

**The British and American Armies in World War II:
Explaining Variations in Organizational Learning Patterns**

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I. Introduction

During the Second World War, American and British armored units fought against the same foe on the same ground using the same equipment. American effectiveness improved dramatically in three years of active operations. British effectiveness improved at a much slower rate during their five years of activity. By 1944, American units were more adept at employing combined arms in concert to achieve a variety of ends, attacking with greater flexibility, and following up tactical success to reap operational and strategic benefits. Why did these military organizations learn and improve at different rates? This question is of more than historical interest. It helps us understand the more fundamental question of how large and complex organizations "learn" lessons and adapt to new circumstances.

This paper examines three candidate explanations for why American forces learned faster than did their British counterparts during the Second World War: (1) American leaders were better mentally and intellectually prepared to understand and react to the lessons of modern war than were the British; (2) there were stronger bureaucratic forces acting to inhibit innovation and learning in the British than the US Army; and (3) the mechanisms in the British Army by which lessons could be codified and transmitted throughout the force were, relative to those found in the US Army, underdeveloped.

This study concludes that relatively poor British learning cannot be explained simply by a lack of creative, innovative thinkers or by the inhibiting effects of bureaucratic politics. Britain produced a number of important and well-respected armored theorists during the inter-war years and engaged in large-scale experimentation with armored forces both before the war and during its initial stages. In contrast, horse-mounted cavalry officers became so dominant in the US military hierarchy that even theorizing about the possibilities of armored warfare became impossible.

What does seem to explain the difference in the rate of learning experienced by the British and US armies are differences in their organizational "infrastructure." The British Army had relatively few channels through which a dialogue among top officers could be sustained. The communication that did occur was hampered by a lack of common army-wide doctrine and the lack of tactical protocols for the orchestration of combined arms units. Reliance on a combination of single-arm regimental standards and on *ad hoc* guidelines issued by theater commanders permitted continual innovation but little cumulation of knowledge. In contrast, American forces benefited from a dense network of channels that allowed for effective communication within the force. The

US Army also developed and maintained clear and detailed guidelines for the employment of combined arms forces. In the US case, doctrine provided a common language for all officers to use in discussing their battlefield observations. It also established a base upon which incremental improvements in operational procedures could be made. American officers were at least as conservative as their British counterparts before the war, but they worked within an organization that was itself capable of absorbing and acting on information.

These conclusions suggest a number of important implications for the larger question of how organizations learn and what makes them effective or ineffective. First, the presence or absence of bright conceptual thinkers may be relatively less important than how the organization itself is structured to "remember" and "transmit" data. Second, organizational culture and organizational structure may be more difficult to neatly differentiate than some suppose; the British Army appeared conservative, but only because organizational structures doomed war-time innovation to failure. Finally, doctrine is not an inherently conservative force, but rather a necessary precondition for meaningful learning and innovation. These implications in turn suggest that reformers or others interested in improving the effectiveness of an organization might do well to focus on how the organization itself processes ideas and information, rather than trying to offer specific suggestions about how it should perform specific production-related tasks.

II. Scope, Methods, and Theories

Within this paper, learning is broadly defined to include not only the recognition of new military possibilities and the generation of new ideas about how to capitalize on them, but also the implementation of those ideas and the execution of actual solutions. The scope of the paper is limited to the development of combined arms tactics during WWII. The discussion of combined arms warfare is in turn limited to the orchestration of ground assets, including tank, anti-tank, artillery, and infantry weapons. For the most part, the focus is on the orchestration of these assets within armored divisions.

The comparative methodology used in this paper provides several advantages over the single-case study monograph frequently undertaken by military historians. By selecting and analyzing the performance of organizations which share similar characteristics or are reacting to similar problems, it is possible to provide a better assessment of how and to what degree differences between the organizations affected battlefield outcomes. The comparative method is particularly instructive in this case, since many of the elements frequently held to be advantageous to learning would seem to favor the British, while the actual outcome proved quite different.

Below, the three candidate explanations touched on in the preceding section are outlined in greater detail. Although the depiction of these theories as distinct and contending single-factor explanations is something of an artifice, making the assumptions of each theory explicit does allow for a more critical evaluation of commonly held explanations than simple narration might permit.

II.A. Cognitive Theory

The cognitive view of organizational learning treats organizations as rational unitary actors, and leaders as the "brains" of the organizations they direct.¹ Learning is, like all other functions, specialized. Management learns; the organization does not. Organizational learning is therefore a loose metaphor for the aggregate level of individual learning within the management group. Implementation of new ideas is assumed to be relatively simple. Leaders map out a plan and, assuming the right hierarchical structure exists within the organization, each component follows direction and plays its role. Leadership acuity is therefore the key to successful learning and the effectiveness of the organization. A cognitive theory of organizational learning predicts the following things:

(1) In successful learning organizations, we should expect to find smart leaders with good ideas, and in organizations that perform more poorly, we should expect to find fewer such leaders.

(2) In successful learning organizations we will find that problems with the organization or its operating procedures are diagnosed. Once these problems are identified and remedies suggested, improvements will be forthcoming. In poor learning organizations, problems will not be diagnosed quickly.

(3) In all organizations, learning will "travel" with leaders. In other words, if a commander with experience takes over a new unit, his experience will accrue to, and benefit, the new unit to which he is assigned.

¹ Cognitive approaches can be used to explain organizational failure or widespread misperception on the part of a group of individuals. See Robert Jervis, *Perception and Misperception in International Politics* (Princeton: Princeton University Press, 1976). The description presented here, however, is simply an idealized statement of how people who take this approach assume that organizations work in response to the commands of leadership. Although the assumptions might be described in terms of the "rational actor model," I have used the label "cognitive" in order to highlight the importance of leadership and cognition in approaches that assume organizations act as unitary actors. Classical management theories, such as the idea of "scientific management" introduced by Frederick Taylor, are founded on the assumption of rationality described above. See Charles Perrow, *Complex Organizations: A Critical Essay* (New York: Random House, 1986), 52-62.

II.B. Bureaucratic Politics Theory

The theory of bureaucratic politics is less a theory of how organizations learn than a theory of why many do not.¹ It does, however, suggest a number of predictions about what might explain the *relative* performance of different organizations. The theory of bureaucratic politics holds that although specialization within organizations improves efficiency in many ways, it also creates new impediments to learning and effectiveness. Each component of the organization will have its own distinct interests that are not necessarily identical to those of the organization as a whole. Hence, elements of the organization will work against one another, diminishing overall effectiveness. Learning, in this view, has little to do with the acuity of leaders. The learning "problem" is, in this case, synonymous with overcoming the natural and vested conservatism of groups and their jealousy of one another. If this view is correct, we should observe the following phenomena:

(1) In poor learning organizations, innovative thinkers will face numerous bureaucratic obstacles. Learning will be faster when the logic of bureaucratic competition favors innovation or when top civilian leaders assert control and force the adoption of new equipment, methods, or procedures.

(2) Solutions to problems or methods for capitalizing on new opportunities will frequently be visible long before their adoption. Even in poor learning organizations, the solutions will be available, but will be ignored because they are not consistent with vested interest.

(3) Having "decided" to innovate, learning will be quite rapid. This will be particularly true if the subordinate unit tasked with carrying out the innovation has an interest in its success and if that unit is a powerful element within the larger organization and can thereby gain access to resources necessary for implementation.

II.C. Theory of Continuous Process Improvement

¹Max Weber, writing in the first decade of this century, was perhaps the first person to systematically assess the dysfunctional side of modern organizations. His writings on this subject are still both relevant and interesting. See Max Weber, *The Theory of Social and Economic Organization*, A.M. Henderson and T. Parsons, ed. (New York: Oxford University Press, 1947). For a classic application of Weber's ideas to governmental organizations and foreign policy, see Graham T. Allison, *Essence of Decision: Explaining the Cuban Missile Crisis* (Boston: Little, Brown and Company, 1971). For two very different ideas about what types of methods might be used to minimize the more pernicious effects of bureaucracy see James Q. Wilson, *Bureaucracy* (New York: Basic Books, 1989); and Barry R. Posen, *The Sources of Military Doctrine: France, Britain, and Germany Between the World Wars* (Ithaca: Cornell University Press, 1984).

A third view of organizations treats them as complex organisms. Complexity makes the coordination of the whole is monumentally difficult, and whatever inefficiencies exist are caused more by this difficulty than by the willful opposition of bureaucratic actors. Successful learning requires a dense and redundant network of channels that allow information to be transmitted laterally and vertically, up as well as down. Learning also requires that information be codified before it is transmitted, so that it will be uniformly understood and processed by all of the component parts of the organization. Given that even seemingly simple tasks will be difficult when they require the coordination of two or more elements, learning requires more than the recognition of theoretical operational possibilities. It also requires the translation of theory into protocols and routines, which can then be systematically evaluated and improved.¹ If this view of organizational effectiveness and organization learning is correct, we should observe the following things:

(1) The infrastructure of an organization--including personnel selection and assignment policies, training procedures, and channels through which officers can communicate informally--will be relatively more important in determining organizational learning rates than will access to ideas or theories.

(2) The existence of detailed protocols for the accomplishment of particular tasks improves organizational learning. The existence of such guidelines enables the whole organization to move forward together while at the same time incrementally improving procedures.

¹The era of continuous innovation in industry has led to a reexamination of organizations and how they learn. In particular, the rapid rate of product innovation in Japan and the incremental nature of advances there, has led to a new body of management literature on this subject. Though this literature has yet to coalesce around a common set of definitions and terms, one of its common themes is its treatment of innovation and learning as similar phenomena that can be maximized through continuous process improvement. A second major theme in this literature is its treatment of the organizational infrastructure as critical to learning and its treatment of leaders more as designers of the learning system than as directors of operations. For a representative sampling of this literature, see Peter M. Spenge, *The Fifth Discipline: The Art and Practice of the Learning Organization* (New York: Doubleday, 1990); James P. Womack, Daniel T. Jones, and Daniel Roos, *The Machine That Changed the World* (New York: HarperCollins, 1990); Robert Hayes, Steven Wheelwright, and Kim Clark, *Dynamic Manufacturing: Creating the Learning Organization*, (New York: The Free Press, 1988); and Ken-ichi Imai, Ikujiro Nonaka, and Hirotaka Takeuchi, "Managing the New Product Development Process: How Japanese Companies Learn and Unlearn," in *The Uneasy Alliance: Managing the Productivity-Technology Dilemma*, Edited by Kim Clark, Robert Hayes, and Christopher Lorenz (Boston: Harvard Business School, 1985).

(3) Smart generals do not necessarily make smart armies. Without a well-developed organizational infrastructure, leadership changes will not make an organization dynamic or responsive.

Summary. Each of these theories places primary emphasis on a different aspect of the organization. Cognitive theories of learning emphasize leadership acuity; theories of bureaucratic politics stress the structuring of incentives at the sub-unit level; and the theory of continuous process improvement looks at the infrastructure that makes feedback and continuous improvement possible. These theories are not mutually exclusive. A single organization may have brilliant leaders, few structural impediments to learning, and a highly developed training and evaluation system. In fact, strengths or weaknesses in one part of the organization are likely to effect other areas. Organizations with strong training and evaluation infrastructures, for example, are likely to cultivate bright and effective leaders. Nevertheless, the theories described above suggest very different things about the character of the organizational learning process. An organization that implicitly or explicitly accepts one theory is likely to allocate scarce resources quite differently than one which accepts another. Consequently, organizations fulfilling broadly the same mission requirements may come in a wide array of configurations, each with different relative strengths and weaknesses. In order to determine which of the theories best describes the actual dynamics of learning in complex modern military organizations, it is useful to compare the record of two militaries with different strengths and weaknesses they grapple with similar problems.

III. Combined Arms Warfare: The British and American Experiences

Although the development of tanks during the First World War promised to revolutionize warfare, neither side was able to use these new weapons to decisively rupture enemy lines during the course of that war. During the interwar period, there was a lively debate about whether and how armor might be employed in coordination with other elements to achieve decisive battlefield results. At the start of the Second World War, however, the German blitzkrieg attacks on Poland and France answered many of those questions. This paper examines the British and American attempts to match or surpass the performance of the German army in combined arms operations.

German victory in its initial blitzkrieg campaigns was not decided by numerical or technological superiority. In fact, when the German army attacked France in 1940, it had fewer

tanks than combined British and French forces. Moreover, British and French main battle tanks were more heavily armored and better armed than their German counterparts. But the German army enjoyed two advantages in the organization of its forces. First, more of its tanks was concentrated into armored divisions and corps and fewer was parceled out to independent armored battalions or infantry divisions than was the case in the French and British army. Secondly, German panzer divisions were organized and trained to act as self-contained, balanced combined arms units. Each German tank division had either three or four battalions of armor with a total of 220-290 tanks, four battalions of motorized infantry, three battalions of artillery, and one each of anti-tank guns, reconnaissance, and engineers.¹ The non-armored elements of the panzer divisions were not after-thoughts, but essential elements of the force. They gave German panzer divisions the ability to defeat a variety of threats when those divisions were operating deep in the enemy rear and enabled them to attack critical depots or blocking positions while losing minimal amounts of mass or velocity to the enemy. When Erwin Rommel's 7th Panzer Division was held up the Meuse River, for example, the division's panzer infantry quickly deployed to conduct an opposed river crossing under the cover of divisional guns.² Later when the same division faced a counter-attack by two battalions of British heavy tanks at Arras, it was able to quickly deploy anti-tank and artillery assets to blunt the attack.

Though the conduct of combined arms operations is immensely complex in practice, in principle it resembles the game, "rock, paper, scissors." Each of the primary combat arms enjoys certain advantages over one or more of the others. For example, high-velocity anti-tank guns in 1940 were capable of killing tanks at 3,000 meters, approximately twice the range at which most tanks of the day could respond. Anti-tank guns were, however, highly vulnerable to artillery fire, which had a range of about 12,000 meters. Finally, artillery was itself quite vulnerable to tank attacks. Tanks were largely impervious to the effects of artillery fire, and any tank that could avoid other threats and close within range, could kill artillery with near impunity. Of course, the actual dominance of one weapon system over another depended on a host of factors, such as the terrain in which the weapons were deployed and the mission assigned to each force. Therefore, the ability to deploy weapons against the most appropriate targets, *given* the specific operational circumstances in which they were deployed, was critical to success.

¹Between September 1939 and May 1940, the German Army converted several "light" and infantry divisions into panzer divisions. In the process, they reduced the number of panzer regiments in each from one to two, though in at least some cases, they added a third battalion to the regiment. Rommel's 7th Panzer Division, for example, had one regiment of three battalions. See *Handbook On German Military Forces*, Facsimile of War Department Technical Manual TM-E 30-451, 1945 (Baton Rouge: Louisiana State University Press, 1990), 102; and B.H. Liddell Hart, ed., *The Rommel Papers* (New York: Harcourt, Brace, and Jovanovich, 1953), 4.

²Hart, *The Rommel Papers*, 193

The next section of this paper evaluates British and American attempts to learn how to conduct combined arms warfare. In order to assess the progress of each army, two British and two American operations are examined. The two earlier battles, one British and one American, show that neither army was adept at coordinating combined arms forces early in the war. An evaluation of the two later battles, however, reveals that while the US Army had become skilled in the use of combined arms forces by the summer of 1944, the British had not. The contrast in learning is remarkable, given that British ground forces were engaged in the war far earlier than American forces and that thirty-two months elapsed between the two British operations whereas only seventeen months separated the two American battles.

