions in reserve, and replaced them with available infantry divisions, the US breakthrough effort would certainly have gone much less smoothly.[7] They might have bought sufficient time to redeploy one or two additional panzer divisions from Panzer Group West,

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[6]. This bombing must be viewed as a "surprise of method," even though it had been employed days earlier in Goodwood. The Germans clearly were not ready for an initial bombardment of this magnitude. The only thing they might have done had they understood the tactic would have been to thin out rather than thicken their forward defenses. This was a common German tactic against heavy artillery barrages on the Western Front in the First World War and on the Eastern Front in the Second World War. This would have permitted US forces to move forward without initial resistance, but they would have then run into undamaged panzers.

[7]. Seventh corps was extremely strong; its second echelon of two armored and one motorized infantry divisions, reinforced with numerous extra units, was for all intents and purposes equivalent in strength to four panzer and one panzer grenadier division. Thus, I doubt that Hausser would actually have been able to stop Cobra with his own armor, even if he had redeployed his two panzer divisions. We have not been able to determine whether US air action would have prevented a rapid redeployment of additional panzer divisions from Panzer Group West.. Although US aircraft were trying to "isolate" the battlefield, the Germans had nevertheless proven quite adept at moving armor around at night.

which in turn could have stalled the US attack entirely.[8] Alternatively, had three or four uncommitted panzer divisions been present at the outset, it is improbable that Cobra would have succeeded at all.

The initial success of Operation Bluecoat can also be attributed at least partly to surprise. German defenses opposite the British right, confronted by the 11th armored division, were quite thin because the Germans were still preoccupied with the threat to Caen farther east, the site of the earlier Goodwood offensive. Yet, the German mechanized reserves were still available and in working order. Once the initial surprise had worn off, the British were unable to prevent the Germans from repositioning them and ultimately bringing the British attack to a halt.

Operations Goodwood and Luttich (the German Mortain attack) illustrate the problems of attacks against a ready enemy. The Germans figured out the British plan at Goodwood about 24 hours before the actual attack. This permitted them to shift reserves and improvise a defense in depth. Although they were able to exploit a number of manmade and natural terrain features, particularly the high ground of the Bourgebus ridge, they had little time for mine laying, then a standard and notably effective German defensive tactic. Ironically, the jump-off of the British attack was greatly hindered by their own minefields, the maps of which had been lost. This suggests that German minefields, had they been present, would have been even more effective. In spite of a substantial superiority in numbers, and a larger initial air bombardment than Cobra, the British breakthrough operation failed, with very heavy tank losses.

The Germans suffered similarly from the compromise of their plan at Mortain. It is quite clear that the Allies were well prepared with strong reserves in depth. The Allies did not alert their frontal defenses--the 30th Infantry Division, until hours before the German attack. This is not explained by any history we have found, but I surmise that the Allies did not want to take the risk of compromising Ultra, the source of their intelligence. A weak and poorly planned German effort ran into a virtual killing zone.

[8]On the other hand, this would have created new offensive opportunities for the British.

Surprise is often viewed as a tool of the offense, but Mortain and Goodwood illustrate the value of surprise to the defense. In both cases the defender acquired intelligence that permitted the movement of reserves to the threatened zone, which was achieved without tipping off the attacker. The fact that defensive surprises can happen, and can exact a very high price, is a cause for caution among those planning and executing breakthrough operations.

**Materiel**

Breakthroughs and exploitations are among the most demanding military operations, especially when conducted against a competent defender. They thus require a lot of resources. An oft quoted rule of thumb suggests that attackers need at least a three to one ratio in combat power relative to defenders--usually measured in weaponry, manpower, and combat units. Our own research suggests that substantial local superiority was necessary, but our sample is small. Somewhat surprisingly, once the German effort in the Bulge is disaggregated, the breakthrough successes that we observe involve an attacker with a better than three to one superiority in engaged maneuver units in the initial assault, and a sustained engaged force ratio well over two to one.

We can shed more light on the purposes to which material superiority is put, and some of its qualitative aspects. First, material superiority may be needed to breach the forward defenses. Where the attacker cannot find a thin defense, he must create it with firepower. The US and the British employed a mix of artillery and strategic bombers--the latter delivering well over 80% of the explosive tonnage in Goodwood and Cobra. On the Eastern Front in WWII, the Russians relied on artillery and tactical aviation to achieve the destruction wrought by Allied bombers in these Western Front battles. It would have taken at least an additional five hundred US 155mm howitzers, with an additional 80,000 rounds of ammunition, firing at a constant 2 rounds per minute, to equal the more than 4000 tons of ordnance dropped by US bombers and fighter-

bombers in under ninety minutes.[9] This helps explain the monstrous strength of Soviet artillery in WW II--it was essential for blasting holes in the defense.

Superiority is also necessary to deal with the tactical advantages of the defender, noted earlier, advantages that the attacker must overcome. The attacker may have to pay quite a lot in casualties to do so.

Large operational reserves, an offensive "second echelon," are necessary to provide the fresh forces that help turn a breakthrough into an exploitation. Cutting through the frontal defenses will often weaken an attacker's first echelon of forces such that they will be in poor shape to deal with the defender's operational reserves, if any. Thus the attacker's second echelon is the insurance policy against the failure of other measures to divert, delay, or destroy the defender's operational reserve. Finally, the defender may have a sufficiently credible reputation for vicious counterattacks, that the attacker's initial forces must veer off to the shoulders of the penetration to defend against them.

One noteworthy commonality in the Cobra and Bulge successes, and the Bluecoat partial success, is that all three breakthroughs were led by infantry units supported by tanks and assault guns. Fully armored units followed immediately behind. The unsuccessful Goodwood operation led with armored divisions. And the German offensive at Mortain was also lean on infantry. While one could argue that it was simply the scarcity of fully armored formations that produced this outcome, its correlation with success merits an attempt at explanation.

Perhaps the main reason why infantry is preferred is that the defender is often dug in and camouflaged. Even if the initial shelling and bombing has eliminated much of the resistance, it is difficult to tell without checking. Infantry is best for finding and taking these positions. I would further speculate that the attacker wants to take advantage of the suppressive (not merely destructive) advantages of his initial barrage or bombing. To do so, he must quickly flood the

[9]Given the higher proportion of explosive to metal in bombs than shells, even more artillery ammunition would have been needed to equal the raw explosive power of the bombing. Shells would have distributed their explosive power more efficiently across the target area, however.

areas attacked with force. For short distances, against shocked defenders, foot infantry with direct support from tanks is quite mobile and occupies very little trafficable terrain or road space. It also provides a wealth of information about whether or not the enemy is crumbling. Finally, as observed in Cobra, foot infantry can get out of the way on command to make room for the offender's advancing armored reserve.[10]

I would speculate further that the transition to a full-fledged exploitation, and sustainment of its momentum, is so difficult that the attacker prefers to have very fresh forces available. If the attacker fights the initial penetration battle with heavily mechanized forces, and encounters serious resistance, the battlefield may become quite cluttered with combat and support vehicles, alive and dead. The initial offensive units may have suffered sufficient attrition, and expended sufficient energy, that they cannot make the transition to the exploitation. Yet, it would prove difficult to pass offensive reserves through them in a timely fashion. World War II infantry units, due to their relative dearth of combat vehicles, may have been ideal for the first eight or ten kilometers of the assault particularly in the close terrain in which these battles generally occurred. (Eight or ten kilometers would have been the likely limit of the range of their own artillery firing from its initial positions.)

We have observed that breakthrough operations depend upon two other "unsung" assets for their success. The areas over which breakthrough battles have been fought are a mess. They are usually saturated with mines and unexploded ordnance, and cut up by demolitions and the attacker's own bombs and shells. Destroyed and disabled vehicles are likely to be plentiful. A

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[10]. This is largely speculation. If we are right about WWII, it is still difficult to guess whether or not, or under what conditions, such calculations would govern today. Most of the forces that NATO or the Warsaw Pact would have committed to a European war would have been mechanized. Even so, discussions of breakthrough operations in that "possible war" tended to assume that Soviet motorized infantry (effectively mechanized) divisions would lead any breakthrough effort. In Desert Storm, the US 1st Infantry Division (mechanized) made the initial penetration of the Iraqi line. These units, of course, are accompanied by infantry fighting vehicles, tanks, and tracked support vehicles of every kind. Thus, they could cause quite a lot of clutter themselves. Presumably, some care would be taken to ensure that initial assault echelons take with them only as much equipment as is essential for their initial task. It seems possible that heliborne infantry could serve some of the functions formerly fulfilled by foot infantry in WWII, and do them better.

tremendous engineering effort is usually necessary to open routes through which supplies and reserves can safely pass. The utility of engineers is best demonstrated in the Cobra breakthrough, the consequences of a dearth of such forces is best demonstrated by the German experiences in the Bulge.

Fast moving armored columns engaged in exploitation will require some resupply of ammunition and more particularly of fuel. Mobile logistics capabilities are thus also of critical importance. A dearth of these capabilities also penalized the German exploitation in the Battle of the Bulge.

Although we can find all these important uses for material superiority, it is important to note that its presence in both Goodwood and Bluecoat proved no guarantee of victory. Material superiority was not even a guarantee of rapid progress. In the case of Goodwood, a massive bombing similar to that at Cobra was no guarantee of annihilation of forward defenses and could not cope with the immense long-range tank killing power of German tanks and 88mm guns arrayed in subsequent positions and in operational reserve. Though generally strapped for resources, the Germans mustered very favorable local force ratios in the Bulge against thin US defenses, but they still could not achieve a sufficient rate of forward progress to outstrip the defender's ability to collect reserves from elsewhere.

**Supporting Attacks**

For breakthroughs to succeed and transform themselves into successful exploitations, local supporting attacks to pin down the enemy on each side of the initial penetration are necessary. The defender needs to be prohibited from bleeding tactical reserves from the immediate flanks of the main penetration and employing them for local counterattacks. Supporting attacks must be proximate in space and time, and have enough strength to seem serious. It would be wrong, however, to suggest that their precise timing can be easily calculated in advance. Larger supporting attacks elsewhere across the front are a reasonable way to draw off operational reserves.

It is also necessary to divert the attention of the enemy artillery on either side of the penetration to their own front. Artillery fire from the flanks is perhaps the defender's most flexible and responsive asset. If it is not suppressed or otherwise occupied, it will be free to fire into the penetration, as occurred on the Elsenborn ridge, the northern shoulder of the German penetration at the Bulge. US artillery to the north of the German main effort was similarly deadly at Mortain; German artillery or heavy mortar fire from the US right during the initial penetration at Cobra was also briefly effective.[11] Arguably the German artillery in back of the Bourgebus Ridge did the same during Goodwood.

Cobra's local supporting attacks were quite good; though the important VIII Corps attack on the VII Corps right flank may have started slightly late. It jumped off only a day after VII Corps, but the delay gave the opposing Germans time that they seem to have used well. They managed a stubborn withdrawal, collected some reserves to attack the right flank of VII Corps, and developed a hasty defense that at least initially prevented it from turning across the German line of retreat for a successful envelopment. The German withdrawal was also shielded by extensive minefields, though it is unclear whether these were hastily laid during the attack, or prior to it. It seems plausible that an earlier VIII Corps attack would have better fixed these German forces, slowed their withdrawal, and reinforced the action of VII Corps.

One may look at Goodwood and Cobra, separated by perhaps 70-80 km, as two battles of a larger theater-level breakthrough operation on the scale of the German assault at the Bulge, or of a Russian or German operation on the Eastern Front. There was probably a greater interval between Goodwood and Cobra, however, than made operational/tactical sense. This may be attributable to the weather. Originally Goodwood was meant to jump off on July 18, and Cobra

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[11]. Students of artillery might argue that this problem is becoming worse for the attacker, since modern medium guns or multiple rocket launchers now have ranges of up to 30 or even 40 km, and their ability to deliver anti-armor cluster ordnance or scatterable mines gives them greater lethality than WWII guns against vehicles. Precision guided sub-munitions will ultimately provide still greater capability. WWII artillerymen relied on dense concentrations of standard high explosive shells to damage tank engines and tracks with fragments. The relatively common US 155mm howitzer had a range of 15 km.

on the 20th. Poor weather delayed Cobra until July 25. The strong British attack at Goodwood had as one of its intended effects the occupation of the bulk of German mechanized power at the eastern end of the Allied Normandy lodgment. The obvious British armored strength still opposite Panzer Group West, even after Goodwood expired, created a threat--an "unfought battle," with consequences similar to a real, simultaneous supporting attack. The jump-off of the planned Bluecoat operation was advanced to July 30 to support the exploitation of the (by then) already successful Cobra breakthrough. Both British operations did then tie down most German Panzer divisions and helped to ensure that the Americans would face no German operational reserve. The competitive quality of US and British military historiography introduces some "cognitive blinders" that often make these battles appear quite independent of one another. They were not, but they do exhibit less coordination and more "friction" than one might have observed in an operation of a single military organization with a clear doctrine for breakthrough operations. General Montgomery tried to put the best face on Goodwood after the fact by suggesting that the diversion of German armor had been its main purpose. Montgomery had fueled expectations of Eisenhower and the RAF generals who released their bombers to support the operation that Goodwood would produce a full-scale breakthrough.[12]

Mortain's supporting attack never got off the ground, and this seems to cost the Germans considerably.

