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THE NORTH AFRICA CAMPAIGN: A LOGISTICS ASSESSMENT

A thesis presented to the Faculty of the U.S. Army Command and General Staff College in partial fulfillment of the requirements for the degree

MASTER OF MILITARY ART AND SCIENCE

by

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B.A.A.S., East Texas State University, Texarkana, Texas, 1983

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The logistical efforts of the campaign are studied against the framework of modern Airland Battle doctrine. The functional areas of manning, fueling, arming, fixing, and transporting are assessed by the doctrinal imperatives of anticipation, integration, continuity, responsiveness, and improvisation.

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ABSTRACT

THE NORTH AFRICA CAMPAIGN: A LOGISTICS ASSESSMENT by Major Mark D. Kitchen, USA, 113 pages.

This study analyzes the logistics operations of the North Africa Campaign. The thesis covers wholesale and retail level preparedness and execution of the U.S. ground force sustainment following the Allied landings in northwest Africa in November 1942. The analysis concludes with the German surrender in Tunisia in May 1943.

The logistical efforts of the campaign are studied against the framework of modern Airland Battle doctrine. The functional areas of manning, fueling, arming, fixing, and transporting are assessed by the doctrinal imperatives of anticipation, integration, continuity, responsiveness, and improvisation.

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INTRODUCTION

In James Huston's definitive history of Army logistics, The Sinews of War, he wrote that "War frequently is likened to a game of chess, but chess is no strategic game, for there is no logistics."[1] Strategic logistics dictated the when and where of America's earliest combat involvement in World War II -- Operation TORCH and the subsequent North Africa Campaign.

From this campaign emerged some of the most notable military leaders in the history of American modern warfare. Eisenhower, Patton, Bradley are names synonymous with the United States' most important World War II successes. Much of the credit for these accomplishments must be attributed to the hard work and creativity of the military's service and support branches. Logisticians faced the monumental task of supporting highly mechanical warfare against a formidable enemy. War would be fought in two hemispheres across vast oceans. In North Africa, Americans would encounter harsh terrain and climate coupled with a poor

industrial and transportation infrastructure. The North Africa Campaign of 1942-1943 presented innumerable challenges to the U.S. logistics structure.

Logistically, the 1930's was a critical period for the American Army. This was an Army armed and trained on the heels of the Great Depression. Research and development of new and improved weapon systems and other military equipment before June 1940 was restricted because of lack of funds. From 1925-1940, the average annual expenditure in this area was only 2.5 million dollars, the preponderance of which was given to the Ordnance Department, limiting the Medical Department and Quartermaster Corps to less than $20,000 per year. In 1937, Congress appropriated only $2,000 for the development of clothing, equipment, and motor vehicles.[2]

The fall of Poland in 1939 and France in 1940 to the Germans, coupled with the potential of war with Japan forced planners to consider potential U.S. involvement. Two years was a short time to build a highly mobile fighting force. Our first campaign -- North Africa -- would be a demanding first test.

The primary research question for the following study is: How effective was the logistical support of the North Africa Campaign (8 November 1942 - 13 May 1943)? Further, was the United States Army prepared to logistically support

desert combat following the invasion of North Africa in November 1942? How could logistical shortcomings have been prevented, eased, or eliminated? How does the support provided during the campaign stand up to the scrutiny of today's Airland Battle doctrine sustainment imperatives (by functional area)? What were the key sustainment lessons learned concerning support of intensive desert combat operations?

In order to pursue and answer the research questions, a general understanding of the strategic and tactical operations is required. What follows is a background summary which puts this study into its proper context and provides a framework for this logistics assessment.

THE BRITISH IN NORTH AFRICA

1939 saw the beginning of war in Europe. Adolph Hitler's Wehrmacht marched almost at will throughout the continent. Poland crumbled under the German onslaught in September of that year. By July of 1940, Norway, Belgium, Holland and France were occupied and under German domination.

Italy, though not a dominant military force in Europe, had aligned itself with Germany. The Italians had participated to a limited degree in the final moments of the

fall of France. Not to be outdone by the German's success, Mussolini directed Italian forces to attack British holdings in the Mediterranean, particularly in East Africa.

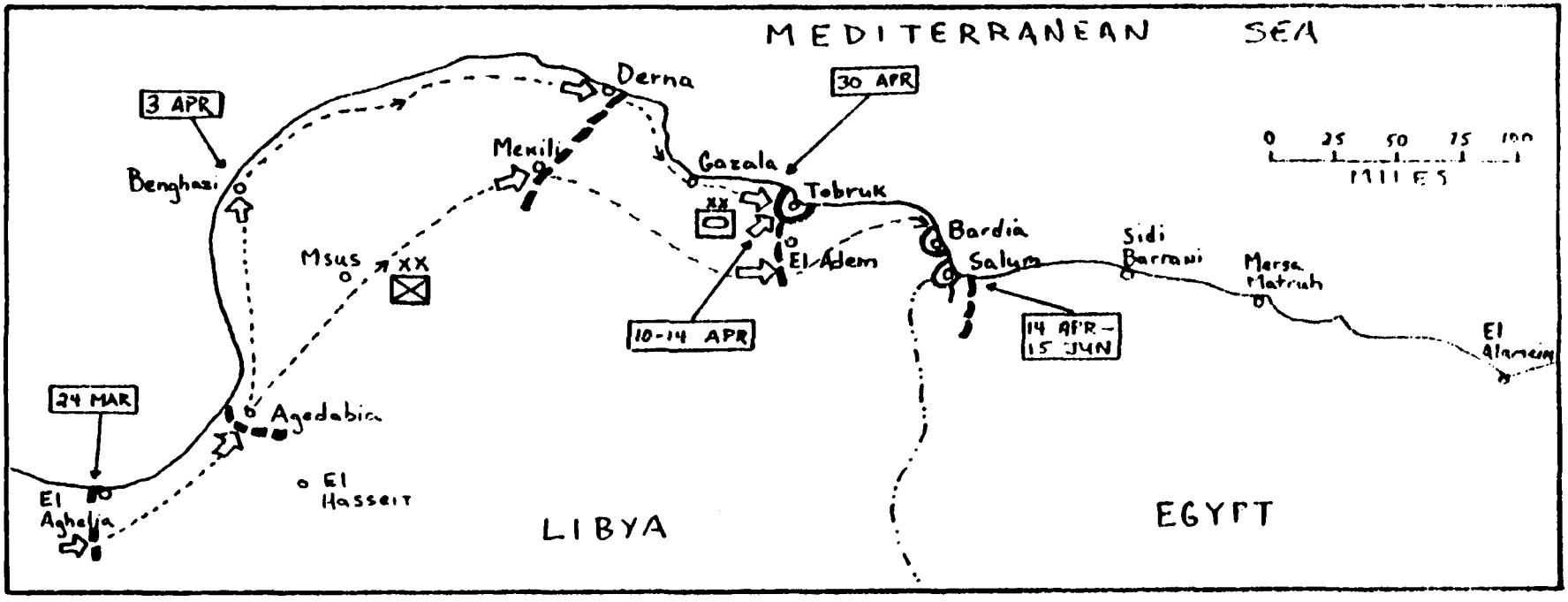
In September 1940, while the Battle of Britain raged in the skies of England, the Italians made their move. Using the diversion to their advantage, Italian forces stationed in Libya attacked a much smaller British force in Egypt. The attack bogged down with little success and the Italians reluctantly agreed to accept a German offer of help. Though Italy demonstrated little military prowess, they opened yet another front in October by invading Greece via Albania. Hitler had previously opposed this maneuver and temporarily withdrew his offer of support to the Libyan operation.

When both the Italians' Libyan and Balkan campaigns began to falter, Hitler provided support to both. Security of the German southern flank was of critical importance to the German plan for the blitzkrieg of Russia in the summer of 1941. Hitler's military support also served to maintain the morale of the Italians and preserve the prestige of the Axis alliance. If Italy had fallen, the possibility existed that they could strike a separate peace accord with the British. Additionally, the free use of the Mediterranean by the British for future operations against the Axis powers could complicate or prevent a total German victory.[3]

To assist the Italian forces in east Africa, Hitler provided an armored force under the command of Generalleutnant Erwin Rommel. Rommel's force, the German Afrika Korps, was an extension of Italian forces. Under the agreement, Hitler provided Rommel general directives only after Mussolini had approved them.

By April 1941, the Afrika Korps had torn across Libya until only the port city of Tobruk remained in British hands (Map #1). The British decision to hold Tobruk at all cost was key to the eventual security of the region. Rommel desperately needed a suitable port from which to support future operations deep into Egypt. The British garrison survived two major attacks by Rommel and seven months of siege before being relieved.[4] Without Tobruk Rommel's Afrika Korps was never able to advance beyond Salum in Egypt, primarily because of supply shortages and stiff opposition from General Wavell's Western Desert Force (Br.).

Wavell came under significant pressure to relieve Tobruk three months into the siege. He ordered an attack over the frontier in mid-June. In what is considered to be a major tactical blunder, he split his two available divisions into six semi-independent task forces and committed them piecemeal.[5] He suffered heavy losses and withdrew eastward from the Libyan-Egyptian border.



Source: Atlas of the Second World War

ROMMEL'S FIRST OFFENSIVE
24 March - 15 June 1941

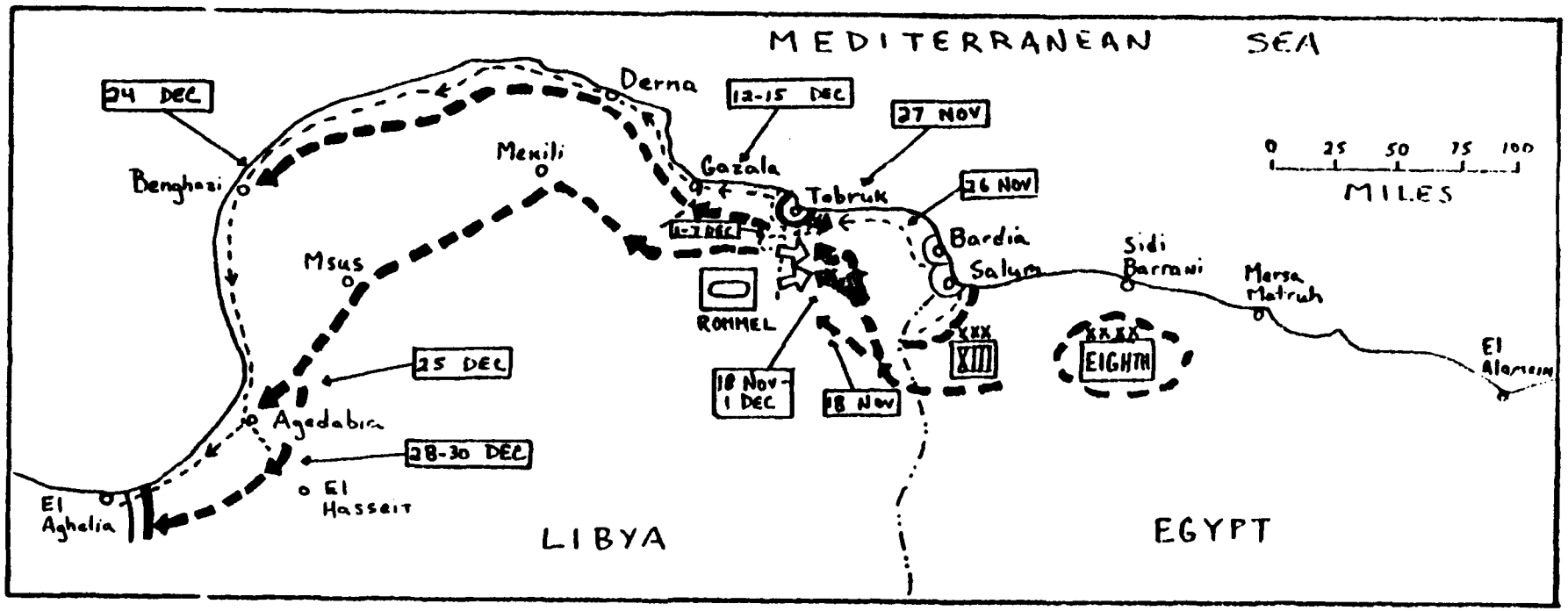
(Map 1)

In July 1941, General Sir Claude Auchinleck succeeded Wavell in command of all British forces in theater. Under his charge, the old Western Desert Force was restructured and by October became the Eighth Army (Br.). The mounting of an offensive was of the utmost importance.

The new Eighth Army (Br.) Commander, General Alan Cunningham, prepared his forces to counter Rommel's recently reinforced Afrika Korps.[6] Cunningham's Army had recently been resupplied with American light tanks and he hoped to numerically overwhelm the Axis forces. He attacked on 18 November 1941 (Map #2), achieving complete surprise and seizing key terrain near Tobruk. Fighting ensued for six weeks in a series of small, uncoordinated actions with no coordinated front.

Because of indecisiveness on Cunningham's part, Auchinleck personally assumed command of the operation. He forced the Germans back from Tobruk and Rommel narrowly escaped a British encirclement in late December. While Auchinleck enjoyed limited success, the Afrika Korps had the opportunity to reinforce and prepare for Rommel's second offensive.

Major General Ritchie followed Auchinleck in command of the Eighth Army (Br.) in December. During the next six



Source: Atlas of the Second World War

AUCHINLECK'S OFFENSIVE
18 November - 31 December 1941

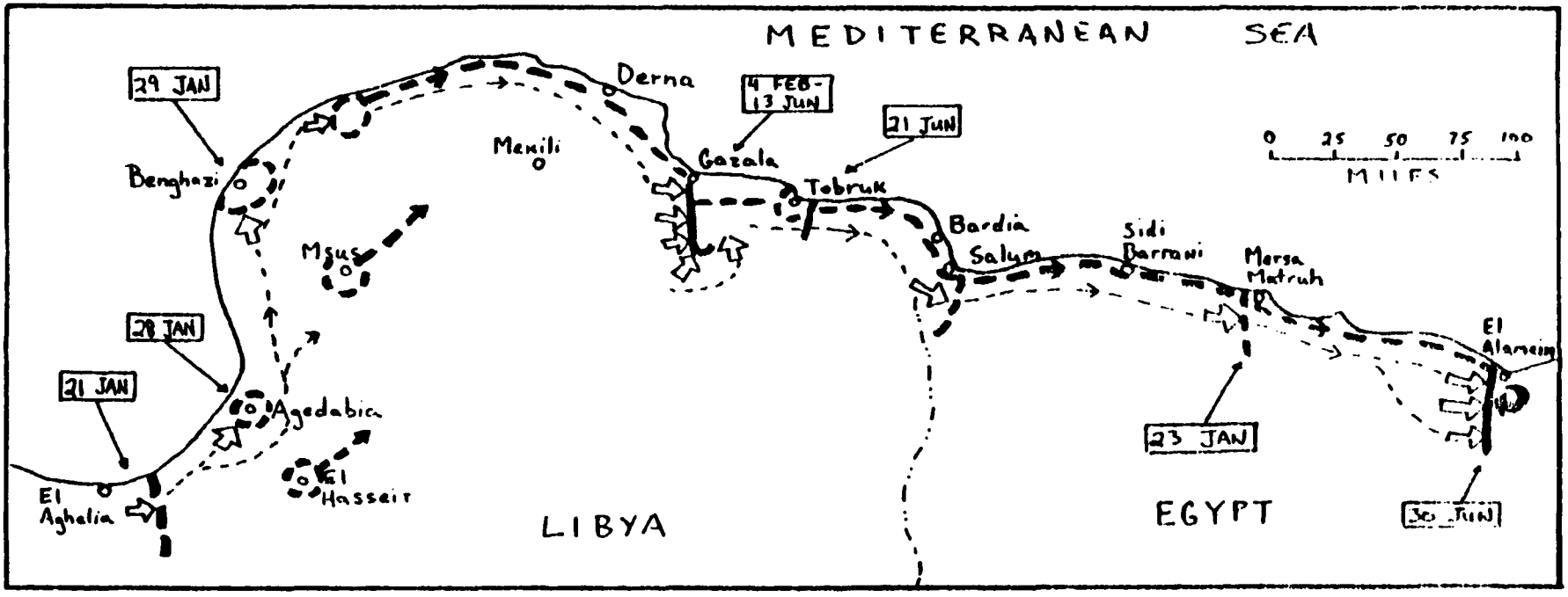
(Map 2)

months, Rommel dealt Ritchie a series of tactical blows (Map #3). Ultimately, Tobruk fell to the overpowering strength of German dive bombers and artillery. Plentiful stocks of transportation assets, gasoline and other supplies fell into Rommel's hands.

