

Scarcity of Time and Logistics in Multi-Domain Operations

A Monograph

by

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Abstract

Scarcity of Time and Logistics in Multi-Domain Operations, by MAJ Lanea J. Dertinger, 57 pages.

This monograph seeks to understand implications for logistics support to large scale formations in multi-domain operations. The intent is to demonstrate that a *fait accompli* prevents the United States from executing large-scale operations in a strategically relevant timeframe. A historical case study about scarce resources informs the analysis of scarcity as a result of temporal conditions in the future. The temporal conditions through which the case study was viewed are duration, opportunity, frequency, and sequencing.

The case study analyzes the logistics support to US Fifth Army in World War II from the strategic industrial base through the operational level in the Mediterranean Theater to Fifth Army's depots. Before officially entering WWII, the United States used time to prepare the industrial base. Today's large-scale formation is at its core, similar to that from WWII with the heavy reliance on ammunition and fossil fuel formations. These demands tie the formations to a logistics tail that limits independent maneuver in Multi-Domain Operations. A *fait accompli* attacks the predictable support structure and removes the ability of the United States to respond with a large-scale combat operation within acceptable timeframes a without a decrease in demand requirements or an increase in industrial base capacity.

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Abbreviations

ADP	Army Doctrine Publication
APS	Army Prepositioned Stock
CMH	Center of Military History
COIN	Counterinsurgency
DLA	Defense Logistics Agency
ETO	European Theater of Operations
LCI	Landing Craft, Infantry
LCT	Landing Craft, Tank
LSCO	Large-Scale Combat Operations
LST	Landing Ship, Tank
MDO	Multi-Domain Operations
MTO	Mediterranean Theater of Operations
PBS	Peninsular Base Section
SSA	Strategic Support Area
USTRANSCOM	United States Transportation Command
USAMC	US Army Materiel Command
WWII	World War II

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Section 1: Introduction

Today we find ourselves in a position where the methods employed for winning wars are fast being outmoded. In the world of tomorrow, commanders who know the most about the potentialities and capabilities of their weapons, about logistics and supply, about the swift concentration of forces by means of modern transportation—these men will be the most successful military leaders of men.

—MG Levin H. Campbell, Jr., 1946, *The Industry-Ordnance Team*

For eighteen years, the US military engaged in counterinsurgency (COIN) operations in Afghanistan and Iraq. Logisticians in today's Army spent their careers rotating through deployments to these locations. The military created sustainment centers in places like Balad, Iraq, and Bagram, Afghanistan. Fuel farms grew over time to store millions of gallons of fuel, and theater ammunition supply points spanned acres of land. Established forward operating bases and logistic networks created set rotational patterns for resupply convoys. High priority spare parts arrived within days via commercial shipping companies. Logisticians and units arrived in theater and coordinated with well-established supply chains that spanned from the industrial base in the United States to the tactical forward operating base.

Today, US Army doctrine focuses on large-scale combat operations (LSCO). The Army is reviewing current force structure, optimized to support the counterinsurgency fight, in order to align it with doctrine.¹ Field Manual 4-0, *Sustainment Operations*, complements the new doctrine and focuses on supporting large (division and corps size) maneuver forces. Logisticians who are more familiar with COIN operations are relearning the challenges inherent in supporting dynamic, large unit movements and operations.²

¹ Arpi Dilanian and Matthew Howard, "Plan, Prepare, Practice: An Interview with Lt. Gen. Laura Richardson," *Army Sustainment Magazine*, no. June (2019): 21.

² Fenicia L. Jackson, Karina Cuenca, and Daniel Austin, "Early Results Testing the New CASL at NTC Improves Readiness," *Army Sustainment Magazine*, no. December (2019): 39.

As logisticians master the current doctrine, they likewise look to the future Army Operating Concept of Multi-Domain Operations (MDO). MDO attempts to solve a layered standoff problem by “rapid and continuous integration of all domains of warfare” through three tenets.³ The three tenets are calibrated force posture, multi-domain formations, and convergence. The concept expects future enemies to deny allied forces the time or space for combat operations, by executing a *fait accompli* attack. As used in the Army Operating Concept, a *fait accompli* “is intended to achieve military and political objectives rapidly...and consolidate those gains...so action by the United States would entail unacceptable cost and risk.”⁴ This paper intends to demonstrate that a *fait accompli* prevents the United States from conducting large scale combat operations in a multi-domain environment within a strategically relevant time period. The United States is unable to react because of the time requirement to increase the strategic industrial base output capacity, the increased demand requirements to support maneuver forces, and the inability to provide sustainment to maneuvering formations in sufficient quantities to penetrate the enemy defenses and exploit the freedom of action.

While the characteristics of future wars may differ from past wars, history provides examples of sustaining large combat formations across time and from the politics and industrial base to the tactical formations which can inform future MDO events. The monograph supports the connection of the US Fifth Army to future wars by discussing strategic and political level context surrounding logistical considerations in the early 1940s. The methodology of the monograph is a chronological case study of the Fifth Army in Italy during the Second World War. During WWII, Fifth Army holds the record for the longest continuous combat operations against enemy forces.⁵ Fifth Army faced the Germans for 601 days, from the initial landing at the

³ US Department of the Army, “The U.S. Army in Multi-Domain Operations 2028,” *TRADOC Pamphlet 523-3-1* (Washington, DC: Government Printing Office, 2018), iii.

⁴ *Ibid.*, 11.

⁵ George Forty, *Fifth Army at War* (New York: Charles Scribners Sons, 1980), 9.

Salerno beaches on September 9, 1943, until the German surrender in Italy on May 2, 1945.⁶ The case study follows Fifth Army's supply chain starting at the strategic logistics considerations during World War II. At the operational level, the paper details logistics provided by the Mediterranean theater before scoping in to the tactical support provided to Fifth Army over its nearly two years on the Italian Peninsula. The monograph reviews Fifth Army's tactical support by a focused study of two periods within the campaign when scarce resources influenced the ability to conduct or continue combat operations. The first of these events is the amphibious landing at Anzio, behind German lines, on January 22, 1944.⁷ This section of the campaign provides for a deeper analysis on the impact of resource priority to the initiation of combat operations. By February 1944, Fifth Army would lose resource priority as Allied Forces prepared for Operations Overlord (invasion into Northern France) and Dragoon (invasion into Southern France), requiring the landing to occur before that time.⁸ The second event explored is Fifth Army's standoff with German forces in Northern Italy during their second winter from October 1944 until March 1945. During this time period, extended supply lines, poor road networks, and ammunition shortages contributed to the decreased offensive operations.⁹ Finally, the paper ties the case study to future considerations of scarce resources in support of convergence in the multi-domain fight.

The monograph views Fifth Army's Italian campaign and its logistics support through the fourth dimension of time as it "pervades all decision making in war,"¹⁰ and provides the criteria

⁶ Jon Mikolashek, *General Mark Clark: Command of U.S. Fifth Army in World War II and Liberator of Rome* (Havertown: Casemate, 2013), 156.

⁷ Clayton D. Laurie, *Anzio*, n.d., 8.

⁸ Lida Mayo, *United States Army in World War II The Technical Services, The Ordnance Department: On Beachhead and Battlefield* (Washington, DC: Center of Military History, US Army, 1991), 213.

⁹ Earl F. Ziemke and Ernest F. Fisher, "The Mediterranean Theater of Operations: Cassino to the Alps," in *The United States in World War II* (Washington, DC: Center of Military History, US Army, 1993), 391.

¹⁰ Robert R. Leonhard, *Fighting by Minutes: Time and the Art of War*, 2nd ed. (CreateSpace Independent Publishing Platform, 2017), 4.

through which to evaluate the case study. In *Fighting by Minutes*, Robert R. Leonhard associates four concepts to describe how “time defines the limits of political and military power.”¹¹ The ideas of duration, frequency, opportunity, and sequencing as outlined in the book articulate a method to view the scarcity of resources in the historical case study. These conditions of time impact the material preparation for the future MDO fight and the ability for convergence. Frequency, as referenced in this paper from *Fighting by Minutes*, is the “pace at which things happen,” and opportunity refers to “a time-sensitive decision point.”¹²

In preparing this monograph, primary documents provide history of Fifth Army’s experiences and of the logistics processes in World War II. The Fifth Army unit history, prepared by unit historians, details the entirety of Fifth Army’s actions in the campaign, including events leading up to the initial invasion.¹³ The Center of Military History’s (CMH) publication on Anzio specifies the operation’s intent, resupply operations, and eventual breakout from the beachhead.¹⁴ Mark Clark’s memoirs offer additional details on strategy and political goals throughout the campaign.¹⁵ *Logistical History of NATOSA* [North African Theater of Operations, United States Army]—*MTOUSA* [Mediterranean Theater of Operations, United States Army], compiled by staff officers serving in Italy, explains details about the Peninsular Base Section, ammunition resupply, motor transportation, rail operations, and fuel pipelines.¹⁶

¹¹ Leonhard, *Fighting by Minutes: Time and the Art of War*, 4.

¹² *Ibid.*, 15.

¹³ Chester G. Starr Jr., Roy Lamson Jr., and Harris G. Warren, “5 January - 6 October 1943, Part I From Activation to the Fall of Naples,” in *Fifth Army History* (Florence: L’Impronta Press, 1945); Louis G. Geiger, “Part IX, Race to the Alps,” in *Fifth Army History* (Washington, DC: Government Printing Office, 1947).

¹⁴ Laurie, *Anzio*, 5, 10, 25.

¹⁵ Mark Clark, *Calculated Risk* (New York: Harper, 1950), 3, 270.

¹⁶ Creswell G. Blakeney, ed., *Logistical History of NATOSA - MTOUSA* (Naples: G. Montanino, n.d.), 27, 85, 149, 161, 172.

In addition to these primary sources, other authors complement the material by articulating nuanced perspectives of unit and leader actions. Martin Blumenson's biographical book on Fifth Army's commanding officer for the majority of the campaign, *Mark Clark*, highlights the unique challenges commanding a diverse and multinational army.¹⁷ *Supplying the Troops: General Somervell and American Logistics in WWII* by John Kennedy Ohl demonstrates how other operations, such as Operation Overlord, dominated the logistic resources allocations.¹⁸

Current US military doctrine and concept publications summarize existing operations and future concepts. Training and Doctrine Command (TRADOC) pamphlet 525-3-1, *The U.S. Army in Multi-Domain Operations 2028* focuses on challenges US forces may face in the future.¹⁹ *Army Sustainment Magazine* articles highlight contemporary issues faced by US Army officers and contain interviews from senior leaders depicting current concerns with the integration of sustainment into MDO.²⁰

In future operations, the US military may be committed to a war when the enemy imposes a *fait accompli* scenario onto the United States or its allies. This, in combination with the enemy's ability to deny access to Allied forces, creates a problem of time for maneuver forces and sustainment required for their success.²¹ US forces will not have the time to develop a support area from which to resupply combat forces within a relevant time period. Fifth Army's experience in Italy, due to its lack of resources, resonates with this future scenario. Fifth Army's struggles with ammunition, fuel, and transportation shortages contributed to operational pauses, a loss of time and opportunity, as the army restored its supply levels and built the networks to

¹⁷ Martin Blumenson, *Mark Clark, the Last of the Great World War II Commanders* (New York: Congdon and Weed, 1984), 239.

¹⁸ John Kennedy Ohl, *Supplying the Troops, General Somervell and American Logistics in WWII* (Dekalb, IL: Northern Illinois University Press, 1994), 225–226.

¹⁹ US Army, TRADOC PAM 523-3-1, vi–xii.