Bluecoat itself had local supporting attacks insofar as two British corps attacked simultaneously. But the incompetent command of the XXX Corps on the left, and bad communications and coordination with the US corps to the British right watered down the possible advantages.

Goodwood, as the relevant chapter demonstrates, was plagued by a host of problems. Two relatively strong supporting attacks were launched. The one west of Caen on July 15,

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[12] For a detailed account of both the battles, and the controversy over their interrelationship, see Carlo D'Este, Decision in Normandy (Harper: New York, 1991, first published 1983), especially Part III: "Breakout."

seems to have diverted the 1st SS Panzer division for a brief period. But it did free itself from the line in time to redeploy as a tactical reserve against the main British offensive. Arguably the British would have been better off delaying that attack until July 18 to coincide with the main Goodwood effort. The Canadians launched a second attack on the immediate right of the British armored corps, into the southern suburbs of Caen, which seems to have been evacuated by the Germans once they realized that British armor was in the process of cutting off their line of retreat. Since Bourgebus Ridge was the obvious problem for the British, they needed a realistic solution. They either required a force structure that incorporated sufficient mobile artillery to suppport an attack up the ridge by their lead units, or, preferably, a second bombing attack to be delivered late on the first day or early on the second day of the offensive. Apparently the air commanders offered an additional attack, but the ground commanders declined. One member of our group argues that the British ought to have mounted their main effort further to the west, in the zone of the earlier Epsom offensive. A two division armored corps might have done well there, while one armored division and several armored brigades and infantry divisions tried to deceive the Germans that the main effort was to the east where it in fact fell.[13]

The Germans had the right idea at the Bulge, and their offensive probably had sufficient breadth, by the standards of their early wartime experience. Their 100km front is probably the largest coordinated effort among our Western Front cases. But the Americans turn out to be too fast--in terms of decision making and mobility. They are also too strong to the immediate north and south. Patton seems to have sensed the US vulnerability in the Ardennes and had a contingency plan ready. His own intelligence officers suspected trouble.[14] The terrain, coupled with the fairly high degree of initiative and persistence displayed by some American troops, helped slow the Germans. Given their overall material weakness, it is difficult to see how the

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[13]. Ken Pollack offered this observation.

[14] Deutsch, "Commanding Generals and the Use of Intelligence," in Michael Handel, ed., Leaders and Intelligence, (London: Cass, 1989), p. 250; and Oscar W. Koch, G-2: Intelligence for Patton, (Philadelphia: Whitmore, 1971), pp. 80-95.

Germans could have done any better. They lacked the strength to tie down US units to the north and south of their main effort.

## THE CONDUCT OF BREAKTHROUGH BATTLES

The attacker's success seems to be strongly influenced by three "tactical" factors--combined arms, maneuver, and tempo. These strongly influence whether or not previous measures that aimed to reduce the density of the defender's forces, or the size of his operational reserves, will be exploited before the defender recovers.

-Combined Arms Tactics

Failure to integrate the action of infantry, artillery, and tanks repeatedly produces major problems for the attacker. Without reviewing the fundamentals of tactics, each arm has a special capability that may solve problems for the other, and therefore reinforce its action. These tactics cannot be improvised; they must be understood and rehearsed before the battle. By 1944, the working consensus in the US and British armies seems to have settled on roughly a battalion of tanks (40-60), a battalion of mechanized or motorized infantry (600-800 soldiers), and a battalion (12-18) of self-propelled howitzers as the appropriate proportion. A British brigade or a US Combat Command appears to have had the capability to command and control two such teams.[15] Tanks and infantry could be, and often were, mixed at even lower levels depending on the tactical situation.

The attacker wants to begin his exploitation before the defender can determine what is happening and deploy available operational reserves. Even if the initial defenses are rendered "thin," through massive bombing and artillery attacks or the defender's scarcity of resources, the attacker will likely encounter surviving strong points. He does not want to be held up by them, so it is best if each team has all the necessary tools to eliminate or suppress them--tanks, infantry, artillery, and engineers. If the enemy has been rendered "thin" on the ground, it is

[15]. By 1944 it was more often the case that a US Combat Command managed only one such team

frequently possible to bypass some strong points to maintain the momentum of the attack. But they cannot be left intact forever, or they will harass the forward movement of supplies and reserves. Thus, the option to bypass them is safer if the attacker is moving forward with multiple combined arms teams. One team can bypass a strongpoint and move on, confident that another team to the immediate rear will be able to deal with the defending survivors. Alternatively, teams can leapfrog each other.

The British suffer considerably at Goodwood from their weak commitment to combined arms tactics; they do little to organize effective tank-infantry-artillery teams, and they pay the price when the dispersed German survivors of the original bombing and artillery barrage recover to harass the forward British armored brigades from the flank and rear. With the Germans secure in small stone farmsteads and villages, the largely autonomous tankers were in no position to suppress them or root them out. Evidence that the British understood their problem surfaces in the Bluecoat operation, where the British make some efforts to organize such teams. The British also seem to have weak abilities to operate these forces together in mutually supporting fashion, even when they are properly organized. Ostensibly, the British suffered in Goodwood because they outran the range of their artillery, and the battlefield was too cluttered to bring it up speedily. But it is noteworthy that the British armored division had only 24 organic self-propelled howitzers capable of keeping up with the advancing tanks; the US armored division had 54. (In Cobra they had even more, since they were reinforced with Corps assets.) As the war progressed the US added six tanks mounting 105mm howitzers to each tank battalion--bringing the total self-propelled artillery for a standard US armored division to 72 guns.)

In the Cobra operation the US forces take great care to organize their exploitation forces into balanced teams. In general the ratio of tank to infantry to artillery battalions is 1:1:1 and the forces often move in that configuration. Moreover, some observers agree that the brutal experience of hedgerow fighting had forced US soldiers to learn quite elaborate combined arms

tactics down to the platoon level.[16] Although it is widely noted that US forces depended heavily on their artillery in the European theater, this is not a fair judgment of the Normandy campaign. Without very close cooperation of tanks and combat engineers, US infantry, supported by artillery, might never have found a solution to the combination of hedgerow terrain and German defensive skill.

The Germans do not use artillery very much in Operation Luttich, the Mortain attack. It may be that they simply did not have it, since the operation was hastily thrown together. And we know that ammunition had become scarce. It is difficult to distinguish the price they paid for weak artillery from the price paid for their more general weakness.

During the initial attacks in the Ardennes, the Germans employed quite a lot of artillery, but not with any great finesse. The initial barrage clearly shocked its victims, but it is difficult to find an instance of US withdrawal unambiguously caused by artillery. Cooperation between German tanks and assault guns, mortars, and infantry varies surprisingly across the front. This is a function partly of the fact that many German units are relatively green--hastily formed and poorly trained. The Germans were also obsessed with operational security, which limited their reconnaissance activity and probably prevented registration of most of their artillery. Those initial attacks that do not carefully combine arms, often do not succeed, or succeed only at great cost. As the Germans begin to penetrate US defenses, they leave much of their artillery behind; presumably because it is horse-drawn and hence not very mobile. They also lack the mobile logistics capability to supply it with ammunition. Thus, US artillery seems relatively unbothered

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[16]. Captain Michael D. Doubler, Busting the Bocage: American Combined Arms Operations in France, 6 June- 31 July 1944, (US Army Command and General Staff College Combat Studies Institute: Fort Leavenworth Kansas, 1988) "Between 19-25 July, the 22d Infantry and CCA's 66th Armored Regiment conducted mock attacks and rehearsals in preparation for Cobra. Tankers conducted classes on the proper distribution of main-gun and machine-gun fire and the correct way to use the "rhinoceros" hedge cutters mounted on 75% of the 66th's tanks. Platoons from the 22d Infantry constantly practiced tank-infantry coordination with the 66th Armored. Infantry units learned how best to mount, dismount, and ride on tanks and taught their soldier how to use the new external telephones mounted on most of CCA's tanks. Infantrymen also found ways to camouflage themselves with vegetation while riding on Shermans." p. 58. This captures the theme of the entire study.

by German counter-battery fire as the battle develops. It is free to blast away at German tanks and infantry with near abandon.

Combined arms also seems to pay big dividends for the defense. Depending on terrain, infantry often does seem able to defend well with a relatively small tank contribution if they have plenty of artillery, towed anti-tank guns, mines, and simple anti-tank rocket launchers. Both US forces in the Bulge, and German forces in Normandy opposite the US Army, get disproportionate help from limited increments of armor. The terrain opposite the Goodwood Offensive, however, required substantial numbers of tanks, assault guns, and long-range anti-tank guns for its defense. Due to their excellent intelligence and speedy reaction the Germans probably had more of these assets concentrated opposite the British than they actually required.

Artillery does appear to be quite effective on defense--opposite the Germans at Mortain and in the Bulge. German artillery, as weak and under supplied as it was, did deadly work from behind Bourgebus Ridge after German tanks and anti-tank guns had stalled the British forward advance at Goodwood. German heavy mortars operating on the immediate right of VII Corps held up its advance.

The term "combined arms" is usually not taken to include the action of air power. But this is the appropriate place to consider its role in these battles. In principle aircraft can provide "close air support" or "battlefield air interdiction." The first delivers firepower in "close proximity" to one's own ground troops, usually in direct communication with them. The second operates independently against enemy ground forces deployed not far from the front, often but not always coordinated with the ground force commander's concept of operations.

The clearest and most striking employment of air power in a "close air support" role, albeit a highly unusual one, was the use of strategic bombers in Goodwood, and Cobra. Supported by tactical aircraft, medium bombers and fighters, they simply generated a huge volume of area destruction against the defenders' front-line positions.

The clearest and most notable application of tactical aviation in the offensive occurs after the US exploitation gets underway in Cobra. US fighters in direct support of armored columns

clearly speed up the pace of the exploitation and pursuit. A battlefield interdiction effort preceded the Cobra attack; its purpose was to further reduce the probability that the Germans could free panzer reserves from the eastern flank of the Allied lodgment, opposite the British and Canadians. Since the British ground effort already had this intent, it is quite difficult to judge the contribution of the air interdiction.

It is noteworthy that the British seem to get little leverage out of their tactical fighters in either the Goodwood or Bluecoat offensive. Since they have virtual command of the air over the battlefield, this is most mysterious. The main obstacle could be weak or nonexistent command and control. Since the British had pioneered in this area in the Western Desert, it is peculiar that they had regressed somehow. US command and control for tactical air in the Cobra breakout is effective. The US appears to have more forward observers, and better communication between air and ground than the British.

In thwarting the Mortain attack, tactical fighters harass the southernmost German column as soon as daylight permits--battlefield air interdiction. The fighters apparently receive little direction from the ground but operate to great effect until the Germans get under camouflage.

Bad weather prevents effective initial use of tactical aviation for close air support by the US defenders in the Bulge. There are, however, a few instances of effective battlefield air interdiction. Once the weather clears, battlefield air interdiction improves substantially, and there are occasional instances of close air support.

For the most part, however, in terms of their effectiveness, both CAS and BAI by tactical fighters and bombers are "dogs that do not bark" in the breakthrough and early exploitation phases of these battles.[17] The main question is why. Among the obstacles to success are poor command and control and intelligence, bad weather, and relatively ineffective munitions. The few cases where we do see tactical aviation employed suggest that when used by the defender, it can inhibit the ability of the attacker to concentrate, or make good progress on the roads. Under

[17] As the US exploitation of the Cobra breakthrough picks up momentum, CAS plays a much greater role.

conditions of virtual air dominance, large concentrations of aircraft can also deliver sufficient conventional ordnance to erode and/or shock a prepared defensive system into temporary inactivity. As noted elsewhere, in this mode air power substitutes for the large Soviet artillery barrages of the Eastern Front in World War II. Finally, it may be that we have missed the "effect of the possible battle." The Germans tended to take great care in moving their armor, showing a strong preference for night transits, out of fearof allied air attack. We cannot find a clear instance where this fear critically delayed the arrival of a German armored reserve, spelling the difference between success and failure in an allied breakthrough operation. But it still may have occurred.

