US Army Logistics in Large-Scale Combat Operations: Distribution of CL III Bulk

A Monograph

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This study addresses three research questions: 1. Why is the US Army structured with the preponderance of POL units in the United States Army Reserve? 2. What is the expected battlefield geometry of a corps support area in LSCO? 3. Can the US Army logistically support distribution of CL III (B) supporting one corps and three divisions in LSCO, within ninety days of mobilizing?

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Abstract

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The US Army's strategic focus is moving from counter insurgency (COIN) to large-scale combat operations (LSCO). Over the past twenty years, US Army logistics has supported combat operations from inherently static forward operating bases (FOBs). These FOBs, in conjunction with contracted bulk fuel delivery, enabled logistical planners to extend the operational reach of maneuver elements. With the shift to LSCO, fuel moving forward of the corps support area may require the US Army to transport bulk fuel in lieu of contractor delivery. This shift would demand more from US Army transportation assets to maintain momentum in offensive operations.

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Acronyms

ABCT	Armored Brigade Combat Teams
APS	Army Prepositioned Stock
ARNG	US Army National Guard
BCT	Brigade Combat Team
BSB	Brigade Support Battalion
CL III (B)	Class III Bulk
COIN	Counter Insurgency
CSC	Composite Supply Company
CSSB	Combat Service Support Battalion
DSA	Division Support Area
EAB	Echelon Above Brigade
ESC	Expeditionary Sustainment Command
FSSP	Fuel System Supply Point
FOB	Forward Operating Base
LSCO	Large-Scale Combat Operations
MEB	Maneuver Enhancement Brigade
MTOE	Modified Table of Organization and Equipment
MTV	Medium Tactical Vehicle
POL	Petroleum Oil and Lubricant
PSC	Petroleum Support Company
QLET	Quick Logistical Estimation Tool
TRM	Tank Rack Modules Total
TVAR	Total Vehicle Availability Rate
USAR	United States Army Reserve

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I. Introduction

The US Army's strategic focus is moving from counter insurgency (COIN) to large-scale combat operations (LSCO). Over the past twenty years, US Army logistics has supported combat operations from forward operating bases (FOBs). The COIN strategy employed inherently static FOBs in order to support stability operations countering insurgent activities. These FOBs, in conjunction with contracted bulk fuel delivery, enabled logistical planners to extend the operational reach of maneuver elements. With the shift to LSCO, fuel moving forward of the corps support area may require the US Army to transport bulk fuel in lieu of contractor delivery. This shift would demand more from US Army transportation assets to maintain momentum in offensive operations.

The *2018 National Defense Strategy* calls for "non-commercially dependent distributed logistics and maintenance to ensure logistics sustainment."[1] This contradicts current logistics doctrine, which states "to supplement shortfalls in the Army petroleum force structure, contracted support may be used in varying capacities. Operational contracted support of petroleum support includes, but not limited to, fixed storage facilities, bulk petroleum line haul and retail fuel."[2] Operational contract support of petroleum is an integral part of current operations, but is vulnerable during LSCO. A recent white paper published in January 2019, by the US Army Combined Arms Support Command, addressed contractor support during LSCO. The author states "as part of the planning process, commanders should anticipate not only the probability of contractor casualties, but also the possibility that commercial support may not be available, feasible, or effective at a critical point, either due to enemy activity or changes in the geopolitical

[1] James N. Mattis, *Summary of the 2018 National Defense Strategy (NDS) of the United States of America* (Washington, DC: Government Printing Office, 2018), 7.

[2] US Department of the Army, *Army Techniques Publication (ATP) 4-43, Petroleum Supply Operations* (Washington, DC: Government Printing Office, 2015), 1-3.

situation."[3] To plan for the worst-case scenario, the US Army must be capable of transporting CL III (B) inside the corps area of operations with organic assets.

The transition to LSCO is necessary due to the changing nature of conflict. Combat operations are expected to take place over a larger area, with a lethality the United States has not seen in the last twenty-five years.[4] Recent military exercises of foreign powers have shown an increased capability to field large multi-division armies. In a recent exercise conducted by Russian forces, Vostok-18, over 300,000 soldiers, 1,000 aircraft, and 900 tanks were employed. In contrast, the US Army employs field-training exercises at the brigade level, around 6,000 soldiers and 87 tanks.[5] If required to counter aggressive actions, or use military forces to remove an occupation force, deployment of the US Army in LSCO will be on a scale not employed by US forces in over twenty years.