²⁰ Arpi Dilanian and Matthew Howard, "Bridging the Gap to Army 2028: An Interview with Gen. John 'Mike' Murray," *Army Sustainment Magazine*, no. December (2019): 11.

²¹ US Army, TRADOC PAM 523-3-1, 7.

support subordinate units.²² Through operational pauses, Fifth Army rebuilt its combat power.²³ Allied Forces imposed resource scarcity on its units in Italy in favor of the Normandy invasion; the enemy may force the supply scarcity in the future.

The Fifth Army case study provides considerations for resource scarcity when the US forces attempt convergence in the future. Fifth Army's resource scarcity and capability shortfalls in World War II provide an analogous comparison to future logistics challenges that impact the development of sustainable operational plans in the maneuver of large forces. The future war's duration, resupply frequency, available opportunities, and resource sequencing will be critical considerations by military planners to develop options for the problem of time. War's duration, while based off the political aims and strategic goals, impacts the development of strategic logistic resources and the industrial capability within the United States. Artillery ammunition, as the paper will expand upon, relies on sequencing in manufacturing and influences the ability to sequence operations in theater. Availability of resources provide options for a commander to sequence operations, exploit opportunities, and maintain pressure on the enemy forces. The case study demonstrates how Fifth Army was unable to do this because of the scarcity of resources. Similar situations, at the strategic and operational levels, are expected to occur in MDO.

Section 2: Strategic Logistics in the Second World War

...understanding of basic logistic principles is essential to the task of providing maximum combat effectiveness within the limitations imposed.

—Henry E. Eccles, *Logistics in the National Defense*

In order to discuss how resource scarcity affected Fifth Army in the Italian campaign, it is important to understand strategic resourcing during WWII and the relation to the Mediterranean Theater of Operations (MTO). US political objectives and preparation before entering the war

²² Clark, *Calculated Risk*, 255, 267, 386.

²³ *Ibid.*, 267.

impacted events throughout the case study including the Anzio landing conditions in January 1944 and the artillery shortage at the winter line 1944-1945. Industrial processes and war production in the United States demonstrate the temporal conditions of duration and sequencing.

The United States officially joined the war after Japan's attack on Pearl Harbor in 1941.²⁴ Prior to this, strategic planners already assumed strategic policy would adopt a Europe-first approach.²⁵ The strategy explicitly stated that the priority of effort, including men, materiel, and resources belonged to the European Theater of Operations (ETO) over the Pacific Theater of Operations (PTO). In 1943, Allied forces determined resource priorities at a series of conferences attended by senior military and political leaders from Allied nations. The Casablanca conference confirmed the resourcing for two invasions, Operation Husky (invasion of Sicily), and the eventual invasion onto the continent from the United Kingdom.²⁶ After the Casablanca conference, subsequent meetings in Washington, DC, Quebec, and Cairo readdressed the problem of finite resources.²⁷ One of the resource debates centered around the apportionment of forces and assets remaining in the MTO and those which would be moved to the United Kingdom in anticipation of the major invasion across the English Channel.²⁸ Fifth Army's landing timeline and operations at Anzio were heavily influenced by these planning decisions, specifically due to the availability of Landing Ship, Tanks (LST) (see figure 1).²⁹ World War II may be remembered large and well-known battles, but at its basis it was a logistics war.³⁰ Limited logistics determined

²⁴ John E. Bokel and Rolf Clark, "Acquisition in World War II," in *The Big "L", American Logistics in WWII*, ed. Alan Gropman (Washington, DC: National Defense University Press, 1997), 126.

²⁵ Ohl, *Supplying the Troops, General Somervell and American Logistics in WWII*, 181.

²⁶ Barry J. Dysart, "Materialschlact: The 'Materiel Battle' in the European Theater," in *The Big "L", American Logistics in WWII*, ed. Alan Gropman (Washington, DC: National Defense University Press, 1997), 360.

²⁷ *Ibid.*, 365.

²⁸ *Ibid.*, 366.

²⁹ Blumenson, *Mark Clark, the Last of the Great World War II Commanders*, 152.

³⁰ Alan Gropman, ed., *The Big "L": American Logistics in World War II* (Washington, DC: National Defense University Press, 1997), xv.

the strategy of theater prioritization and within a given theater, further prioritization of major campaigns and invasion plans.³¹



Figure 1. Landing Ship, Tank. Encyclopedia Britannica, “Battle of Leyte Gulf” (Encyclopedia Britannica), accessed February 25, 2020, <https://www.britannica.com/technology/landing-ship-tank#/media/1/329366/142084>.

The Allies’ plans to prepare for a cross-channel invasion required a lift capacity that was still in the development process and as such, impacted the war’s duration. Leonhard acknowledges that war’s duration, one the of the four temporal characteristics, may be least controlled by a military commander.³² As such, it seems a fitting discussion to include it with the overall strategic context and political aims of WWII. Leonhard describes war’s duration as impacted by a number of factors, including the war’s objective and number of participants.³³ The

³¹ Alan Gropman, “Industrial Mobilization,” in *The Big “L”, American Logistics in WWII*, ed. Alan Gropman (Washington, DC: National Defense University Press, 1997), 2.

³² Leonhard, *Fighting by Minutes: Time and the Art of War*, 70.

³³ *Ibid.*, 71–80.

objective's impact stems from both the physical and political distance until success is achieved.³⁴ The United States faced an enormous physical distance. For Fifth Army, the distance would amount to an approximately 5,000-mile long supply chain.³⁵ The political objective was a combined effort of Allied powers, to defeat the Axis powers and demand unconditional surrender. Given the scale, the United States anticipated a long war.³⁶ The number of participants also impacted the duration. As part of an allied force, partner nations affected the United States' strategy and military operations; this was evident in Italy. The British led operations in the MTO and placed more emphasis on operations in that theater than the United States. The Prime Minister of Britain, Winston Churchill, meant to keep British influence high in the war, leading him to advocate for MTO operations, including the northern drive up Italy by Fifth Army.³⁷ At the operational level, Fifth Army consisted of multinational forces throughout the campaign and was "probably the most truly international of all the Allied Armies."³⁸ While primarily partnered with British forces, Fifth Army at the beginning of 1944 consisted of five corps: two American, one French, one New Zealander, and one mixed of British and Indian soldiers.³⁹ During the campaign, soldiers also hailed from Canada, South Africa, Brazil, and Italy.⁴⁰ Some of the multinational supply challenges for Fifth Army were mitigated through a common pool of resources by the Peninsular Base Section.⁴¹

³⁴ Leonhard, *Fighting by Minutes: Time and the Art of War*, 71.

³⁵ Bruce K. Myers, "Part VIII The Second Winter," in *Fifth Army History* (Washington, DC: Government Printing Office, 1947), 23.

³⁶ Gropman, "Industrial Mobilization," 57.

³⁷ Ziemke and Fisher, "The Mediterranean Theater of Operations: Cassino to the Alps," 5.

³⁸ Forty, *Fifth Army at War*, 9.

³⁹ Clark, *Calculated Risk*, 299.

⁴⁰ Forty, *Fifth Army at War*, 9.

⁴¹ Blakeney, *Logistical History of NATOUSA - MTOUSA*, 237.

A key consideration about strategic level logistics in WWII was that the United States created time to prepare for war by not entering until compelled to do so in 1941. Despite the delay, the United States still required two and half more years before assembling enough combat and support forces and equipment for the main invasion into France.⁴² The United States initially provided material assistance to allies, preferring to remain the “Arsenal of Democracy”, rather than an active military force.⁴³ The Lend Lease Act, passed by Congress in March 1941 had the effect of increasing the industrial base while providing support for allies.⁴⁴ The legislation did more than materially supply America’s allies; the program began to build the war industry within the United States.⁴⁵

Prior to the Second World War, the US war industry was small, not the robust industrial engine that reached a peak production of five billion dollars of war materials in a single month.⁴⁶ The critical raw material list for the war industry initially consisted of a few items, which expanded rapidly during WWII to include rubber, paper, metals and agricultural products.⁴⁷ Initial forecasting estimates fell well short of actual demand. An astonishing example is the estimate on the amount of copper required for the first two years of the war. Actual copper requirements of almost one million tons dwarfed initial estimates of 25,000 tons.⁴⁸ Shortages of materials deemed

⁴² Gropman, “Industrial Mobilization,” 126; Ohl, *Supplying the Troops, General Somervell and American Logistics in WWII*, 226.

⁴³ Gale Encyclopedia of U.S. Economic History, “Arsenal of Democracy,” *Encyclopedia.Com*, last modified 2019, accessed December 28, 2019, <https://www.encyclopedia.com/history/encyclopedias-almanacs-transcripts-and-maps/arsenal-democracy>.

⁴⁴ Gropman, “Industrial Mobilization,” 108.

⁴⁵ Bokel and Clark, “Aquisition in World War II,” 108.

⁴⁶ Levin H. Campbell, *The Industry-Ordnance Team* (New York: Whittlesey House, 1946), 172.

⁴⁷ Erna Risch, *The United States Army in World War II, The Technical Services, The Quartermaster Corps: Organization, Supply, and Services*, vol. 1 (Washington, DC: Center of Military History, US Army, 1992), 62, 66; Gropman, “Industrial Mobilization,” 70; Campbell, *The Industry-Ordnance Team*, 297.

⁴⁸ Gropman, “Industrial Mobilization,” 30.

essential for the Ordnance Department, led to innovation on clothing, supplies, and packaging materials within the Office of the Quartermaster General. New mechanization and computerization increased the processing speed of supply processes.⁴⁹ Other legislation, including the Multiple Awards Act (March 1940), the Speed-Up Act (June 1940) and the War Powers Act (December 1941), eased peacetime procurement procedures in anticipation of war and paved the way for further expansion and development of the industrial base.⁵⁰ By agreeing to logistical coordination between American and Great Britain, common pool munition resources led to a measure of interoperability in fuel and ammunition and in suitability of spare parts.⁵¹ They “fashioned a cooperative effort...unparalleled in the history of warfare...at every phase of the planning and operation of the American supply system.”⁵²

The anticipated duration of the war impacted the development of industrial capabilities. The US Army’s Ordnance Department planned for a multi-year war and created production capacity to meet anticipated requirements, requirements which existed by November 1944.⁵³ The Ordnance Department initiated planning in 1937 for the wartime ammunition program.⁵⁴ To meet the growing and unexpected demand of ammunition, specifically artillery ammunition and bombs, the United States spent three billion dollars to create fifty-eight new facilities.⁵⁵ Civilian manufacturers converted and retooled to produce ammunition subcomponents.

Leonhard’s concept of sequencing addresses the supply of ammunition. First, the Ordnance Department aligned contractor schedules to balance weapon system component

⁴⁹ Risch, *The United States Army in World War II, The Technical Services, The Quartermaster Corps: Organization, Supply, and Services*, 1:9.

⁵⁰ Gropman, “Industrial Mobilization,” 104, 108.

⁵¹ Ohl, *Supplying the Troops, General Somervell and American Logistics in WWII*, 127.

⁵² *Ibid.*, 128.

⁵³ Campbell, *The Industry-Ordnance Team*, 262.

⁵⁴ *Ibid.*, 259.