**Maneuver**

Maneuver is closely related to combined arms tactics. Regardless of the "porosity" of the defenses, the attacker must have the initiative and the skill to find and maneuver through the gaps that exist. At the same time, however, the attacker needs to take some care for security against bypassed strong points. This is one reason why both combined arms task forces, and reserves are necessary. Penetrating forces must be able to fix and sidestep isolated defenders, and they must expect that similarly postured forces will follow along behind to discourage mischief.

Maneuver seems critically important both to the Americans in Cobra and the Germans in the Bulge. The Americans regularly mask and sidestep difficult centers of resistance to sustain their momentum. Their very large exploitation force permits this to be done without undue risk. The Americans are perhaps a tad slow in their exploitation, however. They seem not to understand the pace of the German withdrawal, or the relative weakness of the German flank guard. They repeatedly try to turn across the German line of retreat and are hung up. After several botched efforts they determine to go deep on their own left and then cut across the German line of retreat. This works moderately well to contain the Germans.

In the Bulge, the initial German attacks are characterized by multiple penetrations followed by the envelopment of forward US units. Particularly noteworthy is the double

envelopment of most of the 106th Infantry Division by infiltrating German infantry. Subsequently German forces frequently maneuver around US defenses that cannot be overcome, with Bastogne as the best example. Unfortunately for the Germans, their second echelon is too weak to overcome this obstacle. All they can do is mask it--to the ultimate erosion of their logistical capability to sustain their forward most exploiting units.

With the exception of the redoubtable 11th Armored Division during the Bluecoat offensive, we seldom see this inclination to maneuver on the part of British units. It is not clear, however, that more maneuver would have been particularly rewarded at Goodwood. Some obvious strongpoints were bypassed, to no good end.

**Tempo**

Since JFC Fuller's Plan 1919, students of armored warfare have been struck by the importance of speed. Marc Bloch's assessment of the causes of the French defeat in 1940 stressed the decisiveness of this element in the success of the German Blitzkrieg. Attackers in particular must take advantage of any porousness in the enemy's defenses, or scarcity of reserves, to push through to success. Attackers require an awareness of the importance of time and a determination to use it well. Commanders must make decisions promptly. Opportunities must be exploited wherever and whenever they appear. Lower level commanders need to show some initiative. Where night operations are technically difficult, daylight must be fully exploited. Where night fighting is technically difficult, the night must still be employed for planning, movement, maintenance and resupply.

Goodwood is the "violation" that proves the rule; it shows the British at their worst. Vast amounts of time seem to be wasted, especially by commanders. Bluecoat also shows a certain dilatoriness, which is why so many senior officers in the XXX Corps are relieved. Only the 11th Armored Division (in both battles) shows a certain verve.

The US breakthrough at Cobra shows a certain intuitive understanding of "tempo." Nevertheless, a tendency to go to ground remains; troops become easily discouraged on the first day of the battle. To a very great extent it is Collins' willingness to gamble on an early

commitment of reserves that sustains the necessary pace of the operation. Both Combat Commands of the US 2nd Armored Division on the US left also demonstrate a special appreciation for the value of speed, which is somewhat missing from the 3rd Armored Division and the 1st Infantry Division on the US right. The Germans are for the most part quite sensitive to this issue in the Bulge, but the inexperience of some of their units, uneven command ability, difficult terrain, and a few instances of high US competence and resolve slow them up. There are also status questions that hinder important decisions--such as shifting emphasis from 6th SS Panzer Army to the 5th Panzer Army (German regular Army), which was having more success.

On defense the Germans show considerable dispatch opposite the British at Goodwood and Bluecoat; the US shows considerable dispatch opposite the Germans in the Bulge. Where US commanders are slow in the Ardennes, as is General Jones of the 106th Infantry Division, US forces suffer greatly.

## AFTERWORD

The first general conclusion from our work is pedagogical. While there is certainly an element of self justification in the claim, cooperative, comparative case study is an excellent method for self-education on the finer points of military practice. Other operational and tactical questions are certainly susceptible to this mode of exploration for interested scholars, and practitioners, and arguably even for interested lay persons.

Second, some episodes of military history have produced vast secondary literatures. These monographs can be profitably read and studied singly, as individual histories. But in some cases, such as the battles of WWII, the literature is so vast, and of such detail, that it can support comparative analysis for the purpose of drawing operational and tactical lessons.

One final general conclusion about breakthrough operations seems warranted by our casework. They are neither cheap nor easy. Where actual cases of breakthrough seem cheap and easy, and none of ours do, it is probably because the attackers were very good and very strong, while the defenders were quite incompetent, very weak, or both. These conditions capture the

very beginning and the very end of World War II, but not most of it, which is why it was so long and so brutal. Our specific lessons require commonsense adjustment for their application to modern cases. Fixed and rotary wing tactical aviation permits modern attackers to strike the depths of the defenders' positions. They also permit modern defenders to commit a useful "operational reserve" very rapidly. Missile and rocket artillery also have greater range, responsiveness, and lethality against fighting vehicles. Where the attacker is modern and the defender is mired in the methods and weapons of World War II, breakthrough operations may be highly effective. Where the reverse is true, attackers may find themselves even worse off than were the British at Goodwood. Where both forces are modern, only great destruction can be confidently predicted.

## APPENDIX I

## Breakthrough Battle Data Base

I. Battlefield Survey and Opening Bombing and Bombardment

A. Terrain Considerations

1. Percent of ground covered by forest
2. Predominant type of forest: passable, impassable
3. Predominant ground foliage (in non-forested areas): heavy, light, clear
4. Number of discrete towns per km
5. Percentage of ground covered by major cities
6. Number of kms of paved roads per square km in sector
7. Number of linear kms of impassable waterways per sq km
8. Number of square km's of standing water per square km
9. Average % slope in sector

B. Operational Considerations

C. Preliminary Bombardment

1. Aerial
   a. Duration of bombardment (hours).
   b. Length of time in hours between end of bombardment and beginning of assault.
   c. Number of four-engine bomber sorties.
   d. Number of two-engine bomber sorties.
   e. Number of single-engine ground attack sorties.
   f. Number of tons of bombs delivered
   g. Weather: Cloudy. Clear.

2. Artillery
   a. Number of Guns Involved
   b. Number of Tons of Shells

3. Bombardment Results
   a. Number of Square Km's bombedarded
   b. Number of enemy personnel under bombardment
   c. Number of enemy Armored Fighting Vehicles under bombardment
   d. Number of enemy towed artillery tubes under bomb
   e. Number of enemy casualties.

f. Number of enemy armored fighting vehicles destroyd
g. Number of enemy towed artillery tubes destroyed
h. Number of POW's Attributable to Bombardment

D. Theater level air superiority: Attacker, Defender, Contested.

II. Snapshots in Time: Force Comparisons and Battle Result Information

A. Force Comparisons

1. Engaged Forces
   a. Attacker
      i. Number of Units (Nominal)
         Infantry Battalions
         Armored Battalions
         Mechanized Infantry Battalions
         Artillery Battalions
      ii. Number of Battalion Equivalent Units
         Infantry Battalion Equivalents
         Armored Battalion Equivalents
         Mechanized Infantry Battalion Equivs
         Artillery Battalion Equivalents
      iii. Quantities of Personnel and Equipment
         Combat Soldiers
         Heavy Tanks
         Medium Tanks, Tank D's, Assault Guns
         Other AFV's (Lt tks, A.C.'s, Hlf Tracks)
         Other Motor Vehicles
         Anti-Tank Guns (75 mm and up, inc 88's)
         SP Artillery Tubes
         Towed Artillery Tubes
         Hvy Mortars (100mm) and Rocket Lnchrs
      iv. Additional Information
         Tons of Artillery Ammunition Expended
         Number of four-engine bomber sorties flown
         Number of two-engine bomber sorties flown
         Number of one-engine ground attack sorties
         Number of tons of bombs dropped

   b. Defender: Same as 1 a.

2. Battlefield Reserves: Same as 1.

3. Allocated Theater Reserves: Same as 1.

4. Forces Engaged in Tactical Exploitation: Same as 1, a, i.

B. Combatant and Battlefield Conditions During 24 hour period

1. Weather conditions and effects on ground
    a. Visibility: Good, Poor, Mixed.
    b. Ground: Firm, Soft.

2. Air Superiority: Attacker, Defender, Contested, No effect.

3. Counter-attacks
    a. How many Bn or larger sized counter-attacks were undertaken by the operational defender?
    b. How many battalions were involved in these counter-attacks?

4. Communications
    a. Attacker's Communications: 1. Good, 2. Fair, 3. Poor, 4. Data too inadequate to judge.
    b. Defender's Communications: 1. Good, 2. Fair, 3. Poor,
4. Data too inadequate to judge.
5. Logistics
    a. Attacker's Logistics: 1. Good, 2. Adequate, 3 Marginal, 4. No data.
    b. Number of tons of supplies received per attacking battalion engaged or in tactical reserve.
    c. Defender's Logistics: 1. Good, 2. Adequate, 3. Marginal, 4. No data.
    d. Number of tons of supplies received per defending battalion engaged or in tactical reserve.

6. Surprise: 1. Total, 2. Attack detected, but extent of attack unknown, 3. Insignificant.

7. Additional info on Attacker's situation
    a. Axes of Attack
        i. Number of Main Effort Sectors
        ii. Total Km's in main sector FEBA lines.
        iii. Total number of battalions (subset of II.A.1.a.i. above) engaged in main effort sectors.
    b. Incidentals Influencing Engaged Forces
        i. Did foreward Bn's receive logistical support?
        ii. Were fresh forces committed to engagements?
    c. Incidentals Influencing Exploiting Forces
        i. Did exploiting force receive logistics?
        ii. Were fresh forces committed to exploitation?

8. Defender's Considerations and Incidentals

a. Type of defender's fortifications: 1. Hasty, 2. Prepared, 3. Fortified.

b. Depth of defender's organized defenses in kms.

c. Had the defender placed mines?

d. How many mines were in place within sector?

e. Did defender's engaged battalions receive logistical support during the day?

C. Battlefield Results

1. Casualties, Losses, and POW's

a. Attacker

i. Dead

ii. Wounded

iii. Total casualties

iv. POW losses

v. Tank losses (out of service for at least 12 hr)

vi. Other armored vehicle losses

b. Defender: same as 1,a.

2. FEBA movement and FEBA measurements

a. FEBA (including exploiting force in trace)

b. FEBA (excluding exploiting force from trace)

c. Depth of salient: Height of triangle formed by two shoulder points and farthest penetration--exc. exploit

d. Depth of salient: Height of triangle formed by two shoulder points and penetration--including exploit.

e. Total area (in sq km) secured since D-Day.

III. Post-battle Summary.

A. Did a breakthrough occur.

B. Losses

1. Attacker

a. Dead

b. Wounded

c. Total casualties

d. POW losses

e. Tank losses (presumed never returned to service)

f. Other armored vehicle losses

2. Defender: Same as III.B.1.

C. Movement

1. FEBA movement:  maximum permanent forward movement of FEBA.
2. Total area secured
3. Final linear distance of FEBA

## APPENDIX II

## Breakthrough Battle Data Base: Guidance for Data Collection

I. BATTLEFIELD SURVEY: The database is divided into three parts. Part I and Part III deal with parameters that will not change on a periodic basis and need only be assessed once. Part II includes those things we want to capture for each 24 hour period.

I.A. TERRAIN: For practical purposes, all terrain analysis will be conducted using military 1:100,000 scale maps and as much qualitative description and photographic evidence as we can find. The battle zone covered in analysis should include all ground from the line of departure to the furthest area attacked or seized. This may distort an "objective examination" of terrain conditions in the region, but it also solves many practical problems about defining the battle zone.

I.A.1. FORESTATION: Determine what percentage of the ground is covered by some type of forest or orchard.

I.A.2. FOREST TYPE: Two distinctions will be made about the most common type of forests found in the zone based on whether a tank, with no engineering support, could make its way through the area.

I.A.3. GROUND FOLIAGE: Looking at the extent of ground foliage in non-forested areas, three distinctions will be made. If the area is predominantly covered by cropped grass or arid land, it will be declared "clear." If the area is covered by planted crops or long grass which provides concealment from vision (for, say, standing humans) but do not provide cover from fire or obstacles to movement, it will be called "light." If thick vegetation which hinders tracked movement or direct fire prevails, it will be classified "heavy." Boccage country falls in this last category.

I.A.4. URBANIZATION (TOWNS): Number of discrete towns per km--excluding cities of population 5,000 or more.

I.A.5. URBANIZATION (CITY): Percentage of area covered by portions of major cities (population 5,000 or more).

I.A.6. ROAD DENSITY: Number of km's of paved roadway in sector per square km. There is a rationale for this measure. Trust me on this one.

I.A.7. WATER OBSTACLES (linear): Number of linear kms per square km of waterways which can positively be identified as prohibiting vehicular (tracked?) movement within the zone.

I.A.8. WATER OBSTACLES (standing): Number of square kms covered by standing water obstacles, such as swamps or lakes, per square km in battle area.