The force structure of logistical units in the US Army has continued to shift over the last two hundred years. The evolution of the Army combat force structure has shifted active duty forces to a Brigade Combat Team (BCT) centric formation, logistically postured for logistical support. Current force structure places 76 percent of CL III (B) transportation assets in the reserve component.[6] Planned fiscal year 2023 US Army force structure allocates 10 percent of Petroleum Oil and Lubricate (POL) units to the active duty force, and 90 percent in the US Army Reserve

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[3] U.S. Army Combined Arms Support Command, *How Close is Too Close?: The Risks of Operational Contract Support in a Large Scale Ground Combat Operation (White Paper)* (Fort Lee, VA: Government Printing Office, January 17, 2019), 7.

[4] US Department of the Army, *Field Manual (FM) 3-0, Operations* (Washington, DC: Government Printing Office, 2017), Foreword.

[5] US Army Force Management Support Agency, "MTOE of 2-1 CAV," Force Management System Web Site (FMSWeb), accessed December 20, 2018, https://fmsweb.fms.army.mil/protected/struct/3LevelChart.asp?Update=DRAWCHART&UIC=WAGGFF&OPCON=WAGEFF&DOCST=A&FY=2020&exp=false.

[6] US Army Petroleum Center, *Petroleum Planning and Operations Smart Book* (Washington, DC: Government Printing Office, 2017), 30.

(USAR).[7] The allocation of the preponderance of POL units in the reserve component may impede the responsiveness of logistical support to operations.

The 2017 *National Security Strategy* calls for the military to improve readiness, stating "We must be able to get to a theater in time to shape events quickly."[8] Any large-scale sustainment will require significant reserve component augmentation. Historically, the last major large-scale mobilization of reserve component forces was during Operation Desert Shield, on November 14, 1990, when Secretary of Defense Dick Cheney ordered the mobilization of 125,000 USAR soldiers. This was in conjunction with the deployment of the 7th Corps to the Middle East theater of operations. It took the corps ninety days to mobilize, deploy, and be operationally postured to conduct operations.[9] This ninety-day window of mobilizing reserve component forces to support a corps is the benchmark used to assess responsiveness of logistical units in this study.

Statement of the Problem

Emerging US Army doctrine shifts the tactical logistical focus from the Brigade Support Battalion (BSB) supporting the maneuver of a BCT, to multiple sustainment brigades inside a corps supporting the maneuver of multiple divisions during LSCO. The force structure of sustainment brigades relies on augmentation of POL companies from active and reserve component forces. Estimation of the transportation assets needed to distribute Class III (B) in LSCO is achieved by defining the area necessary to support a corps based on historical and current doctrine. This study examined the current sustainment force structure of US Army POL units to assess whether active duty and reserve component forces are responsive enough to

[7] US Army Petroleum Center, *Petroleum Planning and Operations Smart Book*, 4.

[8] Donald J. Trump, *National Security Strategy (NSS) of the United States of America* (Washington, DC: White House, 2017), 29.

[9] Peter Tsouras et al., "The Ground War," in *Military Lessons of the Gulf War*, ed. Bruce W. Watson (Navato, CA: Presidio Press, 1991), 89.

provide the CL III (B) transportation requirements necessary to sustain LSCO within ninety days of mobilization.

Definition of Terms

Army Support Area: The specific support area for a theater army that is outside of a division or corps' operational area. Established primarily for the positioning, employment, and protection of theater support units; and where most of the sustaining operations occur.[10] This can be co-located in the Joint Security Area.

Class III (B): CL III (B) (bulk petroleum products) includes petroleum products normally transported by pipeline, hoseline, rail tank car, tank truck, barge, or tanker and stored in tanks or containers having a capacity of more than fifty-five gallons.[11]

Day of Supply: The logistics necessary to support a unit for one twenty-four-hour period.