⁵⁵ *Ibid.*, 255.

manufacturing and assembly along with the respective ammunition to create approximately equal quantities of one to support the other. Artillery systems without ammunition were worthless and artillery rounds without a system to fire them, the same.⁵⁶ The arrangement of production schedules started with the sourcing and availability of raw materials. Copper, for example, became a bottle neck material, so if copper was not available to manufacture the ammunition for a weapon system, that weapon system may be delayed in production.⁵⁷ Mining, smelting, and refining facilities for copper all expanded to address shortages in 1942.⁵⁸ Aligning the production of the system and the ammunition ensured critical materials were rationed according to priority and without building a stockpile of an item that could not be immediately used.⁵⁹ Second, after the creation of additional ammunition facilities, the theaters of operation determined the amount and type of ammunition to be manufactured. Major General Levin Campbell, Chief of Ordnance, called ammunition forecasting, “the most complex of all logistic problems.”⁶⁰ Forecasts of ammunition production closely followed actual demand signals from operations in the field and estimated months in advance. The forecasts needed to account for ten sizes of artillery shells and 270 sub-types.⁶¹ If campaigns stalled and artillery usage multiplied, as the Fifth Army’s did, the supply chain is already set and shortages rise. Before the artillery round is in Fifth Army’s supply depot in Italy, the decision to manufacture and ship that round occurred months prior and there is no excess stockpile to redirect to them. Fifth Army would run into shortages of 105mm and 155mm artillery shells during winter of 1944-1945 despite the United States manufacturing enough 105mm shells to circumnavigate the earth at the equator—twice.⁶² On October 14, 1944,

⁵⁶ Campbell, *The Industry-Ordnance Team*, 172.

⁵⁷ Gropman, “Industrial Mobilization,” 70.

⁵⁸ *Ibid.*, 70–71.

⁵⁹ Campbell, *The Industry-Ordnance Team*, 256.

⁶⁰ *Ibid.*, 255.

⁶¹ *Ibid.*, 256.

⁶² Myers, “Part VIII The Second Winter,” 12; Campbell, *The Industry-Ordnance Team*, 252.

Brigadier General Ralph Tate, Assistant Chief of Staff, G-4 for Fifth Army Headquarters wrote a memorandum to the Chief of Staff regarding Fifth Army's ammunition situation. Seven of the ten large caliber munitions were considered critical, and in noting the 155mm gun ammunition, he wrote, "Production capacity in the United States is the reason for this."⁶³ The sequencing of strategic logistics, manufacture of ammunition in this case, would impact the sequencing and tempo of Fifth Army's operations in Italy. The Field Service made attempts to further support the theater troops. In 1943, the Field Service coordinated with industry for cost and time saving measures that would ship ammunition directly from the manufacturer to theater troops without intermediate storage; 85,000 carloads were shipped this way.⁶⁴

Duration and sequencing set conditions at the strategic level for the availability of resources at the national level and inform how combat operations occur. Based on the anticipated length of the war, the United States chose to invest in war production capacity in order to meet future demand. The Ordnance Department's ability to coordinate production in the United States impacted the ability of units to sequence their operations against the enemy.

Section 3: Logistics Support in Italy

From the first amphibious landings up to the establishment of railheads in the present battle areas, the Italian theater has offered supply problems for which there were no precedents.

—MG E.B. Gregory, WWII Quartermaster General

The next step to understanding how logistics in Fifth Army's era will relate to future war concepts is to articulate that critical logistics link between strategic and operational levels of war. This section describes the structure and organization of the logistics enterprise in WWII and the

⁶³ E.A. Sterling, *Ammo Joe's March from the Gothic Line to Victory*, n.d., 17.

⁶⁴ Campbell, *The Industry-Ordnance Team*, 342.

overall concept of support for Italy. These ideas are relevant to current and future doctrine by depicting the vast capacity and capabilities required to sustain an army in continuous combat.

In WWII, the strategic to operational logistic link occurred within the communication zone, which is geographically located between the combat zone and the zone of the interior.⁶⁵ Actions within the zone of interior include those conducted by industry, US Army Field Service, the Ordnance Department, the Office of the Quartermaster General, and other government departments. Today, the zone of the interior is roughly analogous to the industrial base or strategic support area in the MDO concept.⁶⁶ For comparison, members of the Joint Deployment and Distribution Enterprise (JDDE) conduct actions within today's zone of the interior, including Defense Logistics Agency (DLA), US Army Materiel Command (USAMC), and US Transportation Command (USTRANSCOM).⁶⁷ The communication zone contained the administration units and served as a base of operations in support to the combat forces.⁶⁸ Doctrinally, the communication zone was located behind the field army's rear boundary.⁶⁹ The communications zone broke down into advance and base sections. Advance sections contained supply stockages commensurate with operational requirements and provided the army's immediate supply requirements. The rear portion, or base section, received, stored, and prepared supplies for movement towards the battlefield.⁷⁰

⁶⁵ Zone of the Interior "comprises the area of national territory, exclusive of areas included in theaters of operations. The mission...to exploit and develop the national resources in men and material required for military purposes and to supply the means required by the commander of the field forces at such times, in such quantities, at such places, and in such manner and form as will assure him the freedom of action necessary for the accomplishment of his mission." FM 100-10, 15 November 1943.

⁶⁶ US Army, TRADOC PAM 523-3-1, 8.

⁶⁷ US Department of the Army, Field Manual (FM) 4-0 *Sustainment Operations* (Washington, DC: Army Publishing Directorate, 2019), 2–3.

⁶⁸ The War Department, Field Manual (FM) 100-10 *Field Service Regulations Administration* (Washington, DC: Government Printing Office, 1943), 28.

⁶⁹ *Ibid.*, 11.

⁷⁰ The War Department, FM 100-10, 28.

The command and support relationships of theater logistics in WWII remained complicated and in a constant state of flux. “Unknown who was responsible for what, ultimate success...surprising considering the disorder and loss of efficiency engendered by overlapping jurisdictions and power struggles.”⁷¹ Logistics organizations, such as the War Department’s Army Service Forces and the Services of Supply (responsible for logistics plans in the United Kingdom) originated just months before the invasion of North Africa.⁷² Prior to Fifth Army’s invasion, the theater support echelons established an initial staff which formed the basis of the future supply organization called the Peninsular Base Section (PBS).⁷³ Doctrinally, most of the relationship between the PBS and Fifth Army G-4 was one of coordination, where the theater commander appoints a regulating officer to work with the army staff, identify the priorities of the army commander, and coordinate activities accordingly.⁷⁴ Coordination activities continued between PBS and Fifth Army, and elements of the PBS arrived in Naples with Fifth Army to establish supply depots and installations.⁷⁵ The PBS planned for and executed support to Fifth Army using Naples as the base of the PBS support line of communication for the duration of the Italian campaign.

The concept of support for Italy discussed here will narrow the focus to the planning factors and methods of transportation within the peninsula. The geography of Italy played a significant role in the logistical support to Fifth Army and for Fifth Army’s support to its corps. Moving generally south to north, the road network provided only limited cross-communication with the British Eighth Army who moved parallel to Fifth Army on the peninsula. The significance of that divide meant cross-loading supply efforts remained limited as the armies

⁷¹ Dysart, “Materialschlact: The ‘Materiel Battle’ in the European Theater,” 340.

⁷² Ibid., 355.

⁷³ Blakeney, *Logistical History of NATOUSA - MTOUSA*, 27.

⁷⁴ War Department, FM 100-10, 60.

⁷⁵ Blakeney, *Logistical History of NATOUSA - MTOUSA*, 27.

moved north. Additionally, the highway network in Fifth Army's sector allowed for only one major route at a time. Originally, in December 1943, Highway 6 provided the initial route.⁷⁶ Located within Italy's mountainous terrain, the road bottlenecked in several valleys that provided targets for enemy indirect fire.⁷⁷ As Fifth Army progressed north, only Highway 7 existed in sufficient enough quality to serve as the main supply route; worst still, it was not centrally located in Fifth Army's operating area and ran along the western edge of the area nearer to the coast.⁷⁸ Within Fifth Army's area, and ultimately the regions PBS supported from, two highways provided lateral movement.⁷⁹ The supply lines required extensive engineering support as the Germans destroyed roads and bridges throughout their slow retreat north.⁸⁰ Allied air forces also contributed to the destruction as they bombed German supply lines.⁸¹ Knowing the mountainous terrain would limit motor transportation within the peninsula, PBS expected to make full use of ports along the western side of Italy. Fifth Army operations moving north often included the capture of key ports to facilitate resupply operations and shorten lines of communication. Large seaports, such as Naples and Leghorn, were valuable in that they contained infrastructure required to maintain Fifth Army's tempo. Naples, a port just north of the Salerno landing, served as the main port for all supplies entering Italy and remained so throughout the campaign.⁸² It had the capacity to receive small fuel tankers.⁸³ Petroleum pipelines originated from here and pushed fuel

⁷⁶ Harris G. Warren, "16 November 1943 - 15 January 1944, Part III The Winter Line," in *Fifth Army History* (Washington, DC: Government Printing Office, n.d.), 68.

⁷⁷ Edmund F. Ball, *Staff Officer with Fifth Army: Sicily, Salerno, and Anzio* (New York: Expositio Press, 1958), 254.

⁷⁸ Chester G. Starr Jr., "1 April - 4 June 1944, Part V, The Drive to Rome," in *Fifth Army History* (Milan: Pizzi and Pizio, n.d.), 6.

⁷⁹ William D. McCain, "7 October - 15 November 1943, Part II, Across the Volturno to the Winter Line," in *Fifth Army History* (Florence: L'Impronta Press, 1945), 3.

⁸⁰ *Ibid.*, 28.

⁸¹ Ball, *Staff Officer with Fifth Army: Sicily, Salerno, and Anzio*, 275.

⁸² Blakeney, *Logistical History of NATOUSA - MTOUSA*, 19, 153.

⁸³ Ziemke and Fisher, "The Mediterranean Theater of Operations: Cassino to the Alps," 229.

forward to ground forces.⁸⁴ Speaking to the importance of fuel to Fifth Army operations, Fifth Army incorporated liaison officers from PBS into G4 staffs. The Headquarters, Military Railway Service established its operations at Naples because of the railhead capability.⁸⁵ The capabilities at Naples, especially regarding rail and pipeline capabilities reduced requirements on the overburdened truck transportation system and road network.⁸⁶ Leghorn, north of the Anzio landing, would prove to be a valuable port, with a manmade harbor, robust petroleum storage, and distribution capability as Italy's prewar naval base.⁸⁷ The Germans sabotaged Leghorn as they retreated, and the harbor and port facilities required repair before Allied forces could use it as a new resupply point.⁸⁸ PBS operations eventually split between Leghorn and Naples; PBS Forward at Leghorn became PBS Main and Naples became PBS South in November 1944.⁸⁹

Using these ports as the source of resupply in Italy, PBS relied on motor transportation, railroad, and pipelines to supply Fifth Army.⁹⁰ The significance of these methods is relevant when comparing supply requirements of Fifth Army in the 1940s and the supply requirements of a US Army corps today. Today's organizations require significantly more fuel and ammunition and rely on less available transportation. PBS had to use all three of these methods to keep the comparatively smaller army force supplied. PBS was fortunate in that the enemy, once out of the area, did not significantly impact rail operations because the Allied forces maintained air superiority.⁹¹ The discussion below focuses on how PBS used these three methods to resupply

⁸⁴ Blakeney, *Logistical History of NATOUSA - MTOUSA*, 174.

⁸⁵ *Ibid.*, 150, 238.

⁸⁶ Starr Jr., "1 April - 4 June 1944, Part V, The Drive to Rome," 102.

⁸⁷ Ziemke and Fisher, "The Mediterranean Theater of Operations: Cassino to the Alps," 337.

⁸⁸ Bruce K. Myers, "5 June - 15 August 1944, Part VI Pursuit to the Arno," in *Fifth Army History* (Milan: Pizzi and Pizio, 1945), 114.

⁸⁹ Blakeney, *Logistical History of NATOUSA - MTOUSA*, 34.

⁹⁰ Myers, "Part VIII The Second Winter," 22.

⁹¹ Blakeney, *Logistical History of NATOUSA - MTOUSA*, 159.

fuel and ammunition on the peninsula, the two most significant classes of supply in terms of combat requirements and of assets required to move them.