With Tobruk now under Axis control, Rommel and Hitler believed that the capture of the Nile valley was now a real possibility.[7] General Auchinleck again rose to the occasion and assumed command. Though he had lost some 80,000 men, the British finally stopped an equally exhausted and depleted Axis Army near El Alamein, Egypt.[8]

When General Montgomery took charge of the Eighth Army (Br.) in August of 1942, he brought with him a new fighting philosophy. Further withdrawals to the east were not in order. Forces would be massed and no more small independent units would be employed. Montgomery would fight Rommel on the El Alamein line.[9] After repulsing the last Afrika Korps offensive at Alam Halfa, the stage was set for the Battle of El Alamein.

Montgomery's plan was executed in three phases. The first phase, called the "Break-In", was a battle for position and gave the British key terrain. The second phase, "The Dogfight", would attrit enemy forces and supplies to such a degree, they would be unable to withstand the knockout punch. The third phase, "The Breakout", would



Source: Atlas of the Second World War

ROMMEL'S SECOND OFFENSIVE
21 January - 7 July 1942

(Map 3)

collapse the enemy's El Alamein positions.[10] Montgomery's plan was executed to perfection and by 4 November 1942, the Battle of El Alamein had been won.

With the Afrika Korps now in full retreat, Montgomery's task was now to link up with Allied Forces in Tunisia. It was hoped to isolate the Axis Forces there and force their ultimate defeat.

THE GENESIS OF OPERATION TORCH

By 1939, numerous strategic plans had been developed by the U.S. Joint Planning Committee. The committee had previously developed the "color" plans for directing war toward individual nations (i.e., the ORANGE plan for war against Japan). But, by the late 1930's, it became apparent to planners that the next war would be fought against a coalition of enemies. The Joint Planning Committee produced what were known as the RAINBOW plans.

RAINBOW-1 was defensive in nature, protecting the United States and its world-wide vital interests from being jeopardized. RAINBOW-2 and 3 focused on the Pacific in a two ocean war. RAINBOW-4 provided for western hemisphere defense by including the deployment of U.S. forces to South America or the Eastern Atlantic. RAINBOW-5 envisioned aggressive transatlantic operations to defeat Germany and Italy in the eastern Atlantic, Africa and Europe.[11]

As the British fought in North Africa in late 1940 and early 1941, American planners began refining RAINBOW-5. At the ABC-1 (American British Conversations) meeting in 1941, the ground work was laid for America's participation in the war. The Americans agreed in principle to defeat Germany first.

The method by which Germany was to be defeated was far from resolved. Massive land operations in Europe had little support among Army planners. British thought on the matter was that the Germans would be defeated by small, highly mobile forces with superior fire power. These forces would enter the continent at numerous points after preliminary attacks, blockades, and bombardments.[12]

Publicly, the party line from Churchill was, "give us the tools and we'll do the job." Churchill in fact downplayed the need for American forces to participate in the war. His purpose was two-fold. First he wanted to foster support for the Lend-Lease Act which was under Congressional consideration at the time. This was not completely candid. He felt that massive mobilization of U.S. forces would require and consume the goods and munitions being produced in America and being provided to the British.[13]

The results of the ABC-1 meeting generally reflected the British long term strategy. It first called for holding

the Germans in check in North Africa, then knocking Italy out of the war, and finally securing launching positions for an "eventual offensive."[14] At that time there was no mention of a cross-channel invasion, only a process of attacking the enemy fringes. The plan, it seemed, was to exhaust the Axis powers into submission. The Conference assured the continued flow of war materiel and allowed Britain a significant allocation of aircraft. ABC-1 also established the rule that the forces of each partner would operate under their own commanders in separate areas of responsibility. That is, American and British forces would fight in coalition, but would retain force integrity in most cases.

Under arrangements drawn up at the meetings and refinements of the RAINBOW-5 plan, 413,900 Army troops were to be deployed overseas during the first six months following U.S. entry into the war. Of these, however, 236,000 would definitely be assigned within the Western hemisphere and another 109,500 would cover various approaches. The remainder, about 68,000, were to be sent to the British Isles.[15]

The Japanese attack on the American fleet at Pearl Harbor in December 1941 and the subsequent declaration of war by Germany and Italy brought the United States into the growing world conflict. Immediate consultation with Great

Britain was required to formulate and solidify the allied strategy to defeat the Axis powers. President Franklin Roosevelt and Prime Minister Churchill met at the ARCADIA Conference in Washington, D.C. shortly after the attack on Pearl Harbor.

Churchill brought with him a strategic concept for the Allied liberation of French North Africa. Security and control of the region would clear the way for an Allied return to the European continent. The invasion would take place either across the Mediterranean, via the Aegean through the Balkans, or by landings in western Europe.[16]

The American Army, on the other hand, pressed for a cross-channel invasion of northern France at the earliest possible date, probably 1943. This proposed operation would henceforth be referred to as ROUNDUP, with a buildup phase in England code named BOLERO. Roosevelt was eager to put American soldiers into action against the Germans and supported the Army's plan. [17]

A significant product of the ARCADIA Conference was the establishment of U.S. - British Combined Military Command -- the Combined Chiefs of Staff. The CCS, composed of the chiefs of Army, Navy, and Air Forces of the two countries would control joint war efforts world-wide.[18]

Army Chief of Staff, General George C. Marshall, travelled to England in April 1942 to muster support for

Roosevelt's proposal. The British were unreceptive and Marshall himself had to concede that minimum logistics requirements could not be met in time for good campaigning weather. Additionally, because most of the resources for a 1942 landing would have to be British, he acquiesced to an invasion plan called SLEDGEHAMMER.

SLEDGEHAMMER called for an Allied (but primarily British) invasion across the English Channel in September 1942 to establish a lodgement for future operations on the European continent. By design, SLEDGEHAMMER was an emergency measure. Should the Soviet Union be on the verge of collapse because of the German offensive, it would provide a needed diversion to relieve pressure. Secondly, should Germany begin to falter politically, the Allies could use the operation to quickly exploit their weakness.[19]

The Allies failed to resolve disagreement surrounding the BOLERO-SLEDGEHAMMER-ROUNDUP concept and unable to meet the logistical requirements for a 1942 invasion of Europe. On 23 July 1942, Roosevelt threw his support behind the Churchill plan presented at the ARCADIA conference. The CCS agreed to begin planning at once for Operation TORCH, the Allied invasion of Northwest Africa. The final decision would be reserved until 15 September.[20]

President Roosevelt insisted that TORCH be initiated as soon as possible. Furthermore, he gave it priority over

other operations, significantly changing the original CCS recommendation. His decision, in effect, eliminated the possibility of a cross-channel invasion in 1943. Roosevelt had elected the strategy of encirclement rather than a direct attack into the German heartland.[21]

When planning for the Allied invasion began in London in late July, British and American officers disagreed on landing sites and force composition. British planners had prepared an exploratory plan calling for landings at two large and two small ports within the Mediterranean, to be followed by the subsequent seizure of Casablanca. They expected there would be insufficient naval assets for simultaneous landings on the Mediterranean and Atlantic coasts. War Department planners insisted that Casablanca be included in order to ensure an uninterrupted line of communication to the United States.[22]

The key to establishing control in North Africa was to secure the port of Tunis. Hitler felt that as long as Tunis was in Axis hands, it would prevent an Allied attack into southern Europe. The city offered essential port capacity required for any such invasion. British planners, concerned that Axis forces may become entrenched in northern Tunisia urged Allied landings as far east as Bone. Even though the threat of Axis air attacks would be great, the

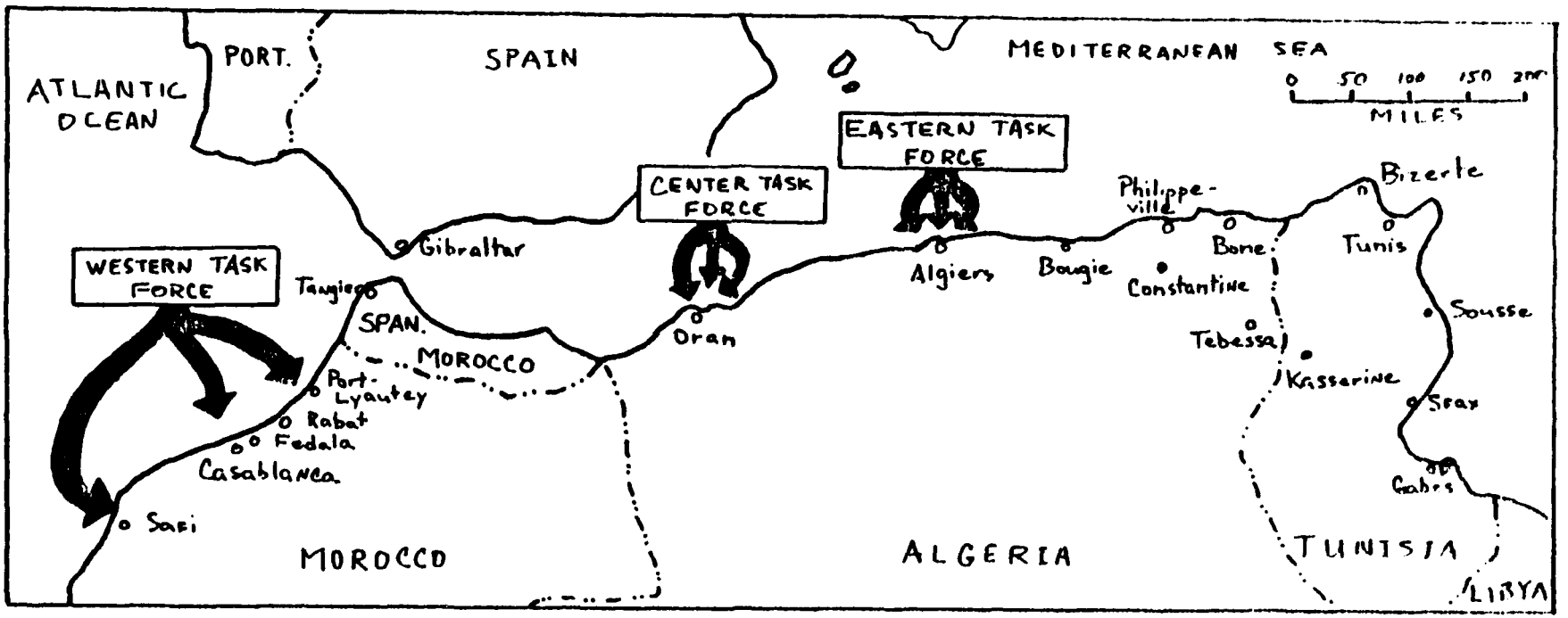
Allied lines of communication in theater would be much shorter.

Forces to be used in the landings caused considerable concern as well. Intelligence reports indicated that the French in northwest Africa would offer stiff resistance if British forces were used in the initial landings. Therefore, it was deemed necessary for the invasion to be predominantly American in nature.[23] Finally, on 20 September 1942, the plan for the Allied invasion was set and decision was made to implement the plan. D-Day was to be 8 November 1942.

Operation TORCH would be the largest amphibious assault of the African continent in history. It would provide needed support and relief to British forces fighting the Afrika Korps. Security of the region would open doors to the underbelly of Europe and ease pressure on the Soviets by diverting Germany forces south. The operation would require herculean efforts by Allied planners and demanded nearly flawless execution. Only three months would pass from Roosevelt's decision to support TORCH until the first U.S. soldier landed in North Africa.

OPERATION TORCH AND THE NORTH AFRICAN CAMPAIGN

Operation TORCH was a three pronged attack (Map #4). The Eastern Task Force under Major General Charles W. Ryder



Source: Atlas for the Second World War

THE ALLIED INVASION

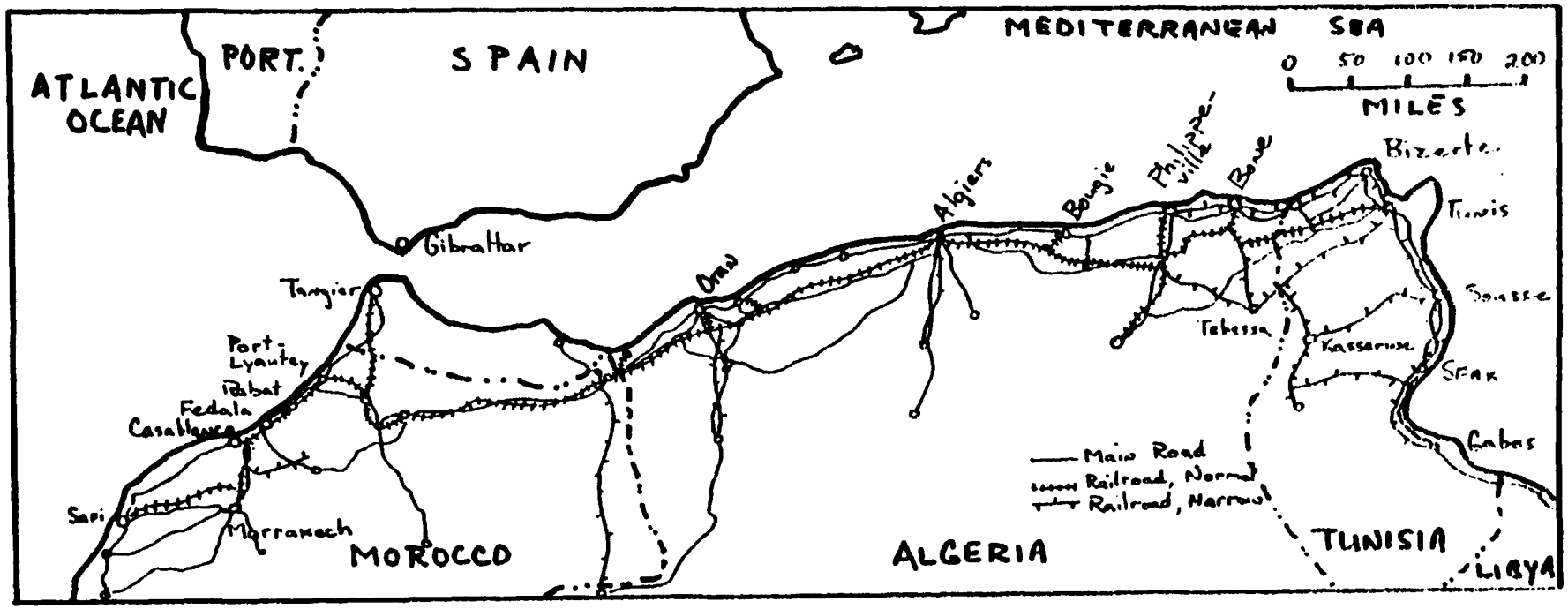
(Map 4)

and the Center Task Force under Major General Lloyd R. Fredendall embarked from the United Kingdom and landed in Algiers and Oran respectively. Major General George S. Patton's Western Task Force landed in Morocco after sailing from the United States. In all, over 100,000 men in 110 ships and 90 escort vessels participated in the assault.[24]

The successful landings marked the beginning of the North Africa Campaign. The campaign concept was uncomplicated. The landing forces would fight eastward to Tunisia. General Montgomery's Eighth Army (Br.) would fight westward from Egypt across Libya and link-up with the Allies in Tunisia in January 1943.

Ahead of the Allied force lay their objective, some 1200 miles to the east. From Morocco to Tunis, movement would be concentrated mostly along the coastal plains. Formidable mountain ranges restricted ready access to the interior. The topographics and industrial/transportation infrastructure of Morocco, Algeria and Tunisia were poor and logistical support in theater would be difficult (Map #5).