I.A.9. AVERAGE % SLOPE: This determination can be made by drawing a single horizontal and vertical line through the middle of battle zone. Count the number of 10 m contour lines which your line crosses and divide that total by the total distance in km's of your line(s). The resulting number is the average percent slope. Try it.

I.C. PRELIMINARY BOMBARDMENT: In this section we are trying to capture the general intensity and effect of the opening aerial and artillery bombardments which frequently precede major breakthrough efforts.

I.C.1. AERIAL: When counting sorties, try to count only those missions on which aircraft actually released ordinance. Do not count missions aborted before attack. We do not expect bombs dropped on identified targets and those dropped through clouds to be equally effective. Therefore, the last item will asses general weather conditions (partly cloudy vs clear) which prevailed during the day.

I.C.h. POW's: Count those POW's who, after the initial bombardment, were simply collected after the initial bombardment because they were too stunned, disoriented, or disheartened to resist seriously. Though this is a judgement call, many of the histories provide lucid accounts of such activities, complete with unit names and some approximate numbers. It may also seem reasonable to count prisoners taken within eight hours of the bombardment from units which were heavily hit.

I.D. AIR SUPERIORITY: Here, we are assessing who has control of the skies in the theater of operations. The level of activity during the battle itself will be captured elsewhere, and only the general condition will be captured here. For example, during the Ardennes Offensive, the U.S. would be given credit for theater level air superiority, despite the fact that the weather prevented them from flying many air missions during the first days.

II. SNAPSHOTS IN TIME: The parameters listed in this second half of the database will be filled for each 24 hour period.

II.A.1. ENGAGED FORCES: Within this particular set of force comparisons, various force measures of engaged units will be made.

II.A.1.i. In counting battalions, we will be counting the number of battalions with at least some elements firing, or receiving <u>direct</u> fire from enemy units. In addition, battalions currently conducting tactical exploitation (see II.A.4 below) will be included. Independent units, such as attached companies or independently operating indirect fire units, will not be counted as fractions of battalions engaged. The count of nominal battalions will include battalion formations regardless of their actual strength. Hence, three battalions, each of which is actually at company strength, will still be counted as three battalions.

II.A.1.ii. In counting battalion equivalents, we want to capture some sense of the actual combat power of the various units. "Combat power" being being an aggregate measure, this is of course difficult. Ignoring many of the difficult issues of a purist's approach, we counted fractions of

units. A full unit ("1") is a unit at 100% of its authorized strength. Since German units were largely ad hoc and almost never actually met TO&E strengths, we have used the average strength of units leaving Germany after building or rebuilding as 100%. Specific figures for these units can be found in the U.S. Army manual on German organization and equipment.

II.A.1.iii. In counting the number of soldiers and weapons engaged, all of the items in the battalions mentioned above will be counted. In addition, equipment belonging to independently functioning or attached units of less than battalion size will be counted. Here, the equipment belonging to attached companies will be included in the tally if they are engaged in combat, or if the battalion they are attached to is in combat. Notice that under these rules of thumb, Task Forces will be counted as one battalion in the battalion count, but their (possibly) augmented size will be reflected in a larger weapons count.

"Combat soldiers" are those soldiers assigned to engaged battalions. Hence, many divisional/corps/army personnel in the area will not be captured in this count. "Heavy tanks" denote tanks over 50 tons (for our purposes, this will probably only include the German Mark VI Tigers). Medium tanks will include tank destroyers and assault guns, despite the more narrow infantry support role of the latter. The medium tank category will include all tanks between 20 and 50 tons. Other AFV's will capture light tanks, armored cars, half-tracks, and any other armored vehicle not captured in the other counts (including Bren Gun carriers).

II.A.1.iv. ARTILLERY/AERIAL ACTIVITY: Sorties and bombardments will be counted if they were directed against "engaged" or "battlefield reserve" ground units. See II.A.1 and II.A.2. In other words, if the targets were within 30 kms of the current FEBA, the attacking air units and their munitions dropped will be counted as directed towards the breakthrough effort.

II.A.2. BATTLEFIELD RESERVES: For the defender, unengaged forces not in contact with enemy units within 30 km's of the current FEBA location will be counted as battlefield reserves. Note, that they may be beyond the initial FEBA (or line of departure) and still be counted as reserves, if they are not beyond the current FEBA. The defender will apply the same rule for counting battlefield reserves, with the additional stipulation that only forces earmarked for the attack will be counted.

II.A.3. ALLOCATED THEATER RESERVES: All forces more than 30 km's from the FEBA, which have been specifically allocated for use in either support of or defense against the ongoing operation will be counted in this category. If the theater commander allocates more forces to the sector because of the gravity of the situation, this will be reflected in a growing theater reserve force size.

II.A.4. TACTICAL EXPLOITATION FORCES: This is a subcategory of engaged forces, and ALL BATTALIONS COUNTED AS EXPLOITING WILL ALSO BE COUNTED AS PART OF THE ENGAGED FORCE. In addition, only battalions will be counted. The intent is to capture the general level of penetration which has been suffered by the defender and the degree of freedom of maneuver the attacker has gained behind enemy lines.

The following are rules of thumb for determining whether a unit is exploiting. They must all be met. 1. The unit generally has freedom of maneuver. If a unit is moving upwards of 5 km's a day it probably fits the bill on this account. AND 2. The unit is not continuously engaged

by the defender's maneuver units and does not heavily engage maneuver forces of company or larger size in any one engagement during the day. AND 3. The unit has moved beyond the area where other battalion sized units are heavily engaged along a roughly continuous front (what we are calling the FEBA).

II.B.1. WEATHER AND GROUND. In determining visibility, we are looking at ground visibility. A day with poor visibility would be one in which ground fog or heavy (sight limiting) rain predominated throughout the day. A day with good visibility would be clear all day, and a mixed one would have periods of ground fog. In determining ground conditions, solid ground will be either 1. dry ground, or 2. frozen ground, if that ground is not under deep snow (say, over 12 inches). Soft ground would be either soaked or covered in deep snow.

II.B.2 AIR SUPERIORITY.

II.B.3. COUNTERATTACKS. We are primarily interested in the extent to which defending forces are engaged in counter-attacks. In counting the number of counter-attacks, the following should be counted as a single attack: units of a single division counter-attacking enemy forces, if and only if those units share a single objective. Forces from two or more divisions are generally assumed to be undertaking two separate counter-attacks, unless there is specific textual evidence to suggest that their activities were coordinated towards the same ends.

Though the number of counter-attacks may be a useful measure to have, the easier one to ascertain is how many battalions were involved. Here, tally up the number of battalions participating in all counter-attacks in the same way that we counted battalions engaged. (In fact, this number, for the defender, will be a subset of battalions engaged). Fractions of battalions and attached subordinate elements will not be counted as fractions.

II.B.4. COMMUNICATIONS. Assessing the quality of communications will of course require judgement. In order to simplify the task, we will limit our investigation to division level communications, since that echelon provides the link to the highest and lowest elements we will be considering in the broader study (i.e. divisions are in contact with Corps, Army, and Battalions).

In coding the quality of communications we will use a four point scale. Good communications are those in which important communications can be transmitted and received without undue difficulty. Fair communications are those in which divisions are in contact with higher headquarters, though there may be some confusion in their dialogue, and in which entire battalions may be without communications links to parent divisions for long periods (perhaps four hours) during the day. Poor communications suggest that divisions are out of contact with higher headquarters for long periods during the day. If there is inadequate information on which to judge, that too will be indicated.

II.B.5. LOGISTICS. Here we are also using a judgmental scale, and are relying primarily on rules of thumb. A "good" rating would suggest that units are not restricted during the day in their use of fuel or ammunition in accomplishing their military tasks. There is no significant rationing taking place. An "adequate" rating would be given to a force if rationing is taking place but in which major targets are not left unserviced and in which vehicles are not abandoned or important moves not made in order to conserve ammunition and fuel. A "poor" rating, then,

would be assigned to units which were forced to abandon equipment, which had major units (battalions) out of ammunition, or which were stripping some units to equip or supply other units. Again, cases of inadequate data should be indicated as such. A more specific measure (number supply tons received) has been included in the unlikely event that such information is available.

II.B.6. SURPRISE. 1. Total, 2. Attack detected, but extent unknown, 3. Insignificant. If strategic surprise was achieved, and at the start of the day in question the defender's higher headquarters were not expecting a major attack, then the first code ("total") should be assigned. By definition (except perhaps when the defenders are part of the Italian Army), this first code can only apply on the first day of an operation. If the defender is, at the start of the day, still guessing about the magnitude of the attack, about its character, or about its general direction, then the second code would apply. Invariably, there will be some tactical surprises on almost every day of battle, and this parameter is not intended to capture those small unit considerations. Only if there is major uncertainty about the general shape of the attack should this second code be applied. If the defender feels fairly sure about the general nature and magnitude of the attack (how many divisions plus or minus 20%), then the third code should be assigned. It is expected that, as time progresses, the code assigned will change.

II.B.7.a. AXES OF ATTACK. For practical purposes, the number of main sector attacks will be assessed by counting distinguishable "clumps" of divisions (Armies in Soviet language, Corps in U.S., British, or German language), attacking with intensity at different points. Where there is space between corps sized efforts which is populated by "holding" units, separate axes will be counted. Where corps attack shoulder to shoulder, multi-corps attacks will be counted as a single effort. Some judgement will obviously be required in determining whether units are conducting holding attacks or whether they are part of a main effort.

II.B.7.b&c. INCIDENTALS. These questions refer to forces defined earlier as engaged (b) and exploiting (c). For each, we ask, did those battalions receive fresh supplies during the day in question? Do the units listed under those headings include any that were not in the previous days count? The total number of battalions in a category could go down during a day, while the answer to the second question could still be "yes." In that case, some battalions would have been rotated away from the front while a fewer number of fresh battalions took their place.

II.B.8.a. FORTIFICATIONS. Hasty defenses are defined as those which have been prepared by and large using battalion assets. Hasty defenses normally include slit trenches, rather than more elaborate bunker structures, obstacles, "artificially" cleared fields of fire, wire emplacements, etc. Prepared positions are more elaborate. They will generally include wire obstacles, abbatis where appropriate, conversion of buildings into strong points, and the erection of earth and log bunkers. Fortified positions are designed for permanence. They are characterized in modern times by the pouring of concrete. They will include concrete gun emplacements, bunkers, and obstacles. They will also include more extensive use of earth moving machines to create additional obstacles and defensive works.

II.B.8.b. DEFENSIVE DEPTH. Here we will measure the depth of occupied battle positions. Notice that this definition excludes areas in which troops are merely resting (not prepared in

position) and that it also excludes areas in which secondary (fallback) positions have been prepared but which are, at current, unoccupied.

II.C.1. CASUALTIES AND LOSSES. Total casualties can obviously be derived from the killed and wounded categories. The measure is included separately in case there is not sufficient data to justify using more specific categories. Tank and armored vehicle losses in this section will include vehicles which appear to have been taken out of action for a period of twelve or more hours. In reality, a precise measure will be difficult and this entry is intended to reflect narratives which describe momentary losses. In other words, this entry will include tanks which are hit but may, in fact, reenter battle the following day. In contrast, those armored vehicle losses counted in Part III of the data base will be limited to vehicles, which, as far as can be determined, never reentered battle.

II.C.2.c. FEBA MEASURES. We will make two measures of total FEBA length, one conservative, the other liberal. The terms conservative and liberal are applied to the definitions of their measure, not to the element of guess-work in our ultimate determinations. The conservative FEBA measure will measure the distance along the line of more or less continuously engaged units, excluding exploiting units from the line and from the measure. The liberal measure will do the same thing, except it will include a trace out to exploiting units. Similarly the conservative measure of the depth of the salient will measure the height of the triangle formed by two shoulder points and the farthest penetration, including exploiting units, while the conservative measure will exclude those units. Area secured will measure the area bounded by the original FEBA and the current FEBA, with the shoulders serving as the hinges of the lines.

[Define weapon types. eg. Heavy tank is so many tons or more etc.]