III.A. The British Experience

Of all the European nations in 1940, the British should have been the most interested in learning how to win attrition wars. Britain had committed itself to total victory against Germany, an enemy which controlled most of Europe and had available human and material resources about which Britain could only dream. Moreover, it was unclear that the British public, Winston Churchill aside, was as willing to sacrifice its sons and daughters as was Nazi Germany. Whether the theater were peripheral or central, it would seem that the British would have sought a decisive style of action. The record shows that the British did try to duplicate the operational methods employed by German forces in 1940. The results were indifferent.

1. Crusader (18 November - 20 December 1941). Operation Crusader was launched five months after Rommel's first attack across Cyrenaica. German forces were entrenched in the so-called "Sollum line." A previous attempt to dislodge German forces from those positions, Operation Battleaxe, had resulted in the piecemeal destruction of the four separate British columns. With that failure, Claude Auchinleck had replaced Archibald Wavell as the commander of the Middle East.

Every effort was made to supply the British Army in Africa with the largest quantity of modern equipment possible. In the eyes of the civilian leadership, equipment was the key to successful blitzkrieg warfare. Winston Churchill himself wrote to Auchinleck that

For the first time, British and Empire troops will meet the Germans with ample equipment in modern weapons of all kinds....Now is the time to strike the

hardest blow yet struck for final victory, home and freedom. The Desert Army may add a page to history which will rank with Blenheim and Waterloo.¹

Auchinleck had every intention of striking a decisive blow with his "mailed fist." As the commander of the newly formed Eighth Army, he chose Alan Cunningham, the victor of Somaliland. Auchinleck's own comments on that selection are revealing. He

was impressed by his rapid and vigorous command in Abyssinia and his obvious leaning towards swift mobile actions. I wanted to get away from the idea, which seemed to be prevalent, of clinging to the coastal strip, and to move freely and widely against the enemy's flanks and communications.²

Cunningham did indeed move freely and widely, and in doing so, he had the luxury of material superiority. Both sides were equal in manpower, each holding about 120,000 men. But two-thirds of Rommel's manpower was located in his ineffective Italian divisions. The British had 700 medium and heavy tanks available for their use while the Axis had only 176.³ The British had 650 aircraft to the Afrika Korps' 330.⁴

The British plan called for one corps to screen the German front between Sollum and Sidi Omar, while the XXX Corps, containing the three British armored brigades, was to slip around the southern flank to Gabr Saleh. Here, they would defeat the bulk of German armor (15th and 21st Panzer Divisions), which Cunningham believed would be forced to engage. After the German armor had been defeated, XXX Corps would then crash down on the German rear.

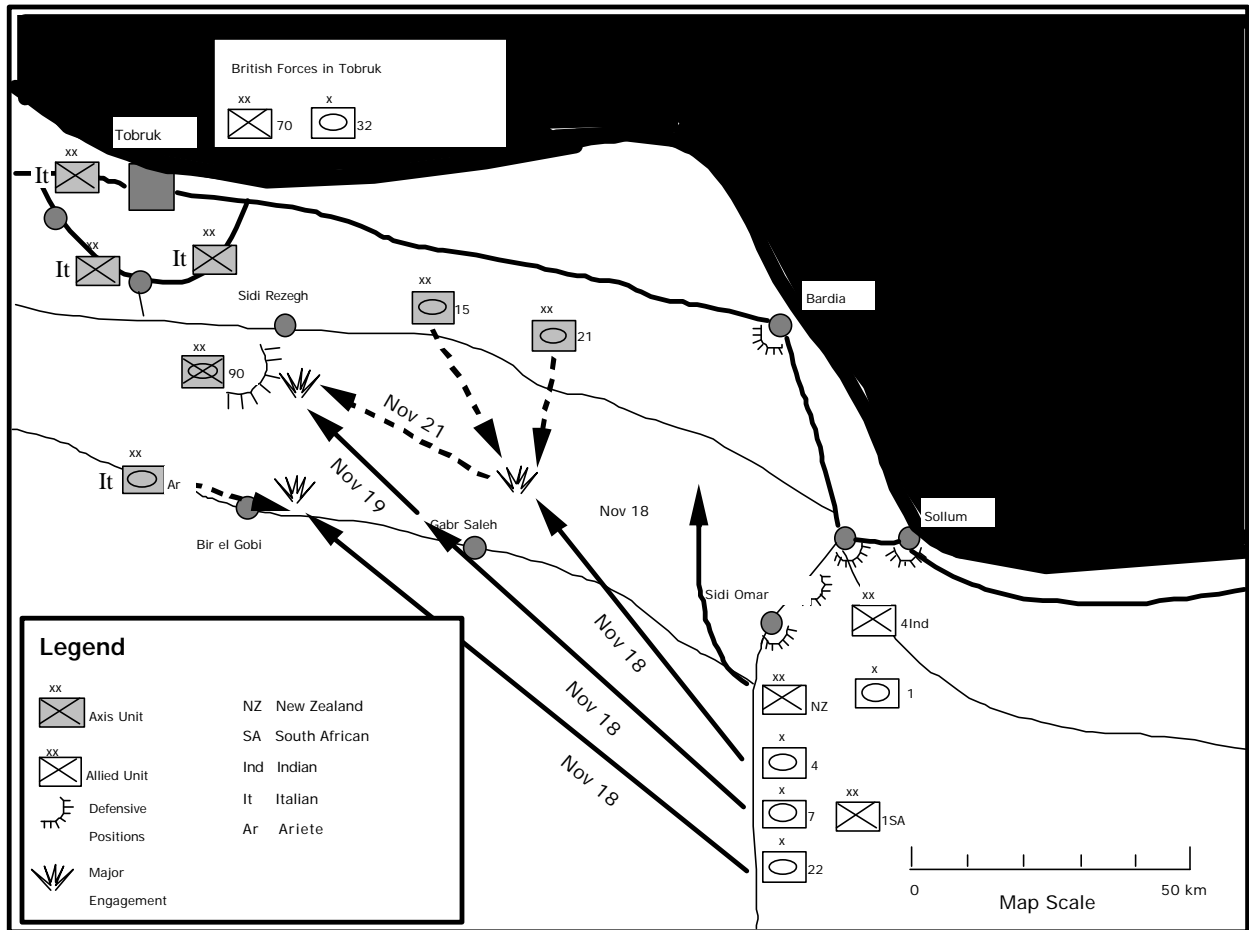
¹Barrie Pitt, *Churchill and the Generals* (Chichester: Sidgwick and Jackson Ltd, 1981), 81.

²Correlli Barnett, *The Desert Generals* (Bloomington: Indiana University Press, 1982), 83.

³These figures exclude tanks weighing less than 15 tons. The Germans tended to have relatively more light tanks than the British at this stage in the war. Nevertheless, if all tanks are included the British still had overwhelming superiority: 950 to 400.

⁴Strength figures are taken from B.H. Liddell Hart, *The Tanks*, Volume II, 1939-1945 (London: Cassell & Company Ltd, 1959), 102. They can be confirmed elsewhere.

Map 1. Operation Crusader: November 18-21, 1941



The battle opened badly for the British. After arriving behind German lines, the brigades became dispersed, with the 7th at Sidi Rezegh, the 22nd at Bir Gubi, and the 4th at Gabr Saleh. On November 21, both German armored divisions converged on Sidi Rezegh, destroying all but 28 of the British 7th Brigade's tanks. On the next day, the rest of the British XXX Corps moved to join battle, but the two remaining armored brigades showed up individually and were defeated in detail. By the evening of November 22, there were only 44 running vehicles in the entire Corps¹, and the 4th Brigade headquarters had been overrun.

Evaluation. The British did understand that replicating German methods required the concentration of armor. The bulk of the British armored force was formed into one division of three armored brigades. The division, in turn, was allocated in its entirety to the XXX Corps. One brigade of "I" (infantry) tanks was maintained with the XIII Corps, but this force (225 Matildas) represented a small fraction of the tanks on hand. However, the Crusader battles saw

¹Barnett, *The Desert Generals*, 103. The Corps began with approximately 450 tanks.

little effective use of combined arms tactics by the British. A training memorandum written in the North African theater in September 1941 noted that the Germans orchestrated tanks with anti-tank guns and recommended the same tactics.¹ Unfortunately, the memorandum apparently had little effect. Tanks almost never coordinated with other elements during the battle. In a detailed narrative of the battle, Robert Crisp, a troop commander in the 3rd Battalion, Royal Tank Regiment, 4th Brigade, mentions the presence of artillery and anti-tank units in his brigade, but never once discusses any action coordinated with them.²

This lack of coordination was most unhappy for the infantry battalions. R.L. Crimp, an NCO of the 7th Division, records one early morning scene at the temporary home of an infantry battalion.

We're just about to start breakfast when there's sudden agitation all around and somebody shouts: 'Tanks!' Sure enough, over the ridge not more than a mile away come rolling thirty or so German panzers, led by one which looks twice as big as any other, flying a huge swastika standard. One look, and everybody dashes for the trucks. Precious kit is slung on board, engines roar into action, and within less than a couple of minutes the whole battalion's on the move....It looks like a stampede, but everything's under control. Apparently these 'scarpers' are accepted desert technique.³

Hasty retreats such as this may have been accepted as a fact of life in the far-flung British army, but they were not tolerated in the German army, which seldom fought engagements at under brigade strength and always joined battle with an integrated, all-arms force.

While the lack of combined arms coordination may have jeopardized the safety of the infantry, it also proved detrimental to the effectiveness of British armor. Tanks could never pack guns of the same range or killing power as artillery or anti-tank weapons. Hence, when they encountered such weapons, they had no choice but to run or charge. The British proclivity for charging the guns has been attributed to the cavalry tradition in the British armored force. This explanation, however, ignores the fact that Hussar and Dragoon regiments held only a portion of all British armor. The remainder was operated by units of the Royal Tank Corps (RTC), whose officers tended to feel the technicians disdain for the traditions and values of their counterparts in the cavalry.⁴ Yet, because of the material conditions in which British armor fought (i.e. without

¹Ibid., 108.

²Robert Crisp, *Brazen Chariots: An Account of Tank Warfare in the Western Desert, November-December 1941* (London: Frederick Muller Limited, 1959).

³R.L. Crimp, *The Diary of a Desert Rat* (London: Leo Cooper, 1971), 51.

⁴Crisp's comment on the cavalry officers was that "they had incredible enthusiasm and dash, and sheer exciting courage which was only curbed by the rapidly decreasing stock of dashing officers

support from other arms), even the battalions of the RTC were frequently forced to "charge" the guns. Crisp, an officer of the RTC, pointed out that a German 88 mm gun

could knock us out at 3,000 yards, whereas the maximum effective range of our 37-mm and 2-pounder guns was reckoned to be about 1,200. The result, in simple arithmetic, was that we would have to be within range of their tanks and guns for 1,800 yards before we could hope to get close enough to do any damage. Eighteen hundred yards, in those circumstances, is a long way. Its sixty-four thousand eight hundred inches....The only answer lay in mobility, pretty fast mobility at that.¹

Of course, this was *not* the only answer. Even a contemporary 81 mm mortar out-ranged the flat trajectory 88 mm gun by over two kilometers. But this solution would have entailed the coordination of more than one type of weapon. As it was, artillery units had a hard time getting close to the front, since, unsupported, they were vulnerable to attacks by German panzers and/or infantry.

Time and again the British tanks charged home. The results were predictable. When the 7th and 22nd Brigades were sent to Sidi Rezegh, the 22nd was drawn into a fight at Bir Gubi. The tanks of this inexperienced brigade charged the guns of the Italian Ariete Division. The brigade lost 52 tanks to no effect.² While the British tended to be (overly) impressed by German equipment, no one could argue that the Italians enjoyed *any* sort of qualitative superiority. Three days later, after the 7th Brigade had been all but annihilated at Sidi Rezegh airstrip by German panzer divisions, the 4th was sent to their relief. Jake Wardrop, a tank sergeant, described the scene:

Just about that time Jock Campbell arrived and took over the whole show. He came running up in a car, shouted over "follow me" and we chased after him for about half a mile round the airfield and there they were--a long line of Mark III's and fifty millimeter anti-tank guns, so we went to town on them. We pulled out to get some ammo and another squadron took over and it was decided to give them the good old charge again. Quite frankly, I was not so strong for this charging business....They had some really big artillery which was lobbing shells amongst us. I was beginning to think we were doing fine when a shell burst just in front.³

In contrast to the British, the Germans used anti-tank guns and artillery as an integral part of their force.

and men." Crisp, *Brazen Chariots*, 39.

¹Ibid., 21.

²Barnett, *The Desert Generals*, 96-97.

³George Forty, ed., *Tanks Across The Desert: The War Diary of Jake Wardrop* (London: William Kimber, 1981), 62.

Interestingly, while there had as yet been no official structural or training changes to ensure better coordination, there was a growing use of informal "Jock columns."¹ These were mixed battalion-sized forces of infantry, artillery, and anti-tank guns (generally one company each, though they were task organized). These columns conducted raids against a variety of German targets and were highly successful in many of their engagements.² Nevertheless, they encouraged, indeed required, the dispersal of force. They consequently left the British completely unable to respond to the concentrated hammer blows inflicted by German panzer divisions. The "Jock column" represented an attempt to capitalize on the possibilities of combined arms warfare, but the scale of these attempts remained small, and they were never institutionalized or diffused throughout the army.

2. Goodwood (18-20 July 1944). By early July 1944, the 21st Army Group in Normandy had grown to more than one million men. These forces were pinned along a strip of coastline 114 kilometers long and 25 kilometers deep, an area that was filled "to the bursting point" with men and equipment.³ The campaign was a month behind schedule, and a breakout was needed somewhere. Allied commanders settled on a plan for a coordinated pair of offensives, one by British (Operation Goodwood) and one by American (Operation Cobra) forces. The British blow was to fall on the east side of the Orne River, and was to originate from the small bridgehead established on 6 June 1944. The goal was to seize all the crossings of the Orne from Caen to Argentan, some fifty miles to the south, thus trapping the main German force to the west.⁴ The

¹The "Jock" column was named after the same Victoria Cross winner, Jock Campbell, who led charges across the Sidi Rezegh airstrip standing in his staff car while holding an oversized flag. Given Campbell's clear understanding of combined arms tactics, we might surmise that the charge at Sidi Rezegh was a function of available assets rather than some innate desire to charge the enemy.

²After being chased around the desert for twelve days, Crimp's company was assigned to a Jock column. Nine days later he reported that "all our time in column has been spent on the move and almost every day we've given the enemy a crafty knock." The job of the infantry and anti-tank guns was "merely to hold defence posts on an arc of about a thousand yards' radial distance from the guns, to protect them in case of counterattack," but this allowed the artillery to hit pre-assigned targets with relative immunity. Crimp, *The Diary of a Desert Rat*, 61.

³Blumenson, *Breakout and Pursuit* (Washington, D.C.: US Army Center of Military History, 1984), 175.