To place PBS's fuel efforts in context, of the materials shipped into theater, fifty percent of the supplies by weight was petroleum, which arrived from more than 1,500 oil tankers. PBS followed the field manual exactly for distribution of Class III (fuel) products.⁹² Beachhead operations relied heavily on packaged fuel for the initial fuel supply and resupply over the beach until more permanent solutions developed.⁹³ This meant using five gallon "jerricans." Field Service contracted for 250 million of these steel gasoline containers for the war, providing the capability for initial fuel resupply until PBS launched other distribution methods.⁹⁴ PBS relied heavily on restoring and adding pipeline for bulk transit of fuel. "Development and use of the military pipeline for gasoline distribution was one of the outstanding achievements of the war."⁹⁵ Ten fuel pipeline systems were installed in Italy, totaling 2,038 miles of pipeline. "Neither tank cars nor tank trucks were available in sufficient number to handle such quantities [for airplanes and tanks and vehicles]."⁹⁶ The pipelines proved to be smaller targets from enemy air and artillery.⁹⁷ Engineer Petroleum Distribution Companies averaged the laying down of two and half miles of pipeline per day.⁹⁸ And railcars moved an average of 42,000 tons of fuel per month in Italy.⁹⁹ PBS preferred using rail and pipeline over motor transportation in ferrying supplies to Fifth Army as the motor transportation assets, in addition to taking up physical road space,

⁹² Blakeney, *Logistical History of NATOUSA - MTOUSA*, 74.

⁹³ Risch, *The United States Army in World War II, The Technical Services, The Quartermaster Corps: Organization, Supply, and Services*, 1:144.

⁹⁴ Campbell, *The Industry-Ordnance Team*, 344.

⁹⁵ Blakeney, *Logistical History of NATOUSA - MTOUSA*, 234.

⁹⁶ *Ibid.*, 174, 202.

⁹⁷ Warren, "16 November 1943 - 15 January 1944, Part III The Winter Line," 70.

⁹⁸ Blakeney, *Logistical History of NATOUSA - MTOUSA*, 201.

⁹⁹ *Ibid.*, 235.

consumed large amounts of fuel themselves. MTOUSA staff described the fuel situation: “Operating conditions in the forward areas could hardly be expected to permit more than one round trip per average day. This many trucks would fill the highway with highly inflammable and dangerous cargo. It would have all the other disadvantages of air observation, weather hazard, heavy maintenance, spare truck fleet, and an exorbitant cost.”¹⁰⁰ During the second winter in Italy, supplies could only move on a single road to supply an entire army, so freeing up road and cargo space allowed other necessary supplies to move forward.¹⁰¹ The rail and pipeline efforts described supported Fifth Army’s average daily fuel usage of 352,407 gallons.¹⁰² In comparison to today, the entire Fifth Army consumption would be the average fuel requirements for only four armored brigade combat teams.¹⁰³ In order to support Fifth Army’s Italian operations, all methods of fuel resupply were required, from packaged five gallon cans to rail cars and pipelines. Ammunition resupply required similar feats.

The initial ammunition supply plan for the MTO followed what today’s logisticians call “push” logistics. Strategic support echelons sent ammunition forward based on supply reports and estimates, but without a commander requesting the ammunition. This process changed by the time Fifth Army invaded Salerno.¹⁰⁴ The invasion of Sicily provided lessons and data for Operation Avalanche (invasion at Salerno) planning considerations and further refined for the Anzio invasion. One of those lessons was the segregation of ammunition by lot; lots are batches of ammunition manufactured at one plant under uniform conditions.¹⁰⁵ While within technical

¹⁰⁰ Blakeney, *Logistical History of NATOUSA - MTOUSA*, 173.

¹⁰¹ *Ibid.*, 235.

¹⁰² Myers, “Part VIII The Second Winter,” 33.

¹⁰³ Calculation of fuel consumption by an armored brigade combat team based of the Quick Logistics Estimation Tool, a planning estimator used by the US Army.

¹⁰⁴ Blakeney, *Logistical History of NATOUSA - MTOUSA*, 85.

¹⁰⁵ US Army Armament Research Development and Engineering Center, *Department of Defense Standard Practice, Ammunition Lot Numbering and Ammunition Data Card* (Washington, DC, 2014), 3.

standards, minute differences between manufactures impact the characteristics of ammunition fired by artillery forces. During the Sicily invasion, artillerymen noted that in order to have confidence in the accuracy of close artillery support, shooting ammunition by lot was essential.¹⁰⁶ The War Department altered the shipping patterns to stop shipping small lots of ammunition. The downstream effects would aid Fifth Army efforts to maintain lot segregation.¹⁰⁷ In real terms, this meant that planning, loading, and offloading of ammunition needed to be detailed, but flexible to adjust when arriving at a beachhead such as Anzio. Failing to maintain lot segregation at any point in the supply chain led to wasted time, manpower, and resources. Fifth Army expended 475,000 tons of ammunition in Italy.¹⁰⁸ But Fifth Army personnel handled 1,300,000 tons—demonstrating the amount of physical movement required.¹⁰⁹ The handling accounts for ammunition from receipt by the by Fifth Army personnel from PBS to the final leg, sometimes hand carried up a mountain to an artillery position.¹¹⁰ PBS estimates twelve million tons of ammunition were received, stored, and moved before arriving to troops throughout the entire MTO.¹¹¹ PBS attempted to closely follow the field manual requirements in storing and issuing ammunition in order to avoid possible abandonment of large quantities of ammunition as the combat units moved forward.¹¹² It has already been noted that it was difficult for industry to know what ammunition should be manufactured. Industry based their assessments on expected unit and enemy actions and on a term the War Department called “unit of fire”. Unit of fire was “a unit of measure for ammunition supply within theater, based upon experience in the theater...represents

¹⁰⁶ Mayo, *United States Army in World War II The Technical Services, The Ordnance Department: On Beachhead and Battlefield*, 185.

¹⁰⁷ *Ibid.*, 186.

¹⁰⁸ Sterling, *Ammo Joe's March from the Gothic Line to Victory*, 8.

¹⁰⁹ *Ibid.*, 8–9.

¹¹⁰ Warren, “16 November 1943 - 15 January 1944, Part III The Winter Line,” 61.

¹¹¹ Blakeney, *Logistical History of NATOUSA - MTOUSA*, 97.

¹¹² *Ibid.*, 75.

a balanced expenditure by the various weapons under condition of normal action.” Theater commanders could modify the War Department’s allocated unit of fire to be specific for their area.¹¹³ This provided a measure of flexibility for the varied theaters and attempted to align the ammunition production with tactical usage. Using this planning factor, after Fifth Army landed at Salerno in September 1943, and within two months ammunition stocks were built to 320,500 long tons, “the largest tonnage ever stored in MTO Class V depots.” Fifth Army’s pace slowed against the strong German defenses and within three months the ammunition situation was considered critical. A special shipment direct from the United States shipped to Naples, arriving in March.¹¹⁴ As a multinational force, elements within Fifth Army, specifically the Brazilians, French, and British, used American made munitions and received their ammunition directly from what the United States maintained in theater.¹¹⁵

This section established the theater level logistics, linking strategic logistics from the zone of the interior to the communications zone in the MTO. As a mechanized force, Fifth Army relied on fuel to move up the Italian Peninsula and PBS needed to use rail, pipeline, and motor transportation to aid in Fifth Army’s momentum. Additionally, the ammunition processes that brought ammunition from the United States relied on the same motor transportation and on considerable manpower to receive, sort, and issue ammunition to Fifth Army units. The next section describes the specifics of resourcing on Fifth Army operations.

¹¹³ War Department, *Field Service Regulations, Administration*, 6.

¹¹⁴ Blakeney, *Logistical History of NATOUSA - MTOUSA*, 87.

¹¹⁵ *Ibid.*, 92.

Section 4: Fifth Army's Italian Campaign at Anzio and the Second Winter

Throughout its entire operations in Italy Fifth Army had more varied supply and service functions and responsibilities that had ever been considered the task of a field army before the war began...unique among American armies...many lessons learned here were put to good advantage in other theaters.

— Bruce Myers, “The Second Winter”, *Fifth Army History*

This section will describe Fifth Army's background, including its origin, organization, and operations in Italy. After a campaign overview, two portions of Fifth Army's campaign will highlight the impacts of scarce resourcing. The first event is the amphibious landing at Anzio, (Operation Shingle) at the end of January 1943.¹¹⁶ Resourcing considerations impacted the operation's timeline, task organization, and resupply.¹¹⁷ The forces landing at Anzio failed to achieve its objective of linking up with Fifth Army from the south and capturing Rome for four months. The second event is Fifth Army's second winter in Italy, where operations slowed to a halt in anticipation of ammunition shortages and strong German defenses.¹¹⁸ Fifth Army spent the winter accumulating stocks of artillery ammunition in support of a spring offensive against the German line.¹¹⁹ These events inform the operational to tactical level of war that form the basis of action in MDO and the inability to exploit opportunities against the German defenses.

Fifth Army activated in North Africa on January 5, 1943, in preparation for future operations into Europe.¹²⁰ The initial mission for Fifth Army stated the desired capability to conduct amphibious operations with at least one infantry and one armored division.¹²¹ Lieutenant

¹¹⁶ Laurie, *Anzio*, 6.

¹¹⁷ Harris G. Warren and John Bowditch III, “16 January 1944 - 31 March 1944, Part IV Cassino and Anzio,” in *Fifth Army History* (Florence: L'Impronta Press, n.d.), 11.

¹¹⁸ Clark, *Calculated Risk*, 350, 387.

¹¹⁹ Ziemke and Fisher, “The Mediterranean Theater of Operations: Cassino to the Alps,” 412.

¹²⁰ Starr Jr., Lamson Jr., and Warren, “5 January - 6 October 1943, Part I From Activation to the Fall of Naples,” v.

¹²¹ *Ibid.*, 2.

General Mark Clark became its first commander and maintained command through December 16, 1944, when he became the 15th Army Group Commander over Fifth and Eighth Armies in Italy.¹²² Originally formed of Army special troops plus three corps, Fifth Army's size and composition fluctuated constantly from its formation and throughout the Italian campaign. A truly diverse force, it encompassed forces from the United States, including African-American and Japanese-Americans. Multinational, soldiers from Great Britain, Brazil, France, New Zealand, Canada, Poland, and Italy fought in Fifth Army. Civilians from these countries, women auxiliaries, and Italian partisans provided contributions and support.¹²³ As the invasions into France grew closer, MTO leadership removed units from Fifth Army to build combat forces for the invasion into southern France.¹²⁴

Fifth Army holds the distinction as serving the longest time in contact with enemy forces during WWII at 601 days.¹²⁵ Operations began September 9, 1943 with Operation Avalanche, the amphibious invasion of Salerno.¹²⁶ The Italian government surrendered on September 8, 1943, as Fifth Army moved across the Mediterranean, leading to uncertainty by the invasion force as to the reaction from Italian and German military forces when Fifth Army arrived on the Salerno beaches.¹²⁷ The Germany army gave a stiff resistance while Fifth Army established the beachhead.¹²⁸ Fifth Army eventually pushed out north of Salerno, capturing Naples with its

¹²² Myers, "Part VIII The Second Winter," 1.

¹²³ Blumenson, *Mark Clark, the Last of the Great World War II Commanders*, 239.

¹²⁴ John Bowditch III, "16 August - 15 December 1944, The Gothic Line," in *Fifth Army History* (Washington, DC: Government Printing Office, 1944), 184.

¹²⁵ Forty, *Fifth Army at War*, 9; Mikolashek, *General Mark Clark: Command of U.S. Fifth Army in World War II and Liberator of Rome*, 159.