Expeditionary Sustainment Command (ESC): Unit designated to provide general support to an area of operations. Provides mission command of logistics units in designated areas of a theater.[12]

Forward Operating Bases (FOBs): In stability operations, FOBs extend and maintain the operational reach by providing secure locations from which to conduct and sustain operations. They not only enable extending operations in time and space, they also contribute to the overall endurance of the force. FOBs allow forward deployed forces to reduce operational risk, maintain momentum, and avoid culmination.[13]

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[10] US Department of Defense, Joint Staff, *DOD Dictionary of Military and Associated Terms* (Washington, DC: Government Printing Office, 2018), 21.

[11] US Army, *ATP 4-43* (2015), 1-1.

[12] US Department of the Army, *Field Manual (FM) 4-95, Logistics Operations* (Washington, DC: Government Printing Office, 2014), 3-5.

[13] US Department of Army, *Army Doctrine Reference Publication (ADRP) 4-0, Sustainment* (Washington, DC: Government Printing Office, 2012), 3-10.

Fuel System Supply Point (FSSP): FSSP is the Army's primary fuel storage and distribution system. The FSSP receives, stores, and issues any fuel the Army uses, supporting both aviation and ground units. The FSSP is a complete, containerized system issued in different fuel storage sizes depending on unit's mission, composition, and fuel demands.[14]

Large-Scale Combat Operations (LSCO): LSCO occur in the form of major operations and campaigns (Corps and Division level) aimed at defeating an enemy's armed forces and military capabilities in support of national objectives.[15]

Line hauls: Operations in which vehicles cannot make more than one round trip per day due to distance, terrain restrictions, or transit time.[16]

Line of Communication: A route, either land, water, and/or air, that connects an operating military force with a base of operations, and along which supplies and military forces move.[17]

Local hauls: Operations in which vehicles can make two or more round trips per day based on distance, terrain, and transit time.[18]

Logistics: planning and executing the movement and support of forces. It includes those aspects of military operations that deal with: design and development; acquisition, storage, movement, distribution, maintenance, and disposition of materiel; acquisition or construction, maintenance, operation, and disposition of facilities; and acquisition or furnishing of services.[19]

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[14] US Army, *ATP 4-43* (2015), 2-23.

[15] US Army, *FM 3-0* (2017), 7-2.

[16] US Department of the Army, *Army Techniques Publication (ATP) 4-11, Army Motor Transport Operations* (Washington, DC: Government Printing Office, 2013), 2-2.

[17] Joint Staff, *DOD Dictionary of Military and Associated Terms* (2018), 141.

[18] US Army, *ATP 4-11* (2013), 2-2.

[19] US Army, *ADRP 4-0* (2012), 1-1.

Operational Reach: The distance and duration across which a force can successfully employ military capabilities. Sustainment provides the Joint Force Commander the means to enable freedom of action and endurance and to extend operational reach.[20]

Peer threat: An adversary or enemy with capabilities and capacity to oppose US forces across multiple domains world-wide or in a specific region where they enjoy a position of relative advantage. Peer threats possess roughly equal combat power in geographical proximity to a conflict area with US forces.[21]

Reserve Component: US Army National Guard and US Army Reserve units.[22]

Supply point distribution: A method of distributing supplies to the receiving unit at a supply point. The receiving unit then moves the supplies to its own area using its own transportation.[23]

Total Vehicle Availability Rate (TVAR): TVAR is the average of the percentage of tasked vehicles available for mission accomplishment over time.[24]

Unit distribution: A method of distributing supplies by which the receiving unit is issued supplies in its own area, with transportation furnished by the issuing agency.[25]

Research Questions

This study was organized using the following three research questions: Why is the US Army structured with the preponderance of POL units in the USAR? What is the expected battlefield geometry of a corps support area in LSCO? Can the US Army logistically support

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[20] Joint Staff, *JP 3-0* (2017), GL-13, III-35.

[21] US Army, *FM 3-0* (2017), 1-9.

[22] US Department of the Army, *Army Doctrine Publication (ADP) 1, The Army* (Washington, DC: Government Printing Office, 2012), 3-8.

[23] US Department of the Army, *Field Manual (FM) 4-40, Quartermaster Operations* (Washington, DC: Government Printing Office, 2013), 2-2.

[24] US Department of the Army, *Field Manual (FM) 55-15, Transportation Reference Data* (Washington, DC: Government Printing Office, 1997), C-2.

[25] US Army, *FM 4-40* (2013), 2-2.

distribution of CL III (B) supporting one corps and three division in LSCO, within ninety days of mobilizing?