⁴After the failure of Goodwood, there was much debate about what exactly the aim of the operation had been. Although Montgomery was to claim that the attack had been diversionary in nature and not designed to achieve a breakthrough, the objective of Argentan, discussed by General Dempsey, the commander of the British Second Army, brings the claim into question. Moreover, during the first hours of the attack, before it was clear that the operation had failed, Montgomery himself had announced to the press that the Second Army had achieved a breakthrough. See Hart, *The Tanks*, 361 for General Dempsey's assessment of the goals. For a discussion of Montgomery's intentions,

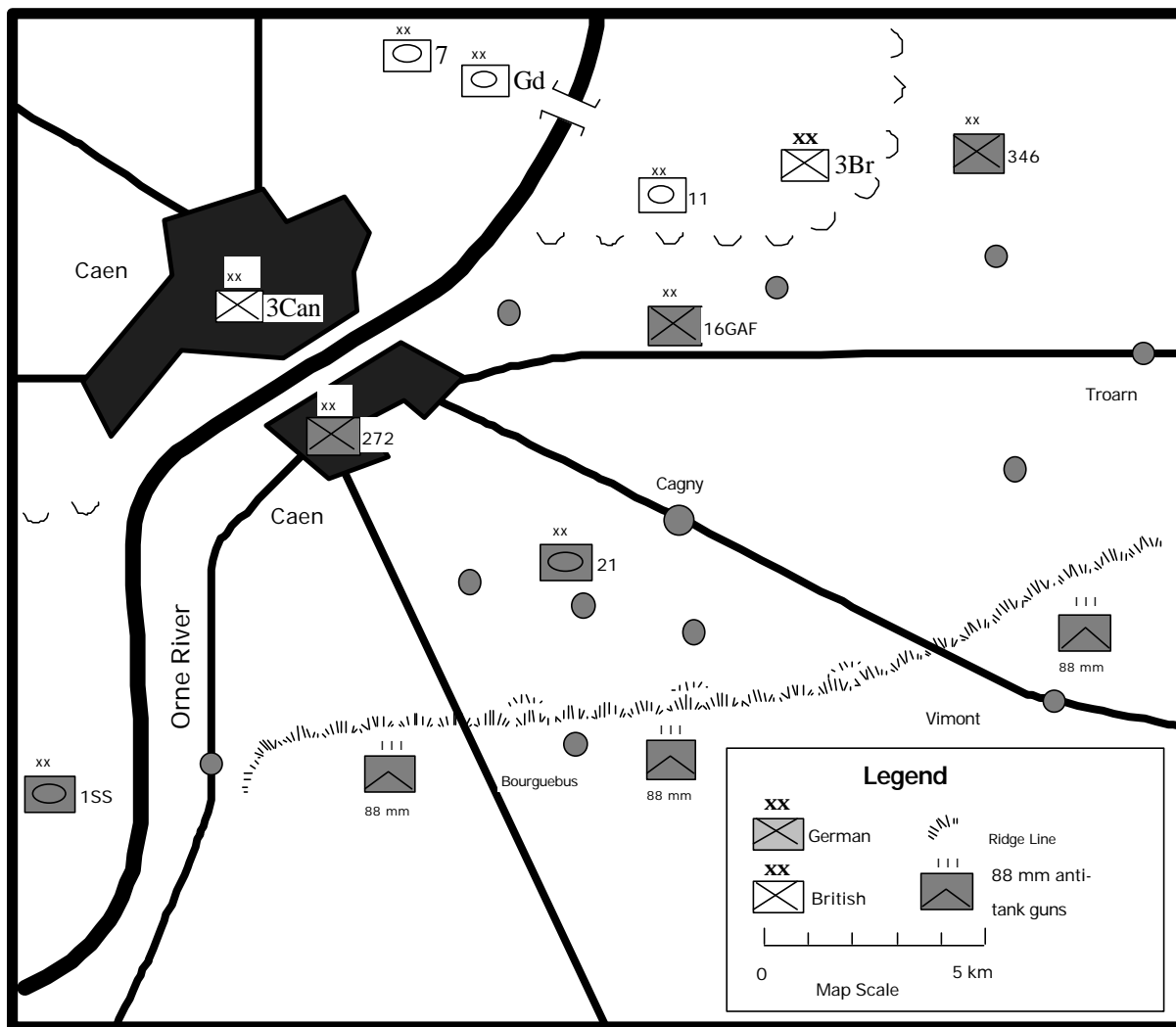
attack was preceded on 15 July by a diversionary attack on the west side of the Orne. This drew in the bulk of German armored reserves, and Second Army Intelligence predicted that no more than 120 tanks and 70 anti-tank guns lay between the British and Falaise.¹

The plan of attack bore the signature of Field Marshal Bernard Montgomery, who thoroughly dominated the British army after 1942. The battle was to be a massive, tightly scripted attack on the enemy's front. The plan called for 2,000 heavy and medium bombers to bomb various targets, from the front to the Bourguebus Ridge, the high ground located behind the German position. Following this, the 750 tanks of the newly formed VIII Corps, would follow a rolling barrage fired by 500 guns past the various villages which dotted the area and up the slopes of the Bourguebus Ridge. On the flanks, two infantry corps, supported by three tank brigades, would secure the sector and follow the armor to subsequent objectives. The width of the entire attack sector was about 10 kilometers, though the tanks of VIII Corps disgorged from the Orne bridgehead through a gap in the minefield that was one tank wide.

see John Keegan, *Six Armies in Normandy* (London: Johnathan Cape, 1982), 216 for.

¹Carlo d'Este, *Decision in Normandy: The Unwritten Story of Montgomery and the Allied Campaign* (London: Collins, 1983), 367.

Map 2. Operation Goodwood, July 18 (A.M.), 1944

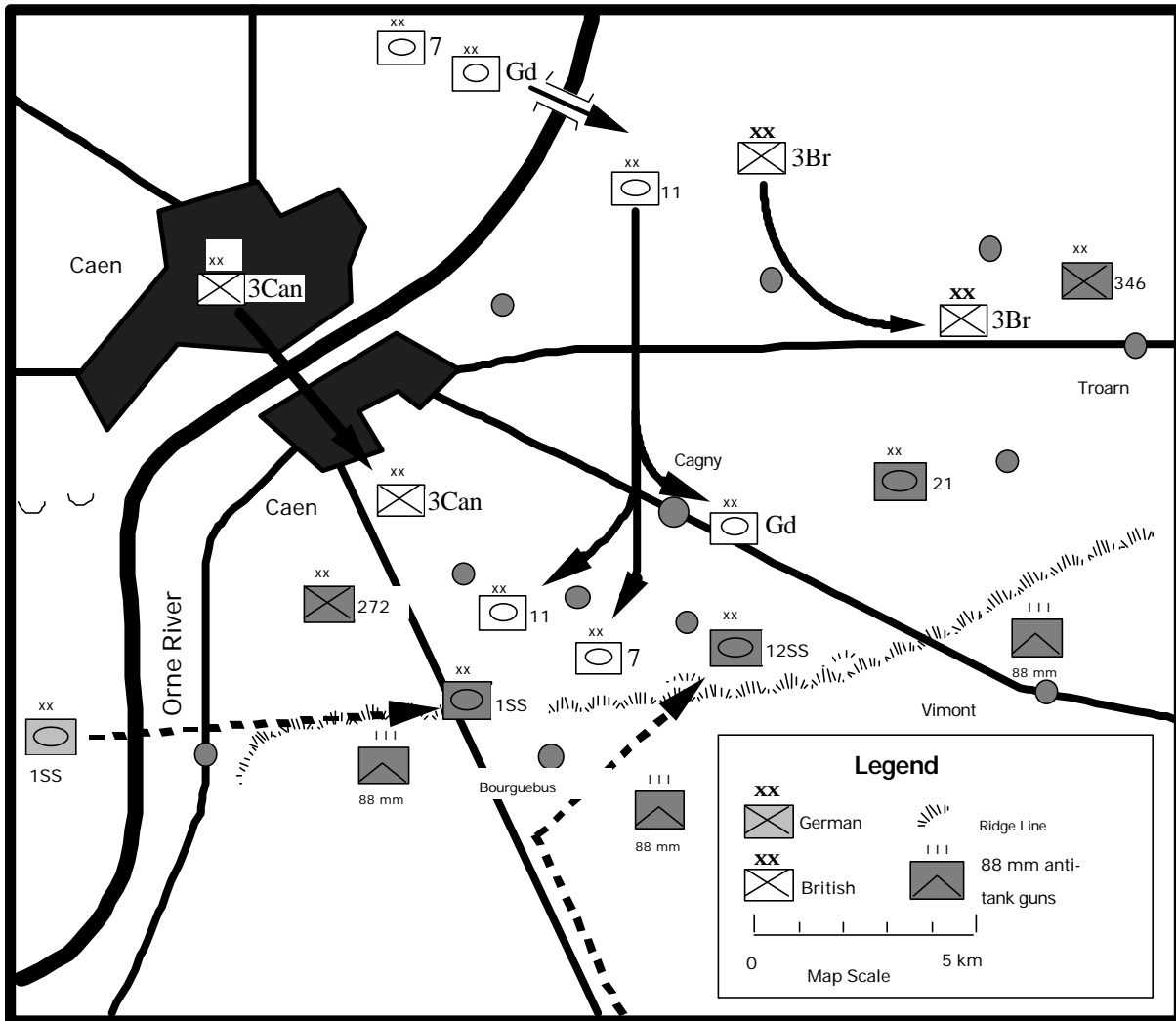


The aerial bombardment was a tremendous success. German companies and battalions surrendered without resistance at the front. Others watched in a daze as the British assault passed.¹ Within two hours, however, resistance stiffened. The 11th Division, leading the attack, was sent reeling from Bourguebus Ridge, which was much more strongly held than originally anticipated. Meanwhile, the Guards Armored Division, following in support, were stopped at Cagny, their first major objective. Although Cagny fell by evening, Bourguebus did not, and the next day's attempt met with no greater success. On July 20, British commanders abandoned the

¹The attack seemed, to all under it, the elemental force of nature. Giant Mark VI "Tiger" tanks were flipped through the air, and virtually every tank in the zone suffered some damage. The psychological damage was, however, worse. "Many were unable to co-ordinate their limbs and, when collected to be marched off to the prisoner-of-war cages, had to be allowed to sit by the roadside until sufficiently recovered to walk in a straight line." Keegan, *Six Armies in Normandy*, 202.

idea of a clean breakthrough and set their sights on local objectives. At its greatest depth, the attack had penetrated about seven kilometers.

Map 3. Operation Goodwood, July 18-19, 1944



Evaluation. As much as any other single factor, continuing problems with the coordination of combined arms forces caused the failure of Operation Goodwood. A summary of the action near Cagny serves to highlight these problems. The 11th Armored Division was to bypass Cagny and attack Bourguebus Ridge. Cagny had been bombed early in the morning, and, as the leading battalion of the 11th Division passed the town at 0900, there were only four functioning 88 mm anti-tank guns. The gunners themselves were badly shaken and managed to hit only one tank from the leading battalion (the 3rd Royal Tank Regiment). Had even a small force of infantry accompanied the tanks, the town could have been taken on the march. Lacking infantry, however, the division instead left behind a force of sixteen tanks to screen the position.

As the morning progressed, the situation around Cagny grew steadily worse. Hans von Luck, the responsible German Battle Group commander, arrived on the scene and organized Cagny's defenses. Tanks which had been damaged or buried by the bombing were recovered, recalibrated, and put into line. At noon, there were eight functioning Mark IV's in or near the town, as well as the four 88's. Von Luck's gunners destroyed all sixteen tanks of the screening force left behind by the 11th Armored Division.¹

By 1100, tanks of the Guards Armored Division had cleared the minefield and were prepared for their attack on Cagny. However, the mechanized rifle battalion of the division's armored brigade, was delayed in crossing the start line for nearly five hours. Until they arrived, all attempts to flank the German positions and find a way into the town were repulsed. As one witness described it,

the whole area was on fire, the earth shuddering from the bombing and shelling. I saw at least forty Sherman tanks blazing; even after this hideous bombardment the Germans were still trying to hold us back. I know for a fact that one German 88-mm gun knocked out eleven Shermans.²

The division's official history reports that "progress without infantry to drive the enemy out of this very enclosed country was impossible."³ Finally, at 1600, the infantry battalion arrived. When they did "the village fell almost at once--because the Germans had no infantry either, only the guns and a single tank."⁴ Cagny should have fallen six hours before it did. Instead, the action cost the 11th Armoured Division about twenty tanks and Guards Armoured Division over sixty of its number.

The failure to coordinate different arms at Cagny was not an isolated event. When the 11th Armored Division encountered massed artillery fire from behind Bourguebus Ridge and anti-tank fire from on top of it, the division's single battalion of organic self-propelled (25-pounder) artillery proved woefully inadequate in response. With no infantry and no artillery, the tanks were once again forced to "charge" the guns. The results were little better than they had been at Sidi Rezegh three years earlier. An officer with the 3rd Royal Tank Regiment wrote:

¹d'Este, *Decision in Normandy*, 374.

²McKee, *Caen: Anvil of Victory*, 295.

³Major-General G.L. Verney, *The Guards Armoured Division: A Short History* (London: Hutchinson, 1955), 41.

⁴McKee, *Caen: Anvil of Victory*, 295.

It was just as the leading tanks were level with Hubert Folie when the fun began. I saw Sherman after Sherman go up in flames and it got to such a pitch that I thought that in another few minutes there would be nothing left of the regiment.¹

One historian compared the British effort on the Bourguebus Ridge to the French cavalry charge at Waterloo, and another called it the “deathride of the armoured divisions.”² The 11th Armoured Division alone lost 110 tanks charging up the Bourguebus Ridge on July 18 (in addition to the tanks it lost screening Cagny). Including losses sustained over the next two days, the British lost over 500 tanks, or 36% of their entire armored force on the continent.³

Later British operations, such as Bluecoat and Market Garden were also plagued by problems in tank, infantry, and artillery coordination. Among other things, these British operations demonstrated that the scripting of battles at the army level is not sufficient to ensure the coordination of an all-arms force. Rather, divisions and regiments must themselves must be capable of quickly deploying a variety of assets to cope with unexpected contingencies.

III.B. The American Experience

When the United States entered the war against Germany, the United States had no compelling need to develop or replicate the tools of blitzkrieg. It could easily have fought the war conservatively, capitalizing on its industrial and human resources to win the war through attrition. Nor was there much reason to expect that it would or could quickly create a finely calibrated military instrument capable of mechanized combined arms operations. In 1938, the United States had a single brigade of mechanized cavalry stationed at Fort Knox, Kentucky. Even Poland maintained more tanks than the United States in 1938. Certainly, the United States was far behind Britain in developing doctrines and structures for the employment of armored forces when war broke out in Europe.

The US Army did, however, learn quickly. Within two and half years, the US Army had outstripped the British in the conduct of combined arms operations. The battles around the Kasserine pass in Tunis in February 1943 and the American Cobra operation in July 1944 illustrate the wartime development of US capabilities. American armor, infantry, and artillery elements were unable to act in concert when the US first Armored Division was attacked by German forces near Kasserine pass, and the division was defeated in detail. During the Cobra

¹Keegan, *Six Armies in Normandy*, 213.