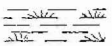
## Map Key

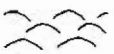

Built-up Area


Town


Village


Forest


Marsh


Hills

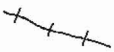

Slope

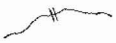

Coast

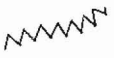

River


Bridge


Road

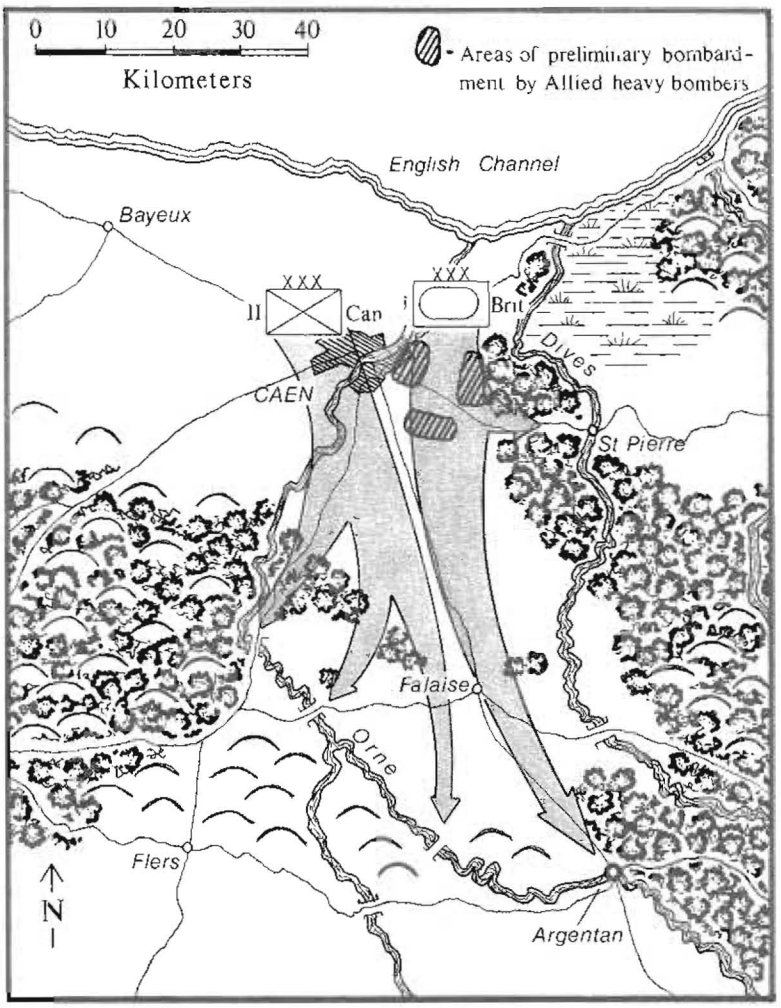

Railroad


Road Block

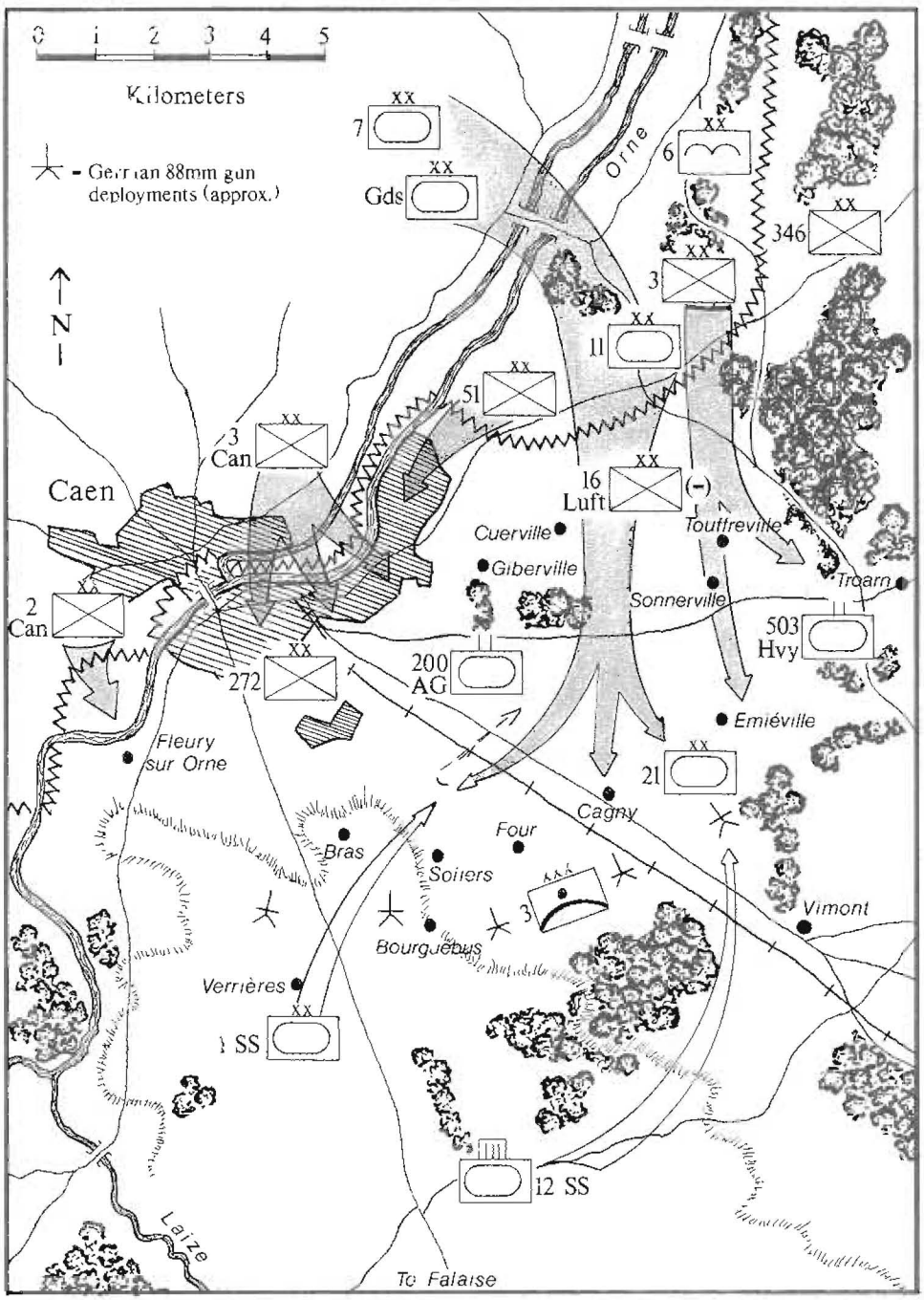

Defender's Front Lines


Attacker's Movement

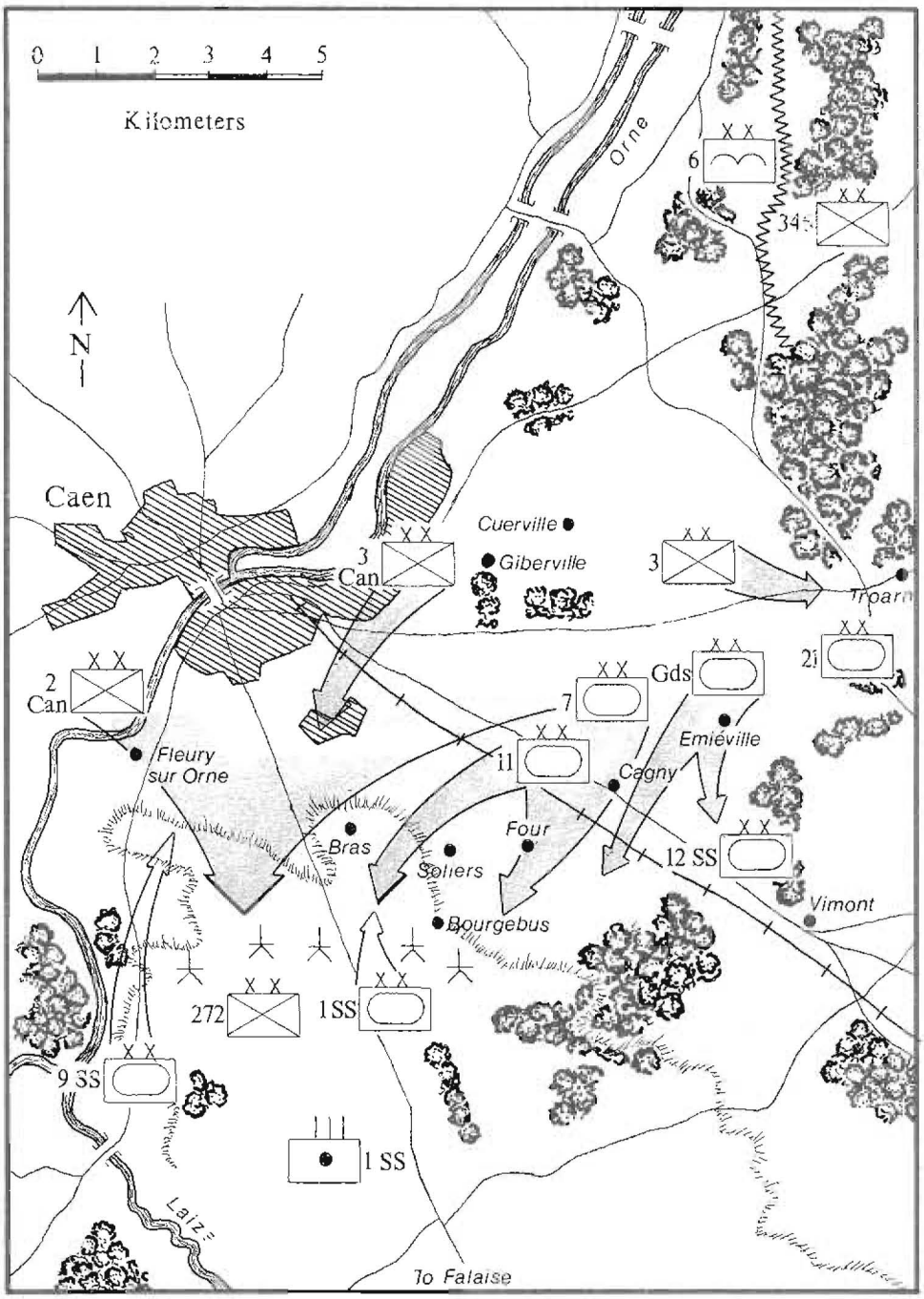