¹²⁶ Martin Blumenson, "The Mediterranean Theater of Operations, Salerno to Cassino," in *United States Army in World War II* (Washington, DC: Center of Military History, US Army, 1993), 23.

¹²⁷ Martin Blumenson, "The Mediterranean Theater of Operations, Salerno to Cassino," 54–55.

¹²⁸ Starr Jr., Lamson Jr., and Warren, "5 January - 6 October 1943, Part I From Activation to the Fall of Naples," 33.

valuable and necessary sea and air ports on October 1, 1943.¹²⁹ Despite the Italian surrender, German forces, using well-prepared defenses, slowed Fifth Army's progress throughout the peninsula.¹³⁰ The mountainous terrain meant the Germans observed Allied force movements and attacked at chokepoints in mountain valleys or from high points as the Army moved north. The Germans destroyed bridges and infrastructure as they retreated, causing Fifth Army to rely heavily on engineering activities to repair roads, bridges, and construct Bailey bridges for forces and resupply to cross rivers and valleys.¹³¹ The advance slowed as the army reached the Volturno River, one of the first linear obstacles.¹³² As the first winter approached, Fifth Army's progress grinded to a halt along the Gustav Line, a fortified German defensive belt.¹³³ The stalemate, along with mounting US political pressure that the Italian campaign was losing its purpose, encouraged Churchill to support and advocate for the Anzio landing behind German lines.¹³⁴ The operation, originally one division, but ultimately two divisions, was part of a three-pronged attack, which included offensive attacks from Fifth and Eighth Armies from the south.¹³⁵ The operation occurred on January 22, 1944, achieving "one of the most complete surprises in history."¹³⁶ The surprise landing allowed a rapid inward expansion until stopped by German forces, preventing Anzio forces and Fifth Army from linking up until May 25, 1944.¹³⁷ Shortly after the link-up, Fifth Army entered Rome on June 4, 1944.¹³⁸ Capturing Rome days before the Normandy

¹²⁹ Starr Jr., Lamson Jr., and Warren, "5 January - 6 October 1943, Part I From Activation to the Fall of Naples," 47.

¹³⁰ McCain, "7 October - 15 November 1943, Part II, Across the Volturno to the Winter Line," 47.

¹³¹ *Ibid.*, 5, 36.

¹³² *Ibid.*, 2.

¹³³ Warren, "16 November 1943 - 15 January 1944, Part III The Winter Line," 6.

¹³⁴ Warren and Bowditch III, "16 January 1944 - 31 March 1944, Part IV Cassino and Anzio," 15.

¹³⁵ Laurie, *Anzio*, 4.

¹³⁶ *Ibid.*, 8.

¹³⁷ *Ibid.*, 25.

invasion led to the event being overshadowed. Fifth Army continued the fight north, forcing Germany to leave forces in southern Europe to defend against the attack and preventing those forces from reinforcing against the Allied forces in France.¹³⁹ IV Corps, under Fifth Army, captured the Port of Leghorn on July 9, 1944, which ensured the survival of Fifth Army through the second winter with this vital line of communication.¹⁴⁰ That winter, as supplies dwindled and artillery ammunition reached critically short levels, the advance stalled again.¹⁴¹ This time it was at the Gothic Line, another fortified belt that spanned the width of the peninsula through the Apennine Mountains.¹⁴² Once Fifth Army reestablished its stockage levels of supplies and gained a full amount of replacement personnel, Fifth Army launched its spring offensive across the Gothic Line, to the Po River valley and into the lower Alps.¹⁴³ Based on previous operational pauses taken by Fifth Army due to supply shortages, German forces expected the same to happen along the Po River. But that did not happen. Fifth Army built robust supply levels throughout the winter near the front lines and gained replacements to ensure all divisions exceeded their allotted strength.¹⁴⁴ German forces surrendered in Italy on May 2, 1945 and Fifth Army transitioned from combat operations and started redeploying home over the next few months.¹⁴⁵

With the Fifth Army's campaign overview complete, a focused study of the Anzio operation follows. Strategically and politically, the British advocated for added importance to the Italian campaign; General Clark concurred that Anzio was a vital component to the overall

¹³⁸ Laurie, *Anzio*, 25.

¹³⁹ Clark, *Calculated Risk*, 270.

¹⁴⁰ Myers, "5 June - 15 August 1944, Part VI Pursuit to the Arno," 81.

¹⁴¹ Bowditch III, "16 August - 15 December 1944, The Gothic Line," 2.

¹⁴² Ziemke and Fisher, "The Mediterranean Theater of Operations: Cassino to the Alps," 299–300.

¹⁴³ Myers, "Part VIII The Second Winter," 93.

¹⁴⁴ Myers, "Part VIII The Second Winter, 93; Geiger, "Part IX, Race to the Alps," 2.

¹⁴⁵ Ziemke and Fisher, "The Mediterranean Theater of Operations: Cassino to the Alps,"

political aim and the military strategy.¹⁴⁶ The Italian campaign was primarily an Anglo-American force, with General Sir Harold R.L. Alexander the commander of Allied Force Headquarters, General Clark, (American), the Fifth Army Commander, and General Sir Bernard L. Montgomery (British) the Eighth Army Commander.¹⁴⁷ Operation Shingle was temporarily cancelled in mid-December, until a change in command structure reinvigorated the effort.¹⁴⁸ On December 25, 1943, at a conference in Tunis, Churchill convinced the Allied forces of the importance of the Anzio landings to reinvigorate the Italian campaign. One of the primary challenges Operation Shingle's viability was the availability of LSTs. Allies needed the LSTs for the cross-channel invasion. Allied Command specified timelines in order to ensure the LSTs could be refit and sent to England in time to prepare for the Normandy invasion; an agreement was reached to extend the LSTs in the area until February 5, 1944.¹⁴⁹ Fifth Army had use of eighty-eight LSTs, which would be able to emplace the two divisions on the beachhead.¹⁵⁰ Additionally, the Allies allocated ninety Landing Craft, Infantry (LCI)(see figure 2), sixty Landing Craft, Tanks (LCT) (see figure 3), and eight Landing Ship, Infantry (LSI) to the Anzio operation.¹⁵¹

¹⁴⁶ Clark, *Calculated Risk*, 270.

¹⁴⁷ Starr Jr., Lamson Jr., and Warren, "5 January - 6 October 1943, Part I From Activation to the Fall of Naples," 18; Blumenson, "The Mediterranean Theater of Operations, Salerno to Cassino," 16.

¹⁴⁸ Laurie, *Anzio*, 5.

¹⁴⁹ Warren and Bowditch III, "16 January 1944 - 31 March 1944, Part IV Cassino and Anzio," 15.

¹⁵⁰ Clark, *Calculated Risk*, 269.

¹⁵¹ Warren and Bowditch III, "16 January 1944 - 31 March 1944, Part IV Cassino and Anzio," 15.



Figure 2. Landing Craft, Infantry and DUKW. USS Landing Craft Infantry National Association, "LCI Facts," accessed 25 February 2020, <http://usslci.org/facts/>.



Figure 3. Landing Craft, Tank (LCT). GlobalSecurity, "Landing Craft, Tank (LCT) Mk5," (GlobalSecurity, 2019), accessed 25 February 2020, <https://www.globalsecurity.org/jhtml/jframe.html#https://www.globalsecurity.org/military/systems/ship/images/lct-mk5-image01.jpg>.

The Allies preferred to place three divisions on Anzio, but the limited number of available craft decreased the landing force from three to two divisions, one British and one American.¹⁵² Not only were the LSTs vital for the initial invasion into Anzio, but they were needed to sustain supplies on the beachhead until the two forces would link up, a challenge given the amount of ships already sailing to England.¹⁵³ Only eight days were allocated for maintenance of the beachhead. After that, if the link up with Fifth Army had not yet occurred, then the divisions would need to maintain their position or withdraw from it.¹⁵⁴ The stockage levels were set at thirty days of supply and fifteen days of fire to support 110,000 soldiers.¹⁵⁵ All supply would be from the ocean until the linkup happened. Some LSTs would remain in MTO and as part of the support plan, six were used to provide daily supply runs from Naples to Anzio.¹⁵⁶ In preparing for the invasion, Fifth and Eighth Armies made a show of preparing for an assault from the south, causing the German commander to move forces from Anzio, ultimately creating an easier initial landing.¹⁵⁷ The German forces regrouped quickly and prevented the linkup of Allied forces for over four months.¹⁵⁸ Knowing that the beachhead may lose its LST support, Colonel Ralph Tate, the Fifth Army G-4, developed an innovative solution.¹⁵⁹ LSTs are a flat bottomed transport ships that can pull far up into the surf, allowing the cargo to be unloaded, or driven off

¹⁵² Mayo, *United States Army in World War II The Technical Services, The Ordnance Department: On Beachhead and Battlefield*, 191.

¹⁵³ Ball, *Staff Officer with Fifth Army: Sicily, Salerno, and Anzio*, 276.

¹⁵⁴ Warren and Bowditch III, "16 January 1944 - 31 March 1944, Part IV Cassino and Anzio," 15, 18.

¹⁵⁵ Clark, *Calculated Risk*, 288.

¹⁵⁶ Laurie, *Anzio*, 23.

¹⁵⁷ *Ibid.*, 9.

¹⁵⁸ *Ibid.*, 20.

¹⁵⁹ Mayo, *United States Army in World War II The Technical Services, The Ordnance Department: On Beachhead and Battlefield*, 192.

in the case of motor vehicles.¹⁶⁰ Colonel Tate directed the cargo trucks be loaded onto the LSTs so they could drive straight off when the LST landed at the beach. Soldiers loaded one class of supply onto each truck.¹⁶¹ Employing this method from Naples (see figure 4), fifty five-ton trucks fit onto an LST.¹⁶² When the LST landed, vehicles drove off, unloading the LST quickly, and decreasing the exposure of the LST to enemy artillery fire. Empty trucks would drive onto the empty LST, and the LST would leave for another round.¹⁶³



Figure 4. Preloaded Supply Trucks and DUKWs at Naples. Center of Military History Publication 72-19, *Anzio*, (Center of Military History), 11.

The method of loading vehicles contributed to beachhead organization and supply segregation. By loading vehicles with like items or items destined for a certain unit, the truck could drive directly to that point and offload. This mitigated the mountains of supplies unloaded on the beach in a disorganized fashion as had occurred during the invasions onto Sicily and Salerno. Specifically, the ordnance soldiers segregated the artillery ammunition by lot and type, providing rapid resupply to artillery units. As the Fifth Army units failed to unite within the eight

¹⁶⁰ Ball, *Staff Officer with Fifth Army: Sicily, Salerno, and Anzio*, 334.

¹⁶¹ Warren and Bowditch III, “16 January 1944 - 31 March 1944, Part IV Cassino and Anzio,” 19.

¹⁶² *Ibid.*, 20.