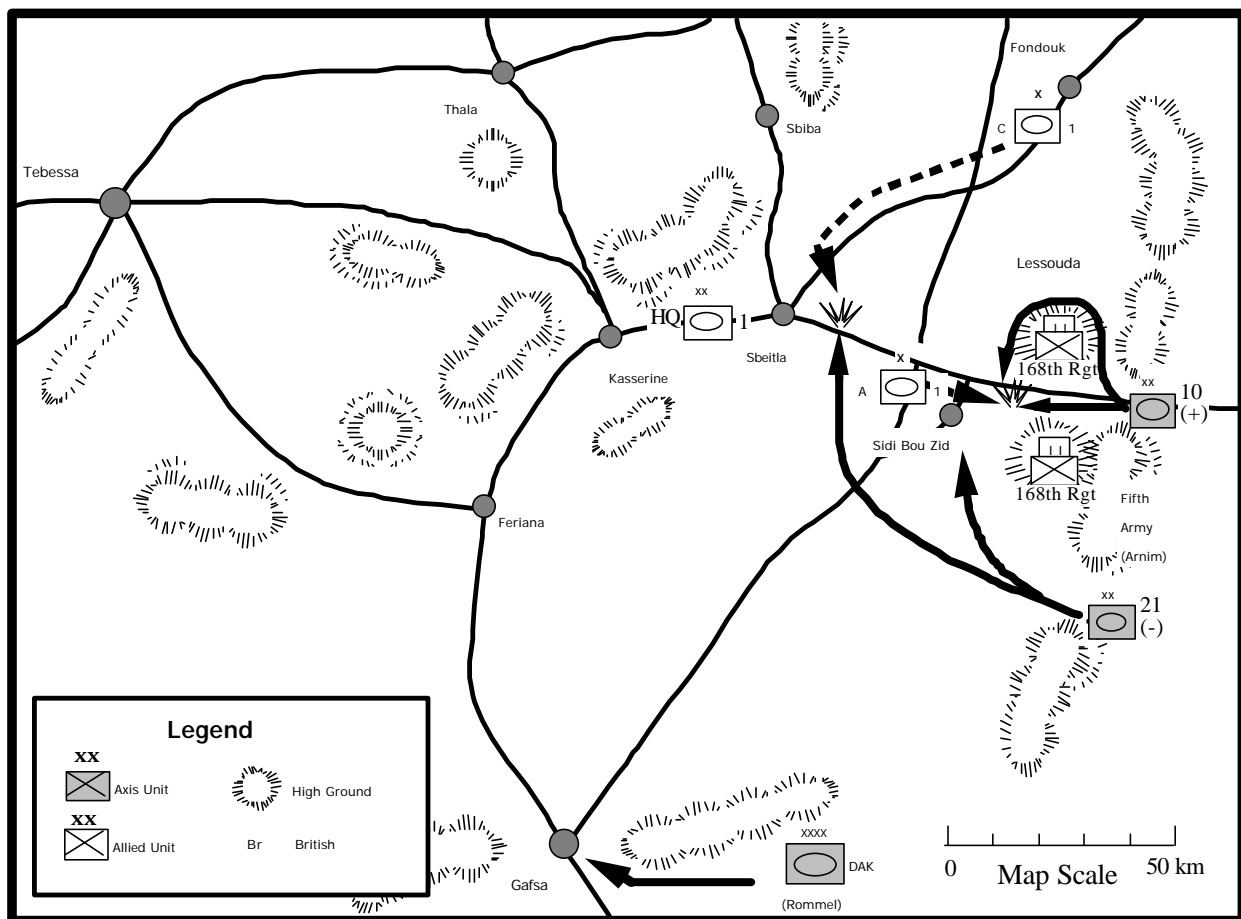
²McKee, *Caen: Anvil of Victory*, 285.

³Blumenson, *Breakout and Pursuit*, 193.

operation, however, US armored divisions operated as effective combined arms units and succeeded in decisively breaching German defensive lines.

1. Kasserine Pass¹ (14-22 February 1943). The Allies had been forced to postpone their final assault on the German positions ringing Tunis during the preceding December, and were preparing to resume their advance in March 1943. In the interim, the Americans, French and British were each holding a portion of the front. The forward American forces were relatively thin, consisting in February of the 1st Armored Division, centered around Sbeitla and Kasserine, reinforced by the 168th regiment near Sidi bou Zid. Three additional American divisions, the 1st, 9th, and 34th, were moving forward to join the 1st Armored Division.

Map 4. Kasserine Pass: February 14-15, 1943



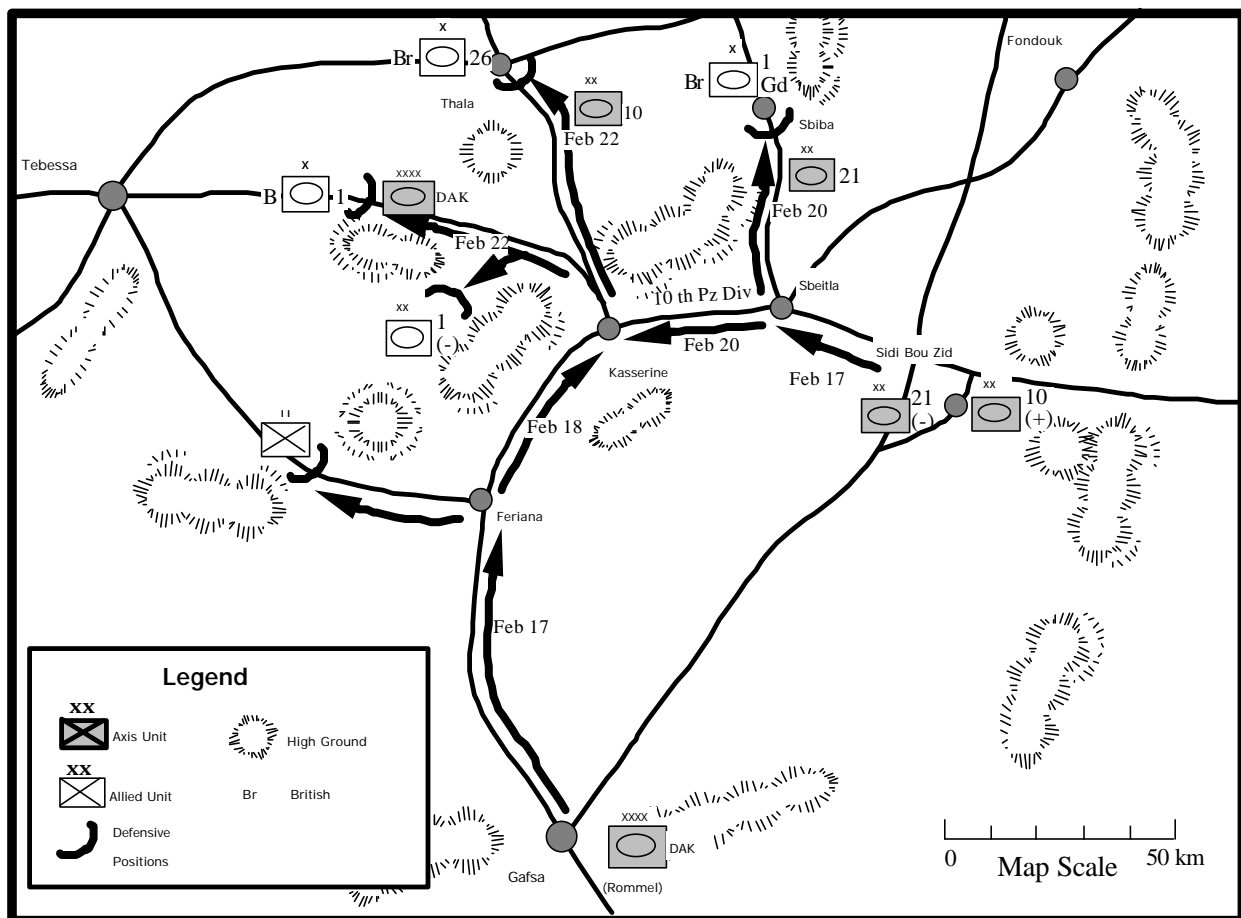
The Germans sought to disrupt Allied offensive preparations by attacking first. In the process, they expected to "instill in them [the Americans] from the outset an inferiority complex of

¹Except where otherwise noted, this description of the American effort of Kasserine is taken from portions of Martin Blumenson, *Kasserine Pass* (Boston: Houghton Mifflin Company, 1967).

no mean order"¹. Two panzer divisions of Arnim's Fifth Army would attack forward deployed American positions in the north, while Rommel's Africa Corps would sweep towards the Kasserine pass from the south. The attack threw American forces badly off balance and destroyed much of the 1st Armored Division. In two days of combat, the division lost 100 tanks, 57 half-tracks and 29 artillery pieces.² In all, the Americans lost 6,700 men, including 3,700 POW's.

As the attack progressed, however, American and British defenses stiffened. The Africa Corps was halted for a day by leading elements of the US 34th Division, and the 21st Panzer Division was stopped at Sbiba by the British 1st Guards Brigade. Though the 10th Panzer Division was able to flank American positions at Kasserine and continue through the pass, by 22 February, it was ultimately stopped by British armor to the south of Thala.

Map 5. Kasserine Pass: February 16-22, 1943



¹Hart, ed., *The Rommel Papers*, 398.

²Charles Whiting, *Kasserine: First Blood* (New York: Stein and Day, 1984), 191.

Evaluation. The American record at Kasserine was decidedly mixed. US units were never able to concentrate their forces adequately and were, therefore, never able to threaten the Germans with any sort of serious reverse. Moreover, during the early phases of the battle, they were not even able to orchestrate the actions of small units effectively. Faulty deployments and slow reaction times prevented US units from employing combined arms tactics effectively.

The American effort to defend the passes east and south of Sidi bou Zid were hopelessly disjointed. The responsibility for the effort fell to the 1st Armored Division under Orlando Ward. Following the II Corps commander's instructions, Ward had dispersed his elements. Combat Command A (CCA) was in the Sidi bou Zid area. CCB was a hundred miles north and was under the operational control of the French commander. The three battalions of the division reserve were situated at Sbeitla, twenty miles west of Sidi bou Zid. Dispersion made it hard for any major element to reinforce any other.

Worse still, the elements of CCA itself was widely dispersed and only marginally task-organized. Combat Command A's commander, Brigadier General Raymond McQuillan, again following the explicit directions of the corps commander, had placed one infantry battalion on each of the two hills overlooking the road to Sidi bou Zid. The two positions too far separated to be mutually supporting and they were located too far from the Combat Command's artillery to receive support from that source. The reserve, a battalion of tanks and a company of tank-destroyers was located to the rear at Sidi bou Zid from where it could theoretically be employed to launch counter-attacks in support of the infantry. Given that the front was wide open, however, there was little to prevent the Germans from penetrating the entire area, blocking the reserve, and isolating each of the American elements from one another.

At about 0600 on February 14, the German attack began. Two divisions, the 10th and 21st Panzer Divisions moved between and around the two American forward positions. By 0730, Djebel Lessouda was completely surrounded, and McQuillan ordered his reserve force forward. The Germans waited for the single battalion of American tanks with eighty three of their own plus supporting artillery and anti-tank weapons. The American armor was soundly defeated by this German combined arms force, and at around 1015, the seven remaining tanks of the American battalion withdrew. The German force pressed on to Sidi bou Zid, forcing the CCA headquarters to retreat west. Two battalions of artillerymen abandoned their guns and fled.

At 1240 on February 15th, Ward ordered the bulk of his division reserve to breakthrough the German cordon and rescue his isolated infantry battalions. The American relief force consisted of a battalion of infantry, a battalion of tanks, a company of tank-destroyers, and two

batteries of artillery. This force, like the CCA reserve, ran into the combined forces of two panzer divisions. By now, the German force in the Sbeitla pass included more than a hundred tanks. The commander of Ward's relief force, fearing encirclement, conducted a rear guard action with his armor, while the infantry and artillery withdrew. Although the tankers fought valiantly, there was little integrated use of combined arms tactics during the engagement, and all but four of the tanks were lost. That night, Task Force Waters withdrew from Lessouda in small groups. Although nearly half escaped, the force was no longer combat effective.

While the American Army had formal Tables of Organization and Equipment (TO&E's) which theoretically resolved the very different requirements for divisional coherence and sub-divisional flexibility, it had yet to achieve the ideal in actual combat. Rommel, comparing the American Army to the British, noted that it had a "tactically more flexible command."¹ But in early 1943 it was far from obvious to observers that the American Army would ever produce division- or corps-sized units capable of coordinating large scale combined arms operations. British and French junior officers commonly called the Americans "our Italians" during the Tunesian campaign, and British General Alexander, arriving in North Africa while the Kasserine battle was in full swing said they were "ignorant, ill-trained, and rather at a loss."²

2. Cobra (25-29 July 1944).³ The Cobra operation showcased an American Army with operational capabilities far above those it displayed in the Tunesian battles of 1943. The operation was launched seven days after the start of the Goodwood operation and resulted in a rupture of the German lines which was rapidly and aggressively exploited. US forces 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. The German Army was unbalanced to such an extent that fled in complete disorder after exploiting US forces threatened to encircle the best of Germany's French-deployed divisions.⁴

¹Hart, ed., *The Rommel Papers*, 407.

²Whiting, *Kasserine: First Blood*, 160, 196.

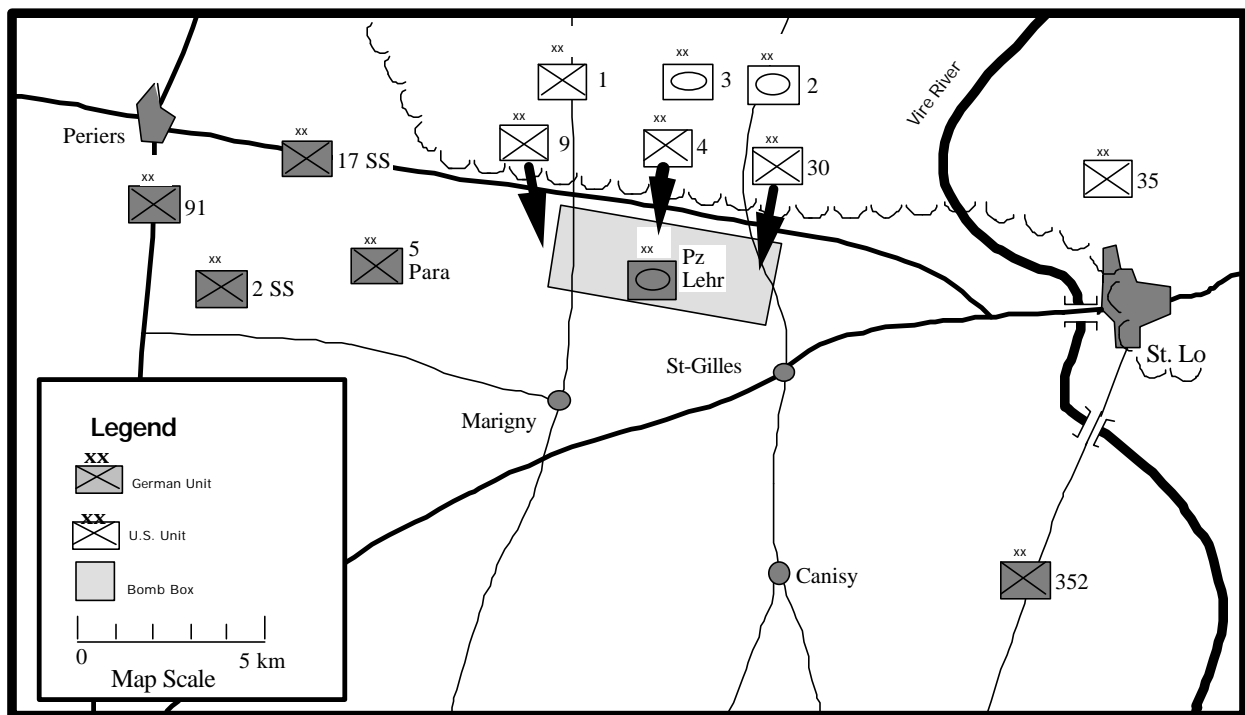
³Except where otherwise noted, the description of events during the Cobra Operation and the Mortain counterattack come from Martin Blumenson, *Breakout and Pursuit*.

⁴One German wrote, "I had seen the retreat from Moscow, which was terrible enough, but at least units were intact. Here, we had become a cluster of individuals." Hastings, *Overlord: D-Day and the Battle for Normandy*, 260.