Casablanca provided the only substantial port on the Atlantic coast. This artificial port had been constructed by the French shortly after World War I. It accommodated about 90 percent of the Moroccan pre-war traffic. Lesser ports were available at Safi, Mehdia, and Port-Lyautey. A standard gauge railroad connected the ports with Marakesh,



Source: Northwest Africa: Seizing the Initiative in the West

LINES OF COMMUNICATION

(Map 5)

parts of the interior and Algiers. The limited road network primarily supported the coastal plain.[25]

Algieria's coastline faces the Mediterranean. Artificial ports were constructed or natural harbors had been improved prior to the invasion. The best port and rail transloading facilities were at Oran, Algiers, Bougie, Phillipeville and Bone. Railways and roads ran primarily east-west along the coast, with some access to the interior. One meter gauge branch rail lines additionally connected the lesser ports with the main line.[26]

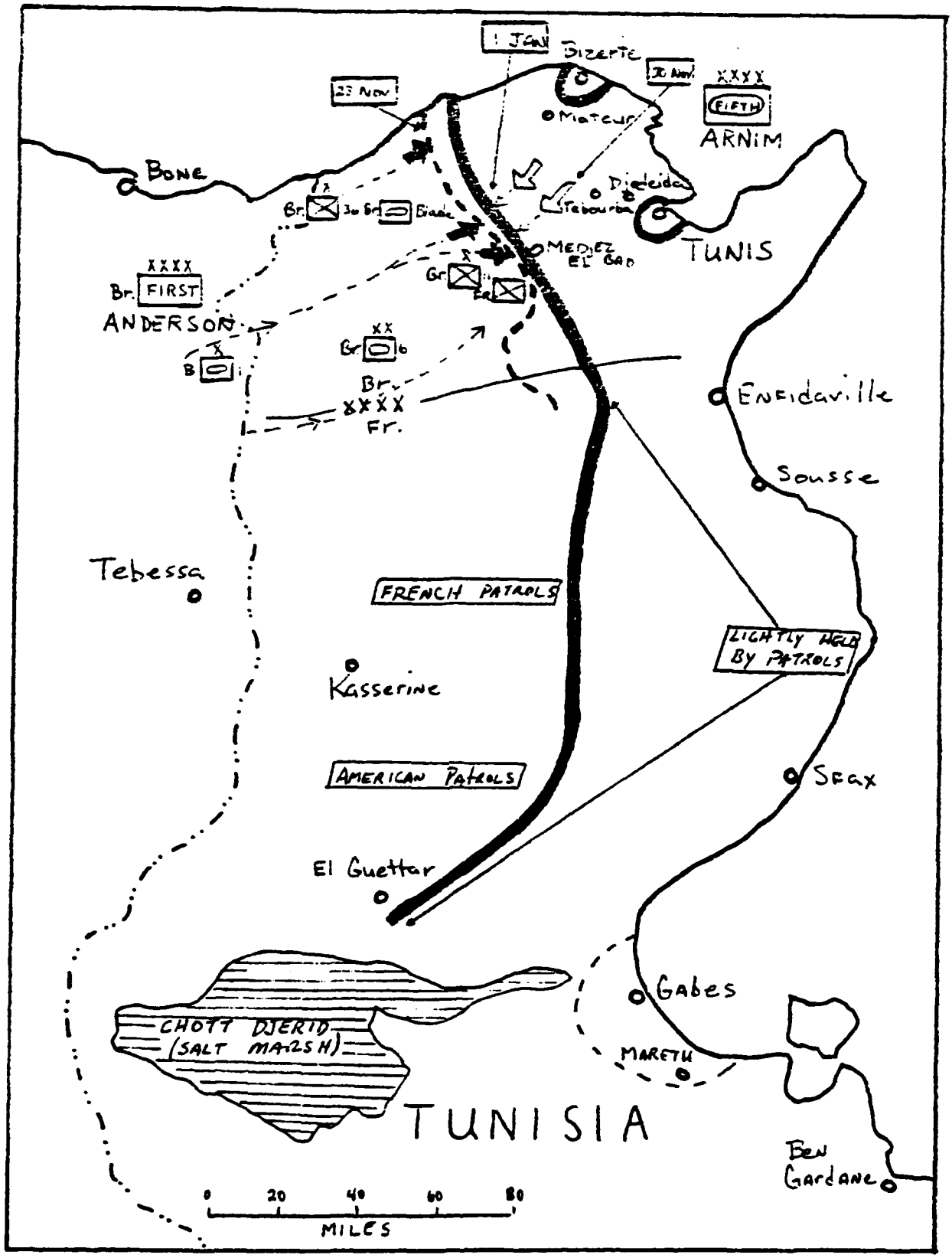
Tunisia also provided a somewhat bleak logistical support outlook. Though the ports at Tunis, Bizerte, Sousse, and Sfax were adequate, the country's supporting transportation network was not. Almost all rail lines were narrow gauge. The main highway system consisted of one east-west coastal route and one roughly parallel interior route. Though these highways would support two-way traffic in most places, numerous bottlenecks were found in narrow tunnels, sharp mountain turns, and snowbound passes.[27]

The North Africa campaign would eventually be a six month effort divided into three major phases.[28] First, was a race between Allied and Axis forces to build up forces strong enough to deny the strategically important Bizerte-Tunis area to the enemy. This key port was to be the focal point for the Allied invasion of southern Europe.

The Germans won this race by a narrow margin. The second phase was marked by the German's initiative to develop and expand a strong perimeter defense around their holdings in Tunisia. The third and decisive period of the campaign centered on the Allied victory at Mareth, the capture of Bizerte and Tunis, and the surrender of Axis forces in North Africa.

Phase I, The Race to Tunis - On 28 November 1942, only twenty days after the landings, Allied forces reached Djedeida, less than sixteen miles from Tunis (Map #6). This marked the furthest advance of the Allies toward Tunis until the final drive of the campaign some six months later. In the north, the 36th Brigade (Br.) advanced about ten miles toward Mateur and met increased resistance in the form of mines and booby traps. Forward positions held until 1 December 1942, when British forces were attacked by dive bombers, tanks, and infantry near Tebourba. Because of the loss of over forty tanks, the force was withdrawn and replaced by Combat Team B of the 1st Armored Division (U.S.) and the 11th Brigade (Br.). On 3 December, the Germans attacked again and the Allies took heavy losses.

Five days later, LTG Dwight Eisenhower, the Allied Commander, authorized the force to withdraw to more defendable ground, however he instructed that Medjez el Bad be held at all cost. Heavy rains hindered the withdrawal



THE RACE FOR TUNISIA
17 November 1942 - 1 January 1943

Source: Atlas for the Second World War

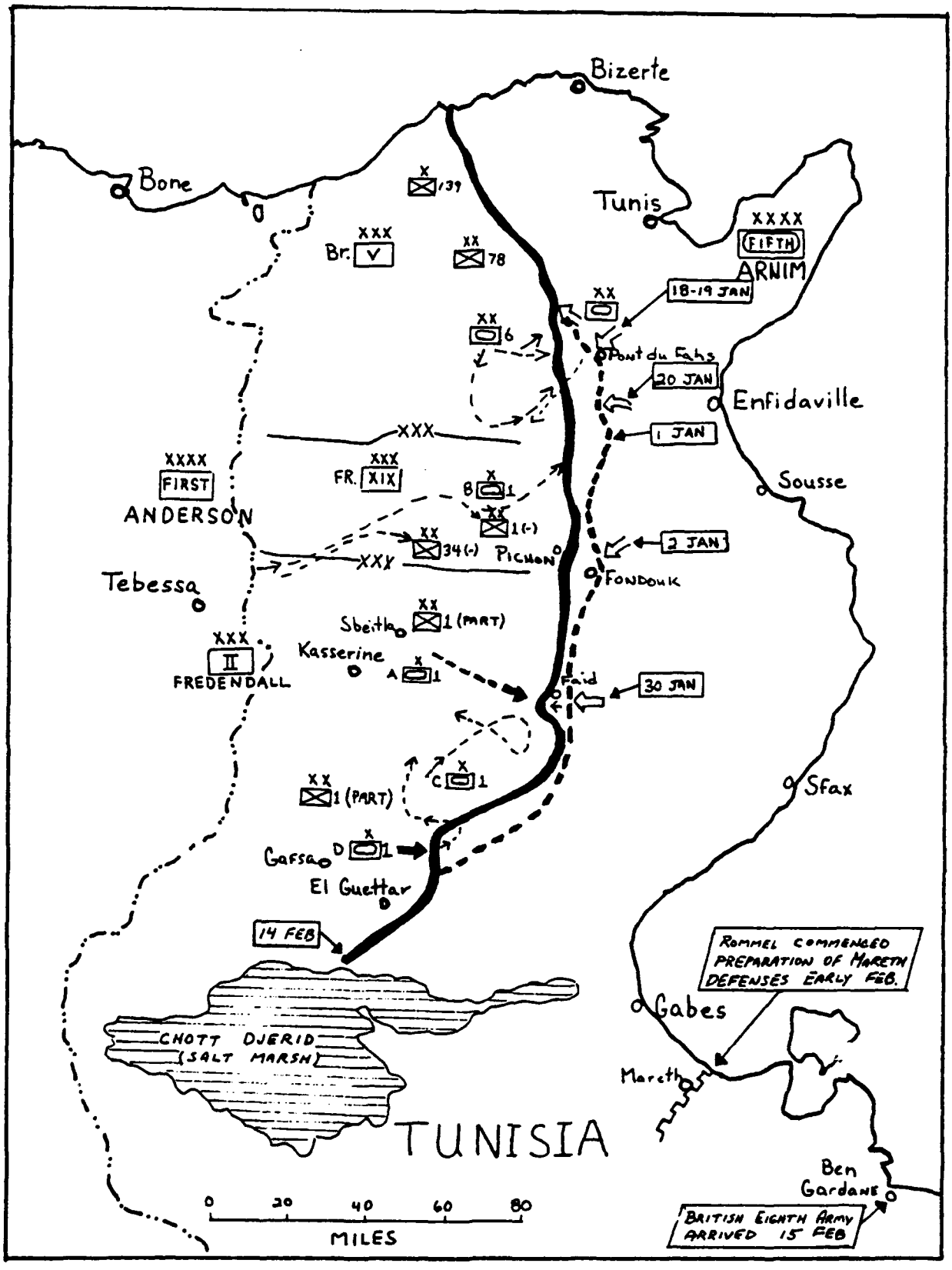
(Map 6)

and much of the badly mired equipment was abandoned, including fifteen of eighteen 105mm howitzers, fifty of sixty-two tanks, and eighty-four of 122 light tanks.[29]

On 20 December, Eisenhower launched another attack with Tunis as the objective. Rainy weather continued to pose significant problems for the Allies. Vehicle movement off of paved roads was impossible. Two-thirds of allied aircraft were inoperable because of mud. Supply lines were inadequate to meet the needs for steel matting and equipment to put airfields in usable condition or to provide general supplies, especially ammunition. The operation was postponed and then abandoned altogether on 24 December.[30]

Only a small force was sent to Tunis because supply activity was inadequate to support a larger force. Handicapped by lack of transportation and slowed by inadequate supply routes, the Allied force was stopped and driven back by the Germans.[31]

Phase 2, Axis Perimeter Buildup of the Tunis Area - By early January 1943, the Tunisian Front extended from the Chott Djerid in the south to the Mediterranean Sea in the north, about 250 miles (Map #7). American paratroops held the desert area around Gafsa and up to Faid Pass. Elements of the 1st Infantry and 1st Armored Divisions began to arrive in the area. Lightly armed but well led French forces held the area around Pichon and Fondouk, as well as



AXIS INITIATIVE
1 January - 14 February 1943

Source: Atlas for the
Second World War

(Map 7)

the Ousseltia Valley. The First Army (Br.), composed of only two divisions plus an additional brigade, occupied the front to the north. Thus, the 250 mile front was being held by the equivalent of three British divisions, part of one American division, and three weak French divisions.

The Allies were concerned that the Germans would mount an offensive toward Bone and isolate the First Army (Br.). As a counterplan, the Allies developed the "Sfax Project", a plan to split the German forces and secure the First Army's flank. The plan fell through, however, when General Montgomery's British Eighth Army, approaching from Libya, failed to reach Tripoli within the required timeframe.

Montgomery had advanced some 1400 miles from the site of his victory at El Alamein. His administrative and logistics support had been stretched to the limit. It would be another eight weeks after his entry into Tripoli before he would be ready to resume offensive operations -- too late to stop the Afrika Korps from reaching Tunisia.[32]

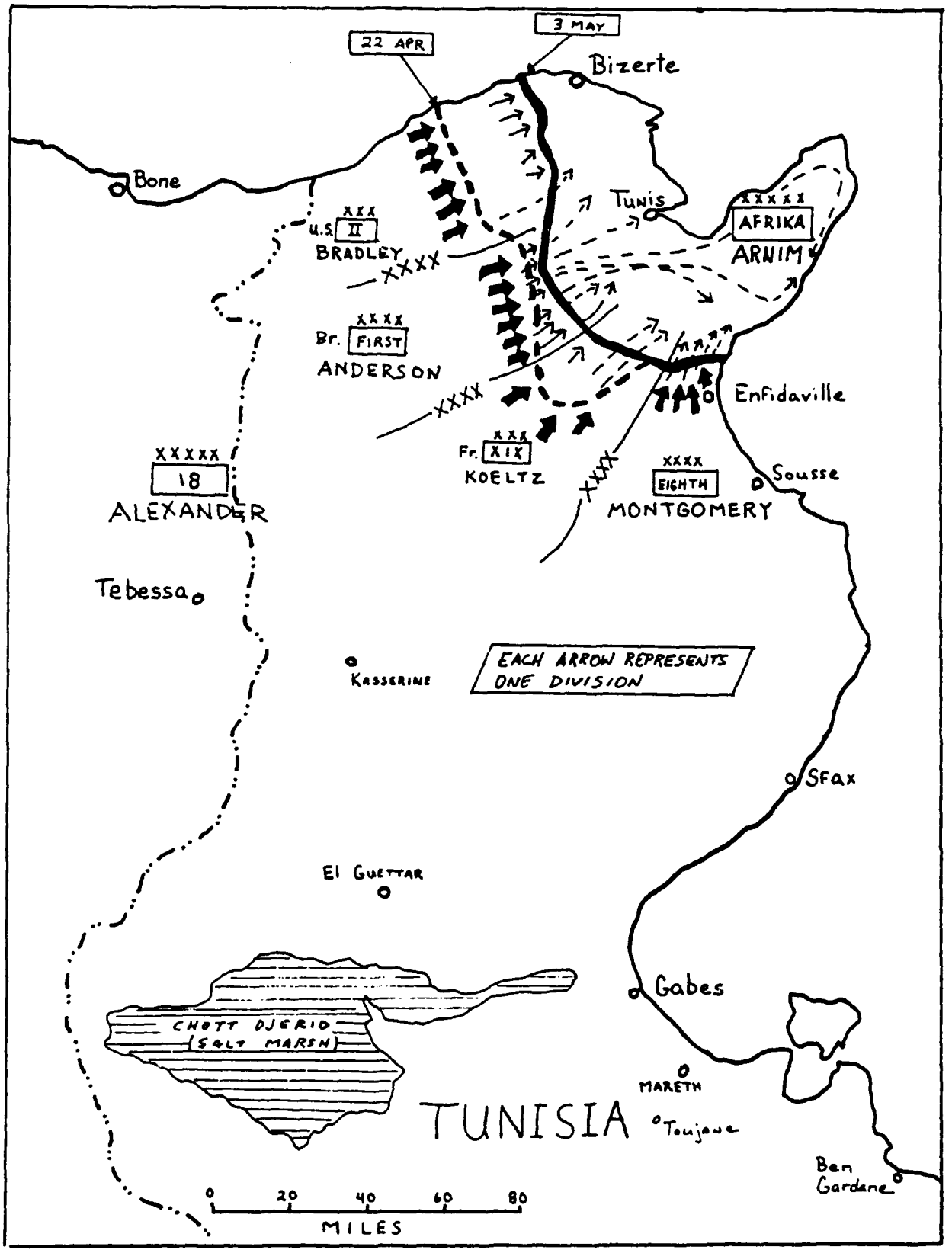
The German forces continued to reinforce the Tunis area. Beginning on 18 January and continuing through early February, the Axis powers conducted offensive operations which considerably weakened Allied positions along the Eastern Dorsal. This mountainous ridge extends from El

Guettar in the south to Pont du Fahs in the north. Key terrain along the Eastern Dorsal was lost, screening Rommel's retreat from Montgomery's forces in Libya. With Rommel's division now in Tunisia, Axis strength swelled to over 200,000 combat troops.

On 14 February, refurbished German troops attacked U.S. II Corps elements in order to control key road junctions and mountain passes around Sbeitla-Kasserine. Loss of these key areas would have isolated the II Corps and laid open key lines of communication, supply areas, and airfields, and would have thrown the Allies off balance before a serious offensive could be mounted. Five Axis divisions overwhelmed Allied forces during the next several days, until a reinforced II Corps managed to drive the Germans back. Finally, on 23 February, the Germans withdrew back through Kasserine Pass, thus affecting Allied strength only temporarily.[33]

Phase 3, The Capture of Bizerte and Tunis - During the first week of March 1943, Rommel's forces took the initiative and attacked British forces near Toujane (Map #8). Three Panzer divisions were met by an alert British force armed with over 500 anti-tank guns. Rommel lost fifty-two tanks, over half the armor in his attacking forces.

Montgomery took advantage of the situation and spearheaded the attack of Rommel's forces around Mareth. In



FINAL ALLIED OFFENSIVE
22 April - 3 May 1943

Source: Atlas for the Second World War

(Map 8)

the confusion of night fighting, the British passed straight through the enemy positions. Rommel continued to withdraw under pressure past Enfidaville, until the final Allied offensive toward Tunis began.