¹⁶³ Mayo, *United States Army in World War II The Technical Services, The Ordnance Department: On Beachhead and Battlefield*, 192.

days, PBS and Fifth Army G-4 coordinated alternate shipping schedules.¹⁶⁴ Liberty ships convoyed from North Africa, bringing in fourteen days of supply every ten days. These ships were essential to building the beachhead reserve stocks. Sustaining the beachhead involved subsequent shipping convoys of four Liberty ships (see figure 5), fourteen LSTs, and other lighterage craft, like the DUKW (pronounced “duck”, 2 ½ ton amphibious trucks) and LCTs from Naples to Anzio.¹⁶⁵ DUKWs were another valuable vehicle, amphibious, and used to ferry supplies and personnel to the beachhead from larger ships.¹⁶⁶

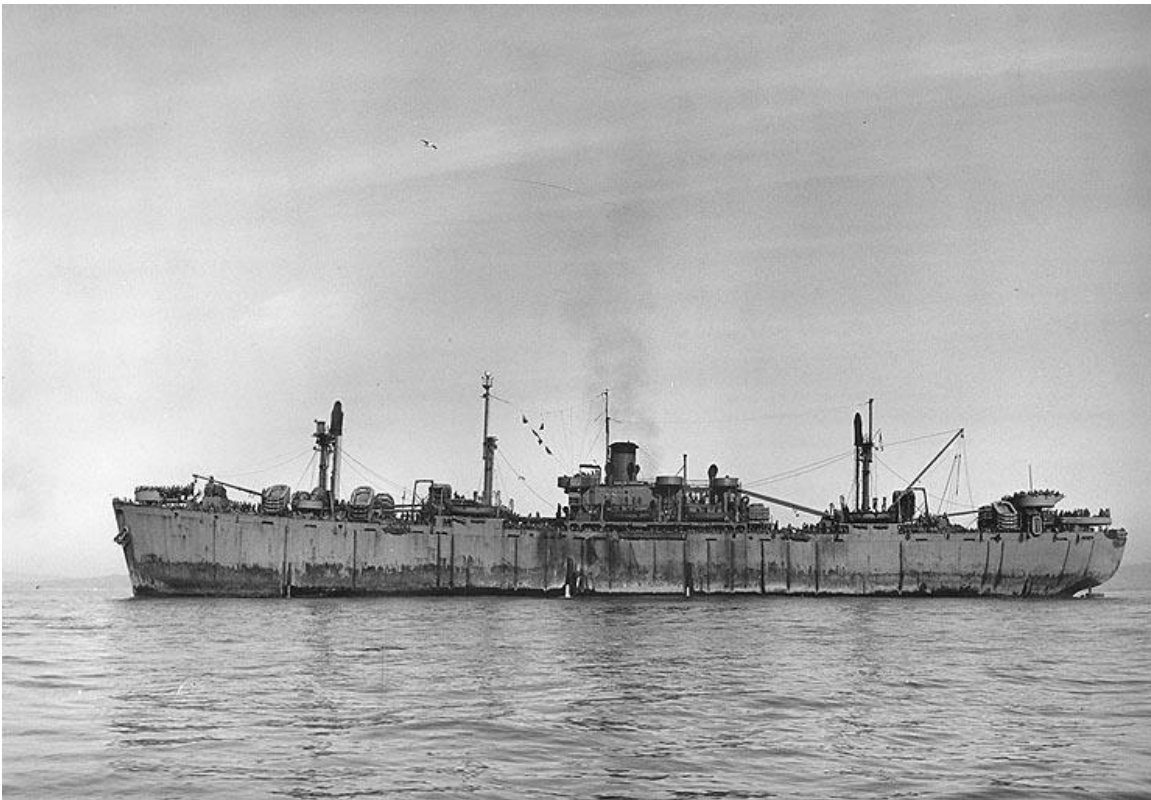


Figure 5. Liberty Ship. History on the Net, “Liberty Ship: The Naval Cargo Vessel,” (Salem Media, 2000-2020), accessed 25 February, 2020, <https://www.historyonthenet.com/liberty-ship>.

¹⁶⁴ Warren and Bowditch III, “16 January 1944 - 31 March 1944, Part IV Cassino and Anzio,” 19.

¹⁶⁵ *Ibid.*, 168.

¹⁶⁶ Blumenson, “The Mediterranean Theater of Operations, Salerno to Cassino,” 38.

The Anzio operation demonstrated Leonhard's concepts of sequencing, frequency, and opportunity. In the loading and preparation for the Anzio landing, the sequence of forces and supplies directly impacted the operations. Preparations, in *Fighting by Minutes*, are those actions which "enable future movement" toward the enemy.¹⁶⁷ Preparations for Operation Shingle applied lessons learned from recent, similar operations: Torch (North Africa), Husky (Sicily), and Avalanche (Salerno).¹⁶⁸ Disorganization and misplaced supplies delayed operations. For example, during the Avalanche landings, the primers for 155mm howitzer became mixed into a pile of rations and lost.¹⁶⁹ The artillery pieces were unable to fire, leading to a loss of valuable time and momentum on the beachhead. The truck-loaded LSTs enabled adjustments to the plan once underway, creating flexibility and responsiveness in support of the divisions on the beach.¹⁷⁰ The physical movement of forces is important. The loading and unloading of LSTs brought troops towards the enemy. What is the balance of combat troops on the beachhead and when do the first support echelons start arriving? In this case, engineering personnel were a vital component in the movement plan as they created berms for the fuel and ammunition supplies arriving on the beachhead. The storage of ammunition on the beach "was perhaps the most critical problem for Ordnance [soldiers] at Anzio."¹⁷¹ Unprotected or consolidated supply caches could lead to catastrophic losses if not adequately segregated by space and earthen berms. Ammunition handlers kept ammunitions properly segregated, organized, and stored, allowing the invading troops to maintain pressure on the German forces.

The Anzio landing demonstrated the frequency of operations. Based off intelligence estimates and the combat plan, the operations staff, with support by the logistics staff, plan an

¹⁶⁷ Leonhard, *Fighting by Minutes: Time and the Art of War*, 120.

¹⁶⁸ Mayo, *United States Army in World War II The Technical Services, The Ordnance Department: On Beachhead and Battlefield*, 171.

¹⁶⁹ *Ibid.*, 180.

¹⁷⁰ *Ibid.*, 192.

¹⁷¹ *Ibid.*, 196.

expected operational pace. Load plans are based on the expected combat frequency. Unloading and beachhead operations must also follow certain tempo. If unloading occurs too fast, supplies dumped onto the beach make it difficult to locate required items at the opportune time. While it may seem that it is better to have the supplies on the beach versus not, the rapid download can lead to slower combat operations. Too much essentially equals not enough as the right supplies cannot be located in sufficient time or quantities to enable the combat forces as previously observed during Operation Husky.¹⁷² Additionally, if the frequency is too slow, the supporting vessels and combat troops are vulnerable. Slow unloading operations create static targets for enemy artillery or air forces. The ingenious plan to load supplies on vehicles provided organization, mobility, and speed at Anzio. The vehicles leaving the ship drove directly to supply depots or to the combat units with fuel, ammunition, and food.¹⁷³ This provided a consistent resupply from the LSTs as the unloading pace not only saved LSTs but allowed a faster turnaround cycle to enable the attacking soldiers. Slow resupply frequency could have left the soldiers without critical supplies. At the strategic level, a increasing the frequency resupply tempo allowed the stockpiles on Anzio to be built in sufficient quantities to be maintained by other lighters and DUKWs in conjunction with Liberty ships and fewer LSTs.

The final aspect observed through this event is the lost opportunity in failing to link in with the rest of Fifth Army. Impacts can only be speculated if Fifth Army had been able to land the third division that was once envisioned for the operation. The balance of combat to support troops is based off the expectation of an engagement or an exploitation; in *Fighting by Minutes*, engagements expect opposed movement against an enemy whereas exploitation does not expect opposed movement.¹⁷⁴ Despite maintaining enough vessels for resupply operations, the limited

¹⁷² Mayo, *United States Army in World War II The Technical Services, The Ordnance Department: On Beachhead and Battlefield*, 179.

¹⁷³ Laurie, *Anzio*, 23.

¹⁷⁴ Leonhard, *Fighting by Minutes: Time and the Art of War*, 120.

numbers of transportation craft restricted the number of troops sent across the beach landing at Anzio and the forces failed to break through the German line for four months.

The second event demonstrating the scarcity of resources faced by Fifth Army was the shortage of supplies as Fifth Army approached their second winter in Italy. In *General Mark Clark*, the author calls the chapter on the winter line “Starving Time,” a nod to the wasted time that resulted from a shortage of men and materiel.¹⁷⁵ The shortage stemmed mainly from three reasons. First, the Overlord and Anvil invasions, since the end of 1943, maintained the priority of personnel and resources.¹⁷⁶ Second, the terrain and road network in Northern Italy greatly limited the resupply capabilities within Fifth Army. Third, ammunition shortages, influenced both by manufacturing capacity and combat operations led to a severe shortfall. These events caused General Clark to assume defensive positions near the Gothic Line through the winter of 1944-1945 and stopped the offensive advancement. General Clark required robust resources, especially in artillery ammunition, to break through the German defensive line.¹⁷⁷ He anticipated needing the winter to rebuild his supply levels in order to attack the German defenses. In the spring, after building their stocks, Fifth Army finally launched an assault against the German defenses.

The first issue leading to this operational pause was that of being a second-tier theater of operations in Europe. The Mediterranean operations, and Italy within those, moved down on the list of priorities for limited resources.¹⁷⁸ Despite the robust war industry production levels, resources were restricted and allocated according to the Allied strategy. As early as December 1943, Allied preparations for continental invasion into France affected Fifth Army. General Clark commented, “After the Allied invasion of France, we were a ‘forgotten front’ which until the

¹⁷⁵ Mikolashek, *General Mark Clark: Command of U.S. Fifth Army in World War II and Liberator of Rome*, 141.

¹⁷⁶ Ohl, *Supplying the Troops, General Somervell and American Logistics in WWII*, 225.

¹⁷⁷ Bowditch III, “16 August - 15 December 1944, The Gothic Line,” 187.

¹⁷⁸ David W. Ellwood, *Italy 1943-1945* (New York: Holmes and Meier Publishers, 1985), 72.

spring of 1945 never had enough men or enough equipment to mount a quick, decisive and fatal blow at the enemy...short of everything that was needed at some stages of the campaign.”¹⁷⁹ The LST requirement affected the initial Anzio timeline and the subsequent resupply efforts after the link up of forces occurred south of Rome. All classes of supply lacked.¹⁸⁰ Items originally designated for Italy were rerouted to France.¹⁸¹ Motor transport replacement was non-existent.¹⁸² Salvage operations through the winter provided replacement equipment, especially in motor transportation.¹⁸³ Ordnance personnel repurposed Italian civilian automobile factories to rebuild ordnance items.¹⁸⁴ Throughout 1944, Fifth Army lost personnel, despite holding the widest front up to that time in Italy.¹⁸⁵ The Allies reallocated French forces and VI Corps to the invasion in southern France.¹⁸⁶ In October, two of Fifth Army’s heavy battalions also left in support of Operation Anvil.¹⁸⁷ Individual replacements dwindled.¹⁸⁸

In addition to the supply and personnel shortages Fifth Army experienced during the second winter in Italy, the Italian terrain limited the options from which to sustain Fifth Army in its winter position along the Gothic Line. In July, Fifth Army captured the port of Leghorn.¹⁸⁹ The Germans destroyed much of the infrastructure, but engineering units quickly started restoring the port capabilities. The ports proximity to northern Italy meant a shorter line of communication for

¹⁷⁹ Clark, *Calculated Risk*, 3.

¹⁸⁰ *Ibid.*, 387.

¹⁸¹ Myers, “Part VIII The Second Winter,” 30.

¹⁸² Mayo, *United States Army in World War II The Technical Services, The Ordnance Department: On Beachhead and Battlefield*, 216.

¹⁸³ Myers, “Part VIII The Second Winter,” 29.

¹⁸⁴ Myers, “Part VIII The Second Winter,” 22.

¹⁸⁵ *Ibid.*, 5.

¹⁸⁶ Bowditch III, “16 August - 15 December 1944, The Gothic Line,” 184.

¹⁸⁷ Ziemke and Fisher, “The Mediterranean Theater of Operations: Cassino to the Alps,” 389.