Shortly before the Cobra operation, the Allied commander Dwight Eisenhower stated that "a breakthrough at this juncture will minimize the total cost [of the war]."¹ The intent of this attack was to convert high force ratios in Normandy into a breakthrough of some sort, thereby allowing even more of the Allied force to be brought to bear against the German army. The actual breakthrough was to be conducted by the US VII Corps.

Like in the British Goodwood operation, the assault was to be preceded by a massive bombing attack by Allied medium and heavy bombers. The plan then called for an attack by three infantry divisions across a seven kilometer stretch of front. As a breach was created, those divisions would move to secure the shoulders of the breakthrough area, while one motorized and two armored divisions passed through the gap. This armored force was then to swing west and trap the remainder of the German LXXXIV Corps. Like the other battles discussed above, few things went according to plan. Nevertheless, American forces proved capable of reacting to unexpected situations and deploying appropriate assets in a timely and effective manner.

Map 6. Operation Cobra: July 25, 1944



Despite a devastating preliminary aerial bombardment, the infantry attack quickly fell behind e to artillery fire, which had a range of about 12,000 meters. Finally, artillery was itself

¹David Eisenhower, *Eisenhower: At War, 1943-1945* (New York: Random House, 1986), 377.

quite vulnerable to tank attacks. ^{??}Tanks were largely impervious to the effects of artillery fire, and any tank that could avoid other threats and close within range, could kill artillery with near impunity. Of course, the actual dominance of one weapon system over another depended on a host

¹Divisional reports at the end of the first day indicated that no infantry division had penetrated more than 2,300 yards beyond their start points. The ability of the Germans to maintain the line during the first day was a function of three factors. First, many of the morning's bombs fell short, causing seven hundred casualties among the Americans and delaying their advance by hours. The delay allowed the stunned German defenders to recover their balance. Second, although the Germans units within the target zones were badly disrupted, units to the flank reacted quickly and pinched in against the attack. The 2nd SS and 17th SS were particularly active against the American right flank. Finally, the terrain was well suited to defense. Eisenhower, *Eisenhower*, 380-382.

of factors, such as the terrain in which the weapons were deployed and the mission assigned to

given the specific operational circumstances in which they were deployed, was critical to success.

The next section of this paper evaluates British and American attempts to learn how to conduct combined arms warfare. In order to ³ assess the progress of each army, two British and two American operations are examined. The two earlier battles, one British and one American, show that neither army was adept at coordinating combined arms forces early in the war. An evaluation of the two later battles, however, reveals that while the US Army had become skilled in the use of combined arms forces by the summer of 1944, the British had not. The contrast in learning is remarkable, given that British ground forces were engaged in the war far earlier than American forces and that thirty-two months elapsed between the two British operations whereas only seventeen months separated the two American battles.

III.A. The British Experience

Of all the European nations in 1940, the British should have been the most interested in learning how to win non-attrition wars. Britain had committed itself to total victory against Germany, an enemy which controlled most of Europe and had available human and material resources about which Britain could only dream. Moreover, it was unclear that the British public, Winston Churchill aside, was as willing to sacrifice its sons and daughters as was Nazi Germany. Whether the theater were peripheral or central, it would seem that the British would have sought a decisive style of action. The record shows that the British did try to duplicate the operational methods employed by German forces in 1940. The results were indifferent.

¹Johnathan House, *Towards Combined Arms Warfare: A Survey of 20th-Century Tactics, Doctrine, and Organization* (Fort Leavenworth: Combat Studies Institute), 110.

1. Crusader (18 November - 20 December 1941). Operation Crusader was launched five

¹ For a discussion of combined arms tactics used by American forces during the Cobra operation, see Michael Doubler, *Busting the Bocage: American Combined Arms Operations in France, 6 June - 31 July 1944* (Fort Leavenworth: Combat Studies Institute, 1988 and Michael Doubler, *Closing with the Enemy: How the GIs Fought the War in Europe, 1944-1945* (Lawrence: University Press of Kansas, 1994). For a general account of operations, that makes reference to particularly notable actions along the way, see Hastings, 252 - 266, and Blumenson, 264 - 282.

enched in the so-called "Sollum line." A previous attempt to dislodge German forces from those positions, Operation Battleaxe, had resulted in the piecemeal destruction of the four separate British columns. With that failure, Claude Auchinleck had replaced Archibald Wavell as the commander of the Middle East.

Every effort was made to supply the British Army in Africa with the largest quantity of modern equipment possible. In the eyes of the civilian leadership, equipment was the key to success. In the eyes of the civilian leadership, equipment was the key to successful blitzkrieg warfare. Winston Churchill himself wrote to Auchinleck that

¹Ibid., 261-262.

¹Joe Lawton Collins, *Lighting Joe: An Autobiography* (Baton Rouge: Louisiana State University Press, 1979), 245.

ans with ample equipment in modern weapons of all kinds....Now is the time to strike the hardest

¹Ibid., 245.

victory, home and freedom. The Desert Army may add a page to history which will rank with Blenheim and Waterloo.

Auchinleck had every intention of striking a decisive blow with his "mailed fist." As the commander of the newly formed Eighth Army, he chose Alan Cunningham, the victor of Somaliland. Auchinleck's own comments on that selection are revealing. He

was impressed by⁷⁷hiWherever possible, positions were flanked and attacked from the rear or bypassed entirely. Despite this flexibility of its employment, the American force never lost coherence or direction. Indeed, the use of parallel routes of advance required the closest coordination between subordinates and commanders to succeed. Attacking day and night with balanced combined arms forces down parallel avenues of attack, the 2nd Armored Division was able to widen the limited breakthrough achieved by infantry forces and open a hole through which George Patton's Third Army could pour unimpeded into the German rear.

III.C. Differential Learning Rates

By the end of 1942, when American forces first landed in North Africa, British armored forces had been fighting the Germans for two and a half years. Only days before Operation Torch placed American units in combat in Europe for the first time, Montgomery's battle hardened army had inflicted a major reverse on the Germans, showing all that the British Army was a force to be reckoned with. Yet the pattern of British military learning and adaptation was very spotty and incomplete. Despite the fact that Montgomery was able to produce victory with the British Army, deficiencies which had been prominent in 1940 plagued the British army until the end of the war. Tank-infantry and tank-artillery coordination, which had been weak in 1940, also proved problematic during the Crusader, Goodwood, and Market Garden operations.

While weaknesses in the use of combined arms were particularly noteworthy, other problems dogged British armored forces throughout the war. British forces seldom showed flexibility during the attack by changing axes of attack in mid course, seldom attacked at night, and did not follow up success with vigor. At other times, their armored forces simply showed a surprising lack of craft knowledge. During the battles of July 1944, British armored forces frequently withdrew into laager at night. While this was a reasonable precaution in the desert, where a withdrawal of a few hundred meters mattered little and where the approach of enemy

¹Hastings, *Overlord: D-Day and the Battle for Normandy*, 258.

artillery might be detected miles away, it made little sense in Western Europe, where such tactics frequently ceded the enemy hard-won ground and made the armored formations themselves vulnerable to artillery attacks.

In contrast to the British and in spite of their prewar inexperience with armor, the Americans learned quickly and developed highly effective armored units. Within three years of Germany's invasion of Poland, the Americans had developed a structure for armored divisions that is standard to this day. More importantly, less than a year and a half after their first taste of combat, American units had learned how to capitalize in practice on the flexibility that their TO&E's afforded in theory.

While there was still a good deal of rivalry between the rising and declining superpowers, few Englishmen would call the Americans "our Italians" after 1943. Richard O'Connor, one of Britain's most gifted armored commanders during the war, wrote to his wife in August 1944 that "having seen a good deal of them [the Americans] recently, I think there is a lot to be learned from them."¹ Rommel, on convalescent leave after being wounded on the eve of Goodwood, wrote that "what was astonishing was the speed with which the Americans adapted themselves to modern warfare."²

IV. EXPLAINING VARIABLE LEARNING

The discussion of the battles above reveals that the US Army learned how to employ combined arms tactics more quickly and effectively than did the British. Here, we will review the evidence to determine if differences in the rate of organizational learning can be explained by the cognitive, bureaucratic politics, or continuous process improvement theories outlined in the second section of this paper. Since each theory associates effectiveness and learning with a different dimension of the organization, we will examine the impact of each dimension of the organization--leadership, structure, and infrastructure--on learning and effectiveness.

IV.A. Theorists, Operational Leaders, and the Cognitive Theory.

The view of organizations as unitary actors places responsibility for learning and performance on leaders. This section will examine the military ideas and ideals held by American and British military officials from 1918 to 1945 to determine whether differences in the quality of

¹John Baynes, *The Forgotten Victor: General Sir Richard O'Connor* (London: Brassey's, 1989).

²Hart, ed., *The Rommel Papers*, 521.

conceptual thinking can explain the patterns of organizational learning described earlier. In undertaking such a study, one is immediately confronted with the question of whose ideas matter. Who are the leaders? Two groups are treated here. The first group of "leaders" include anyone who had something to say about mechanization. These are the theorists. The second group are the senior operators. Included here are those individuals who held army or corps commands during the war. Although this is a rather arbitrary selection of "senior leaders," it suffices to impose some selectivity and order upon a huge universe of possible individuals.

A second question which confronts the analyst of intellect is which ideas matter. In keeping with the primary focus of this paper, I have adopted the simple expedient of looking mostly at ideas about combined arms operations by mechanized units. This treatment will itself be divided into two general parts. The first will examine prewar thinking on the proper organization of forces. The second will focus on wartime diagnoses of organizational flaws and proposals for their correction.

With the benefit of hindsight, it is easy to find major flaws or incongruities in individual British prewar theories of mechanized warfare. Nevertheless, what characterized that body of thought as a whole was its broad scope and general foresight. While all the answers had not been worked out in detail by 1939, all of the important issues had certainly been raised and many of the correct answers found. The ideas of JFC Fuller and Liddell Hart, who may be regarded as the intellectual forefathers of British armor, provided inspiration for British armored advocates during the interwar period.

Both Fuller and Hart clearly understood the psychological and material importance of gaining access to the enemy rear areas. They also recognized the need for armored forces to act in a concentrated mass. During the First World War, Fuller conceived an ambitious agenda for armored operations which became known as "Plan 1919." It had a clear vision of victory:

without any warning whatsoever fleets of Medium D tanks should proceed at top speed...directly at the various [enemy] Headquarters lying in the primary tactical zone....As soon as orders and counter-orders have been given a little time to become epidemic, *a carefully mounted tank, infantry, and artillery attack should be launched*, the objective of which is the zone of the enemy's guns; namely the secondary tactical zone some 10,000 yards deep.¹

¹Kenneth Macksey, *Tank Warfare: A History of Tanks in Battle*, (London: Rupert Hart-Davis, 1971), 70.

Finally, the pursuit would follow, taking the attacking force "...at least 20 miles a day for a period of five to seven days."¹ In order to achieve these results, Fuller called for the employment of some 30 tank brigades, including 2,592 heavy tanks and 2,400 medium tanks, across 90 miles of front. Hart was also preoccupied by the importance of striking at the enemy's rear area. Success in such an attack, he believed, would resemble an "expanding torrent."² Although Hart began the interwar period primarily interested in infantry tactics, he was converted to armor by Fuller and ultimately came to believe in the essential dominance of tanks and of the need to create specialize armored formations. A prolific writer, Hart was largely responsible for the creation of the experimental mechanized brigade in 1927. The mechanized brigade allowed armored officers and enthusiasts an opportunity to experiment with actual forces on maneuver.

Throughout the interwar period, there was a lively debate in Britain about what mix of weapons should be deployed in armored formations. The early armor advocates thought there should be a high proportion of tank battalions within armored brigades and divisions. Nevertheless, other arms were to play an important role, even if their numbers were to be limited. Fuller, for example, thought that anti-tank guns could serve as a base around which tanks could maneuver. These would allow a force to fight a "defensive-offensive" in which anti-tank guns would

take up a position which the enemy will have to attack in order to carry out his plan, then it will generally be to the advantage of his opponent to let him attack, and directly his attack begins to succeed, or fail, to launch a counter-offensive in full force against him.³

Fuller also believed that it would be necessary to have "tank-marines," small forces of motorized infantry to cope with anti-tank weapons and other obstacles,⁴

¹Ibid., 71.

²John Mearsheimer points out that Hart never fully discussed the actual scope of a desired exploitation phase and he argues that the "expanding torrent," raised as it was with infantry forces in mind, was never intended to signal a belief in strategic consequences of successful infantry attacks. John Mearsheimer, *Liddell Hart and the Weight of History*, (Ithaca: Cornell University Press, 1988), 44. In fairness to Hart, however, it must be observed that few if any theorists of any nation felt that armored forces could achieve the kind of 1,000 mile exploitation actually enjoyed by the German army in 1940. The father of the German armored corps, Heinz Guderian, wrote that "(w)e intend to make a breakthrough and roll up the enemy front in order to exploit the characteristics of the tank in co-operation with other weapons." These words hardly illicit the image of a pounding drive deep into the heartland of enemy states. Cited in Macksey, *Tank Warfare: A History of Tanks in Battle*, 92.

³Brian Holden Reid, *J.F.C. Fuller: Military Thinker* (London: MacMillan Press, 1987), 166.

⁴Ibid., 164.

By 1933, Hart and Fuller had become relatively less important to the future of armor and other voices had joined the debate over the proper structuring of armored divisions.¹ Nevertheless, the debate over the optimal weapons mix for armored formations remained lively. Percy Hobart, who was involved in some of the late 1920's maneuvers and was to command the 7th Armored Division beginning in 1938, believed that tanks were independently dominant.² Vivyan Pope, Brigade Major at the Tank Corps Center at Bovington and later Inspector of Armored Vehicles, felt there was a need for armored infantry.³ In 1929, the first official manual on armored warfare entitled Mechanized and Armored Formations appeared in Britain. In it, the author, Colonel Charles Broad, called for a variety of brigade structures, including "light" and "tank." Within these formations, the ratio of tank battalions to others would vary, but there would be tight coordination between infantry and armor in all.⁴

British theorists and tank pioneers understood the uses to which armor could be put (the disruption of rear areas). A majority of them also understood the need for armored units to incorporate other supporting arms. British pre-war thinkers sparked and participated in a wide ranging debate that raised virtually all of the issues which were to become critical during the 1940's. All things being equal, this should have been the intellectual lubricant that primed the learning motors of an army. As actual wartime data entered the equation, incremental doctrinal and organizational improvements should have quickly followed. This, at least, would be the view suggested by a cognitive theory of organizational learning.

The contrast with the American Army could not have been more extreme. In the United States, there was very little serious thought given to the organization of mechanized units before the

¹Fuller came to perceive injustice at every corner and shut himself out of the world of active experimentation. His biographer, Brian Reid, records two very interesting commentaries on this subject, one by Percy Hobart and one by Lindsay. After a Christmas dinner with Fuller in 1929, Lindsay remarked that "it is a pity, for having done so much to get the Idea going, he has dropped completely out of the working that Idea into reality." Ibid., 151. Hart, who was never a practitioner, turned most of his intellectual energy to arguing the existence of defense dominance and the dangers of continental involvement during the 1930's.

²Hobart was purported removed because he did not believe in the proper mix of combined arms. Bryan Perrett, *A History of Blitzkrieg* (London: Robert Hale, P. 1983), 103. But while Hobart may have overstated the role of the tank, he surely did not believe tanks should be completely independent of other forces. Rather, he wanted separate tank armies, commanded by career tank officers who could organize the other arms as they saw fit. Ultimately, he thought that the entire Army might be mechanized and armored. Macksey, *Tank Warfare: A History of Tanks in Battle*, 80, 145.