Defender's Movement




Planned British Goodwood Offensive




Goodwood - Operations on Day One


0 1 2 3 4 5
Kilometers
N
Orne
Caen
Cuerville
Giberville
3 Can
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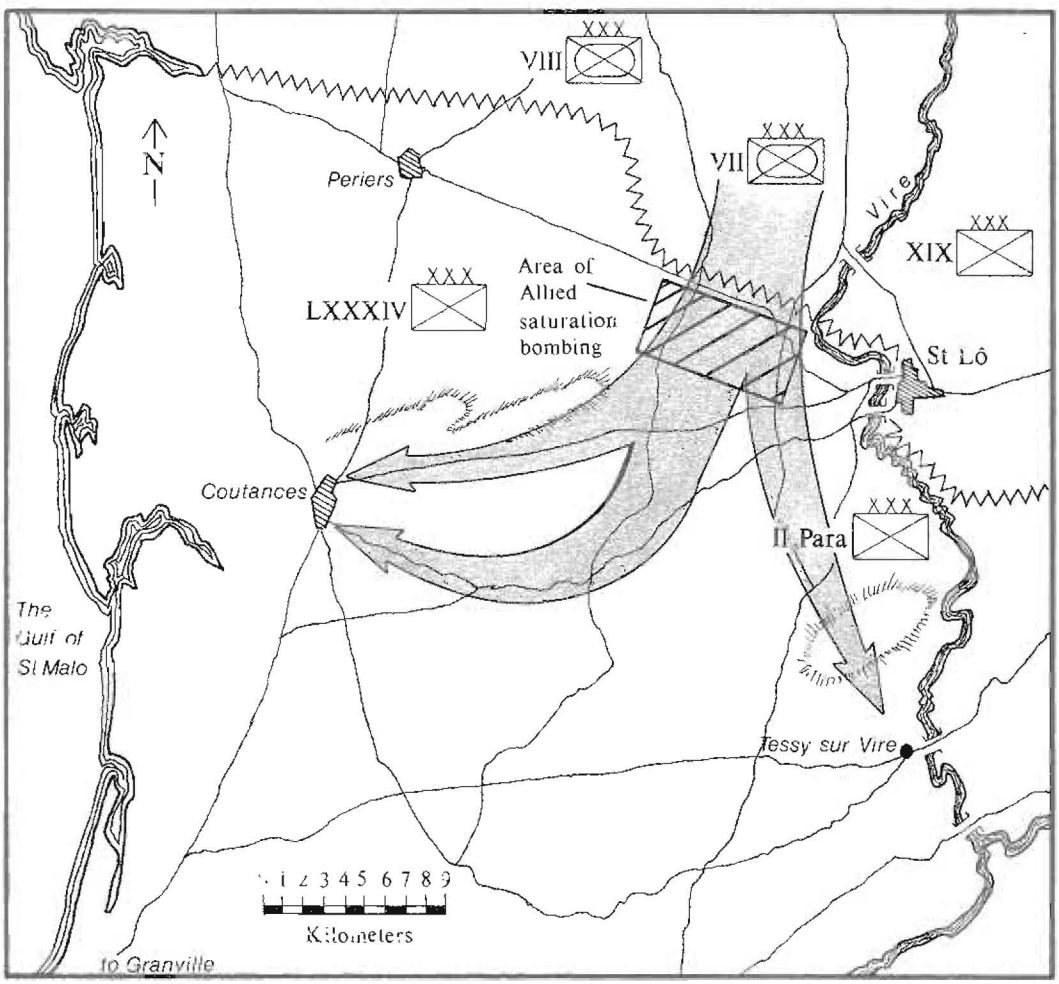
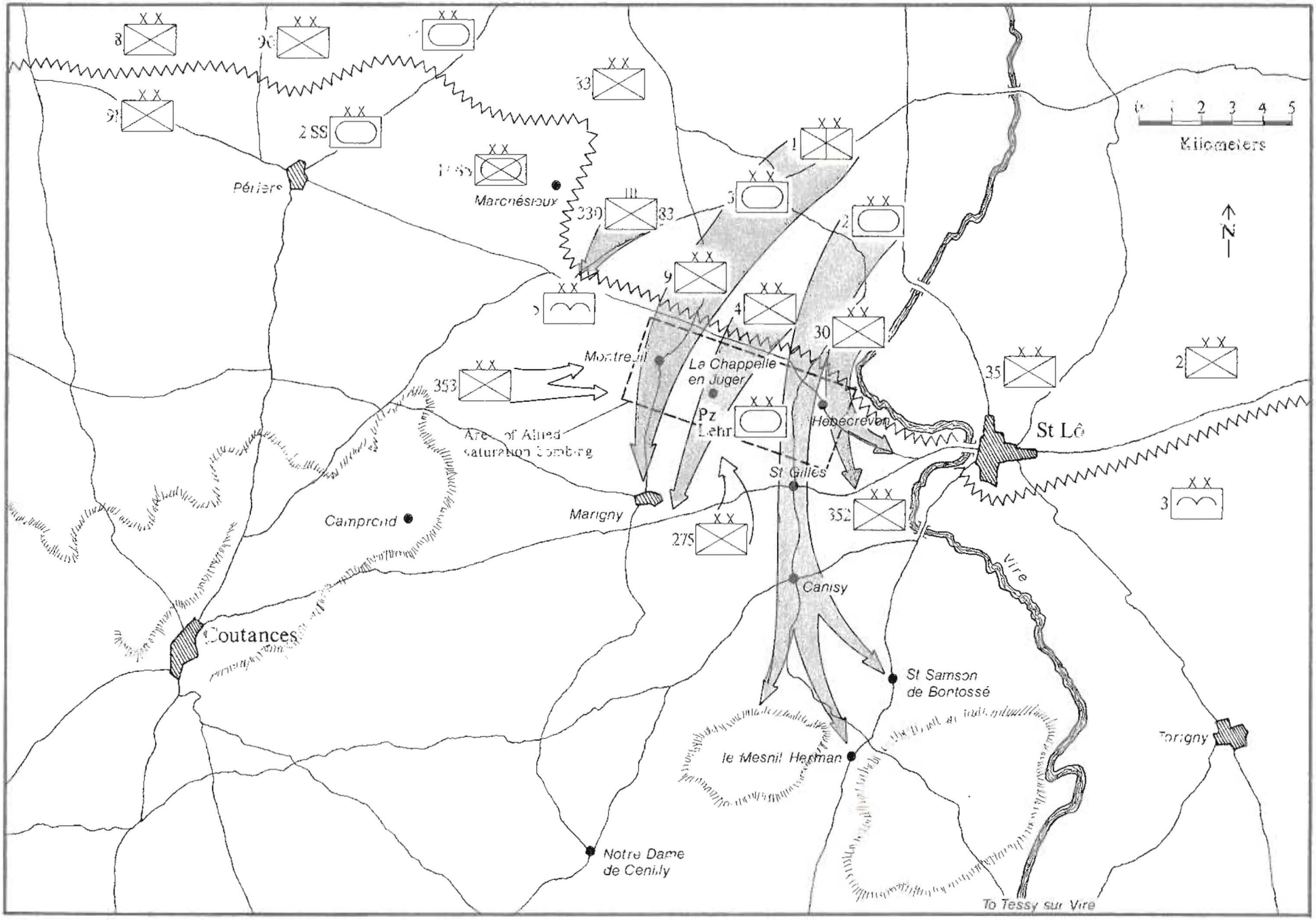
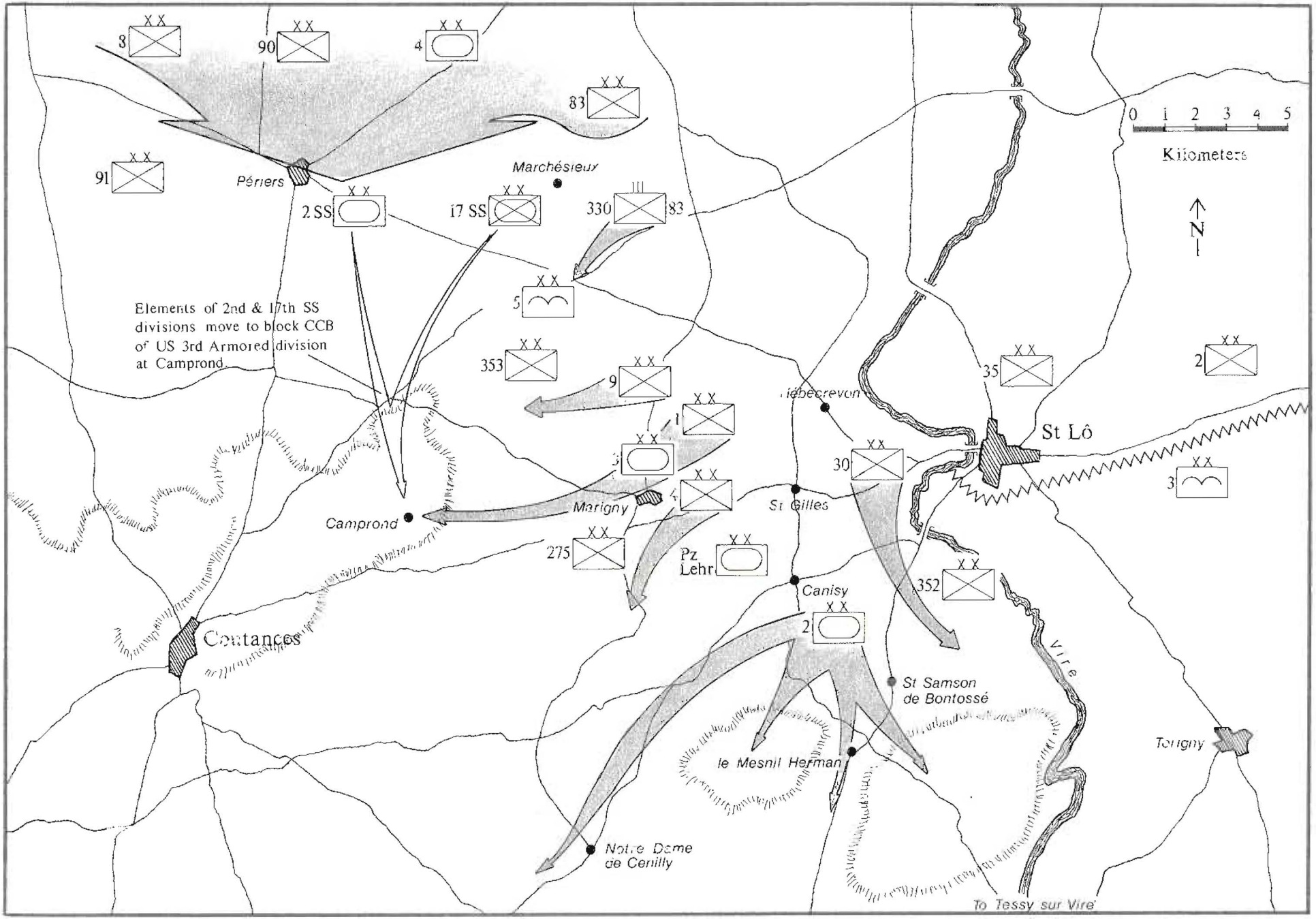
6
34
2i
2 Can
Gds
7
11
Emiéville
Cagny
Fleury sur Orne
Bras
Four
Soliers
12 SS
Vimont
Bourgebus
272
1 SS
9 SS
1 SS
Laize
To Falaise