Organization of Study

This monograph is organized into six sections. Section I includes the introduction, statement of the problem, definition of key terms, and research questions. Section II presents a literature review of the total force concept, the reserve component, POL force structure, and LSCO. Section III provides the methodology used to gather and assess the data. Section IV will utilize a notional corps support area to estimate the logistical support requirements. Section V provides an analysis of the CL III (B) requirements, and the transportation assets necessary to distribute CL III (B) in the corps support area. Section VI provides a summary of the research, recommended force structure changes, and conclusions.

II. Literature Review

As the Army shifts from COIN to LSCO, it is necessary to look at any potential changes in doctrine, organization, training, material, leadership and education, personnel, and facilities used to prepare for and conduct US Army logistics. The newly published *Field Manual (FM) 3-0, Operations* states, "large-scale combat operations present the greatest challenge for Army forces."[26] This shift has the potential to create capability gaps, specifically in the logistics capacity and capability. The organization of US Army logistical units, and the ratio of logistical units in the active and reserve component is important when assessing US strategic requirements. The total forces required to conduct operations have never been solely in the active force, but with the majority of POL unit allocation in the USAR, the responsiveness needed to sustain large scale operations is potentially constrained.[27]

[26] US Army, *FM 3-0* (2017), 1-2.

[27] US Army Petroleum Center, *Petroleum Planning and Operations Smart Book*, 4.

To better understand why the predominance of POL units are in the USAR, it is necessary to review several historical factors that influenced US Army force structure. These include implementation of the Total Force Concept in the mid-1970s, changes in US Army force structure in the 1980s and 1990s, and the shift to modular BCTs in the mid-2000s.

Total Force Concept

The United States fought against Viet Cong and North Vietnamese forces from 1965 to 1973, with predominately active duty forces.[28] In 1965, Secretary of Defense Robert McNamara proposed to President Johnson a call up of 100,000 reserve soldiers, which the President disapproved.[29] This decision remained US policy throughout the war, ensuring that the majority of soldiers were active duty. As the war continued in the 1970s, public support for the war deteriorated. There was an argument that including reserve component forces would have greatly influenced the conduct of the war, with community debate pressuring the US government to conclude the war earlier.[30]

In 1969, Secretary of Defense Melvin Laird directed that reserve component forces would have a separate budget to account for operations, maintenance, and procurement.[31] This set the stage for what would become the Total Force Concept, integrating the USAR and US Army National Guard (ARNG) into the total army by explicitly directing the flow of money. By setting up separate accounts in the budget, it was possible to ensure reserve component forces were adequately resourced. In 1970, Secretary Laird further directed that the total force concept would apply to all aspects of planning, programming, manning, equipping, and employing guard and

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[28] Ernest R. Dupuy and Trevor N. Dupuy, *The Harper Encyclopedia of Military History,* 4th ed. (New York: HarperCollins Publisher, 1993), 1321.

[29] John R. Groves, *Crossroads in U.S. Military Capability: The 21st Century U.S. Army and the Abrams Doctrine* (Arlington, VA: The Institute of Land Warfare, 2001), 2.

[30] Ibid.

[31] Comptroller General of the United States, *DOD "Total Force Management"-Fact or Rhetoric?* (Washington, DC: General Accounting Office, 1979), 5.

reserve forces.[32] By 1973, this concept became the Total Force policy. All active, guard, and reserve forces were now treated as part of a total force package, with ARNG and USAR forces as the primary augmentation of the active force.[33]

The total force concept was rooted more in domestic considerations than strategic, with the main incentive to maintain affordable armed forces based on "inducement rather than induction."[34] The total force concept attempted to balance fiscal responsibility with force structure, with the goal to address and constrain manpower, the fastest growing portion of the defense budget.[35] Some proposals preceded the total force, such as merging the National Guard and reserves into a federally controlled National Guard of the United States, or merging the USAR into the National Guard.[36] Both concepts failed to garner support, and the total force concept continued to maintain the framework of the active, guard, and reserve forces.