³Ronald Lewin, *Man of Armour: A Study of Lieut-General Vivyan Pope and the Development of Armoured Warfare* (London: Leo Cooper Ltd, 1976), 70.

⁴Macksey, *Tank Warfare: A History of Tanks in Battle*, 85.

outbreak of European war. In part this was due to the lack of armored vehicles with which to experiment. In Britain, armored units were in continuous existence during the entire inter-war period.¹ Large experimental brigades had been formed in Britain in 1921 and 1927. The first American experimental brigade was not created until 1928, and it was disbanded within three months. While the brigade was in operation, its only tanks were derelict French and British models that had been pulled out of storage and put in running order. The entire budget for armored vehicles between 1925 and 1939 came to a grand total of \$60,000. Less than twice the \$35,000 projected cost of a Christie tank in 1938.²

Given this lack of equipment, it should not be surprising that there were no notable armored theorists in the United States during the inter-war period. There were, in fact, few who even took an interest in armor. Those who did frequently borrowed their ideas from British theorists. When the experimental brigade was formed in 1928, its structure exactly matched that of the British experimental brigade of the preceding year.³ Chaffee, the most prominent champion of armor in the US army during the interwar period, relied heavily on reports from Britain for the development of early armor doctrine.⁴ After 1932, when a permanent one-squadron mechanized cavalry regiment was formed, the Americans gained some experience of their own.⁵ Unlike in Britain, however, where the primary question was what the composition of armored units should be, US advocates had to fight throughout the 1930's for the continued survival of even the experimental unit. The infantry branch maintained that tanks were only valuable as support weapons, while senior cavalry officers held that horse-mounted cavalry was more mobile and reliable than tanks and could even find ways to defeat them in combat.⁶ The overwhelming conservatism of senior leaders and the lack of equipment with which to experiment made it difficult for those with an interest in armor to conduct any meaningful dialogue on fundamental

¹The British Army and the Royal Air Force used armored car units extensively to control their imperial domains. In 1920, there were eight such colonial armored car companies in existence. This number rose throughout the 1920's. Many of these armored car companies incorporated tanks, and there were continuing tank building programs during the 1920's. In 1922, for example, 140 new tanks were ordered. Kenneth Macksey, *A History of the Royal Armoured Corps, 1914-1975* (Beaminster: Newtown Publications, 1983), 43.

²Macksey, *Tank Warfare: A History of Tanks in Battle*, 131.

³James Cary lists one battalion each of light tanks, heavy tanks, artillery, and motorized engineers. James Cary, *Tanks and Armor in Modern Warfare* (New York: Franklin Watts, Inc, 1966), 218.

⁴ Macksey, 131.

⁵A second regiment was added in 1936, and these became the basis of the 7th Cavalry Brigade (mechanized). As its name would suggest, the unit operated as mechanized cavalry. According to House, the other arms were not fully cooperative. House, *Towards Combined Arms Warfare*, 76.

⁶Macksey, 131 - 132.

organizational issues. On 1 September 1939, the United States had 28 operational tanks and no doctrine for armored warfare.¹

To balance out the picture, it must be said that much of the opposition to armor was as much bureaucratic as intellectual, a subject which will be taken up later. Nevertheless, the result was a complete lack of discussion and debate among US military officers of the possibilities offered by mechanization and the best ways to capitalize on them. In 1939, the British were clearly ahead of their American peers in thinking about armored warfare.

Nor were British battlefield commanders unable to grasp the ideas of their own armored pioneers. Although some British commanders, such as Cunningham, had little experience with armored forces, other senior British commanders, such as Wavell, O'Connor, and Auchinleck, were well versed in armored operations. British commanders realized where the tactical deficiencies in their army lay. After Operation Battleaxe, Michael Creagh stated in a summary that "when on the defensive, his [the German] policy was to draw our tanks on to his guns, and then to counter-attack with tanks."² Training memoranda to this effect were issued to armored commanders prior to Crusader.³ More formal reviews were undertaken by the training branch of the General Staff of the Army, which, based on analyses prepared by theater commanders, issued Notes from the Theaters of War and Current Reports from Overseas. In Notes No. 1, "Cyrenaica November 1941," the German practice of attacking defended positions with combined arms was elucidated. In Notes No. 10, the organization of combined arms "battle groups" within German armored divisions was discussed in detail.⁴ Given the acuity with which British commanders diagnosed the flaws in their own organization, it is all the more remarkable that adequate means were never found for the coordination of combined arms forces.

British operational shortcomings cannot be ascribed to a shortage of tank theorists or to deficiencies in their theoretical corpus. Nor can those deficiencies be entirely blamed on the inability of senior officers to appreciate theories of armored warfare or diagnose operational shortcomings within their own organization. American prewar thinking on mechanization was minimal, yet the operational standards of US armored units exceeded those of similar British units by the end of 1944. In so far as leadership acuity can be distinguished from other dimensions of

¹John Clemens, "Waking Up from the Dream: The Crisis of Cavalry in 1930's," *Armor*, May-June 1990.

²Barnett, *The Desert Generals*, 108.

³Ibid., 108.

⁴Ibid., 234-239.

these military organizations, it provides a wholly unsatisfactory explanation to the relatively slow rate of British development.

IV.B. Military Structures and the Bureaucratic Politics Theory.

The cognitive theory of learning and effectiveness examined above posits that leaders and their ideas are primary determinants of success or failure. One of the assumptions integral to that theory is that leaders collectively exercise firm control of their organization and that all the elements of the organization work together towards a common purpose. Theories about the effects of bureaucratic politics take issue with that assumption and argue instead that subordinate elements of large organizations are highly territorial, compete for resources and prestige, and frequently work at cross-purposes with one another.

Several students of British operations during WWII have argued that while British theorists were ahead of their time, they were blocked from positions of responsibility by more conservative senior leaders who had risen from infantry and, particularly, cavalry commands.¹ Certainly, many of the early armored theorists interpreted events this way. The truth is, however, that the decentralized structure of the British army was far more conducive to experimentation and the free competition of ideas than was the more rigidly structured US Army. While there were undoubtedly conservative forces operating in the British army, the theory of bureaucratic politics fails to explain why American forces learned faster than British ones during WWII.

Both the American and British Armies were closed, clubbish, and elitist. Beyond those similarities, however, there were significant structural differences which conditioned very different patterns of political interaction between subordinate units. The British Army was highly decentralized. Officers either belonged to one of two branches, infantry or cavalry, or to one of several corps, such as artillery, tank, engineers, or ordinance. These branches and corps were responsible for training specialists, formulating doctrine, and establishing TO&E's for units within their domain.

¹See, for example, Douglas Orgill, *The Tank: Studies in the Development and Use of a Weapon*; or Michael Howard, *The Theory and Practice of War* (London: Cassell, 1965). The obstructionist argument pervades virtually all of the early post-war works on mechanization. The explanation for this perception is that those most concerned with the subject, the tank pioneers, all made (and probably) believed the argument. Mearsheimer's description of Liddell Hart's efforts to resurrect his reputation after the war provides a good snapshot of how such a proposition could be spread within the closed community of military actors and writers. Mearsheimer, *Liddell Hart and the Weight of History*, particularly 178-201.

What made the British system unique, however, was the regimental system associated with the Cardewell Army Reforms of 1871. The system was originally instituted to facilitate the maintenance of colonial forces, and its purpose had not changed by the 1930's. Under the Cardwell system, each regiment, almost all of which contained two regular Army battalions, was responsible for maintaining one battalion overseas.¹ The battalions themselves were "brigaded," both at home and abroad. Wherever sufficient units were stationed, brigades were formed into divisional units. A junior officer was expected to join a particular regiment and remain with that regiment until graduating to commands above battalion level. Once above battalion command, assignments tended to be fairly short, with command time at brigade frequently interspersed with time spent conducting regimental, branch, or corps administration.

While outwardly promoting conservative values (exemplified by the traditions of the British officers mess, polo playing, etc.), the system allowed new ideas to flourish under the cover and protection of many overlapping structures. The history of interwar British mechanization, which was pioneered by a small group of inventors and co-opted by the more powerful majority, is a classic success story for advocates of entrepreneurship. When the British Expeditionary Force Deployed to France in 1939, it was the first entirely motorized force in history.² While subsequent events should chasten the advocates of decentralization and the entrepreneurial spirit, the achievements of the British system cannot be denied.

Before the war, several advocates for armor, including most prominently JFC Fuller, came to embrace their cause with near messianic zeal and tended to see opponents at every turn. They felt that professional armored officers had been denied access to authority and that maneuvers had been skewed to reflect poorly on the Royal Tank Corps. There was, however, little evidence to substantiate either claim. JFC Fuller himself was appointed as the first commander of the Experimental Mechanized Force in 1927. Although Fuller rejected the offer on the grounds that he would also be required to command a non-experimental brigade thus compromising the experiment, Fuller's objections were not shared by the rest of the tank corps, which tended to view the command arrangements as adequate and the establishment of the Mechanized Force as a great opportunity.³ One of the younger generation of armored officers, Lindsay, remarked that "it is a pity for having done so much to get the Idea going, he has dropped completely out of working that

¹Field Marshal Lord Carver, *The Seven Ages of the British Army*, (New York: Beaufort Books, Inc., 1984). For an explanation of the system's origin, see 60-61; for an explanation of its maintenance during the interwar period see 195-198.

²Brian Bond, *British Military Policy Between the Two World Wars* (Oxford: Clarendon Press, 1980), 172.

³Robert Larson, *The British Army and the Theory of Armored Warfare, 1918-1940* (Neward: University of Delaware Press), 134.

Idea into reality.”¹ Despite Fuller’s suspicion of the high command, he was able to advance to the rank of Major General before retiring from the Army in 1933.

Liddell Hart was never a practitioner of armored warfare, but was, together with Fuller, instrumental in developing early theories of armored warfare. In 1924, Liddell Hart retired from active service, because of a heart condition.² Nevertheless, he was never far from the policy community. Writing first for the Daily Telegraph and later for the Times, Liddell Hart had access to military information from his many acquaintances within the military³, and was often able to weigh in on important policy debates. During the mid-1930’s, Hart was asked to “conduct an analysis of the Army List and compile a list of noteworthy officers from the generals down to colonels” for Duff Cooper, the Secretary of State for War.⁴ In 1937 Liddell Hart became the personal advisor to the Duff Coopers successor as Secretary of State for War, Hore-Belisha. Among other things he did in this capacity was to engineer a purge of the Army leadership.⁵

Other early advocates of armor held important operational commands during both the interwar and wartime periods. Percy Hobart was given command of the Seventh Armored Division when it was formed in Egypt in 1938.⁶ Later, he organized and commanded the 11th Armored Division and the 79th Armored Division.⁷ Vivyan Pope was appointed the command of the Mobile Force (brigade) when it was dispatched to Egypt during the Abyssinian crisis in 1935. In 1940, he became Director of Armored Fighting Vehicles and held great influence over the appointment of senior armored commanders.⁸ In 1941, Pope himself was appointed to command the XXX Corps, the first British armored corps ever formed, though his untimely death in a plane crash prevented him from actually assuming command.

Nor were field exercises systematically biased against armor. Some tank officers criticized the ground rules for the 1934 maneuvers, in which the armored contingent was required

¹ Reid, *J.F.C. Fuller: Military Thinker*, 151.

²In Liddell Hart's memoirs, Hart presented two pieces of correspondence from Fuller which followed his retirement suggesting that Hart had been removed because of his unorthodox views. John Mearsheimer, who had substantial access to British archival records, claims that there is no evidence to substantiate the charge. Mearsheimer, *Liddell Hart and the Weight of History*, 3.

³Liddell Hart first broke the story that someone other than Fuller would hold the 1927 command and wrote several articles condemning the conditions under which Fuller had been accepted to assume command. Fuller's successor, it should be noted, assumed command with the arrangements unaltered in their essentials.

⁴ Mearsheimer, *Liddell Hart and the Weight of History*, 74.

⁵Ibid., 74.

⁶Bond, *British Military Policy Between the Two World Wars*, 183.

⁷Macksey, *A History of the Royal Armoured Corps, 1914-1975*, 86, 144.

⁸Ibid., 114.

to attack a single complex in the enemy division's rear, rather than being allowed to choose its targets independently or raid with impunity. Although this exercise, like all others, was somewhat contrived, its groundrules hardly doomed the armored force to failure. To the contrary, the scenario allowed armor free access to the infantry's rear area, rather than requiring mechanized units to first achieve a breakthrough. The target complex itself was spread over 140 square miles. It was not a single easily defended point as was ingenuously suggested by critics. Moreover, other exercises seemed positively biased in favor of armor. In 1931, an exercise was held in which a brigade of tanks was pitted against an infantry column on the march.¹ A later exercise pitted armor against an enemy truck convoy on the march.² The tactical parameters defined in these scenarios would have been considered ideal by tank commanders of any era.

It was in fact the relatively sheltered emergence of the Royal Tank Corps which ultimately led to the co-optation of mechanization by the rest of the Army. The cavalry began its adjustment with the conversion of some of its horsed units to armored car units in the late 1920's. The conversion to armored cars was a response to exigencies in the colonial world, where armored cars provided better security for British patrols and gave small units greater firepower than larger mounted patrols. The infantry begin experimenting with machine-gun and anti-tank carriers in the mid-1920's,³ and the artillery created the world's first self-propelled artillery piece, the "Birch" gun, in 1926.⁴

In 1935, the CIGS, Montgomery-Massingberd, ordered the entire Army--infantry, cavalry, and artillery--to accelerate the process of mechanization. It was announced that 28 infantry battalions would be converted to mechanized machine-gun battalions and that the remainder would become motorized infantry. The cavalry continued converting horse mounted battalions into armored car battalions and added light tanks to its inventory as well.⁵ The galvanizing event behind all this activity was Wavell's analysis of the 1934 maneuvers. He had concluded from those exercises that while dismounted infantry could hold fixed positions, only mechanized infantry could play any role at all (offensive or defensive) in mobile warfare. These views were expressed formally in the Field Service Regulations published in 1936. The infantry and cavalry, threatened with obsolescence and informed of that fact by continuous tank demonstrations, had

¹Larson, *The British Army and the Theory of Armored Warfare, 1918-1940*, 157.

²Ibid., 165.

³Macksey, *Tank Warfare: A History of Tanks in Battle*, 86.

⁴General Noel Birch, as director of artillery, designed the 18-pounder mounted on a tracked chassis. A battery of six guns was produced in time to be included in the Experimental Brigade of 1927. Bidwell, *Fire-Power: British Army Weapons and Theories of War 1904-1945*, 173-174.

⁵Bond, *British Military Policy Between the Two World Wars*, 172.

every incentive to adopt armor. Because the British Army had been gradually moving towards mechanization for ten years before the outbreak of war, even many senior officers who were not “advocates” of armor or members of the Royal Tank Corps had significant experience with its use.