Allied forces continued to make progress, having surrounded Bizerte-Tunis and the German forces under General Von Arnim. Allied forces converged from all directions, overwhelming all remaining resistance and forcing their surrender. In all, over 240,000 Axis prisoners were taken, as well as over 1000 guns, 520 aircraft, and 250 tanks.[34]

DEFINITION OF TERMS

North African Campaign - Generally, the campaign is considered to be the Allied effort to seize control of North Africa and defeat the Axis forces employed there. It covers the period immediately following the successful landings of Operation TORCH on 8 November 1942 until the German surrender at Bizerte-Tunis in May 1943.

Sustainment Functions - As defined by FM 100-5, those functions include the manning, arming, fueling, fixing, and moving of the force, as well as the protection of the sustainment system.

Airland Battle Sustainment Imperatives - As defined by FM 100-5, the imperatives include anticipation, integration, continuity, responsiveness, and improvisation.

Classes of Supply (North Africa Campaign timeframe)[35]

Class I - Supplies generally consumed at a uniform rate regardless of conditions, primarily food.

Class II - Clothing, weapons, and other items for which there were specific allowances for units or for individuals on tables of organization and equipment, tables of basic allowances, tables of allowances, and other lists.

Class III - Gasoline, lubricating oils, and other fuels and lubricants commonly referred to as POL (Aviation fuels and lubricants are referred to as Class III-A).

Class IV - Miscellaneous category for items such as construction and fortification materials needed for special purposes and not otherwise classified.

Class V - Ammunition, explosives and chemical agents.

CHAPTER ONE END NOTES

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[15]Ibid., 56.

[16]Howe, Seizing the Initiative, 10.

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[18]Ibid., 318.

[19]Howe, Seizing the Initiative, 11.

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[23]Ibid., 28.

[24]United States Military Academy, The War in North Africa, Part 2 (The Allied Invasion) (West Point, NY: United States Military Academy AG Press, 1947), 8-12.

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[26]Ibid., 19.

[27]Ibid., 20.

[28]USMA, Part 2 (The Allied Invasion), 14-15.

[29]Ibid., 19-20.

[30]Ibid., 20.

[31]Ibid., 22.

[32]USMA, Part 1 (Operations in Egypt and Libya), 26.

[33]USMA, Part 2 (The Allied Invasion), 23-32

[34]Ibid., 34-38.

[35]Huston, Sinews of War, 493.

CHAPTER TWO

METHODOLOGY AND LITERATURE

LIMITATIONS AND DELIMITATIONS

This work will be limited to the evaluation of the sustainment system which supported U.S. forces during the North Africa Campaign. Logistic preparations for Operation TORCH are not considered except as related to the conduct of the campaign. It will not include other Allied forces, unless actions in their support impacted on U.S. operations. Generally, the study will be limited to land forces. The sustainment of naval and air forces will not be explored unless is is deemed relevant.

SIGNIFICANCE

An examination of the lessons learned and the effectiveness of the U.S. Army's last great desert campaign may serve to improve upon the sustainment plan for today's forces. Comparisons may be drawn between the North Africa Campaign and the Persian Gulf War in Iraq in 1990 - 91. In-theater lines of communication quickly stretched over hundreds of miles from ports to front line areas. Both

campaigns demanded high levels of mobility by coalition forces and intense logistics efforts.

REVIEW OF LITERATURE

As with any major military campaign, a wealth of information is available on the strategic considerations for U.S. involvement. There are literally hundreds of books, articles, theses, and reports which provide the reader with analysis of the tactical execution of the North African Campaign. Some of these sources are obviously more accurate than others. Many of the discrepancies may not necessarily be "wrong" as such, but are highly dependent on the authors' perspective, research material available, or perhaps in some cases, a vivid memory.

While there is an abundance strategic and tactical information, there is little concerning the logistics effort of the North Africa Campaign. There is, however, one outstanding secondary source available, The Logistical History of NATOUSA-MTOUSA, compiled by Colonel C. G. Blakeney, who worked as a G-4 staff officer in the Allied Force Headquarters. Published in 1945, it is a "lessons learned" book which covers many of the broad logistical support areas which I seek to explore in this thesis. It is a "warts and all" account of the efforts of the North

Africa theater in supporting combat operations. There is an admitted pride of accomplishment on the part of Colonel Blakeney, but it provides an excellent account of procedures in place at the beginning of the campaign and a record of the major logistics organization, installations, and operations.

Another sound secondary source is from the Army Historical Series. The Sinews of War: Army Logistics 1775-1953 by James A. Huston. While it is a broad sweep of Army logistics, it is an accurate summary of the impact of logistics on the campaign.

Other sources available are primarily Army Ground Force Observer Reports, various status reports, plans, and other related material. In regard to the Observer Reports, particular consideration will be given to the apparent expertise and qualifications of the individual(s) submitting the reports. These reports were submitted to the Army Staff by Army War College students after visits to the theater. There is no way of establishing the credentials of the individual filing the report. It is a very likely possibility that information was "provided" to these observers versus the individual "digging up" the issues of the day. Most of these Observer Reports do appear to have a basis in fact. Many of the problem areas identified in

those reports appear in Colonel Blakeney's historical record as well as James Huston's Sinews of War.

Current Army field manuals and regulations were of much use in defining and evaluating Airland Battle sustainment activities. In as much as these documents provide support operations doctrine to the field, they were considered accurate and appropriate for the needs of this research effort.

RESEARCH METHODOLOGY

In order to establish a framework of the combat operations of the campaign, only histories sanctioned by the United States Army were used to establish the tactical environment. For that purpose, I primarily used two books. First, from the U.S. Military History Series I read George Howe's book Northwest Africa: Seizing the Initiative in the West. Secondly, a book called The War in North Africa, Part 2 - The Allied Invasion written by the staff at the U.S. Military Academy in 1947 provides an excellent synopsis of combat operations. I then conducted a review of the broad sustainment categories as prescribed by today's Airland Battle doctrine. Specific logistical areas of the campaign were explored by keying on documents available which addressed the sustainment functions. Extensive use was made of existing studies, unit histories, G-4 reports,

intelligence summaries, official orders/correspondence, and Army Ground Force Observer Reports.

This study is an examination of the combat service support functions as defined by today's Airland Battle doctrine. It is further an evaluation of those functions against the Airland Battle sustainment imperatives defined in Chapter One. Secondary sources, such as The Logistical History of NATOUSA-MTOUSA were used to identify problem areas and primary sources were used to verify and examine those areas. Once identified, the problem was studied by going "back in time" to look at the planning for that area and then "looking forward" to examine the impact of that problem on the tactical situation.

CHAPTER THREE

THE SUSTAINMENT STRUCTURE

Many similarities may be found in the Army of 1942 and the Army of 1991. This is particularly true of corps and division support activities. Though there have been innumerable changes in technology, equipment, strategy, and force composition, the underlying support philosophy and employment of these units is basically the same. This is not to say, however, that substantial differences don't exist. This is especially evident regarding responsibilities of the national level sustainment agencies.

THE ARMY SERVICE FORCES AND THE SERVICES OF SUPPLY - 1942

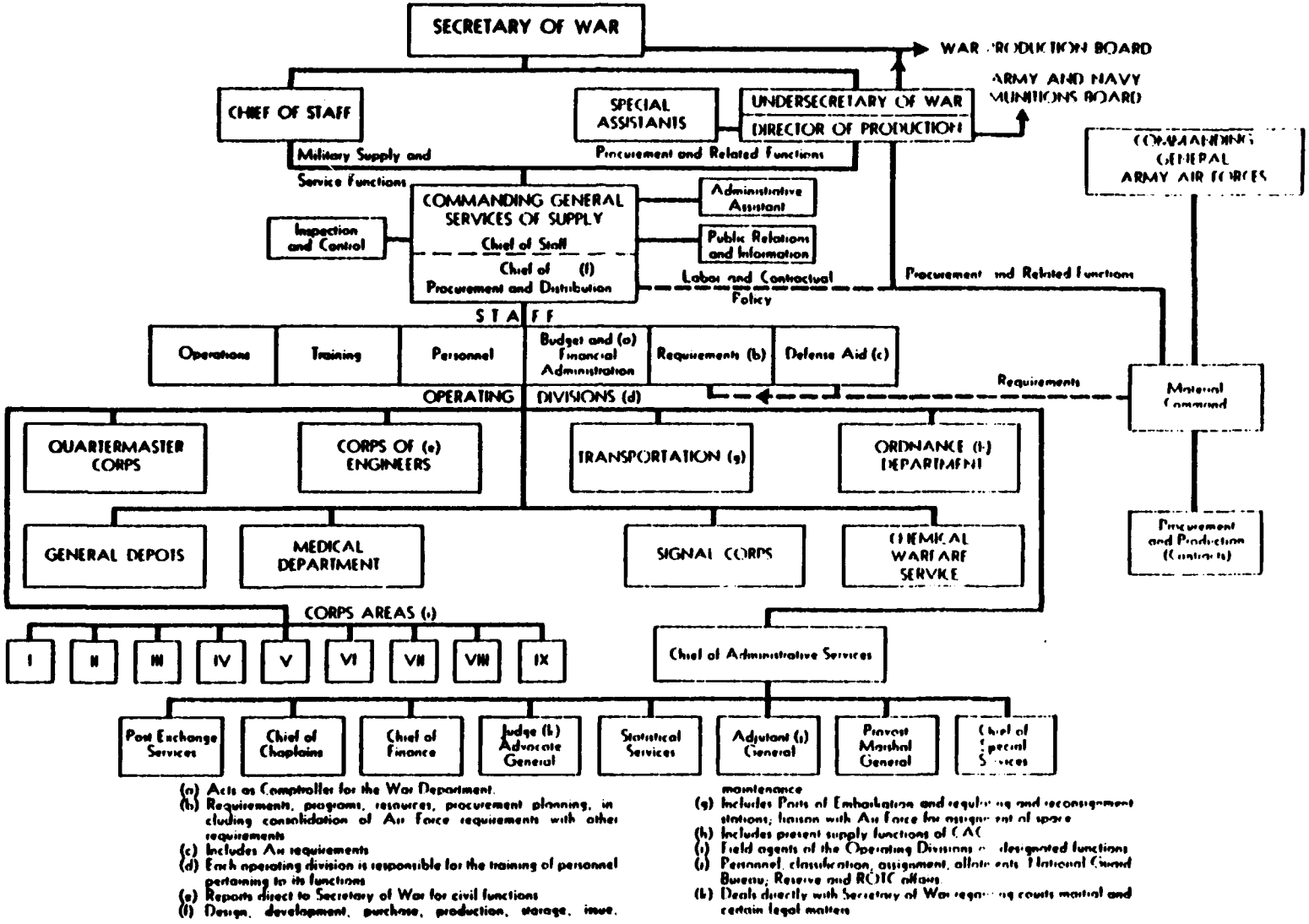
Before Pearl Harbor, the Army was poorly organized for the procurement of warfighting materiel. There was little coordination of the logistics effort below the Secretary of War. This, in conjunction with an effort for autonomy by the Army Air Force led to a major War Department reorganization in March 1942.[1]

The command structure would now have three major components -- the Army Ground Forces (AGF), the Army Air Forces (AAF), and the Army Service Forces (ASF). The reorganization recognized the need to handle procurement and supply operations as one integrated activity.[2]

No supply activity or service branch could have handled it all by themselves. World-wide deployment of troops into combat theaters demanded that rations, clothing, spare parts, ammunition, weapons, and other articles of war be centrally controlled. Prudent management required adherence to schedules which would bring these items and soldiers together at the right time and place.[3]

The mission of the Army Service Forces was a bold one -- "to provide services and supplies to meet military requirements." In addition to the inherent procurement and supply functions, this mission brought with it many less defined tasks. Among the many responsibilities were the development and administration of purchasing and contracting procedures, labor relations, and the basic and technical training of service soldiers and units.[4]

The War Department reorganization placed five major elements under the control of the Army Service Forces (Fig. #1). First were the G-1 (personnel) and G-4 (supply) of the War Department general staff. Second was the Office of the Under Secretary of War (OUSW). The OUSW was generally



(a) Acts as Comptroller for the War Department.
(b) Requirements, programs, resources, procurement planning, including consolidation of Air Force requirements with other requirements
(c) Includes Air requirements
(d) Each operating division is responsible for the training of personnel pertaining to its functions
(e) Reports direct to Secretary of War for civil functions
(f) Design, development, purchase, production, storage, issue, maintenance
(g) Includes Ports of Embarkation and regulating and reconsignment stations; liaison with Air Force for assignment of space
(h) Includes present supply functions of CAC
(i) Field agents of the Operating Divisions for designated functions
(j) Personnel classification, assignment, allotments National Guard Bureau; Reserve and ROTC affairs
(k) Deals directly with Secretary of War regarding courts martial and certain legal matters

ORGANIZATION OF THE SERVICES OF SUPPLY: 20 FEBRUARY 1942

Source: The Organization and Role of the Army Service Forces

(Fig. 1)

responsible for the supervision of the War Department's procurement activities and general economic mobilization. Third were eight administrative bureaus which would eventually become the ASF Headquarters.[5]

The fourth element placed into the ASF were the nine corps areas, which would shift to become the service commands. Their mission was to execute the ASF's functions as field agencies throughout the United States, except as related to procurement, new construction, or operation of staging areas and depots.[6] Their functional responsibilities included the induction and assignment of personnel, operation of fixed communications facilities, and numerous other duties.

The last area put under ASF control were the six "supply arms and services" of the War Department.[7] These were later designated as the technical services. Transferred were the offices of the Chief of Ordnance, the Quartermaster General, the Chief of Engineers, the Surgeon General, the Chief Signal Officer, and the Chief of Chemical Warfare Service. Each of the services brought with them their headquarters as well as installations throughout the United States.

Each of the services' agencies provided for its own procurement activities. Each developed various types of military equipment and stored and distributed this material

where required. There had been little change under the 1942 reorganization. The primary difference was that instead of reporting their activities through the Under Secretary for procurement or the Chief of Staff on other matters, they now responded to the ASF Commanding General.[8]

Each of the technical services had dual responsibilities. Each chief headed a major operating unit in the ASF with extensive procurement and distribution of supplies. But now, in addition, each of these services were expected to exercise technical supervision over their specialty throughout the Army.[9]

Unlike the Army Ground Forces and the Army Air Force, the ASF did not enjoy the benefits of a truly unified command. Under the previous organization, supply and administrative department heads reported directly to the Chief of Staff. Now they had been bumped down a step in the War Department hierarchy and answered to the Commanding General of the ASF. Under the reorganization, these department heads retained significant authority and responsibility. It proved difficult to transform the group into a cohesive, unified staff.[10]

Another problem lay in the wide range and scope of the functions to be performed. The numerous minor agencies and bureaus, which had matured in the War Department, were now assigned to the ASF. The primary purpose was to relieve

the Chief of Staff and the War Department General Staff of a myriad of burdensome duties. The result was that in addition to its supply and procurement mission, the ASF had become a command of "things in general."[11]

The major problem facing the ASF in March 1942 was procurement. Because of limited production experience in most military items, critical shortages were abundant. If all critical military items of equipment had been pooled, only about twenty percent of America's thirty-four divisions could be equipped.

Procurement was naturally linked with the distribution of materials. Supplies produced in America's factories and arsenals would be of little use unless they could be delivered where and when needed.