The Army Chief of Staff, General Creighton Abrams, applied the total force concept to the post-Vietnam force. In 1973, wanting to expand the active Army from thirteen to sixteen divisions without increasing troop numbers, General Abrams increased the active duty force by eliminating duplicate active and USAR responsibilities. This shifted 70 percent of the combat service support from the active force to the USAR.[37] There was immediate fiscal support for this, with USAR units operating at an estimated cost saving of one-half to one-sixth of active duty units.[38] With the increase in active duty divisions, and the shift of logistical units to USAR, the active duty force could no longer conduct large scale combat operations without the reserve

[32] Comptroller General of the United States, *DOD "Total Force Management"*, 5.

[33] Patrick M. Cronin, *The Total Force Policy in Historical Perspective* (Alexandria, VA: Center for Naval Analysis, 1987), 9.

[34] Ibid., 1.

[35] Cronin, *The Total Force Policy in Historical Perspective,* 5.

[36] John T. Correll, "Origins of the Total Force," *Air Force Magazine* (February 2011): 95.

[37] James Kitfield, *The Prodigal Soldiers* (New York: Simon and Schuster, 1995), 150.

[38] Ibid.

component. From a logistics perspective, in order to deploy anything above a division-sized element, it would be necessary to augment the active duty force with reserve component forces.

By the end of the 1970s, the Army was changing its strategic focus. AirLand Battle was a new approach that recognized the three-dimensional nature of modern warfare.[39] From the 1970s through the 1990s, the Army continuously redefined force structure to meet operational requirements. New ideas emerged from various Army initiatives to adjust force structure including: the TRICAP Division (1971), Division Restructuring Study (1976), and the Army 86 Study (1979). There was also the implementation of the Army of Excellence (1983), and Force XXI (1995).[40]

Through all these force structure changes the need for a division to logistically support itself remained constant. Up to Force XXI, active duty units were logistically resourced to internally support the division. The Division Support Command was part of every division modified table of organization and equipment (MTOE). The Division Support Command was a brigade sized element consisting of a Supply and Transportation Battalion, Medical Battalion, and Main Support Battalion. There was a Forward Support Battalion for each combat arms maneuver brigade in the division. In both the Army of Excellence and Force XXI structures, the active duty army was able to provide logistical support to initial operations on a scale comparable to LSCO.[41]

The current force structure reflects changes needed to support conflicts in Iraq and Afghanistan after the attacks on September 11, 2001. The initial invasions of Afghanistan and Iraq were successful with the existing organizational structure of the army, but an emerging counter-insurgency in Iraq challenged current doctrine and force structure. LTG David Petraeus,

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[39] US Department of the Army, *Field Manual (FM) 100-5, Operations* (Washington, DC: Government Printing Office, 1986), 7.

[40] Glen R. Hawkins and James Jay Carafano, *Prelude to Army XXI: US Army Division Design Initiatives and Experiments 1917-1995* (Washington, DC: US Army Center of Military History, 1997), C-14 to C-22.

[41] Paul Hurley, *Sustainment Capacity and Capability Gaps: Large Scale Combat Operations* (Fort Lee, VA: CASCOM CDI, 2018), 3.

Commander of the US Army Combined Arms Center, directed the development of *Field Manual (FM) 3-24, Counterinsurgency* in 2006.[42] This new FM 3-24 created a paradigm shift for employment of combat forces in a COIN environment, and caused a reorganization of US Army formations.

In response to the demands of the COIN doctrine, and the requirement to deploy units below the division level to conduct stability operations, the Army adapted a Modular Force Structure.[43] The Army restructured from a Cold War focus of division centric deployable units (Force XXI), to a modular BCT construct that would be more agile and responsive to counter-insurgency operations. From a sustainment viewpoint, the switch to a modular brigade enabled all necessary logistical assets to be internal to a BCT; but this modularity came at a cost. Previously the division support command was resourced at the division level to provide sustainment to two or three organic maneuver brigades. With the shift of logistics assets from the division to modular brigades, the division sustainment brigade was no longer able to support the division without external assistance.

The requirement to conduct operations above the brigade level has transitioned from a counter-insurgency fight with the new strategic focus on LSCO. As noted in *FM 3-0 Operations*, "Large-scale combat operations are the greatest challenge for Army forces."[44] To be prepared for LSCO, the US Army must be manned, equipped, and trained to operate across the range of military operations. The new *FM 3-0* states divisions and corps are central to the conduct of large-scale combat.[45] The employment of a division with the potential reliance on reserve component augmentation may not be responsive enough. Primarily because there are specific

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[42] US Department of the Army, *Field Manual (FM) 3-24, Counterinsurgency* (Washington, DC: Government Printing Office, 2006), Foreword.