The American Army was divided into a much simpler array of structures and tended to be more centralized than the British Army. There was no equivalent of the British regimental system, and the branches, particularly cavalry and infantry, tended to exercise a great deal of control over events which effected their welfare and operation. Given this environment, US armored theorists could find little “space” within which to operate during the inter-war years. Despite the importance of the tank in ending World War One, the Tank Corps, which had been formed in 1918, was abolished by the National Defense Act of 1920,¹ and despite the general advantages of clip fed rifles over horses displayed in the war, cavalry officers came to dominate the military.²

Two years after the 1928 experiment in mechanization, General Douglas MacArthur, the Army Chief of Staff, ordered both the infantry and cavalry to mechanize their units. Neither branch complied. Croft, the infantry chief, argued that tanks were novelties and were clearly of secondary importance on the battlefield.³ John Herr, the cavalry chief, took a more extreme position, saying that he would not cut a single horseman to make room for tanks. As if to underscore his opposition to mechanization, Herr attempted to reintroduce the saber to the cavalry inventory in 1938.⁴ Interestingly, George Patton, who became one of US army’s best and best-known tank commanders during the Second World War, ardently supported Herr’s opposition to mechanization during the 1930’s.⁵

The evolution of Patton's position on the issue of mechanization is instructive, since it sheds light on the political environment of the US Army between the wars. Patton served with the Tank Corps during World War One and won the Distinguished Service Cross for gallantry in action. Immediately after the war, his writings about the tank were entirely positive. After the Tank Corps was disbanded in 1920, Patton transferred to the cavalry. In 1928, he was assigned to

¹Russell F. Weigley, *The American Way of War* (Bloomington: Indiana University Press, 1973), 217.

²On this subject, the work of Edward Katzenbach is particularly interesting. Edward L. Katzenbach, "The Horse Cavalry in the Twentieth Century," in Robert Art and Kenneth Waltz, Eds, *The Use of Force: International Politics and Foreign Policy* (London: University Press of America, 1983).

³Macksey, *Tank Warfare: A History of Tanks in Battle*, 131.

⁴*Ibid.*, 132.

⁵For Patton's comments on the most useful kind of blade, see Blumenson, ed., *The Patton Papers*, Vol. I, 925.

the office of the chief of cavalry, moving for the first time outside the operational realm. During his earliest days in that position, Patton continued writing enthusiastic papers about the value of armored cars. Shortly, however, the chief of cavalry sent Patton a message about the cavalry's position on mechanization, asking him to write a paper on the "limitations of mechanization."¹ From that point until the 1940 Louisiana maneuvers, Patton served as an advocate of horse-mounted cavalry. In 1929, for example, Patton published an opinion piece in the Washington Post, saying

surely the remarks of Colonel JFC Fuller who during the course of four years' war...attained only the rank of Lieutenant -Colonel, or the opinions of such a hack-writer as Captain Lyle [sic.] Hart seem puerile when compared with the forceful statements of the elite of the military world....(A) critical examination of the value of [horse-mounted] cavalry as compared with or modified by the so-called scientific arms is necessary.²

Patton supported Herr's re-introduction of the cavalry sword in 1938 and wrote several articles about which blade might be most useful in combat. Throughout the interwar period, political considerations made it impossible for Patton and other officers with experience in mechanized operations to contribute to the development of an effective mechanized force.

The net effect of bureaucratic obstruction in the US army was a lack of discussion about how combined arms tactics might be employed with mechanized forces. When war broke out in Europe in 1939, no US Army units then in the order of battle had conducted training in such operations. Although it is undoubtedly true that there were active opponents of mechanization in the British Army, they met with far less success than conservatives in the US military. The argument that bureaucratic politics was the decisive factor in the poor performance of British armored forces during WWII cannot be sustained either by the facts of the British case alone or by a comparison with the effects of bureaucratic politics in the US Army.

IV.C. Organizational Infrastructure and the Theory of Continuous Process Improvement.

The era of regular and planned innovation in industry has given rise to a relatively new body of literature on organizational learning and effectiveness. The common element in this literature is its focus on continuous process improvement (or dynamic learning) and its treatment of organizational infrastructure as the primary determinant of learning and effectiveness. Within this literature, infrastructure is defined as the set of channels and procedures by which information is conveyed from one functional or operational element to other parts of the organization. This

¹Ibid., 843.

²Ibid., 860.

section examines the infrastructures of the British and American armies and looks at how differences in those infrastructures effected the ability of each to adapt to new circumstances. The evidence offered here does support the notion that the relative strength and redundancy of an organization's infrastructure makes it either easier or harder for that organization to learn.

The British Army had immense difficulties moving from a theory of armored warfare towards the establishment of a doctrine of armored warfare, and it had even more difficulties converting doctrine into tactical procedures. In 1938, the Field Service Regulation was the only official army-wide operational guide that was not associated with a branch or regiment. Its contents were, however, largely abstract rather than procedural.¹ During the war, Notes from the Theaters of War provided more concrete assistance. The Notes, however, were written as communiqués by the regional commands, and they provided no army-wide standard which could serve as a basis for incremental improvements.

Behind this lack of army-wide tactical procedures and standards was the regimental system and the decentralized nature of the British Army. Of all the European powers, only the British assigned so many training responsibilities to the regiment and so few to war department headquarters. Even some individual entry training, which was conducted almost entirely at the army level or by military branches in other cases, was partly conducted at the regimental level in the British Army. The concentration of resources at the regimental level acted to inhibit training at brigade and divisional level. Responsibility for larger scale exercises was placed primarily on the major home and overseas commands, and there were no Army level exercise facilities which were funded and equipped to cope with such events on a routine basis. Even by the end of the war, there was no center where tactical procedures could be systematically resolved. Exercises conducted on the Salisbury Plain (a tiny plot of land by American standards) were as close as the British came to a center for army tactics. But those exercises were held under the auspices of the Home Command, which did not have the authority to establish tactical procedures for the entire force. In any case, there was no center or staff assigned to evaluate the occasional exercises held there and write or adjust procedures based on the findings.

The decentralized nature of the British Army which hampered the development of army-wide tactical procedures also plagued the development of coherent fighting units. It is perhaps easier to understand the full impact of decentralization if one looks at the experience of a specific division. The 7th Armored Division, which was involved in both the Crusader and Goodwood

¹On this general point, see Williamson Murray, "British Military Effectiveness in the Second World War," in Allan Millett and Williamson Murray, Eds., *Military Effectiveness* (London: Allen & Unwin, 1988).

operations, spent a total of about two weeks during the war training as a single body, despite numerous breaks in its battlefield activity.¹ Even after the fall of Tunis, when the division was sent to Homs on the Tunesian coast for four months, no division or brigade level exercises were held. Although individual training occurred, the regimental histories suggest that even battalion-level training was not systematically conducted.

The 7th Armored Division's stay at Homs was somewhat unusual in that the whole division was dispatched to one location. Generally, when the division was out of the line, battalions were dispersed, each going to its own camp or to a regimental depot. In April 1941, for instance, when the division was sent to refit in Egypt, the 2nd Rifle Battalion was stationed on the Suez Canal to watch for air dropped mines. The armored battalions were sent to the camped in the delta.² Divisions in the US and German armies, in contrast, conducted systematic training at all echelons when they were out of line.

Battle, of course, may be considered a form of training. Armies are frequently described as "battle hardened," a phrase which suggests that some inherent value accrues from combat. However, it may be the case that gains in operational effectiveness derive largely from the ability to train new units or retrain old ones based on lessons learned from actual operations. The memoirs of Heinz Guderien suggest that training regimes for German armored units were, for example, modified after the Anschluss and again after the Polish Campaign. The British experience suggests that the experience of combat itself may not result in significantly improved operational capabilities if the lessons of combat are not systematically distilled and used as the basis for improved training. In June 1944, there were high expectations for what the "desert rats" might achieve in Europe. In fact, however, their performance was worse than that of most other British armored units.³

Among other problems the 7th Armored Division experienced was a lack of continuity in its subordinate unit composition. The regimental system was again largely to blame. The regiments protected their own turf, creating something of a union system within the British Army.

¹This estimate is based on a survey of a wide variety of documentary sources, including a large number of regimental histories. A two week exercise in February 1944 is recorded in George Forty, *Desert Rats At War*, Vol 2 (London: Ian Allan Ltd, 1975), 44. This book and other material suggests that Percy Hobart, who commanded the division from 28 August to 15 November 1939 trained the division hard, though I was unable to find sufficiently detailed material on that period in the division's history to determine exactly what sort of training was conducted.

²Major RHWS Hastings, *The Rifle Brigade in the Second World War, 1939-1945* (Aldershot: Gale & Polden Ltd, 1950), 68.

³The division's performance was so bad that the division commander was removed after the Bluecoat operation.

The Royal Horse Artillery regiment, for example, was responsible for providing the army with self-propelled artillery battalions. It protected this function, and other regiments, such as the Honourable and Ancient Artillery could not be converted. Similarly, the Rifle Brigade supplied the army with mechanized infantry battalions, so units of the Queen's Royal Regiment could not be supplied with armored personnel carriers.¹ As a result of this union system, any change in divisional TO&E's resulted in wholesale replacement of battalions instead of the conversion of battalions already assigned to the divisions. Continuity also suffered when the regiments rotated battalions between the Home Command and the various field commands.

Nor were War Department sponsored official TO&E changes the only ones with which the Seventh Division had to contend. Frequent leadership changes above, below, and at the division-level undermined the cohesion of units and their ability to learn together. Churchill replaced the commander of British forces in the Middle East during each of the first three years of the desert war. Theater commanders had great latitude in structuring or restructuring their forces. Perhaps more importantly, the lack of army-wide doctrinal standards meant that each commander was likely to arrive in the theater with a radically different operational style than that of his predecessor. Wavell resurrected the 19th Century British light mobile desert column and conducted converging attacks with independently operating corps-sized all-arms units. Auchinleck seems to have adopted more of his ideas from modern theorists on mechanized warfare. He tended to mass armored divisions under a single corps and use the armored fist to sweep towards the enemy rear area while British infantry and artillery fixed the enemy in place. Montgomery preferred to lay siege to his enemies front lines. Montgomery often said he was "crumbling" the enemy front, as though his forces were conducting sapper missions against a medieval fortress. There was even less continuity of command at the division-level. During five and half years of war, The 7th Armoured Division had ten commanders.²

For the 7th Armored Division (like all divisions in the British Army), frequent changes in command meant learning a new way of war semi-annually. Command discontinuity also meant that in addition to formal army-wide TO&E, each division also faced the prospect of more idiosyncratic changes in its composition by theater commanders. During the war, the number of battalions in the 7th Armoured Division went from twelve to twenty-one back down to twelve. Eleven distinct brigades were, at one time or another, organic to the division. Mechanized infantry was added, then later reduced when motorized infantry and artillery components were added.³ In

¹ The Queen's Royal Regiment provided motorized, truck-mounted infantry. They could not, however, be equipped with armored vehicles (such as half-tracks).

²Forty, *Desert Rats At War*, Vol II, 9.

³Major-General G.L. Verney, *The Desert Rats: The History of the 7th Armoured Division 1938-*

all, forty-two different battalions passed through the division as organic elements. Of the twelve battalions with the 7th Armoured Division in July 1944, only four had been present under the same flag three and a half years earlier.¹ The lack of divisional cohesion that resulted from these discontinuities in command and constitution frequently resulted in the scattering of battalions during active operations. In emergencies, therefore, it was often easier to create scratch brigades out of battalions from different divisions than it was to reassemble the original divisions. Battalions organic to the 7th Armored Division were therefore frequently operating under different commands, while non-organic battalions were often attached.

In this environment, where leaders, neighbors, and expected behaviors changed constantly, individual regiments and battalions sought security through closer association, or informal “alliances,” with other battalions. A typical case was the relationship that developed between the 2nd Battalion of the Rifle Brigade (a regimental designation) and the 2nd Battalion of the Royal Horse Artillery. The official history of the Rifle Brigade records that

Among the gunners our greatest friends were the 4th R.H.A. For months at a time in the desert the 2nd [battalion of the] Rifle Brigade administered and commanded batteries of the 4th R.H.A., and the 4th R.H.A. companies of the 2nd Rifle Brigade. Occasionally, we fired their guns....²

It is significant that the relationship described above was between mechanized infantry and self-propelled artillery. The rationale for mechanizing the Rifle Brigade in 1937 had been that “tanks would require specially trained infantry to work with them in close support.”³ In practice, however, mechanized infantry and armored units seldom operated in close coordination. In fact, infantry battalions and battalion commanders tended to be distrustful of armor, which had a reputation of “bugging-out” at the worst moments.⁴ The hostility was sufficiently widespread and palpable that armored officers too were clearly aware of the situation.⁵ The bilateral associations that developed between battalions in the British Army did have some salutary effects.⁶ But in

1945 (London: Hutchinson, 1954), 283-290.

¹Ibid., 283, 289.

²Hastings, *Overlord: D-Day and the Battle for Normandy*, 77.

³Ibid., 1.

⁴Murray, “British Military Effectiveness in the Second World War,” 128.

⁵Crisp, a tank squadron commander, reported “puzzled looks on the faces of the infantrymen and gunners” of one unit with which he was operating when his tank pulled back, unannounced, to reload. Crisp, *Brazen Chariots: An Account of Tank Warfare in the Western Desert, November-December 1941*, 88.

⁶The Support Group--or non-armored brigade--of the 7th Armored Division banded together as a cohesive unit in 1941. Hastings, *The Rifle Brigade in the Second World War, 1939-1945* (1950).

general they served more as a sad commentary on the state of combined arms operations in the British Army than as a viable solution to problems effecting the force.

Organizational decentralization hampered the British Army's ability to produce units adept at quickly deploying combined arms elements to react to unforeseen circumstances. General Montgomery, who dominated the British Army after 1942, sought to compensate for the lack of a flexible instrument by reducing uncertainty, centralizing the control of battle management, and carefully scripting the movements and actions of various specialized divisions. Total control was the essence of Montgomery's way of war. Indicating that he would not tolerate independent action by subordinates, he told his XXX Corps commander on the eve of Alamein that "It will be an army battle, Ramsden--an army battle."¹

By centralizing battle management and carefully scripting the movements of divisions and brigades, Montgomery was able to win battles where previous British commanders had failed. But those methods entailed a number of costs that prevented the British from fully capitalizing on the capabilities of modern mechanized forces. Reducing uncertainty required that the maneuver of friendly forces be minimized until the enemy's forces were thoroughly beaten. Prior to the battle of El Alamein, he wrote in his journal "no more maneuver, fight a battle."² Rather than slicing through the enemy line, Montgomery sought to obliterate part of it. This required overwhelming force and frequently contributed to congestion on the battlefield, further hampering the ability of local commanders to deploy or redeploy forces in response to evolving situations. In the case of Goodwood, the large size of the attacking British force also had the effect of compromising surprise.³

Given the lack of coherence within the British force, success probably required the kind of authoritarian command style practiced by Montgomery. But Montgomery's authoritarian style, readily imitated by his staff and senior subordinates, meant that information coming up the chain of command was unlikely to get an adequate hearing at higher headquarters. When Major-General

¹Barnett, *The Desert Generals*, 261.

² *Ibid.*, 271.

³ On the night of 16 July, a Luftwaffe photo reconnaissance aircraft dropped a flare over the Orne River bridges and recorded the large-scale movement of forces towards the east side. Field Marshal Sperrle of Luftlotte 3 issued an intelligence report predicting a large attack "to take place southeastwards from Caen about the night of the 17th-18th." The attack was delivered at 0500 on 18 July. Max Hastings, *Overlord: D-Day and the Battle for Normandy* (London: Michael Joseph 1984), 233. Sepp Dietrich, the commander of the 1 SS Panzer Corps, claimed after the war that he first learned of the impending attack by pressing his ear against the ground and feeling the vibrations of armored vehicles in the distance. Alexander McKee, *Caen: Anvil of Victory* (London: White Lion Publishers Unlimited).