BASE SECTIONS

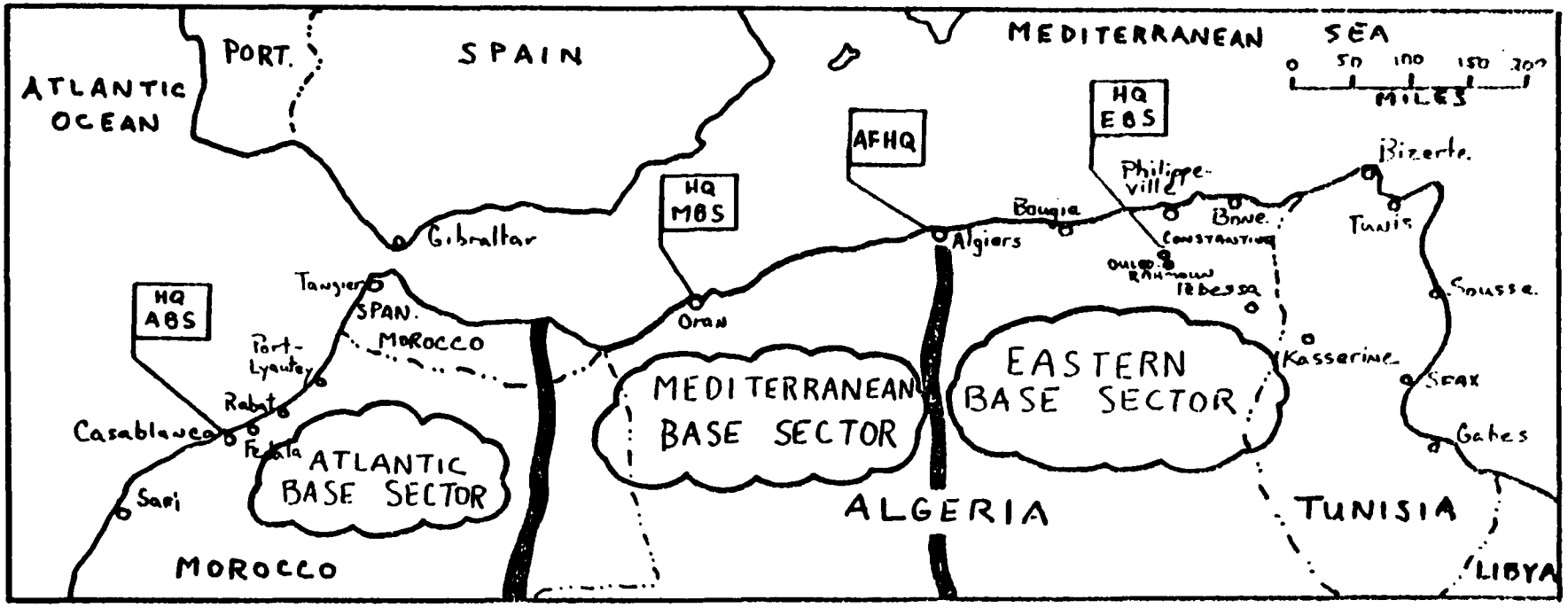
Because of the desire to retain the predominantly American character of the invasion force, a clear division of the U.S. and British sustainment functions was needed. Each task force organized its own supply service, including base sections to become operational in the ports as soon as possible after the invasion. It was expected that two base sections (for the Western and Center Task Forces) would

come under Allied Force Headquarters AFHQ soon after the invasion.[12]

Late in the planning period prior to the TORCH invasion, the Services of Supply (SOS) requested a complete support plan from AFHQ. The draft of the plan, provided on 27 October 1942, had some substantial shortcomings. The task forces could not establish adequate inventory and supply controls on incoming material until the base sections could become fully operational. Because of this it was decided that for the first two months, Class II, IV and V supplies would be automatically furnished to the theater in accordance with War Department estimates. After that time, limited requisitioning could begin.[13]

On 4 December 1942, almost a month after the landings, a theater supply plan was published. Patton's Western Task Force was to be supported directly from the United States with requisitions flowing directly to the New York Port of Embarkation. The Center Task Force would receive its supplies not only from the United States, but would also get supplementary shipments from England. Center Task Force requisitions would flow through AFHQ to the SOS activity in the United Kingdom.[14]

The reestablishment of AFHQ from Gibraltar to Algiers brought a greater degree of command and control to the base sections (Map #9). The Atlantic Base Section (ABS) in



Source: Rpt on Supply Sit in North Africa Theater of Opns

BASE SECTION MISSION AREAS

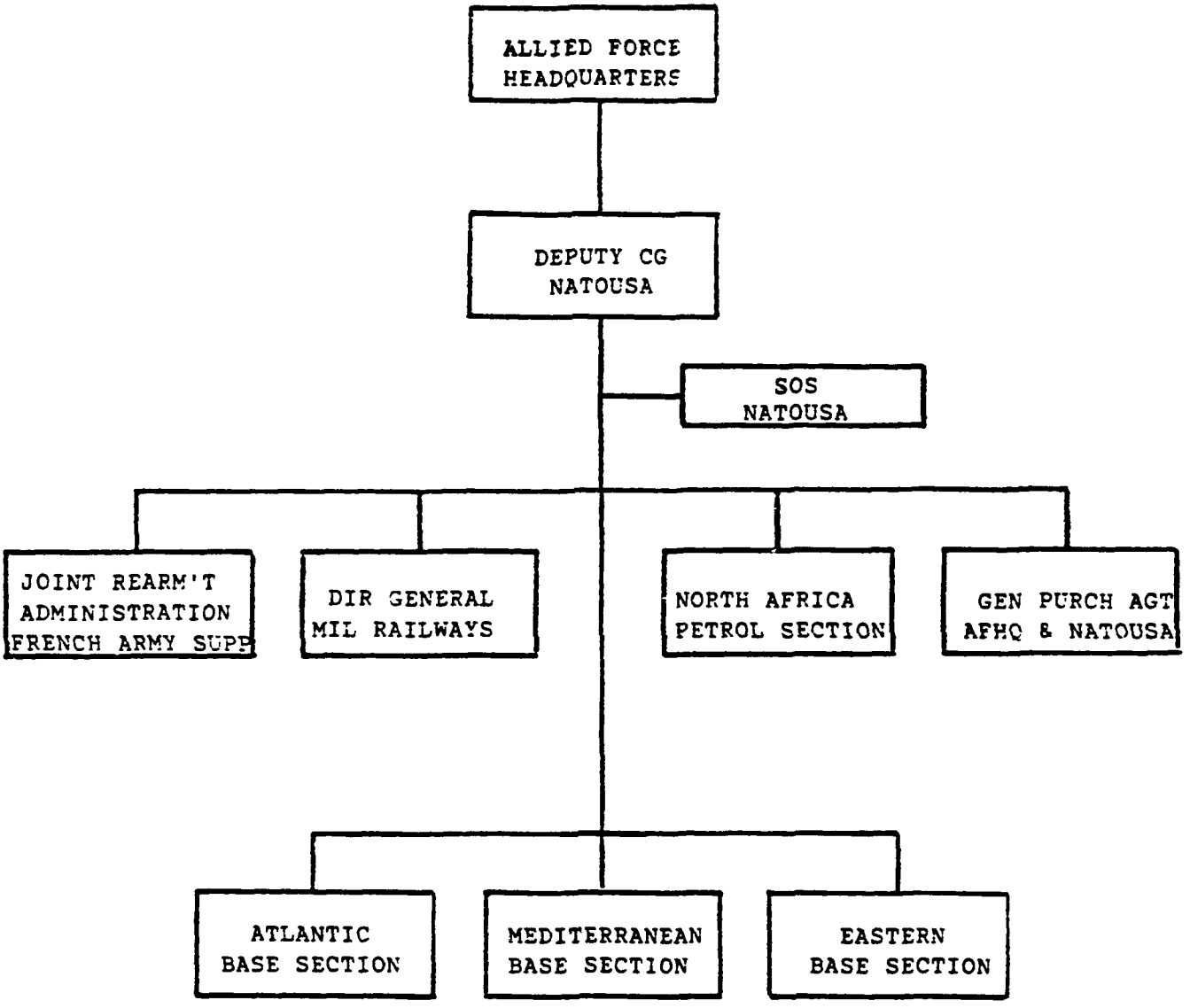
(Map 9)

Casablanca and the Mediterranean Base Section (MBS) in Oran now reported directly to the AFHQ G-4. The G-4 functioned as the central supply operations staff until the Communications Zone (COMZ) was established.[15]

Finally, on 15 February 1943, the SOS, NATOUSA (North African Theater of Operations, United States Army) assumed responsibility (Fig. #2). Now, the base sections would be under the command of the Commanding General, Zone of Communications for all matters except supply, maintenance, construction and transportation functions. There, they would answer to the CG, SOS NATOUSA.[16]

Simultaneously, the Eastern Base Section (EBS) was established at Constantine in order to provide more responsive supply support to U.S. Army forces in Tunisia. The EBS was organized much like the other base sections and was initially stocked by them pending regular shipments into Philippeville.[17]

The base sections were each responsible for operating the ports and moving supplies from the ports to advanced and intermediate depots where they were stored and issued. Among the numerous additional functions were medical evacuation, burial, procurement, traffic control and transportation. Each base section also issued supplies to civil agencies, French Army logistics units, and coordinated the exchange of supplies with the British.[18]



Source: Rpt on Supply Sit in North Africa Theater of Opns

THEATER ORGANIZATION OF SUPPLY

(Fig. 2)

With each task force given the mission to initially support themselves came wide differences in their sustainment philosophies. As was noted earlier, the Eastern Task Force being mostly British, did not call for the establishment of a base section. MG Fredenhall's Center Task Force, deploying from England, reinforced his corps staff with personnel from the base section to be formed later. BG Thomas Larkin, the future MBS Commander, in fact brought with him a small staff and participated with the II Corps G-4 in the task force landing at Oran. When the transition from Corps to base section control came, its commander and staff were well in tune to the situation and the needs of the force. The MBS was fully operation on D+28 (6 December 1942).[19]

During the formation of the Western Task Force from July - September 1942, MG Patton wanted "Fast moving, hard hitting units with plenty of armor." His ground force had been originally formed around three amphibious divisions. But now with the inclusion of heavier forces and about 60,000 service troops, allocated transportation capacity had been exceeded. The deficit, about 900,000 tons, was equivalent to eighty-four ship loads.[20]

There were three possible choices for corrective action. The first option was to make additional shipping assets available and to supplement port capacity in

Morocco. The second option was to send a smaller force (reduced from 167,000 to about 100,000) which would be fully equipped and mobile. The last option (and ultimate selection) was to send the larger force, but with less mobility and firepower.[21] The result was a significant shortage of quartermaster units to facilitate cargo transloading at the port.

In order to ensure supplies would be available between the time the beachhead was secured and the ports were opened, ships were combat loaded. That is, each vessel carried a full complement of each class of supply to support its passengers or troops landing in a particular area. Though this method was uneconomical in the use of space, it reduced the risk of losing any one class of supply to enemy fire.[22]

Chaos reigned in the initial supply operations at Casablanca and the smaller ports nearby. Much of the difficulty resulted from the inefficiency of the participants, the speed with which they had been assembled, and their inability to rehearse the operation. An acute shortage of motor transport prevented the forward movement of supplies away from the port.[23]

Slowly, order was brought to the Atlantic Base Section. On 19 November 1942, D+11, the first administrative convoy of ships arrived in Casablanca. With

it was thirty days of supply of quartermaster items and 32,000 service troops, including the headquarters needed for operation of the port.[24]

The ABS Commander, BG Arthur Wilson, and his staff had not been included in the assault force. BG Wilson was extremely critical of the initial port operation, citing a lack of planning, order, and a few experts to take charge.[25]

The situation in the Eastern Task Force was different. Though it was predominantly British, Americans were interspersed with the force. However, there was no U.S. supply organization there to provide them support. By February, it was decided that the Americans should be split out and given their own front. The British would be on the left (north), and the French in the center, and the U.S. on the right (south).

This action unmingled the lines of communication and established the need for an organization to support them. Thus, the Eastern Base Section (EBS) was activated and headquartered in the Tunisian city of Constantine.[26]

For the EBS, supporting the American force was quite complicated. The principle port was in Phillippeville, some forty miles away. Supplies were carried via standard gauge railroads to Ouled Rahmoun, where it shifted to narrow gauge. So it was decided to form the EBS around depots

created at Philippeville, Bone, Ouled Rahmoun and Tebessa.[27]

CORPS AND DIVISION SUPPORT

Many of the support concepts put into practice at the corps and division level during the North Africa Campaign are still exercised today. Company sized support elements were routinely inserted with command and control elements into the corps. These units were fielded dependent upon the size and type of units and divisions to be supported.

Corps level units performed a myriad of tasks. The support package was configured in order to provide what we consider today as direct and general support operations.

The American force deployed to North Africa was employed in numerous ways. Rarely did the II Corps with its integral divisions fight as a single combat force. As such, divisions and regiments were regularly attached and detached to fight in different configurations. This has lead to some problems in identifying a definitive support structure for the campaign.

Tables of organization were in a constant state of flux. The typical armored division support slice of the day was located within the division trains. There was found a

medical battalion, a quartermaster battalion and a maintenance battalion (or company dependent upon TOE). At the time, an engineer battalion and a signal company were also part of the armored division and considered a part of the support package.

Infantry and motorized division support structures were almost identical to that of the armored division. Maintenance companies did not become an integral part of most divisions until after the North Africa Campaign.

Today, the Division Support Command (DISCOM) provides the division level logistics and medical support to all divisions. DISCOM elements operate as multifunctional battalions providing transportation, supply and services, maintenance, and medical support. Divisions are normally augmented by corps level support units operating in the division area of operations.[28]

The Corps Support Command (COSCOM) provides direct and general support to all corps and ivisional forces. Corps support groups provide command and control of supporting units.

The corps materiel management center provides centralized management of supplies and maintenance throughout the corps area. The corps movement control center, as the name implies, provides transportation management for the movement of ammunition, equipment and

supplies from corps general support units to COSCOM and divisional direct support units.

The COSCOM medical brigade provides medical treatment for not only the corps, but soldiers evacuated from the divisions. As required, COSCOM medical units provide for further evacuation to hospitals in the Communications Zone.[29]

CHAPTER THREE ENDNOTES

[1]James A. Huston, Sinews of War: Army Logistics 1775 - 1953 (Washington, D.C.: Office of the Chief of Military History, 1966), 414.

[2]Ibid., 414.

[3]John D. Millet, The Organization and Role of the Army Service Forces (Washington, D.C.: Center of Military History, 1985), 38.

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[14]Ibid., 67.

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[20]Richard M. Leighton and Robert W. Coakley, Global Logistics and Strategy 1940-1943 (Washington, D.C.: Office of the Chief of Military History, 1955), 425.

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[23]Ibid., 50 - 51.

[24]Ibid., 52.

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[26]USACGSC, Mediterranean Theater, 2.

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[28]U.S. Army, FM 100-10 Combat Service Support (Washington, D.C.: Department of the Army, 1988), 1.17.

[29]Ibid., 1.18 -1.19

CHAPTER FOUR

SUSTAINMENT ACTIVITIES

The North Africa Campaign presented innumerable logistics challenges to the American forces. Many units were undermanned or had no experience in war. The terrain and weather, both harsh and unforgiving, did not accommodate smooth logistics operations. Tactical groupings into small task forces spread over wide fronts resulted in supply personnel operating as small independent units without the aid of proper staffing or equipment.

What follows is a summary of the major logistics concerns in the theater in five areas -- manning, arming, fueling, fixing and transporting. The sixth sustainment function, protection of support assets, is addressed in each area.

MANNING - MEDICAL SUPPORT

Perhaps the biggest problems medical organizations faced during the campaign were rooted in the initial planning. As stated earlier, each of the three task forces

was responsible for its own logistical planning and support operations. Planning for the Western Task Force was done in the United States and for the other two task forces in the United Kingdom. Because of this dispersion, the AFHQ Surgeon had little direct influence in the early phases of medical operations except for broad policy.[1]

Each of the three task forces was significantly different. The WTF was influenced by restrictions imposed because of available tonnage on transport ships. Only the minimum number of medical personnel and equipment could be included during the initial operations. Only medical detachments and "skeletonized" medical battalions took part in the initial landing phase. Evacuation hospitals were scheduled to arrive on later convoys and fixed hospitals were not scheduled to arrive until late December 1942.[2]

The Center Task Force, given the freedom to integrate a more substantial support slice, allotted two evacuation hospitals and one surgical hospital to the assault force. Fixed hospital facilities were scheduled to arrive between 20 November and 20 December.