¹⁸⁸ *Ibid.*, 391.

¹⁸⁹ Blumenson, *Mark Clark, the Last of the Great World War II Commanders*, 225.

Fifth Army's resupply. Instead of supplies moving from PBS at Naples and shipped to smaller ports along the western coast or transported along the clogged rail and roadways, Leghorn offered a more direct approach to Fifth Army.¹⁹⁰ PBS brought supplies through the ports to approximately fifty to seventy-five miles inland, where the Fifth Army supply dumps were located (see figure 6).¹⁹¹

SUPPLY PLAN - PBS MAIN AND FIFTH ARMY

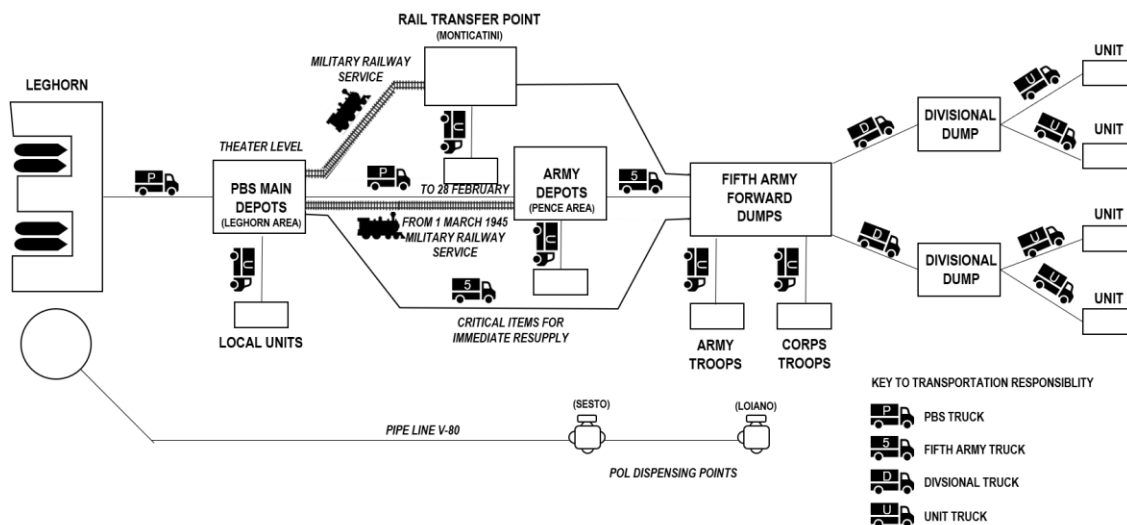


Figure 6. Supply Plan – PBS MAIN & Fifth Army. Adapted from Creswell G. Blakeney, ed., *Logistical History of NATOUSA - MTOUSA* (Naples: G. Montanino, n.d.), 72-73.

Even with the port of Leghorn relatively close to the Fifth Army operating space, the mountainous terrain limited the availability of adequate roads to sustain Fifth Army. One main supply route provided all resupply to Fifth Army's four divisions, corps and army soldiers.¹⁹² From the supply dumps, routes extended along winding, narrow mountain roads up to fifty miles to front-line units.¹⁹³ At the army level, the transportation section controlled all transportation

¹⁹⁰ Gregory, "QM Supply at Anzio and the Italian Theater," 18.

¹⁹¹ Myers, "Part VIII The Second Winter," 22.

¹⁹² Blakeney, *Logistical History of NATOUSA - MTOUSA*, 235.

¹⁹³ Myers, "Part VIII The Second Winter," 21.

assets, including those within the quartermaster units; this included movement by air, rail, water, and land. This section maintained control of all main supply routes and established policies for control within the army.¹⁹⁴ A divisional G-4 staff officer within Fifth Army spoke to the traffic control required for movement due to the congested nature on the roads, “Absolute, dictatorial control over all traffic movement, must be exercised by a central division authority...this same need has appeared in both corps and army concerning the main routes.”¹⁹⁵ One pipeline opened on November 23, 1944, but it was not until March 5, 1945, that a second pipeline head opened (at Pistoia).¹⁹⁶ When railroad capabilities improved in late January 1945, motor transportation requirements improved.¹⁹⁷ The final leg required rubber boats or aerial tramways to cross streams.¹⁹⁸ In northern Italy, as they had throughout the campaign, Fifth Army relied on mule trains to move supplies internally to resupply the final leg. Throughout the campaign, up to 800 mules provided front line soldiers with food, ammunition, and supplies.¹⁹⁹

The final and potentially most impactful reason for Fifth Army’s inability to maintain sequenced operations was due to the lack of artillery ammunition required to break through and destroy the German defenses.²⁰⁰ “Artillery ammunition shortage, which had handicapped our drive toward Bologna...played a part in our failure to resume offensive action during the winter.”²⁰¹ In 1944, artillery ammunition shortages loomed as winter approached. Fifth Army identified the shortage as early as August 1944 and subsequent ammunition inventories

¹⁹⁴ Myers, “Part VIII The Second Winter,” 66.

¹⁹⁵ George H. Revelle, JR., “Under Fifth Army a Division G-4 Operates,” *Military Review* XXV, no. 3 (1945): 55.

¹⁹⁶ Myers, “Part VIII The Second Winter,” 33.

¹⁹⁷ *Ibid.*, 27.

¹⁹⁸ *Ibid.*, 22.

¹⁹⁹ Clark, *Calculated Risk*, 320.

²⁰⁰ Mikolashek, *General Mark Clark: Command of U.S. Fifth Army in World War II and Liberator of Rome*, 156.

²⁰¹ Clark, *Calculated Risk*, 406.

demonstrated a greater shortage of specific types of ammunition.²⁰² The Fifth Army G-4 maintained a series of communications to the army chief of staff regarding the status of all ammunition, with the focus on medium to large caliber artillery ammunition. These rounds were used for offensive operations and to maintain an active defense throughout the mountainous Apennine region.²⁰³ Internal memorandums laid out the potential severity to the entire campaign when stating, “stocks will be exhausted by the end of the periods stated [10 November to 10 December], with nothing on hand to repel counter attacks.”²⁰⁴ Not only were Fifth Army offensive operations stalled from a lack of ammunition, but there was risk of losing their position or suffering major defeats due to the inability to stop a potential German advance. By contrast, in October 1944, the German artillery appeared to have no restrictions on its use of ammunition.²⁰⁵ By the end of October, General Clark issued instructions that offensive operations would not begin before December 1; “the controlling factor was the status of ammunitions stocks available to Fifth Army.”²⁰⁶ Compounding the challenges of German resistance, low priority levels, and difficult lines of communication was that of the inability of the industrial base to meet the demands in the field. As noted previously, the war industry as a whole faced a finite amount of raw materials for all munition production. Allocation of those materials and coordination of contractor manufacturing schedules was a robust challenge.²⁰⁷ The looming shortage had been identified and brought to General Somervell’s (Commanding General, Army Service Forces) attention, who ordered the strict allocation of ammunition to each theater and ordered the increase in artillery ammunition production.²⁰⁸ But because those decisions were made months before

²⁰² Clark, *Calculated Risk*, 387.

²⁰³ Sterling, *Ammo Joe’s March from the Gothic Line to Victory*, 21.

²⁰⁴ *Ibid.*, 24.

²⁰⁵ Bowditch III, “16 August - 15 December 1944, The Gothic Line,” 164.

²⁰⁶ *Ibid.*, 175.

²⁰⁷ Gropman, “Industrial Mobilization,” 33.

²⁰⁸ Ohl, *Supplying the Troops, General Somervell and American Logistics in WWII*, 235.

Fifth Army's stalemate at the second winter line, Fifth Army's campaign was forced to a stop until sufficient levels of artillery ammunition, personnel and material, were rebuilt.²⁰⁹

The second winter line demonstrates the lost opportunities due to poor frequency and sequencing of resupply operations. Fifth Army lacked the resources at the right time to maintain its tempo of operations. The frequency of resupply slowed below the required level to sustain forces in movement toward the enemy. The artillery ammunition particularly highlights the concern. To supply Fifth Army, and the rest of the theaters, with artillery ammunition required the entire war industry system to maintain a certain frequency. As operations changed in Italy, either from advances or stalls, the rate of ammunition changed drastically. Like a sound wave, once the frequency signal from the ammunition manufacturing was sent out, the effect was set. The theater would have to react to the frequency established months before the current situation. Fifth Army attempted to regulate its expenditures in order to match the expected frequency of resupply to its operations. Some factors were beyond its control and eventually, Fifth Army needed to stop attacking the Germans, leading to a lost opportunity.

When Fifth Army stopped before the Gothic Line, it transitioned from the movement aspect of sequencing to the preparation phase. In preparation, Fifth Army built its supply capabilities over five months in anticipation of future engaged, opposed movements, towards the enemy. As noted, American forces were at risk from low artillery ammunition. If the German forces had realized the opportunity to exploit Fifth Army's initial preparation time, the campaign outcomes may have been different. Fifth Army regained its required resources over a five-month period, and expanded to the equivalent of ten divisions, including 10th Mountain Division, specialized for Alpine fighting.²¹⁰ When the spring offensive finally began in April 1945 after months of preparation, Fifth Army maintained movement against the German forces, exploiting

²⁰⁹ Mikolashek, *General Mark Clark: Command of U.S. Fifth Army in World War II and Liberator of Rome*, 152.

²¹⁰ Geiger, "Part IX, Race to the Alps," 2.

the German inability to move against them. “German plans of retirement had been based on the assumption that even in the event of a major breakthrough, Fifth Army...would have to await supplies before resuming the offensive.” With the correct frequency of resupply and sufficient preparation, Fifth Army exploited the situation and gained a victory by executing against the opportunity in front of them; this time, successfully, from the long build-up of logistics capabilities.²¹¹

Section 5: Fifth Army’s Scarcity Informs Multi-Domain Operations

Future field operations will be governed by logistics rather than by strategy and tactics. To be successful future commanders must be thoroughly skilled in all phases of logistics...

— MG Levin H. Campbell, Jr., *The Industry-Ordnance Team*

In MDO, the United States expects the enemy to execute a *fait accompli* attack in order to balance against the robust combat power the United States can project across the globe if given the time. Fifth Army’s resource scarcity provides a powerful analogy of this problem in future war. Fifth Army faced significant supply challenges that required a balance of detailed planning and flexible ingenuity in order to overcome the resource scarcity in the MTO. The scarcity of resources limited operations which led to lost opportunities as seen by the delayed force link up after the Anzio beach landing. Planning and flexibility will be invaluable in overcoming the challenges of large-scale combat operations in future wars if the enemy imposes a *fait accompli* situation. This section explores the future concept of MDO by briefly outlining the conditions that may lead to future wars, connecting lessons of the past to future considerations for MDO, and examining time, space, and capabilities as required by the concept of convergence.

In TRADOC Pamphlet 523-3-1, *The U.S. Army in Multi-Domain Operations 2028*, the United States preference for future war is outlined as first wanting to first deter adversaries from

²¹¹ Geiger, “Part IX, Race to the Alps,” 125.

engaging in future wars against the United States and its allies.²¹² As part of achieving deterrence, the United States relies on the posturing of forces and equipment to support rapid mobilization and movement of combat forces against an enemy threat.²¹³ The US Army accomplishes this by using army prepositioned stocks (APS), maintaining the ability to power project forces, and stockpiling supplies.²¹⁴ US Army Materiel Command (USAMC) and USTRANSCOM support most of the efforts. USAMC maintains APS worldwide for the US Army. These stocks consist of equipment sets for maneuver, logistics, field artillery, and enabling units which allows the US Army to rapidly move soldiers to the equipment, saving time until equipment ships by sea to the new theater. USAMC operationalized the storage of these items to be ready in a “fight tonight” mentality, reducing the time a unit needs to draw the equipment.²¹⁵

Power projection includes aspects from multiple sectors of the homeland, or what MDO calls the strategic support area (SSA).²¹⁶ This may include modernizing the ability to deploy forces from a given installation or validating the availability of strategic mobility assets. In September 2019, USTRANSCOM conducted a mobilization of the Organic Surge Fleet in order to test the readiness for large-scale combat operations. The USTRANSCOM official after-action report “validated concerns regarding the readiness of the...fleet.”²¹⁷ The readiness exercise may not have met the standards set by the government; however, the rollout demonstrated the commitment of the United States to its ability to project forces across the globe.