GPB “Pip” Roberts, the commander of the 11th Armored Division at Goodwood, predicted that his armored brigade might run into anti-tank guns deep in the German position and argued that his infantry brigade should not be detached to deal with German forward defenses, he was told by the VII Corps commander that if he was unhappy with his tasks “then one of the other divisions could lead.”¹ Organizational decentralization and the lack of an effective infrastructure inhibited the development of both unit coherence and operational procedure in the British army. Those weaknesses in turn required the centralization of command at the corps- and army-level, which made it difficult for British units to exploit opportunities at the tactical level.

During the war, the American Army, building on an existing training system, developed an elaborate infrastructure that permitted the development, codification, and continual evaluation of new tactics and doctrine. The outstanding feature of the US system was its treatment of both unit training and the development of tactics as inseparable elements. This seamless system contributed directly and indirectly to American military performance. First, the US training system produced reasonably uniform divisions, which could be relied upon by higher commanders to perform to known standards. Second, within two years of America’s entry into the war, it was producing high quality divisions capable of conducting high-tempo combined arms operations on a sustained basis. Third, it ensured that doctrine was disseminated and understood by units and unit commanders. Forth, it ensured that doctrine could be improved in light of ongoing operations. Finally, the system was designed to produce a common army-wide language. These aspects of the US training infrastructure operated in concert. Uniformity in divisional performance, for example, made it easier to evaluate doctrine, since execution could be assumed to be relatively constant.

Virtually all of the elements of the training and doctrine system had some precedent, but the full system was formalized by General Lesley McNair. McNair was appointed the Chief of Staff of the GHQ by George Marshall in August 1940 and became Chief of the Army’s Ground Forces in March 1942.² In both positions, he concerned himself primarily with the development of American forces. Of all the military theorists or battlefield commanders discussed in the preceding sections of this paper, McNair’s contribution to the Allied war effort was perhaps the most important. Thus, although the cognitive theory of organizational learning provides an inadequate explanation for the differences between US and British performance insofar as it focuses on individual battlefield commanders or military theorists, the following discussion of McNair’s activities suggests that the ideas of individuals can make a critical difference,

¹d’Este, *Decision in Normandy*, 373.

²E.J. Kahn, *McNair: Educator of an Army* (Washington: The Infantry Journal, 1945), 212.

particularly when their activities are directed towards the system by which the organization itself learns.

In 1940, there was no doctrine for conducting large-scale mechanized operations.¹ For this, McNair formulated a three-part program designed to develop, disseminate, test, and modify US Army doctrine. The first part of the program was a circuit of lectures, discussions, and demonstrations. Key commanders and staff officers participated in this program, which was designed to enhance the awareness of the full range of unit types and capabilities. This, McNair thought, would be useful in promoting a stronger understanding of how those elements might be coordinated combined arms warfare. Although McNair thought that demonstrations and lectures were necessary and inexpensive, they were the least important part of his larger system. Describing the limits of such measures, he wrote that

however realistically the demonstrations might simulate combat, and however thorough the explanations and discussions might be...[they would] have only limited value. Except for small selected units, the troops played no part; the assembled officers enlarged their knowledge but had no chance to practice it.²

The second part of the program, inspection tours by key staff members from the various branches, ensured that doctrine was being followed at the front. More importantly, it allowed specialists to evaluate the effectiveness of existing doctrine and collect feedback from practitioners about how it might be improved. Over 1,500 reports were filed by these observers from the Mediterranean and European theaters alone. Observer reports “helped to link together divisions fighting overseas with the War Department, the army’s school system, and units training for overseas deployment.”³

¹ Michael Doubler argues that while a number of tactical questions had yet to be resolved, early US wartime experience validated the efficacy of existing prewar military doctrine. The basis for that statement, however, is an examination of the 1941 version of Field Manual 100-5, which incorporated observations from the first two years of the war in Europe. More importantly, although the distinction of doctrine and tactics is both substantively important and analytically useful, there is no hard and fast rule about where the boundary between the two lies. Doubler tends to define doctrine restrictively, treating it as the most general set of principles about how operations should be conducted. This paper defines the prewar period as before Hitler’s invasion of Poland and takes a somewhat more broad view of doctrine. Nevertheless, Doubler makes an astute point insofar as he argues that it was far easier to arrive at general doctrinal principles than to convert those into tactical procedures. Michael Doubler, *Closing with the Enemy: How GIs Fought the War in Europe, 1944-1945*.

²Roberts, *et al.*, *The Organization of Ground Combat Troops*, 410.

³Doubler, *Closing with the Enemy: How GIs Fought the War in Europe, 1944-1945*, 270.

The establishment of maneuver centers and the conduct and evaluation of large-scale maneuvers conducted at those centers, was the third and most important part of McNair's program. Large-scale maneuvers had long been a central element of the American army's philosophy of training, doctrine, and force development. When budgets began to grow, exercises expanded to huge proportions, giving division and corps commanders a sense of the problems they would face in real war. The VII Corps, formed in January 1941, had conducted two corps level exercises and participated in one multi-army level exercise by the end of September.¹ The final exercise, held in Louisiana and Texas,² included the use of 1,000 airplanes, two armored divisions, seven infantry divisions, anti-tank units, and a company of paratroopers. In all, 400,000 men were gathered to fight across a "battlefield" that stretched along the Louisiana-Texas border from Beaumont to Shreveport.³

Exercise results were studied in detail by all the key participants and reports were prepared for McNair and his staff. The process enabled the army community to identify which tactics worked and which did not. After action reports were prepared and forwarded to McNair. As the commander of the vast Desert Training Center, George Patton had the opportunity to contribute regular maneuver findings back to the centers of doctrinal control. A letter from Patton to General Jake Devers, the chief of the Armored Force, is instructive. Patton wrote

I am writing to tell you how really splendid I think the Armored Force manuals are....I hope you will forgive my bombarding you with letters, but I feel that the success of this whole thing depends on keeping you fully informed of what we are doing.⁴

Patton also frequently wrote to McNair. In one letter, he commented on equipment performance. Another dealt more directly with doctrine:

I am glad if my somewhat informal weekly reports are of interest. I have tried to make them short and readable but I fear the one I am sending this week will be a little long. However, since it is the first time to my knowledge that a fairly large group of armored vehicles were successfully commanded from the air by voice radio, the report may be of interest....Please let me assure you that your

¹Collins, *Lightning Joe: An Autobiography*, 107-115.

²The Louisiana maneuvers of 1941 should not be confused with those in the same location conducted during 1940. For the 1940 maneuvers, during which senior American commanders began to perceive that the US was suffering from a conspicuous shortage of armored formations, see John Cranston, "1940 Louisiana Maneuvers Lead to Birth of the Armored Forces," *Armor*, May-June 1990.

³Collins, *Lightning Joe: An Autobiography*, 111-113.

⁴Blumenson, ed., *The Patton Papers*, Vol. II, 62.

sympathetic interest in what we are doing is a very rich reward for whatever efforts we are putting out.¹

The American high command learned with its units. The process was both hands-on and iterative.

Throughout the war, maneuvers were used to develop and test new tactical procedures. The experience of units in combat gave leaders new insights into the weaknesses in their own tactical repertoire, but combat itself did not spark the spontaneous generation of “natural” solutions to those problems. Rather, overcoming unforeseen difficulties frequently required that units be pulled out of the line to devise and retrain in the use of new tactical procedures. After standard US combined arms tactics proved ineffective in the Norman hedgerow country, systematic efforts were initiated by forward divisions to develop new solutions. Divisions frequently arrived at different solutions to tactical problems and within certain bounds, there was no attempt to impose procedural uniformity.² Wherever major flaws were found in either the organization or tactics of US forces, solutions were implemented throughout the entire force. The introduction of Combat Commands and the conversion of regiments into battalions throughout the armored force reflected lessons learned in combat and gave US divisions a degree of flexibility not found in the British force. More importantly, the US divisional training ensured a base-line operational uniformity that was completely lacking in the British army.

In fact, a large portion of McNair’s efforts were directed towards the creation of this training scheme. Under this system, which was largely in place by February 1942, new divisions entered a "training cycle" which was to last 44 weeks.³ The cycle was divided into phases, each of which had a prescribed set of training tasks to be accomplished by each element. Each phase also culminated in a set of GHQ designed tests, which were to be passed prior to moving to the next phase. Phase 1 (17 weeks), "individual training," was oriented towards training at the individual and small unit level. The GHQ sponsored "final exams" centered mostly on platoon standards. Phase 2 (13 weeks), "unit training," was designed "to develop each unit into a fighting team capable of fulfilling its own particular role in battle." Maneuvers were the primary training tool, beginning first with company exercises and concluding with regimental ones. A minimum of sixteen hours a week were to be devoted to night training. The battalion was the primary unit type

¹Ibid., 69.

²Doubler, *Closing with the Enemy: How GIs Fought the War in Europe 1944-1945*, 265 - 299.

³Robert R. Palmer, Bell I. Wiley, and William R. Keast, *Procurement and Training of Ground Combat Troops* (Washington: USGPO, 1948), 442. As originally conceived, the training program only applied to infantry divisions. Armored divisions came under these regulations after June 1943. See Kent Roberts, Robert Palmer, and Bell Wiley, *The Organization of Combat Ground Troops* (Washington: Historical Division, U.S. Department of the Army, 1947), 409.

tested after phase completion. Finally, Phase 3 (13 weeks), "combined arms," was intended "to weld the several units of the division into a division team capable of acting as a concerted whole and maintaining itself under any and all battle conditions." this phase was conducted almost entirely outdoors and used the following three training methods: (1) regimental combat team exercises, (2) divisional exercises and maneuvers, and (3) command post exercises. The training culminated with a set of "free maneuvers" in which one new division was pitted against another in a "battle" conducted day and night in differentiated terrain, under conditions which would necessitate good use of supporting units.

Even after deployment, the maintenance of operational standards demanded that divisions continue to train, whenever possible, in accordance with a training cycle that replicated in miniature the division's original training sequence. After the Louisiana Maneuvers, the divisions which had participated returned for four months of less glamorous but equally important small-unit training, starting at squad and platoon level. Battalions conducted refresher training and were re-tested in fundamental drill and tactics.¹ After July 1942, divisions were directed to conduct such training even when deployed to staging areas near the front. After its drubbing at Kasserine and the subsequent fall of Tunis, the 1st Armored Division was sent on a 1,300 mile march to western Morocco, where it bivouacked away from population centers and settled in for a summer of training. While the British 7th Armoured Division rested and refitted at Homs in regimental cantonments, the US 1st Armored Division conducted "large-scale day-night exercises" in the heat and dust of Oran.²

Although US units frequently devised their own tactical protocols to deal with local conditions or new tactical challenges, the degree of success they experienced in those efforts can be largely attributed to the larger training system, which made both the whole force and each individual division a "learning organization." Even at the division-level, the training cycle allowed new techniques to be adopted at the lowest or highest echelons and for other headquarters or tactical elements to adjust their own procedures to accommodate whatever side-effects those changes might bring. McNair's standardized training system also facilitated the horizontal and lateral transmission of information by giving officers a single set of vocabulary and a solid understanding of what that vocabulary meant in practice. It was probably this training system, rather than the innate creativity of US soldiers that made the US army superior to the British in their ability to absorb and act on new lessons.

¹ Collins, *Lighting Joe: An Autobiography*, 115.

²George Howe, *The Battle History of the 1st Armored Division* (Washington: Combat Forces Press, 1954), 257.

At the unit level, the ability to learn from experience and to devise improved tactical procedures was greatly facilitated by the efforts McNair made to minimize changes to US divisional composition. Continuity increased mutual trust between subordinate units and allowed their officers to develop personal relationships which further facilitated communication and cooperation. Despite several major organizational changes, the 1st Armored Division maintained its battalions more or less intact throughout the war. Whereas forty-two battalions rotated through the British 7th Armoured Division as organic elements during the course of the war, of the ten battalions with the US 1st Armored Division in 1945, nine had either existed in or been created from elements existing within the division when it was formed in 1940.¹

The contrast between the British and American infrastructures could not have been more extreme. In the American Army, channels of communication were redundant, sophisticated, and frequently exercised. In the British Army, channels were so diffuse and informal that they were almost meaningless. While there were few obstacles to direct contact between individual senior officers in the British Army, there was nothing that brought the entire community into a direct dialogue about a set of well defined issues and questions. The British fought disjointed battles, because they trained as disjointed units. The battles in which American divisions fought reflected their more coordinated, standardized, and centralized training methodology. Neither the British units nor British commanders could make the kinds of steady incremental improvements which characterized tactical adaptation and learning in the American army.

V. CONCLUSIONS

When one considers the scope and complexity of modern battles such as Crusader, Kasserine, Goodwood, and Cobra, it becomes obvious that no single leader can direct the activities of an army in battle. Failure modes are numerous, and the side which cannot wield its weapons quickly, instinctively, and decisively towards a common purpose is lost.

Leaders are important, but they must be consistently good throughout the organization. A single general at the top cannot compensate for poor leadership at the company-, battalion-, and brigade- levels. Moreover, in modern armies, good leadership at all levels is likely to be a product of well developed training regimes. Leaders learn by doing, and they tend to learn with

¹Ibid., 8, 441. Although one armored regiment was been eliminated in 1942 and the remaining armored, artillery, and armored infantry regiments had been converted to battalions in 1944, all of the battalions created in 1944, except for the 16th Armored Engineer Battalion, were formed from the component companies of the original regiments. Regimental headquarters staffs were transferred into the new battalion headquarters.

their units. The training system itself must of course come from somewhere, and leaders can be indispensable in providing their units with the comparative advantage that good training provides. Of the leaders discussed in this paper, the single individual who had the most to do with delivering victory for the allied forces during WWII was General McNair, who never commanded troops in battle.

A hands-on, active approach to learning--including the use of maneuvers that are carefully constructed and systematically evaluated--is also necessary to convert theories of war into practical doctrines for the conduct of war. Theories of war establish the logical connections between technological and social developments on the one hand and military possibilities on the other. But military theories alone cannot deliver victory on the battlefield. The British were rich in theory but poor in practice. To have an impact on the battlefield, theories must be translated into doctrine--or sets of procedures for accomplishing specific battlefield tasks. Effective doctrine can only be developed through the practice and evaluation of proposed procedures under simulated battlefield conditions.

This paper does reveal an inherent tension between organizational structures capable of generating innovative theory on the one hand and ones capable of executing existing procedures effectively. The decentralized British structure seemed more adept at fostering innovation during peacetime, while the more centralized US arrangement seemed better at producing a more coordinated, coherent, and flexible force during wartime. Given the inability of the British to capitalize on their pre-war ideas during the war, and given the ability of the US to quickly overcome their own pre-war doctrinal backwardness, we might draw the tentative conclusion that a relatively centralized approach has important advantages overall. Nevertheless, case studies on organizations that perform well in both wartime and peacetime would be useful in determining what types of structures are optimal under a range of circumstances.

A less ambiguous conclusion is that innovation and learning can be described in terms of "continuous process improvement" and that the primary determinant of success or failure is the strength of the infrastructure that binds the organization together. A highly developed infrastructure is essential to the development of all other parts of the organization. In order for an organization to learn, its members must share a common language. Such a language comes from doctrine that is observed army-wide. Unit level training produces units and leaders of high and, perhaps as importantly, relatively uniform quality. Maneuvers allow both doctrine and training to be evaluated systematically, enabling those aspects of the organization to be continuously improved. All of these "learning systems" form a coherent and seamless whole. Any leader seeking to promote organizational learning and innovation should treat the problem as one which can only be

tackled organization-wide. Priority should be given first to the system of learning itself, and only then to specific questions of doctrine, organization, or hardware.