The Eastern Task Force, being primarily British, incorporated a lighter U.S. medical force. Only divisional medical battalion clearing and collection companies, augmented by auxiliary surgical groups, were needed to

support U.S. forces. Third and fourth echelon support were provided by the British.[3]

Plans drawn up for and by the task forces for combat medical service in the landing were spelled out in considerable detail. However, they were based mostly on manuals which had been prepared without realistic knowledge of amphibious operations. U.S. observers had participated in the costly Dieppe raid in August 1942 and represented the Army's bank of knowledge on such operations. The Dieppe raid was a joint British and Canadian assault on France which resulted in over 50% casualties. Therefore, it is not surprising that the casualty estimates predicted for the TORCH landings were too high, given the relatively light French resistance.[4]

Each of the task forces experienced medical organizational problems immediately following the assaults. For example, on the beach west of Algiers where elements of the ETF landed, collection company personnel came ashore by 0730 hours on D-Day. They landed on the wrong beach and were forced to make a ten mile march carrying equipment on litters to reach the battalion aid station they were to support.[5]

In the Center Task Force, an evacuation hospital could not be established until after the arrival of the D+3 convoy. Up to that time, there had been little evacuation

from the combat zone because of a blocked harbor and the delay in arrival of ships carrying hospital equipment.[6]

Patton's Western Task Force also had medical support shortcomings. During the first few hours of the landing at Safi (south of Casablanca), casualties were held at aid stations for which sand dunes offered the only cover. Numerous improvised hospitals were set up in Casablanca and Fedala, staffed by medical battalion personnel. School buildings, casinos, and private homes were utilized with supplies borrowed from local merchants, doctors and the Navy. On the night of 12 November, one of these hospitals provided care for 400 burn victims of a U-Boat attack -- 100 patients needing repeated transfusions. Flashlights gave the only illumination until floodlights could be secured.[7]

From the medical point of view, the invasion phase provided several salient points. First, in no instance did collection or clearing elements get ashore early enough or with enough equipment. Additional medical supplies had been scattered all over the beach, complicating an already marginal situation. Secondly, there was poor intelligence as to the conditions medical units would actually face. It was based on either no combat experience, or the static support experience of World War I.[8] Lastly, the failure to establish fixed hospitals immediately after the assault

made it necessary to hold mobile medical units in Oran and Casablanca to care for invasion casualties and prevented them from moving with the II Corps.[9]

By January 1943, II Corps headquarters was established in Constantine. MG Fredendall began building his forces in the vicinity of Tebessa. By 1 February most of three divisions were deployed. Three medical battalions organic to the divisions, two evacuation hospitals, a surgical hospital and an additional battalion were also based around Tebessa.

When the Germans seized the initiative at the end of the rainy season, Rommel struck the II Corps hard near Faid Pass, some eighty miles to the southeast. Intelligence had expected the attack farther north. Fredendall, caught off guard, prepared to stand at Kasserine Pass, forty miles east of the breakthrough. Enemy tanks blew through the pass, catching U.S. armor forces out of position. The Germans drove to within twenty miles of Tebessa before being turned back by shortages of ammunition and fuel.

Fighting leading up the the Faid attack had spread collection and clearing companies over hundreds of miles in rough, mostly roadless country. A withdrawal of medical units was ordered in response to the German advance. On the first day of the withdrawal, the collection company of the 109th Medical Battalion was captured together with most of

the medical detachment of the 168th Infantry Regiment -- in all ten medical officers and 100 enlisted men.[10]

By the time the Germans broke through at Kasserine, medical units around Tebessa were evacuated thanks in no small part to British ambulance units. Bad weather had made air evacuation impossible. These moves were done quickly and in good order. Commanders were impressed by the fact that a 200 bed section of the 48th Surgical Hospital could evacuate its patients, tear down and be ready to move in four and a half hours. This was in sharp contrast to 750 bed evacuation hospitals which had no organizational transportation assets and could move only when Corps provided assistance. Their relative immobility kept them so far from the front that distances of 100 miles between the clearing station and the hospital were common.[11]

Following the Germans' withdrawal from southern Tunisia, the first task for the Corps was to move 150 miles north. Though this involved moving 100,000 men across the British First Army, it was accomplished without interruption to any supply or service and without enemy detection.[12] Sustainment activities in the north were considerably easier than in the south. The II Corps was now supported by three 400 bed and two 750 bed evacuation hospitals, instead of one 400 bed and two 750 bed units in the south. Forward

hospitals were now only five to twenty miles from the fighting, instead of the twenty-five to 100 miles in southern Tunisia.

During the northern campaign's first ten days, fighting was conducted in mountainous country, again mostly without roads. Even though evacuation distances were significantly shorter, the task was particularly difficult. In the 9th Division area, mules were used in order to negotiate the terrain.[13]

The final week of the campaign, in May 1943, saw the Allied forces gain the initiative in their move to seal off Von Arnim's German forces in the Tunis region. Medical support now closely resembled the doctrinal structure outlined in the field manuals. The coastal plain and its road network eased support operations significantly. The 51st Medical Battalion provided supervision of two captured German field hospitals. They were allowed to continue operations until 15 May, when all prisoners needing hospitalization were turned over to the 9th Evacuation Hospital.[14]

MEDICAL EVACUATION

In general terms, medical evacuation is defined as the movement of patients within the combat zone and to the COMZ; within the COMZ; and the evacuation from the theater

of operations to the United States. This requires that all levels of support be closely integrated in order to provide optimal patient and unit support.

The evacuation policy is determined by evaluating the ratio of fixed hospital beds to troop strength; the sick and wounded rate; and the availability of evacuation facilities. Within the United States, evacuation policy was quite rigid. However, within the North African theater a more flexible policy was adopted. The tactical situation, flow of casualties and the need for mobility limited what could be done in forward areas. Therefore a thirty day policy was in effect in the forward base section, and a ninety day period was established in the Mediterranean and Atlantic Base Sections.[15]

In an effort to equitably distribute patient load and to concentrate patients being evacuated to the U.S., they keyed on hospitals where transportation would most likely be available. This reduced patient load in the forward areas, and minimized the time patients spent waiting for troop transports in Oran and Casablanca.[16]

Methods of evacuation within the theater were challenging and innovative. On land, cross-county ambulances were the primary means when distances were short. But when dictated by terrain or weather, the 1/4 ton jeep was used extensively for moving litters short

distances. It was extremely valuable in negotiating mountain trails too rough or narrow for ambulances. Larger vehicles, the 3/4 ton weapons carrier and two and 1/2 ton trucks were unsatisfactory except for the mildest of ambulatory cases. These vehicles imposed great discomfort on patients and their use was restricted except in extreme emergency situations.[17]

Hospital trains were used extensively in the theater. Though they were not shipped from the United States, use was made of captured or improvised trains for medical evacuations. Early in the Tunisian phase of the campaign, the trains were under British control. In early March 1943, a French train was obtained for American use. Since most troop transport ships available for evacuation to the United States were sent to Casablanca, this train was used extensively between there and Oran. Both trains were made up of second and third class cars and box cars rigged for litter patients. Extensive reconstruction of these trains provided comfortable accommodations and safe, speedy transport.[18]

The most imaginative use of rail evacuation was in the 9th Infantry Division area. At one point in the campaign, a railroad line cut the division front. Two 1/2 ton trucks were fastened back to back with their rims fitted over the rails. One truck powered the vehicle on the way to

the rear, the other on the return trip. This configuration carried twelve litters at a time, but because of the exposed position, could only be used at night.[19]

For a time, mule pack evacuation was used in isolated instances in Tunisia. The mules were harnessed in tandem with a litter slung between poles attached to the saddles. The chief advantages were in reducing the number of men needed to evacuate casualties (only 1/4 the number needed for litter hand-carry), reduced exposure to enemy fire, and the ability of mules to cover greater distances than a squad of litter bearers. Disadvantages to their use focused on patient safety, particularly regarding controlling the animals under fire and the difficulty to keep the patient on the litter if the mule began bucking. Patient apprehension was significant, fearing the mules would run away uncontrolled. Medical authorities recognized these shortcomings and recommended that the practice not be adopted as standard policy.[20]

Evacuation via water was very limited. No U.S. hospital ships were available. However, some space was allocated on British ships for evacuation from Algiers/Oran to the U.K. and from Bone/Algiers to Oran.

In the absence of other means, the troopship was the only thing available for the evacuation of the sick and wounded to the United States. Three key factors limited

troopship evacuation. Originally, theater policy allowed only those patients mentally and physically capable of taking care of themselves in the event of disaster to board the ships. This policy was liberalized in February 1943 to allow all categories. The next factor was that medical facilities on these ships were poor. Lastly, overland travel restrictions initially in the theater prevented casualty evacuation all the way to Casablanca. Most troopships were routed to Casablanca, not Oran or Algiers.[21]

Air evacuation was the most desirable means, offering comfort, safety and speed. For the first three months of the campaign, air evacuation was not systematized. It was done locally on the initiative of surgeons and air corps officers. In fact, support was provided mostly to Air Force personnel themselves using C-47 aircraft.

In January 1943, the theater surgeon met with the 51st Troop Carrier Wing and outlined a plan to maximize air evacuation. Generally, ground forces would be responsible for establishing medical facilities near airfields and provide reception and triage services. The Air Forces would coordinate communications between ground medical facilities and provide property exchange and care en route. Only general guidelines were published and details were purposely avoided for fear it would hinder flexibility and rapid expansion. For a time this was sufficient, but as traffic

volume increased, centralized control by AFHQ was instituted.[22]

MANNING - GRAVES REGISTRATION

The first regular graves registration company was authorized only two years before the TORCH invasion. In theory, this unit of five officers and 125 men could support a corps of three divisions. Functionally, graves registration was a staff responsibility, usually under the G-1 or G-4.[23]

Shipping restrictions imposed on the Western Task Force necessitated that two of these companies remain in the United States. Initially, fighting forces would be responsible for the collection, identification and burial of their own dead. In most cases, little information and even less experience was available to these units.[24]

Unit commanders objected to the employment of combat soldiers to perform recovery and burial of their own dead. Unit chaplains with the assistance of NCO's and enlisted men, normally assumed the task.[25]

The 46th Graves Registration Company, originally scheduled to deploy with the WTF finally arrived in Constantine on 2 March. This, in conjunction with a theater graves registration service established in April, finally offered some relief. There were now standard procedures for

securing mortuary supplies and services and temporary burial sites.[26]

Even after the arrival of the 46th, there were still not enough assets to relieve the combat soldier of a significant role. Though GREGG personnel were able to establish forward collection points, it did not satisfy the demoralizing experience of the ground forces handling the remains of the dead.

MANNING - OTHER AREAS OF INTEREST

Replacements were provided to the theater in sufficient numbers throughout the campaign. There were two major areas of concern however.

The first problem was the level of training of troops arriving in North Africa. Though there were numerous instances, a prime example was cited in February 1943. The 1st Infantry Division was anxiously awaiting 1500 replacements who had not received a reasonable amount of basic training. The division had to establish a training center in the division rear by drawing instructor personnel from units actually engaged in combat.[27]

The second problem was the shortage of replacements for infantry attrition. To make up for this shortage, skilled maintenance soldiers were taken from Ordnance units or redirected from replacement pools into infantry units.

This only complicated the already overtaxed ability of support elements in the theater.[28]

In another area, laundry and other services were difficult throughout the campaign. Quartermaster units were not deployed for this purpose. But in addition, soap was scarce and could not be purchased locally. In cities, laundry services were available by hiring civilians, but laundries were not available to support soldiers in the field. Hot water systems were in abundance, however fuel to operate them was in short supply. Bathing, even indoors, was a cold water proposition and very unpopular because of the cold weather. Impromptu baths in streams were not recommended because of the possible induction of parasites.[29]

The quantity of rations available for U.S. troops was never a problem in the campaign. Quality, however, was another matter. American "C" rations provided excellent nutrition, but a steady diet of them over several weeks or months proved undesirable.

Fresh meat was in short supply due to the shortage of reefer ships or refrigeration capacity in theater. Local procurement of fruits and vegetables was effected in order to minimize shipments from New York. Over 1700 tons of vegetables, 700,000 grapefruits and 5,000,000 oranges were consumed between February and June 1943. Field bakeries

were available, however they were constantly plagued with mechanical failures. Ovens sat idle because of a burner shortage caused by the lack of unleaded fuel.[30]

ARMING

During the planning for Operation TORCH and the subsequent campaign, ammunition was perhaps the scarcest of commodities. In 1940, only the Frankford and Picatinny Arsenals were capable of manufacturing new artillery ammunition. Only a few ordnance depots were capable of renovating old ammunition and private ammunition plants did not exist. Secretary of War Stimson, remarking on the meager state of ammunition stocks, said, "We didn't have encugh powder in the whole United States to last the men we now have overseas (1943) for anything like a day's fighting."[31]

Drastic measures were taken to remedy the situation. A network of 60 GOCO (government owned, contractor operated) ammunition plants was built between June 1940 and December 1942.[32]

Ammunition requirements for the invasion were determined by each task force staff and shipments were made from both the United States and the United Kingdom. These requirements were based in "units of fire" as determined by the Theater Commander.[33] A unit of fire was defined as

tactical unit of measure of average ammunition expenditures for weapons in the command.

The plan for North Africa called for 3 units of fire to land on the beach on D-Day and then 1 1/2 units of fire per day for the next 7 days. After that, 3/4 units of fire per day for 30 days would build a 30 day supply and 1/2 unit of fire thereafter until a 60 day stock was built by January 1943. Shipments were automatically generated by the War Department and initially did not reflect the theaters' true needs.[34]

Soon stockages of ammunition well in excess of the 60 day target were built on the beaches of Casablanca, Oran and Algiers. This was primarily the result of relatively light French resistance during the invasion. No attempt was made to slow deliveries because of future requirements toward Tunisia, and eventually Sicily.[35]

Corps level Ordnance Corps units had the primary responsibility for ammunition supply and distribution in the theater. A Provisional Ordnance Group (POG) was formed with Fredendall's approval which provided command and control of two (and eventually five) battalions. The 1st Battalion, composed of maintenance companies, provided Ordnance service (less ammunition) for Army units in Oran and Arzew. The 2nd Battalion, composed of maintenance and ammunition units,

provided support to all Army organizations outside of those cities.[36]

Early ammunition operations centered on the establishment of ammo dumps. Extensive use was made of Arab labor and it was not without its problems. Many of the laborers, being young or weak, couldn't handle heavy loads. Adherence to schedules was nearly impossible during the rainy season because of their distaste for working in foul weather. They would, on occasion, pilfer weapons and ammunition for personal use.[37]

Late November brought the arrival of the 62nd Ammunition Battalion, which was immediately reconfigured to become the POG's 3rd Battalion. They took over operation of three ammunition dumps.[38]

When the II Corps moved to southern Tunisia in January, the POG went through a major reorganization. The new configuration provided a balanced support package of maintenance and ammunition units over the broad front. The main ammunition depot was established northwest of Tebessa. Ammunition supply points were operated at Feriana, Sbeitla and Maktar, 60 to 80 miles to the east.[39] Here they supported the II Corps while attached to the First British Army under General Anderson. For the next few weeks, Allied Forces took part in numerous operations along the maintain passes to stop German jabs into the line.

By 25 January, General Eisenhower had expressed his urgent need for transportation assets with which to move supplies and equipment. Rolling stock, for highway movement, was of critical importance because of the sparse rail lines in the region. By the time the Afrika Korps breached the Corps front at Kasserine in mid-February, there was little movement of ammunition forward. Stocks were adequate at the ammunition dumps, but inadequate transportation hampered its supply. Huge quantities of Class V were wired for demolition, however the German withdrawal back through the pass at Kasserine negated the requirement to destroy it.[40]

After the move to northern Tunisia in March for the final drive to Bizerte, ammunition support was to become less complicated. The build-up of ammunition supplies occurred at a phenomenal rate, quickly amassing 9,000 tons at Bone. From there, it was loaded onto landing craft and fishing boats and moved under the cover of night to the shallow port of Tabarka.[41] From that point, it was only a short haul by truck to the front.

Ammunition companies were placed on the flanks of the Corps during that final drive. The POG Commander, Colonel John Medaris, employed a philosophy key to today's support doctrines. He strongly believed that Ordnance services should be "so far forward at all times that troops need not

seek it out, but merely by 'holding up their hands' may have them filled with adequate tools of war."[42]

Several key lessons were learned regarding ammunition support in North Africa. First, it was found there was little need for some types of ammunition which were shipped to the theater. These automatic shipments, based on War Department estimates, were eventually stopped and stocks depleted or shipped elsewhere.[43]

The second lesson was that the supply of Class V to the Corps was hampered by lack of experience. War Department estimates projected for ammunition consumption were highly inaccurate. This lead to the development of the "Day of Combat Experience" yardstick by the II Corps.[44] This in conjunction with newly initiated reporting resulted in issue of daily expenditures of ammunition and less fluctuation of inventories.

The third lesson was that like petroleum consumption, ammunition usage varied greatly on terrain. In the last battles in Tunisia, artillery and infantry forces were used extensively in the rocky hills and valleys controlled by the enemy. Tanks, vulnerable in the region, played a minor role.[45]

In summary, lack of ammunition in the North Africa Campaign was not a significant problem. Inventory inefficiency and the lack of responsive transportation were the biggest challenges faced by the Corps.

FIXING

The highly mechanical nature of the American force assembled for combat in North Africa brought with it many challenges. The extended lines of communication, rough terrain and the remarkable speed of the II Corps movement into Tunisia were all factors in the maintenance task of the force.