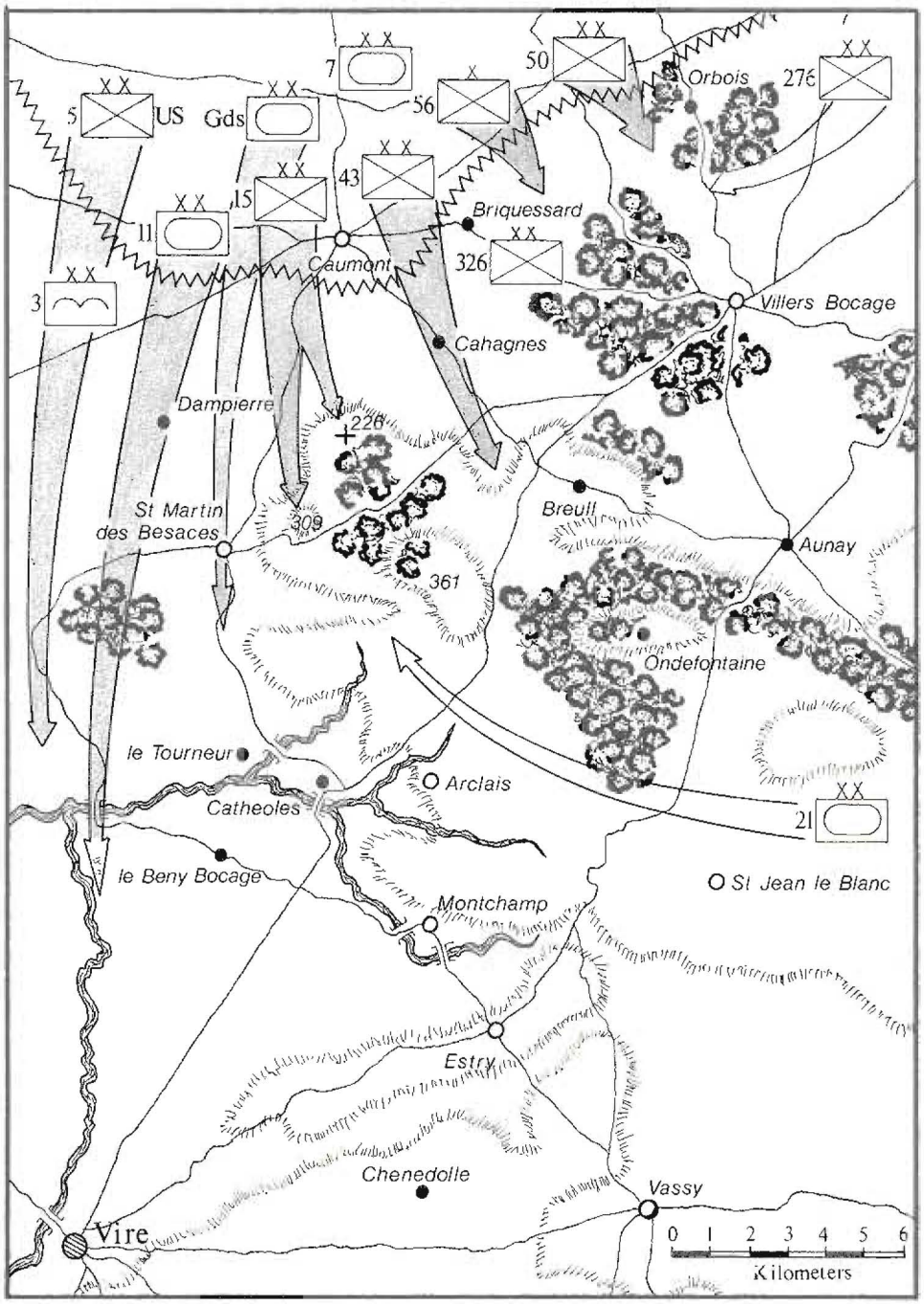

Planned US Cobra Offensive, July 1944



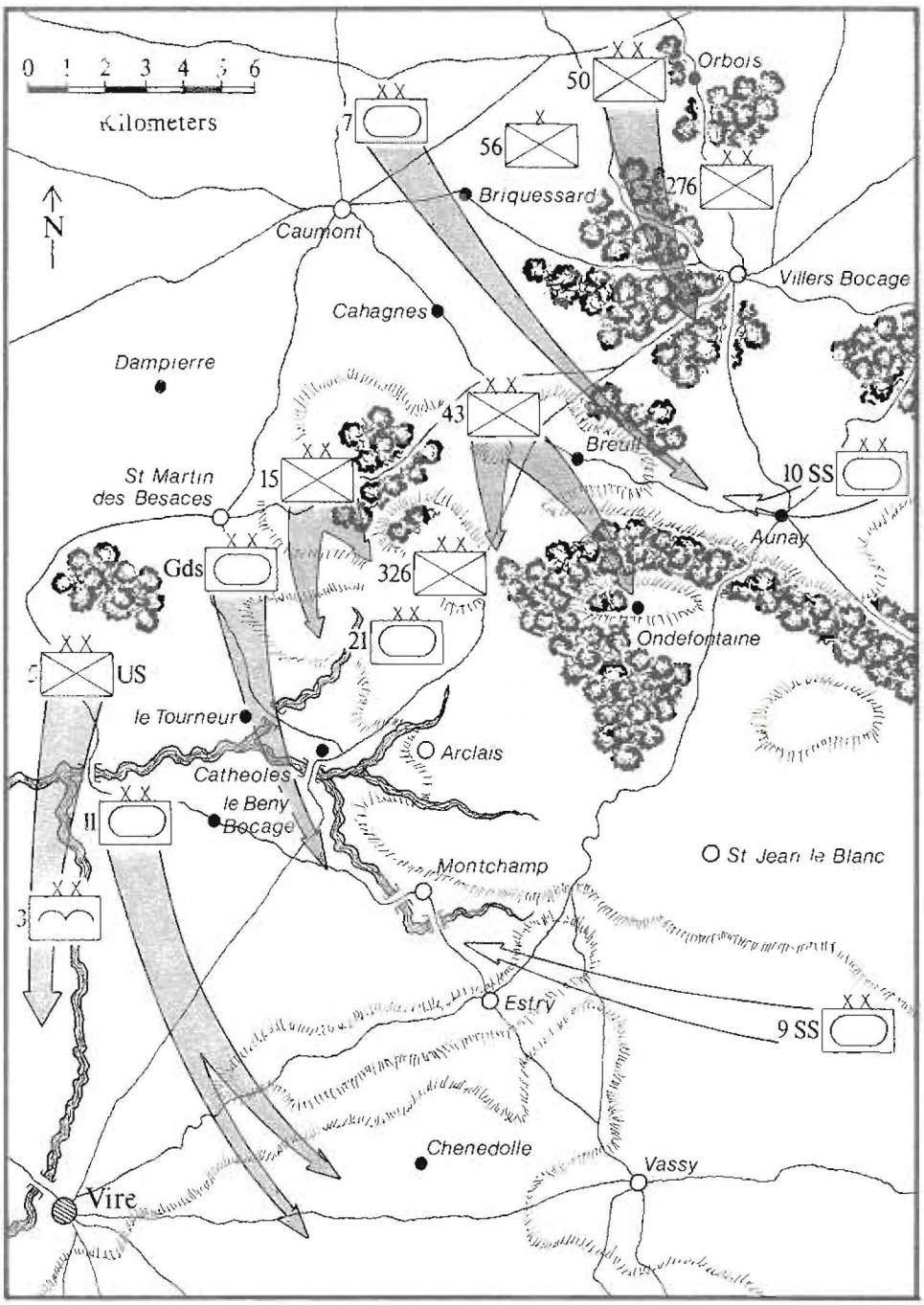

Cobra - US Attacks 25 & 26 July 1944



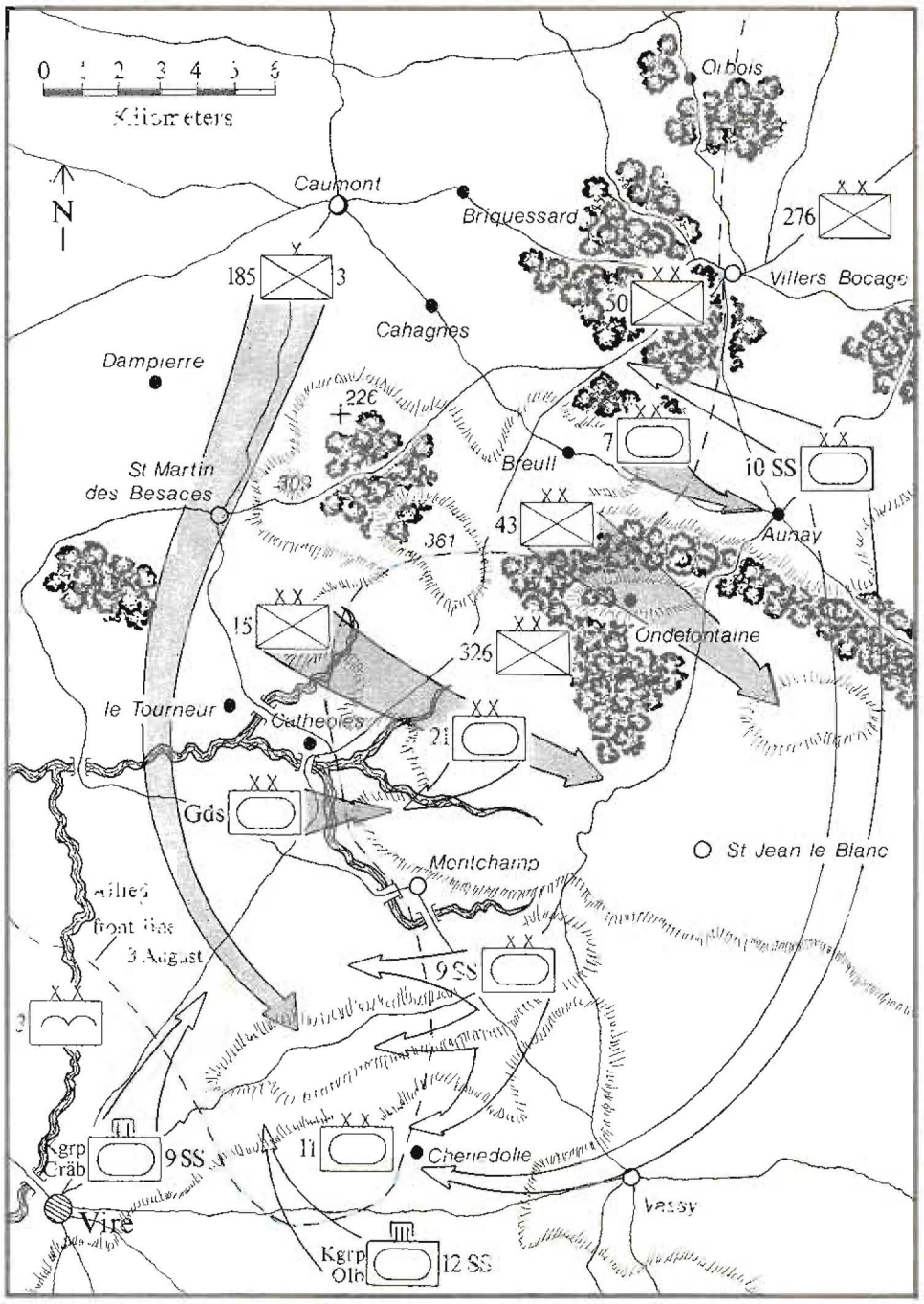

Cobra - US Attacks on 27 July 1944



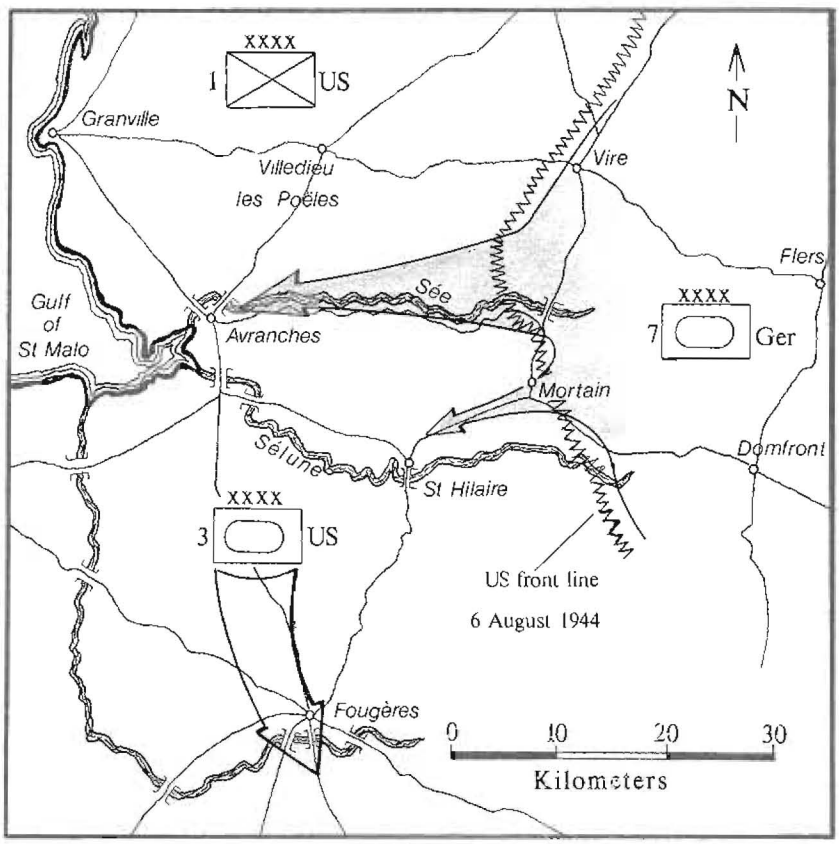

Bluecoat - British Breakthrough, 30-31 July 1944



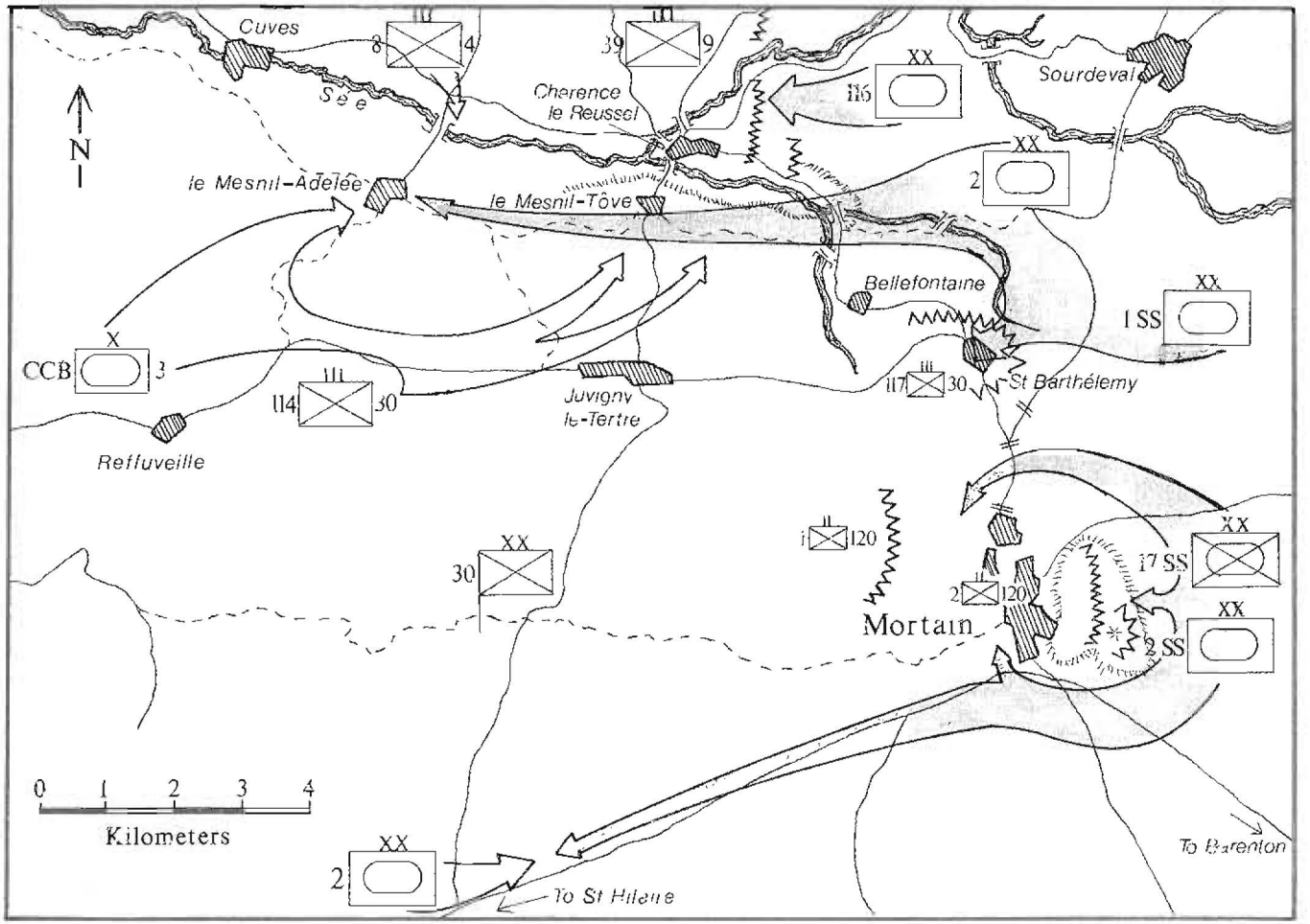

Bluecoat - British Exploitation, 1-2 August 1944




Bluecoat - German Counterattacks, 3-6 August 1944




Planned German Offensive August 1944


Cuves
Sée
Cherence le Reussel
Sourdeval