²¹² US Army, TRADOC PAM 523-3-1, vii.

²¹³ Edward A. Fraser and Robert V. Abernathy, “Strong Europe: A Continental-Scale Combat Sustainment Laboratory,” *Army Sustainment Magazine*, no. June (2019): 37.

²¹⁴ *Ibid.*, 37.

²¹⁵ Stephen M. Twitty, “Logistics Important to Shaping the European Theater,” *Army Sustainment Magazine*, no. December (2019): 15.

²¹⁶ US Army, TRADOC PAM 523-3-1, 47.

²¹⁷ USTRANSCOM J37, *Comprehensive Report for TURBO ACTIVATION 19-PLUS* (Scott Air Force Base, 2019).

The final aspect of deterrence discussed in this paper is the stockpiling of required supplies. Similar to APS, the United States positions these stockpiles around the world on land and sea in order to provide a responsive initial or immediate resupply. The United States maintains war reserve stocks domestically and abroad. If these deterrence measures, as part of an integrated deterrence strategy, fail to stop an adversary, then the US Army intends use the forward positioned equipment and expeditionary forces to stop a *fait accompli*, creating time to achieve advantages for an acceptable political outcome. If those both fail, MDO calls for a protracted war to defeat the enemy and return to competition.²¹⁸

Conventional force war may be in response to the enemy's *fait accompli*, in which the United States expects its enemy to use conventional forces to create a new status quo that poses an unacceptable risk of intervention by US forces. If that occurs, the US Army anticipates that it must react within weeks or months of the enemy action to achieve an acceptable political outcome.²¹⁹ The US Army would then implement and use the programs mentioned above: APS, power projection, and stockpiled supplies and war reserve.

These ideas are visible in history during World War II, and specifically, as seen by the Fifth Army case study. By using time to mitigate scarce resources, the United States started building its supply base in the late 1930s. Time allowed the development of legislation for lend-lease programs and the growth of the industrial base within the United States. Within the concept of time, planning, sequencing, and frequency attempted to mitigate the shortage of resources, specifically those in Italy. Sequencing of artillery ammunition and weapon production by the industrial base was a consequential by-product of scarce raw materials and real-time operations. Planning for resource shortfalls impacted the type, time, and place of operations as demonstrated by the landing at Anzio. Shortage of landing craft dictated the number of soldiers placed on the

²¹⁸ Army, "The U.S. Army in Multi-Domain Operations 2028," 24.

²¹⁹ US Army, TRADOC PAM 523-3-1, 24.

beach initially and in subsequent resupply capabilities. Frequency of resupply across the beaches and on a limited road network dictated the approach through which Italy's combat forces received their requirements. Fifth Army's fuel consumption required railcar, tanker truck, and pipelines to meet the demand. Since WWII and even recently, US Army formations have only increased internal demand requirements.²²⁰

One of the assumptions in MDO is the reduction of demand by up to fifty percent. Other papers delved into demand requirements in areas of power consumption, water generation, and fuel consumption.²²¹ New technologies exist to decrease requirements through the use of auxiliary power units, hydrogen fuel cells, or microgrids.²²² However, even the new tactical vehicle is still a fossil fuel-based energy user despite initial attempts to use a hybrid diesel-electric system.²²³ Leader-follower vehicles, unless using battery technology, still require fuel resupply, take up space on the road, and are targetable by enemy forces. Other recommendations include adding more bulk fuel units to meet the shortfall gap.²²⁴ Fifth Army staff noted the unsustainability of increasing the amount of vehicle distribution on the road network and the vulnerabilities of a steady resupply of fuel trucks to an enemy attack. Long range fires could target static fuel locations or explosive laden drones could take advantage of the near continuous rotations of fuel vehicles required to sustain a mechanized or armor division in a large-scale operation. Another area of high demand in current and future operations is artillery and long-range fires. Warfighter exercises show the artillery ammunition expenditures are unsustainable and exhaust current

²²⁰ Peter Van Howe, "The Challenges of Multi-Domain Sustainment," *Army Sustainment Magazine*, no. June (2019): 53.

²²¹ Landis Maddox, "Overcoming Multi-Domain Battle Sustainment Challenges through Demand Reduction Initiatives" (US Army War College, 2018), 1.

²²² *Ibid.*, 18, 21.

²²³ Christian Seabaugh, "Oshkosh JLTV First Drive Review," *Motortrend*, last modified 2019, accessed February 26, 2020, <https://www.motortrend.com/news/oshkosh-jltv-first-drive/>.

²²⁴ Abraham T. Sweeney, "US Army Logistics in Large-Scale Combat Operations : Distribution of CL III Bulk" (monograph, US Army Command and General Staff College, 2019), 36.

inventories. In comparing the quantities of artillery fired in WWII and the rate of expenditure in current Warfighter exercises, an assumption is that future large-scale combat operations would require additional production to create and sustain the levels of ammunition to fight the way units intend to fight. Current US Army formations depend on extensive supply chains, so those concerns are even more valid today as MDO requires independent maneuver from the strategic support area to the enemy close area.²²⁵ Fifth Army was only able to overcome their demands by operational pauses of up to five months in order to build enough combat power to resume offensive operations. Months of preparation may not “create the conditions favorable to a political outcome.”²²⁶

In TRADOC Pamphlet 523-3-1, one of the key required capabilities includes the ability to conduct precision logistics. The military identified gaps existing in the current structure to provide the agile, reliable, and responsive precision logistics called for in MDO.²²⁷ Precision logistics is “the art of delivering support forward utilizing a combination of sensor-driven predictive analysis, condition-based maintenance at the point of need, and robotic autonomous delivery combined with the beneficial results of demand reduction to enable multi-domain formations to present a credible deterrence during competition, to transition to armed conflict with speed and agility, and to execute Multi-Domain Operations in depth, including resupply of formations conducting independent maneuver to extend time and reach of protracted operations.”²²⁸ The supporting concepts that enable precision logistics include Future Vertical Lift and Army Networks to improve the resupply efforts.²²⁹ Improving visibility of the expenditures through the Army Network shortens the supply and demand lag demonstrated in

²²⁵ US Army, TRADOC PAM 523-3-1, 19.

²²⁶ *Ibid.*, viii.

²²⁷ Bradley Cooper, “Precision Logistics : Sustainment for Multi-Domain Operations,” *Institute of Land Warfare*, no. 19–4 (2019): 2.

²²⁸ US Army, TRADOC PAM 523-3-1, GL-8.

²²⁹ *Ibid.*, xi.

Fifth Army's by creating an almost instantaneous demand back to the industrial base. Joint Munitions Command (JMC) briefed the USAMC commander on the new technology intended to provide flexibility in the allocation of ammunition requirements through "real-time, risk-based, distribution and positioning decisions."²³⁰ New technology may enable the flexibility to rapidly shift scarce resources during time-sensitive MDO to maintain the correct frequency of resupply and sequence of resources.

In responding to a threat, MDO relies on the tenet of convergence to bring capabilities together across all domains in order to create a window of time and maneuver space to conduct offensive operations against the enemy. Central to the tenet of convergence are the ideas of time, space, and capabilities. The enemy intends to restrict the US Army in each of these areas. The enemy's *fait accompli* attack counters the time to react and prepare. The enemy's ability to reach US forces through conventional long-range artillery fire or through cyber, space, or electronic warfare reduces the space for US forces to operate. The enemy mitigates the ability of the United States to apply capabilities like APS because of the time scarcity and reduced or impeded physical space. The *fait accompli* exploits traditional US actions in preparation for a large-scale war. In WWII, the United States spent years creating the production capability to fight a peer competitor. Future operations cannot depend on the luxury of time to prepare for movement against the enemy.

In order for convergence to succeed, US forces apply the temporal principles of duration, frequency, duration, and opportunity. A war's duration may be largely determined by the political will of the election officials and their constituents. If the United States expects a protracted war, then the investment in production capacity enables the United States to provide for future needs. The United States anticipated entering WWII eventually, and in consequence, increased its war

²³⁰ Kara Stetson, "Munitions Readiness in the Strategic Support Area Continues to Provide Lethality That Wins," last modified 2020, accessed February 27, 2020, https://www.army.mil/article/232916/munitions_readiness_in_the_strategic_support_area_continues_to_provide_lethality_that_wins.

production capabilities. Today this would provide the start point for agile, responsive, and reliable precision logistics required by MDO. The sequencing of operations, including the preparation, movement, and exploitation of forces interweave with the resupply frequency.

Fifth Army's landing at Anzio required detailed, but flexible, resupply to sustain the momentum on the beach. This included understanding previous successes and failures in order to apply those lessons at Anzio. The idea to resupply by driving trucks off the LST, a novel approach, allowed the combat forces to maintain movement towards the enemy and make significant gains. Longer term, the frequency of resupply and use of multiple vessels and routes provided a manageable flow of supplies that avoided overwhelming or under resourcing the beach. Fifth Army was unable to create opportunities after initial gains to exploit the situation at Anzio and link up with Allied forces from the south. This was partly due to the resource scarcity. Convergence will be almost synonymous with opportunity as convergence provides the time and space to operate in the close area, penetrating the enemy defenses and exploiting the success. Once that occurs, sequencing and frequency once again become vital components. The opening under which US forces can move may vary by speed and activity. Precision logistics resupply must be flexibly applied to the unfolding situation. Fifth Army planned and produced requirements months ahead of the actual demand, requiring Fifth Army to alter their operations as demonstrated by the reduced artillery fire from November 1944-March 1945. That essentially halted operations in the south. Under convergence, stalled offensive operations may allow the enemy to regain its advantage, decreasing the time and space for independent maneuver. Fifth Army was fortunate that the Germans did not press the advantage at the second winter line, when Fifth Army was vulnerable to enemy attack. Future formations may not be able to mask the power asymmetry.

Without addressing industrial base capacities, the increase of requirements, or the shortfalls in distribution capabilities, the US Army will not be able to meet its intent to prevent a *fait accompli* attack or quickly defeat the enemy in protracted war. The US Army structure today

is not unlike its WWII predecessor in that the force will rely heavily on the industrial base to grow and maintain exorbitant levels of artillery ammunition. Conventional formations consist of fossil fuel reliant vehicles and equipment that necessarily tie the unit to a significant logistics tail. The logistics capabilities are limited to the minimally essential amount or even less than that, requiring a continuous flow of uninterrupted resupply to sustain the formation. The PBS staff noted the foolish idea of filling a road with a constant stream of fuel vehicles. This is contrary to the idea of independent maneuver. Insufficient industrial base capacity limits the duration of the war and removes the option of entering a protracted war from political leaders. Logistics requirements challenge the sequencing and frequency of resupply by continuously committing limited assets in support of divisions or corps. Lack of distribution methods and capabilities removes opportunities to exploit gains created by convergence. To improve its ability to counter an enemy *fait accompli*, the US Army should reduce its vulnerability by decreasing the reliance on predictable support structures and prepare the industrial base for a rapid transition to mass industrial production of materiel.

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