Maintenance doctrine, devised by Ordnance planners in 1942, provided for a five echelon system. First and second echelon maintenance were relatively simple tasks performed by the using organization. Third echelon maintenance, or medium maintenance, was performed in mobile shops in close proximity to supported troops. This is similar to today's direct support (DS) maintenance which replaces engines, transmissions, recoil mechanisms etc., and supplies parts to the lower echelons. Fourth echelon or heavy maintenance, included more complex tasks, such as component rebuild, done in fixed facilities. It roughly equates to general support (GS) maintenance today. Lastly, fifth echelon maintenance was performed at arsenals and encompassed rebuild and overhaul of end items. Today's comparison is depot maintenance.[46]

Upon deployment to the North African theater, first and second echelon maintenance were considered to be a command function. It called for enforcement and corrective

actions in command channels. Higher echelons were primarily the responsibility of the technical services and concerns were handled through technical channels. So in that regard, third, fourth, and fifth echelon maintenance responsibilities flowed from the base sections.[47]

Maintenance organizations in North Africa were formed under the Provisional Ordnance Group (POG). This was the same headquarters which provided command and control of the ammunition units discussed earlier. The Group essentially provided for one battalion to provide third and fourth echelon support in Oran and Arzew. Another battalion provided for third echelon support outside those cities.[48]

The Group's immediate and most important task was to provide badly needed trucks to move the force. In order to save space aboard ship, forty percent of all vehicles had been shipped only partially assembled and packed in crates. Assembly plants were set up near the docks and operations began. Parts packages accompanying the crates were sometimes incomplete, missing electrolyte or brake fluid. French and Arab laborers used in shops caused some unforseen problems in servicing vehicles. On one occasion, they were found filling automobile batteries with wine from the casks on the docks.[49]

By 10 December, the race to Tunis was underway. Over seventy-five light and medium tanks had been lost by

Combat Command B (U.S.), mired and abandoned in mud. After only a brief encounter with the Germans, it was a critical loss.

The 30th Ordnance Heavy Maintenance Company left Oran for Combat Command B, which had fallen back. Badly needing tanks, it was here we discovered one of the first serious shortcomings of the war. II Corps had not foreseen the need for tank transports and had only ten in theater. The 30th Ordnance Company got four of them and took four tanks to the front. They also took with them all available spare parts and worked vigorously to get Combat Command B back on their feet.[50]

Maintenance and spare parts support was provided to widely dispersed units throughout a wide front. Lines of communication were becoming stretched and the daily "piecemeal" shipment of supplies was becoming inefficient. Plans were made to establish a forward general supply depot in Constantine. This would allow for more maintenance assets forward. Before it could be accomplished however, the "Sfax Project" came to life.[51]

The "Sfax Project" or Operation SATIN was Eisenhower's plan to attack with the II Corps eastward to prevent the union of German forces at Tunis. Rommel, approaching from Libya, was rushing to reinforce Von Arnim. The plan called for a major reconfiguration of the Corps to encompass three multinational equivalent divisions.

Logisticians protested the feasibility of the plan, citing that poor LOC's would not support more than an armored division and possibly an additional regiment. The supply lines were long and weak. The nearest major port, Oran, was 445 miles away. Casablanca was another 440 miles west of Oran. Base sections were not yet well established at the ports.[52]

Eisenhower cancelled the SATIN operation in late January, deciding instead to keep II Corps in mobile reserve in the Tebessa area. There they would conduct limited operations and build up strength to attack when General Montgomery's Eighth Army (Br.) could catch Rommel at the southern Tunisian border.

The move of the II Corps to southern Tunisia had extended U.S. road transportation abilities beyond capacity. Shortages of automotive spare parts were acute. Colonel Urban Niblo, Commander of the Provisional Ordnance Group, warned AFHQ that unless drastic action was taken immediately to obtain parts for the 6,000 trucks carrying supplies to the front, the tactical situation could be affected. Ninety-five percent of all trucks in the Tebessa area needed some repairs. Many vehicles required overhaul, having driven over 15,000 miles with almost no maintenance.[53]

Spare parts furnished under the War Department's automatic supply system, came packaged in lots. In theory, each lot would support 100 vehicles for one year. In practice, these lots were unbalanced, containing too many of some parts and not enough of others. Replacement engines were in desperately short supply.[54]

Improvisation was the name of the game in maintenance companies. Extensive use was made of wrecked vehicles and cannibalization was commonplace. In one case, the landing gear of a downed German airplane was used to manufacture a vehicle machine gun mount. In another case, a 37 mm gun taken from a wrecked P-39 formed the axle of a makeshift trailer and a disabled truck provided the wheels.[55]

While the II Corps made its move to the north, the Eastern Base Section established a salvage yard at Tebessa. With the assistance of the 188 Ordnance Battalion, they cleared the battlefield of ammunition, vehicles, clothing and scrap. From that massive effort came 2,117 tons of badly needed repair parts and over $200,000 in reclaimed parts from wrecks.[56]

There were many lessons learned from the maintenance support efforts in North Africa. First, there were some problems concerning the availability of technically competent maintenance personnel. Faced with high attrition rates in the infantry, personnel from technical services

were moved into combat units. The efficiency and morale of some maintenance units was affected and was reflected in poor shop output.[57]

The second key lesson was that the five-echelon maintenance system worked when effectively employed. It was, however, very important to keep evacuation to a minimum and accomplish maintenance as far forward as possible.[58]

The third point to be taken was that the liberal use of civilian personnel was essential.[59] This allowed military personnel to be available for more urgent duties.

Lastly, the original spare parts supply plan was by and large unsatisfactory. Automatic shipments in lot sets were inefficient and did not support the theaters' actual demand. A requisitioning system based on usage would have been extremely beneficial to readiness.[60]

Overall, spare part availability very nearly prevented Eisenhower the freedom of action he desired. Newspaper correspondent Ernie Pyle wrote, "This is not a war of ammunition, tanks, guns, and trucks alone. It is as much a war of replenishing spare parts to keep them in combat as it is a war of major equipment."[61]

FUELING

Critical to the conduct of the Allies' highly mobile warfare was the reliable supply of fuel. The criticality of

this commodity had been proven in the deserts of North Africa in the fluid duels between British forces and the Afrika Korps. The initiative exploited by those forces in the see-saw battles in Libya and Egypt can be tied directly to the availability of gasoline supplies.[62]

Although the administration, procurement and distribution of supplies was normally a Quartermaster responsibility, their role in petroleum products was somewhat different. Because of the large quantities required in war by the Allied Force and essential civilian elements, logistical control was held by several high level U.S. and Allied agencies. The Quartermaster Corps was responsible for computation of Army requirements.[63]

Within the theater, the task forces were initially responsible for their own Class III planning and execution. Hence, in a short time it was apparent there was much duplication of effort. Also apparent was the need for centralized control in order to maximize the effectiveness of petroleum facilities.

In January 1943 the AFHQ Petroleum Section was established to handle the military requirements. Working closely with British and civilian planners, the section collated the estimated requirements of the force and those of vital civilian concerns. All petroleum products were shipped from the United States until Middle Eastern sources

became available. This became common stockage so that any Allied truck, plane, or ship could refuel at any depot in North Africa.[64]

In the planning stages of the operation, POL was rationed in terms of pounds per man per day. However, all factors needed to be taken into account could not be foreseen. The British experience was only a rough guide. U.S. planners had no American experience tables on which to base their estimates.[65] The arbitrary figures arrived at for the invasion were five gallons per day per wheeled vehicle and fifty gallons per track laying vehicle.[66]

Vehicles participating in the assault went ashore with tanks full. Additional fuel in five gallon cans was carried on each vehicle (1/4 ton - 2 cans, 3/4 ton - 5 cans, over 3/4 ton - 10 cans). Another seven days supply was combat loaded in cans aboard the assault convoy. A gasoline supply company with II Corps landed at Oran on D-Day and established fuel dumps for air and ground forces by D+1.[67]

By D+3, the gasoline refinery in Oran had been readied for Allied use and the contents of one tanker ship were off loaded. Various fuel dumps had been established in the area by D+7. With the initial pressure of organization and stockage eased, attention was turned to the collection, classification and refilling of fuel containers.[68]

With the initiative of the southern Tunisian operations around Tebessa and beyond came the challenge of fuel distribution. The base supply dump, operated by the Mediterranean Base Section, was situated about 125 miles west of Tebessa. It was fed from the ports at Philippeville and Bone. The primary Corps site was at Tebessa with rail and truck heads at Sbietla, Feriana, and Gafsa. With such extended lines of communication, a target of seven days of supply was established.[69]

Because of the lack of bulk transport facilities at Tebessa, all fuel was shipped in 55 gallon drums. The drums had been filled at Ouled Rahmoun from storage tanks which were, in turn, supplied by pipeline from Philippeville.

Drums were not practical for troop use beyond the Corps fuel dump. Handling and dispensing equipment was not available, even in the armored divisions. POL was moved in the standard 750 gallon tanker trucks or in five gallon cans.

The tanker truck was considered to be too small for economical operation and the handling of five gallon cans was slow and burdensome. One solution to this dilemma was to mount eighteen 55 gallon drums on a 2 1/2 ton truck, moving to the bulk dispensing unit, and filling the drums on the truck. From there, fuel was pumped directly into vehicles, airplanes, or five gallon cans and the truck

returned for more fuel. The benefits of this innovative yet simple solution were numerous. Significant reductions were made in transportation and labor requirements.[70] It eliminated the unnecessary handling of drums and created a 950 gallon tanker from a 2 1/2 ton vehicle with capacity in excess of the standard tanker.

When five gallon cans were used at the unit level, two containers were utilized. The British model was non-returnable. Made of thin metal, it was poorly constructed and could not withstand rough handling, corrosion or even the pressure of normal stacking. Petroleum loss from the "flimsies" was estimated at 40 - 60 percent.[71]

The American can was adapted from a German model captured by the British in 1940. The "Jerrican" was sturdy, stacked easily and could be fitted with a nozzle for easy pouring. It was necessary to return them to the fuel dumps to be refilled. There were inevitable shortages of cans throughout the campaign and periodic "no can - no gas" policies were imposed.[72]

When the Germans began attacking along the Eastern Dorsal in February 1943, II Corps elements were forced to withdraw. The fuel dumps at Maktar and Sbeitla pulled back into Tebessa. At Feriana, 50,000 gallons of gasoline could not be evacuated in time and it was ignited with grenades

and .50 caliber machine gun fire. The stockage position at Tebessa swelled to 500,000 gallons. Fearing it could be lost to the enemy, 400,000 gallons were further retrograded another 30 miles west.[73]

After the Afrika Korps withdrew back through Kasserine Pass and had been counterattacked, operations moved to the northern coastal plain. The II Corps dump was located in a wheat field at Sidi-Mhimech, near Beja. A forward area was established at Djbel Abiod. Both locations were selected for their tactical locations and accessibility to rail and truck heads.[74]

Though the supply line from the base section to the using unit was 125 miles long, conditions for support were more favorable. Though road and rail nets were still limited, the front was narrower and units were concentrated.[75] As the Corps advanced toward their objective of Bizerte, the Eastern Base Section assumed control of the Djebal Abiod facility. By the time of the surrender at Bizerte on 8 May, the Eastern Base Section took over the gasoline dump at Michaud, just sixteen miles from the Corps objective.[76]

Remarkably, at no time during the entire campaign did stockage levels exceed the calculated requirements and at no time did a vehicle sit idle waiting for fuel.[77] Some important lessons were learned, however, and they were applied throughout the rest of the war.

The potential of the tactical pipeline was realized. Initially tested during the 1941 North Carolina maneuvers, over 740 miles of four inch pipeline was laid in six months in North Africa. This relieved a potentially over burdened transportation infrastructure of having to move millions of gallons of fuel over road and rail. It also allowed fuel to be moved day and night with relative security.[78]

Badly needed U.S. experience tables were developed based on the Tunisian operation. One applied to cross-country marches and active combat and the other to administrative movements. In the south where supply lines were long, the allowance of five gallons per day per wheeled vehicle was insufficient. The fifty gallon factor for tracked vehicles was confirmed. In the north, however, where fighting was on a narrow front, commanders made better use of armor and the figures were reversed.[79]

The estimates for the campaign made by the War Department were generally correct overall. The benefit of the tables, however was that now the right kinds of fuel could be moved forward and more efficient fuel operations conducted.

TRANSPORTING

James Huston called the invasion of North Africa in 1942 "...A graduate school in logistics when too many

officers had not yet completed elementary school ..."[80] If this was true, then transportation was surely its hardest course.

Whether by rail, highway or air, supplies were provided to front line soldiers, usually when and where they needed them. The problems inherent with moving tons of materiel over 1200 miles were enormous. No single mode of transportation could handle the requirement alone, even in the best of circumstances. Working in concert, most demands were met.

Early operations around the ports were similar to those of the other functional areas. Despite the confusion, progress was made. Efforts were made to hire local citizens with their trucks and wagons to help sort and haul the jumbled supplies strewn across the beaches. Payment was made in cigarettes, cloth, or canned rations, but soon workers took the opportunity to pilfer. Many drivers, after being given a loaded truck and directions just disappeared. Two days after the landing, tons of ammunition and rations were discovered on local fishing boats.[81]

Rail service was established in theater shortly after the landings. Two U.S. railway operating battalions were located east of Oran to support both British and American forces. Battalion detachments were located at Casablanca and Oran to oversee rail operations there. By February

1943, the Headquarters, Military Railway Service (MRS) was established in Algiers and assumed responsibility for the rehabilitation, technical development and operation of theater rail service.[82]

Shortly after the invasion, railway supplies poured into North Africa. In January, a rail car assembly plant was set up in Oran. In the next ten months, over 1,200 rail cars were built, supporting not only the campaign at hand, but the invasion of Sicily.[83]

Actual operation of the railroad system was primarily accomplished by U.S. troops. The exception was in Morocco, where local civilians operated under military supervision. The steep grades and the use of cars without air brakes required the use of many brakemen. During the Tunisian phase of the campaign, particularly east of Constantine, the trains were subject to sabotage, bombing and strafing. In some cases, only night operations were possible.[84]

One of the biggest problems faced by the MRS was the placement of empty rail cars. In order to maximize efficiency, a control center was established in Algiers. Its function was to allocate empty cars which met hauling requirements to the ports. Early in the campaign, when many tanks were moved forward by train, flat cars were reconstructed to meet structural demands.[85]

Pilferage of goods in transit was a common problem. Military guards were placed on most trains and in all of the larger rail yards. The principle targets of thieves were food, tobacco, clothing and cloth. All had a very high value on the black market.[86]

As might be expected, supply movement required large numbers of highway movements. In order to control these movements, a system of convoys was used. Individual vehicles were allowed to travel freely throughout the theater. However when ten or more vehicles were to be moved, they were organized into convoys and schedules and routes were prepared. The convoys were usually limited to twenty-five vehicles.[87]

Some difficulty with the convoy system arose when British vehicles used the American road nets. British convoys were not organized unless there were at least twenty-five vehicles. By the end of the campaign, that number grew to fifty. When ten or more British vehicles entered the U.S. road net, they would be stopped and scheduling could be arranged. The result was delay in British movements and their "infiltration" into U.S. traffic. They were often undetected until the traffic net was overloaded.[88]

When Eisenhower opted for the "Sfax Project" to cut off the Afrika Korps' coastal approach to Tunis, the transportation task was monumental. Supplies were to be

moved forward to a staging area at Tebessa. After the supply build-up phase, the "SATIN" Task Force would pass through, restock and proceed to the Sfax. This was a reversal of the classic supply concept of being supported from the rear.[89]

The rail lines running south into Tebessa could only carry about 250 tons of supplies per day, about a third of the II Corps requirement. A single highway connected Constantine in the north with Tebessa.[90]

The immediate problem was the availability of trucks. After the Casablanca Conference on 25 January, Eisenhower told General Marshall and ASF Commander LTG Brehon Somervell of his desperate requirement. Somervell cabled Washington for 5000 2 1/2 ton trucks, 400 1 1/2 ton trucks, 72 tank transporters, and 2000 trailers. The shipment was assembled and shipped by 15 February and arrived in early March. Though the response was remarkable, it was too late to support the "Sfax Project".[91] The operation was cancelled, citing Montgomery's failure to maintain pressure on the German withdrawal. Tebessa, now close to the front lines, had stocked ten days of Class I and III supplies.

By early February, the growing non-availability of trucks was a serious problem. Serious parts shortages for trucks would have soon impacted on tactical operations.[92]

Intense maintenance operations managed to hold vehicles together until relief came in March.