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le Mesnil-Adelée
le Mesnil-Tôve
Bellefontaine
1 SS
CCB
3
St Barthélemy
Juvigny le-Tertre
Reffuveille
Mortain
17 SS
2 SS
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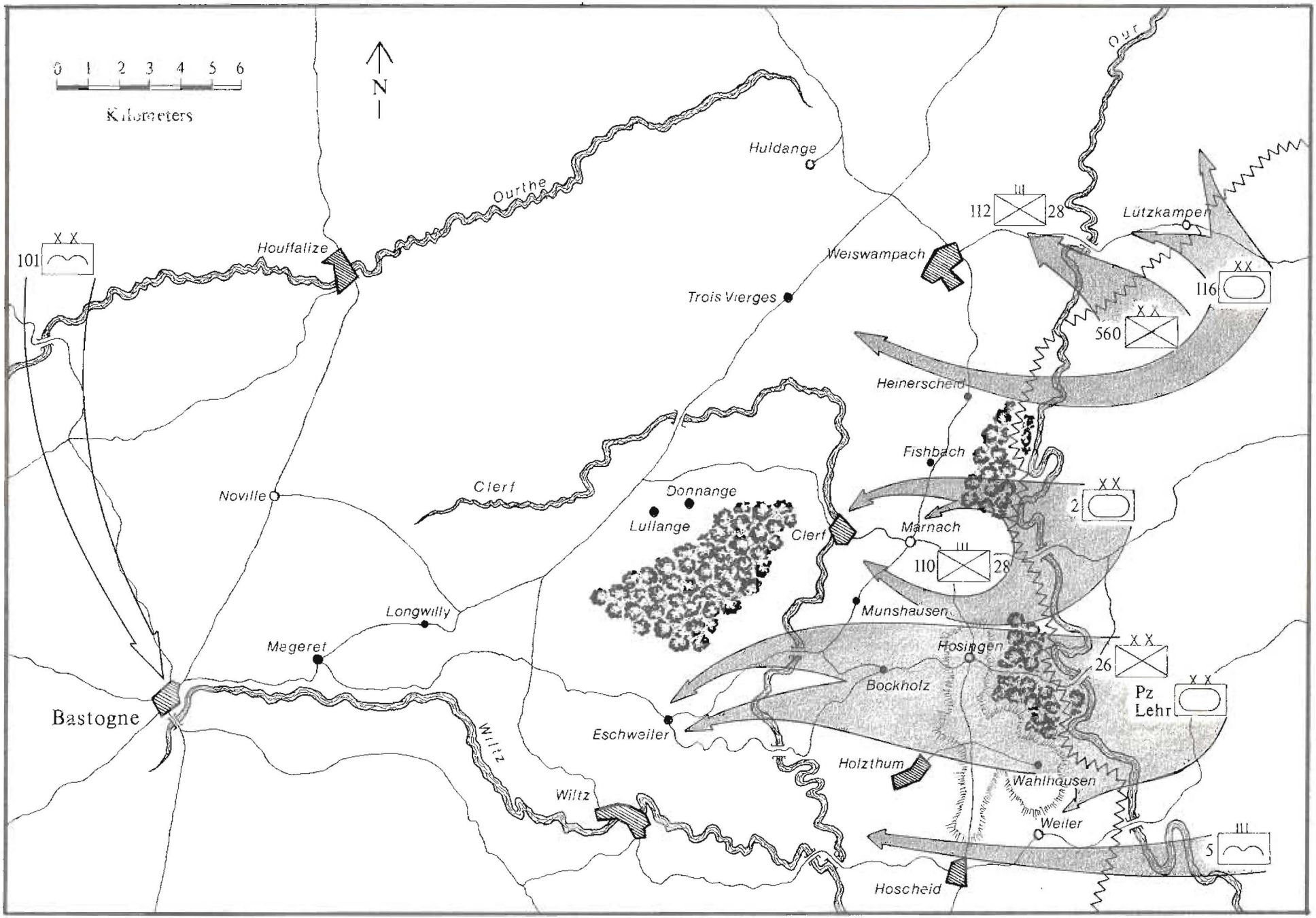
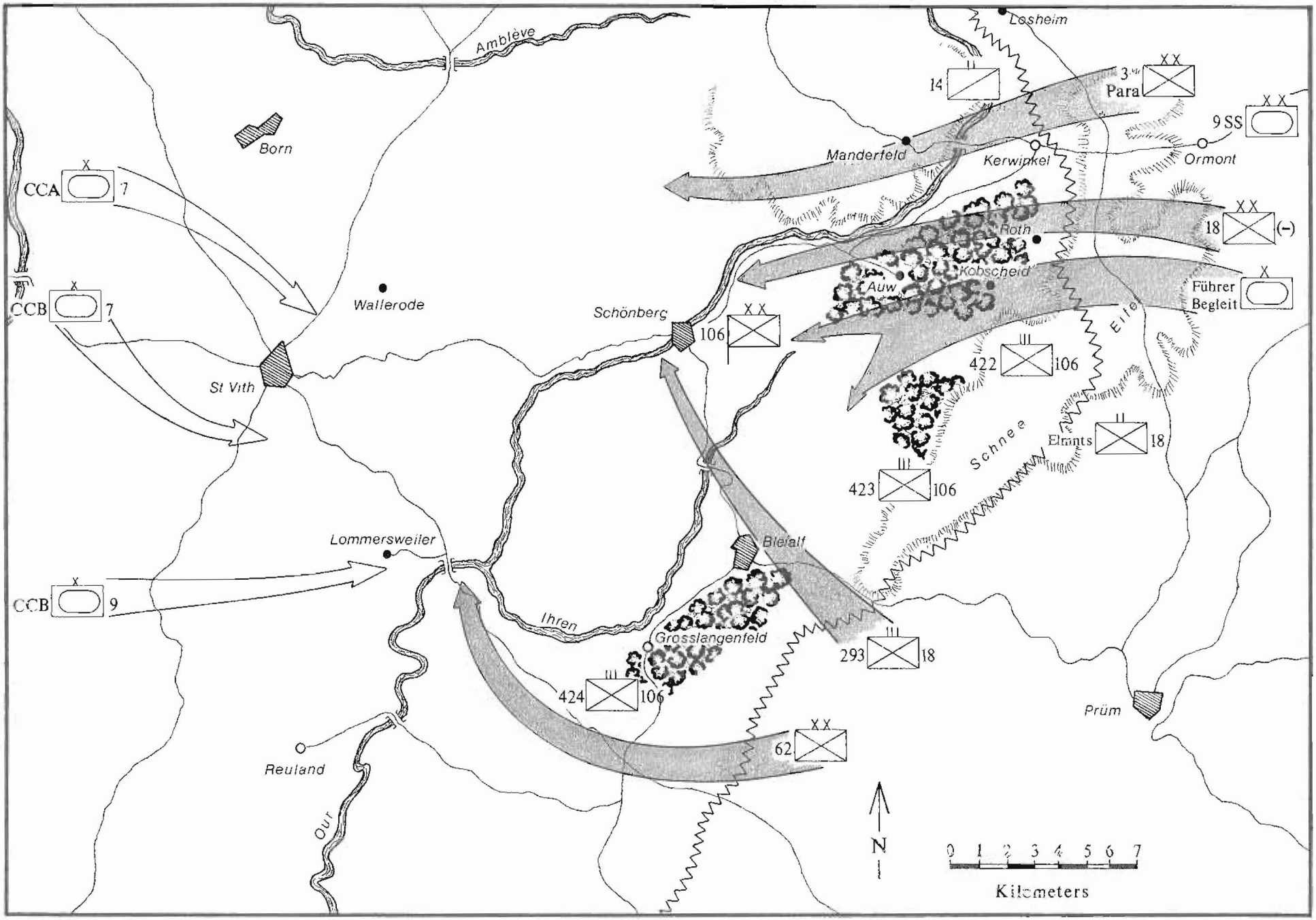
Kilometers
To St Hilaire
To Barenton

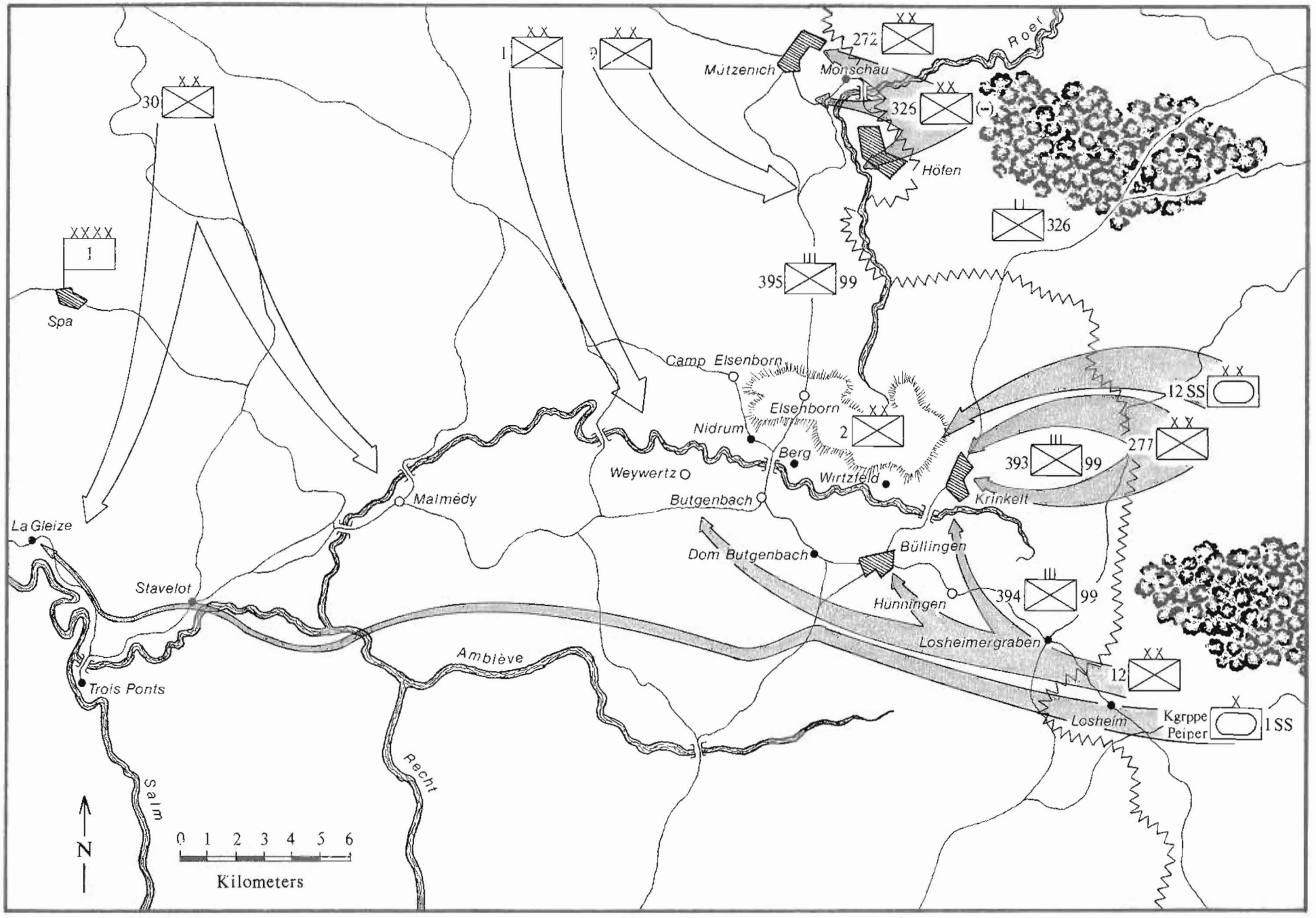
Mortain




Bulge - Fifth Panzer Army Attacks, 16-18 December 1944




Bulge - German attack against the Schnee Eifel, 1618 December 1944




Bulge - 6th Panzer Army Attack, 16-18 December.