Assembly of vehicles in Oran and Casablanca was conducted at a rapid pace. On 6 - 7 March, the trucks Somervell promised arrived and were dispatched without delay. By 15 March, the theater shortage of trucks and other equipment had been made up.[93]

The II Corps movement to the northern sector began on 10 April. While the move was not considered to be extraordinary, it was challenging. Supplies built up around Tebessa were moved in 5,000 vehicles in driving rain over secondary roads. Main roads were avoided in order to prevent blockage of British supply routes. Ordnance units moved tanks and heavy artillery. Reinforced by additional tank transporters from the British First Army, the entire 1st Armored Division was lifted 200 miles in less than forty eight hours.[94] In all, more than 12,000 vehicles and 94,000 troops had arrived in the northern sector by 23 April.[95]

By allowing stocks to dwindle in Tebessa, a stockage of six days supplies were built up in the northern sector. All II Corps supply targets had been met by 22 April, except some ammunition lines and some rations. Corps supply points were established directly behind the divisions. The improved lines of communications allowed the Eastern Base

Section to provide services and supplies farther forward than before. Gasoline and rations were issued directly from forward railheads, freeing up truck transport to respond more readily to divisional needs.[96]

After the German surrender, new demands were made on truck companies. By 9 May, II Corps had captured 41,836 prisoners. Before the surrender the evacuation of prisoners to the Eastern Base Section compounds had little impact on truck capacity. However, on 11 May 26,000 prisoners had to be moved to Michaud, north of Mateur. Luckily, prisoners "cooperated splendidly, moving toward Michaud on foot or riding in automobiles, or on bicycles or motorcycles, asking only directions to the compound."[97]

Faced with overwhelming challenges to support the theater, transportation units accomplished much in the six month campaign. Poor roads, few railroads, and unforgiving terrain and weather all worked against their success. But responsible support and unity of effort did much to overcome those obstacles.

CHAPTER FOUR END NOTES

[1]United States War Department, Logistical History of NATOUSA-MTOUSA (Naples, Italy: G. Montanino, 1945), 295.

[2]Ibid., 295.

[3]Ibid., 295.

[4]Charles M. Wiltse, The Medical Department: Medical Service in the Mediterranean and Minor Theaters (Washington, D.C.: Office of the Chief of Military History, 1965), 108.

[5]Ibid., 111.

[6]Ibid., 115.

[7]Ibid., 115 - 118.

[8]Ibid., 120 - 121.

[9]War Department, Logistical History, 295 - 296.

[10]Wiltse, Medical Service, 125 - 126.

[11]Ibid., 127.

[12]Ibid., 130.

[13]Ibid., 132 - 133.

[14]Ibid., 134.

[15]War Department, Logistical History, 301.

[16]Ibid., 302.

[17]Ibid., 304.

[18]Ibid., 305.

[19]Wiltse, Medical Service, 132.

[20]War Department, Logistical History, 306 - 307.

[21]Ibid., 321 - 323.

[22]Ibid., 321 - 323.

[23]William F. Ross and Charles F. Romanus, The Quartermaster Corps: Operations in the War Against Germany (Washington, D.C.: Office of the Chief of Military History, 1965), 214.

[24]Ibid., 214.

[25]Ibid., 214.

[26]Ibid., 26.

[27]U.S. Army War College, Observers' Report to the Commanding General Army Ground Forces, by Colonel J. Werner, 29 March 1943.

[28]War Department, Logistical History, 249 - 255.

[29]U.S. Army War College, Observer Report, by Lieutenant Colonel G. E. Lynch, 5 March 1943.

[30]Ross, The Quartermaster Corps, 139 - 141.

[31]Harry C. Thompson and Lida Mayo, The Ordnance Department: Procurement and Supply (Washington, D.C.: Office of the Chief of Military History, 1960), 104 - 105.

[32]Ibid., 104 - 105.

[33]War Department, Logistical History, 79.

[34]Ibid., 79 - 80.

[35]Ibid., 35.

[36]Lida Mayo, The Ordnance Department: On Beachhead and Battlefront (Washington, D.C.: Office of the Chief of Military History, 1968), 114 - 119.

[37]Ibid., 120.

[38]Ibid., 129.

[39]Ibid., 129.

[40]War Department, Logistical History, 81.

[41]Mayo, Beachhead and Battlefront, 145.

[42]Ibid., 146.

[43]War Department, Logistical History, 81.

[44]Ibid., 82.

[45]Mayo, Beachhead and Battlefront, 146.

[46]Thompson and Mayo, Procurement and Supply, 448 - 449.

[47]War Department, Logistical History, 250.

[48]Mayo, Beachhead and Battlefront, 118 - 119.

[49]Ibid., 119 - 120.

[50]Ibid., 122.

[51]Ibid., 123.

[52]Ibid., 124.

[53]Ibid., 132 - 133.

[54]Ibid., 133.

[55]Ibid., 135.

[56]Ibid., 143.

[57]War Department, Logistical History, 155.

[58]Ibid., 259.

[59]Ibid., 268.

[60]Ibid., 265.

[61]James A. Huston, The Sinews of War: Army Logistics 1775 - 1953 (Washington, D.C.: Office of the Chief of Military History, 1966), 504

[62]Ross and Romanus, The Quartermaster Corps, 155.

[63]Ibid., 155.

[64]Ibid., 156.

[65]Ibid., 156

[66]Headquarters, Services of Supply, European Theater of Operation, Report Covering Trip to North Africa - (P.O.L. Inspection), by Major Victor N. Moore, 5 October 1943, 1.

[67]Ibid., 3.

[68]Ibid., 3.

[69]Ibid., 4.

[70]Ibid., 11.

[71]Ross and Romanus, The Quartermaster Corps, 162.

[72]Ibid., 163.

[73]Ibid., 60.

[74]Allied Force Headquarters Petroleum Section, Report of II Corps Gasoline Supply in the North African Campaign, by Major Victor N. Moore, 6 July 1943, 7.

[75]Ibid., 7.

[76]Ross and Romanus, The Quartermaster Corps, 64.

[77]AFHQ Petroleum Section, II Corps Gasoline Supply, 5.

[78]War Department, Logistical History, 234 - 235.

[79]Ross and Romanus, The Quartermaster Corps, 157 - 158.

[80]Huston, Sinews of War, 518.

[81]Ross and Romanus, The Quartermaster Corps, 52.

[82]War Department, Logistical History, 147.

[83]Ibid., 148.

[84]Ibid., 148 - 149.

[85]Ibid., 149.

[86]Ibid., 158 - 159.

[87]Ibid., 160 - 161.

[88]Ibid., 161.

[89]Ross and Romanus, The Quartermaster Corps, 57.

[90]Mayo, Beachhead and Battlefront, 132.

[91]Ibid., 132.

[92]Ibid., 132 - 133.

[93]Ibid., 140.

[94]Ibid., 142.

[95]Ross and Romanus, The Quartermaster Corps, 63.

[96]Ibid., 64.

[97]Ibid., 64 - 65.

CHAPTER FIVE

CONCLUSION

The North Africa Campaign presented American commanders with many problems never faced before. Operation TORCH, the ensuing campaign, and indeed the rest of World War II were unlike any war before. The increased range and lethality of highly technical modern weapon systems had changed the face of combat forever. Armies were now motorized and with the introduction of armored, mechanized, and airborne divisions, more mobile than ever. Fluid battlefields, rapid advances, and wide unit dispersion were all signature elements of the campaign in North Africa.

Logistical support in such austere surroundings could have hardly been more difficult. The sustainment effort was complicated by not only inexperience on our part, but world-wide demand for U.S. war fighting material. The support package for the II Corps was never completely available. Physical constraints made that impossible.

In the annals of U.S. military history, other campaigns may have had more instances of bold maneuver or heroic action. This campaign, however, marked the first

wide-spread use of American armor forces in desert warfare. Lessons were learned at high cost -- 2,715 American dead, almost 9,000 wounded, and over 6,500 missing. By mid-May, success belonged to America and its allies. Half of that success story was logistics.

The overall logistical support of the North Africa Campaign can only be classified as a qualified success. Did U.S. forces (in concert with the Allies) defeat the enemy? Obviously the answer is yes. Were U.S. forces ever defeated because of a shortage of war fighting materiel? Perhaps the case could be made that when Combat Command B took initial losses in their light M-3 Stuart tanks at the hands of German 75mm high velocity guns, they would have fared better with the heavier M-4 Sherman tank. Was this early engagement lost because of superior equipment being unavailable or the superior quantity and experience of the Germans?

When Americans suffered a bloody loss at Kasserine Pass in February 1943, poor military intelligence and questionable tactics were likely culprits. On the plus side was the availability and effectiveness of American artillery which put many of Rommel's tanks out of commission. The Afrika Korps had been surprised by the accuracy and rapidity of American indirect fire. Rommel considered the Americans

"fantastically well equipped" and concluded that the Germans "had a lot to learn from them organizationally."[1]

Production lines in the United States worked feverishly to provide war materiel world-wide. The newest equipment was rushed into the hands of American fighting men in North Africa Campaign, the sustainment effort is probably best judged by the effectiveness of the support provided to and with the equipment on hand.

The research questions identified in Chapter One must by their nature be addressed jointly. The questions were:

1. How effective was the logistical support of the North Africa Campaign (8 November 1942 - 13 May 1943)?

2. Was the United States Army prepared to logistically support desert combat following the invasion of North Africa in 1942?

3. How could logistical shortcomings have been prevented, eased, or eliminated?

4. How does the support provided during the campaign stand up to the scrutiny of today's Airland Battle doctrine sustainment imperatives?

5. What were the key sustainment lessons learned concerning support of intensive desert combat operations?

Given any operation of this magnitude and scope in peacetime or wartime, logistics operations improve as the theater matures. This was the case in North Africa.

The manning sustainment functions analyzed in this thesis were performed well in spite of two major shortcomings. The first was the lack of integrated planning by the separate invasion task forces. Plans for early medical support were very different, based on limited accurate information, and led to a high degree of inefficiency. The second major problem was the failure to include fixed hospitals in the early invasion forces. Had those facilities been made available, smaller, more mobile medical units could have followed the combat forces into Tunisia. Evacuation routes were stretched beyond what are now considered to be acceptable distances. An additional side-effect was the unnecessary movement of patients between hospitals.

On a positive note, improvisation and responsiveness were key to the medical support offered to the II Corps. On many occasions, particularly soon after the landings, medical activities of a doctrinally lesser capability assumed a greater role with outstanding results. Given the extended lines of communication, evacuation methods displayed great imagination. Air evacuation of patients rearward from division areas was not employed until this campaign. Today, it is common medical evacuation practice.

The need for graves registration personnel had certainly been recognized prior to the invasion, but units

were not integrated in assault forces because of shipping limitations. Improvisational support on the part of the combat units was poor and considered an unacceptable burden. Graves registration units were included in subsequent invasion forces in Sicily and Italy. In general, services - laundry and bath, graves registration - were poorly integrated into the fighting force. The result, however, did not have a significantly negative impact on combat power.

Organizationally, Ordnance units had grown at a tremendous rate. During the summer of 1942, the Chief of Ordnance assumed responsibility for automotive maintenance and related spare parts distribution for the Army. This had previously been under the control of the Transportation Branch in the Quartermaster Department. Only 60 days before the invasion, the Tank - Automotive Center was established in Detroit.[2] This new mission was added to the already rapidly expanding arsenal system manufacturing ammunition and Ordnance responsibility for its world-wide distribution.

Before the campaign, there was no single Ordnance organization larger than battalion. A headquarters was needed which could provide command and control of corps maintenance and ammunition units. Approval for a regiment or group could not be obtained before the invasion, the Provisional Ordnance Group was formed.

It can be said that during the course of the campaign, ammunition was never in short supply. It was supplied in required quantities to front line units when they needed it. The problem was inventory levels of some lines and stockage efficiency. Stockpiles of unwanted ammunition, specifically 37mm Anti-Aircraft and 37mm Tank and Anti-Tank ammunition, were moved numerous times. At the same time, there was an insatiable need for 105mm howitzer ammunition throughout the campaign. In time, II Corps gained control of the problem by intense management and requisitioning based on actual usage. Automatic shipments from the United States were halted and demand satisfaction of ammunition improved.

Maintenance organizations were integrated well into the II Corps' scheme of maneuver. The major problem was the erratic supply of spare parts to the theater. Predicted spare part usage by the War Department was unsatisfactory and largely inefficient. Again, as in medical units, improvisation was the order of the day. Extensive use of salvaged vehicles and battlefield recovery of repair parts did much to ease the transportation shortage problem.

Remarkably, the fuel supply to the force was never significantly interrupted. This campaign saw the first significant use of the tactical pipeline. Pipeline construction units had wisely been included in the D+3

convoys and by May 1943 had laid over 700 miles of pipe. The pipelines immeasurably eased the highway and rail transportation burden experienced in North Africa.

While responsiveness may have been the keystone to fueling efforts, the system was clearly saturated with inefficiency. Separate task force planning certainly took its toll on fuel sustainment, and central organization at the theater level did not begin until January.

The sole use of five gallon cans below corps level was highly inefficient and manpower intensive. It would seem that with the addition of several tanker trucks and trailers at the division or brigade level, workload would have decreased and mobility significantly improved.

POL overstockage in theater had a positive benefit in the execution of the campaign. Fuel estimates for gasoline and diesel fuel had been planned by the War Department. The total gallons used in the campaign came close to that estimate, however usage rates by type vehicle were substantially different. High stockage levels allowed the flexibility needed for the increased consumption rates of tracked vehicles in the northern phase of the campaign.

Transportation was perhaps the one central weak link which limited more sustainment success. Extensive road and rail networks were simply not available. Compounding that problem was the non-availability of trucks and tank

transporters. The lack of these vehicles perpetuated a spiral of high usage, little time for preventive maintenance, and excessive repair parts requirements. Urgent relief came in March, just in time for the II Corps move to the north.

The North Africa Campaign was marked by three general logistical shortfalls. These problems were generally common throughout the five sustainment areas. They were:

a. Given the nature of resistance in Casablanca and Oran, a greater support slice should have been included in the assault force. This could have been accomplished with little or no impact on current or subsequent combat operations. Units which should have been included were quartermaster, ammunition, and graves registration companies, as well as fixed hospital facilities.

b. A single organization should have been the focus of sustainment operations in the theater. Each task force had planned their own support and each technical service was working in a "stovepipe" manner. It was not until late January 1943, when all support operations were brought under theater control, that centralized management truly integrated support with the tactical forces.

c. Lines of communication could have been reduced substantially by landing a larger proportion of

forces on the Mediterranean coastline. It had been the British recommendation during ABC-1 to land all assault forces within the Mediterranean. The U.S. opted to ensure uninterrupted supply lines by seizing the Atlantic port of Casablanca. Additional combat force landings at Oran and Algiers could have impacted positively on the ability of the Allies to seize Tunis in December. Because of limited support, friendly forces closed to within 16 miles of Tunis in December before being turned back. They consequently had to wait until May 1943 to overwhelm the Germans by mass and isolation.

Many key sustainment lessons were learned in North Africa which are clearly applicable today.

a. Sustainment activities must be completely integrated into the campaign plan. Failure to give them full consideration will impact on combat power.

b. The five-echelon maintenance system works only when applied and is an item of command accountability.

c. Maintenance evacuation generally wastes valuable time. Equipment must be fixed as far forward as possible.

d. Inventory efficiency is critical in order to conserve manpower and transportation assets.

e. The use of local labor for sustainment activities should be exploited to the highest practical

degree. This again will free service troops to work far forward and be responsive to the needs of combat soldiers.

f. Fuel consumption factors are highly dependent upon terrain, the type of movements involved, and the nature of combat which is being waged.

g. The U.S. and its Allies should operate two separate lines of supply and should not attempt to intermingle them.

North Africa had been a test bed not only for new equipment, but new Army tactical and logistical doctrine as well. Many risks had been taken in this first incursion against the Germans. Early in December, when the hope of quick Allied victory in Tunisia was fading, General Eisenhower still believed those risks had been necessary. He said that operations up to that time had

> "violated every principal of war, are in conflict with all operational and logistical methods laid down in textbooks, and will be condemned by all Leavenworth and War College classes for the next twenty-five years."[3]

For the most part, Eisenhower was correct in his assessment. He was wrong on one count, however. Almost <u>fifty</u> years have now passed since the North Africa Campaign and the logistics efforts are being studied for modern applicability.

CHAPTER FIVE END NOTES

[1]Lida Mayo, The Ordnance Department: On Beachhead and Battlefront (Washington, D.C.: Office of the Chief of Military History, 1968), 140.

[2]Harry C. Thompson and Lida Mayo, The Ordnance Department: Procurement and Supply (Washington, D.C.: Office of the Chief of Military History, 1960), 399.

[3]Richard M. Leighton and Robert W. Coakley, Global Logistics and Strategy 1940 - 1943 (Washington, D.C.: Office of the Chief of Military History, 1955), 455.

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