[43] Andrew Fieckert. *U.S. Army's Modular Redesign: Issues for Congress* (Washington, DC: Congressional Research Services, Library of Congress, 2006), CRS-6.

[44] US Army, *FM 3-0* (2017), 1-2.

[45] US Army, *FM 3-0* (2017), 1-5.

timelines and legislative requirements to mobilize and employ reserve component forces to augment the division.

The Reserve Component

The current *National Security Strategy* states "readiness requires a renewed focus on training, logistics, and maintenance. We must be able to get to a theater in time to shape events quickly."[46] The current Army force structure is capable of internal support at the brigade combat team level, not the division or corps level required for LSCO. Quickly mobilizing reserve component forces to enable LSCO is essential to support the national security strategy. This is not to say reserve component forces are not able to perform their assigned duties superbly, but there are inherent bureaucratic, administrative, and policy decisions that could affect the responsiveness of the reserve components.

Reserve component units provide operational capabilities and strategic depth to meet US defense requirements across the full spectrum of conflict.[47] The reserve components maintain this capability generally through thirty-nine training days a year, consisting of one weekend a month, and two weeks annually.[48] These forces are mobilized in several ways depending on the circumstances and authorities required. By detailing the mobilization process in following paragraphs, the potential complexity of the process is described. The reserve component can mobilize in time of war or national emergency declared by Congress, or when otherwise authorized by law. An authority designated by the Secretary of Defense may, without the consent of the persons affected, order the total mobilization of reserve forces to active duty for the duration of the war or emergency and for six months thereafter.[49] When the President declares a

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[46] Trump, *National Security Strategy*, 29.

[47] Office of the Assistant Secretary of Defense for Reserve Affairs, *Managing the Reserve Components as an Operational Force* (Washington, DC: Government Printing Office, 2008), 3.

[48] Ibid*,* 1.

[49] United States Code, Title X, sec. 12301 (a).

national emergency, he or she can authorize partial mobilization of reserve forces to active duty for not more than twenty-four consecutive months.[50] The President can direct through state governors to federalize ARNG units. When federalized, they are ordered to duty as reserves of the US Army.[51]

The president can determine a mobilization is necessary to augment the active forces for any named operational mission, or find it is necessary to provide aid to a potential weapon of mass destruction or terrorist attack on the United States. Through a presidential call up, the Secretary of Defense is authorized to call reserve forces to active duty for not more than 365 consecutive days. Not more than 200,000 members of the Selected Reserve and the Individual Ready Reserve may be on active duty under presidential call up at any one time, of whom not more than 30,000 may be members of the Individual Ready Reserve.[52]

If necessary, the Secretary of Defense can respond to a governor's request for federal assistance with an emergency reserve call up in response to a major disaster or emergency in the United States or its territories. There are no personnel limitations, and the forces cannot serve more than 120 days. Another route to mobilize reserve forces is through the secretary of one of the military departments, who can determine it is necessary to augment the active forces for a preplanned mission in support of a combatant command. The Secretary may order any unit of the reserves to support a combatant commander on active duty for not more than 365 consecutive days. Not more than 60,000 members of the reserve components of the armed forces may be on active duty under this section at any one time.[53]

With the various options for the mobilization of the reserve forces, LSCO will most likely require the use of a presidential call up to support a combatant command. If there was a

[50] United States Code, Title X, sec. 12302.

[51] United States Code, Title X, sec. 12403 and 1246.

[52] United States Code, Title X, sec. 12304.

[53] United States Code, Title X, sec. 12304 (b).

requirement to exceed 200,000 soldiers from the reserve forces, it would require congressional approval, and would imply a national emergency. The reserve component access flowchart in figure 1 depicts the steps necessary to mobilize. The process starts with the combatant commanders request for additional forces. With the necessary reserve component forces identified, the Office of the Secretary of Defense for Mobility will assess the requirement and staff through the Secretary of Defense Orders Book for approval by the Secretary of Defense, and forwarded to the President of the United States as required.[54]

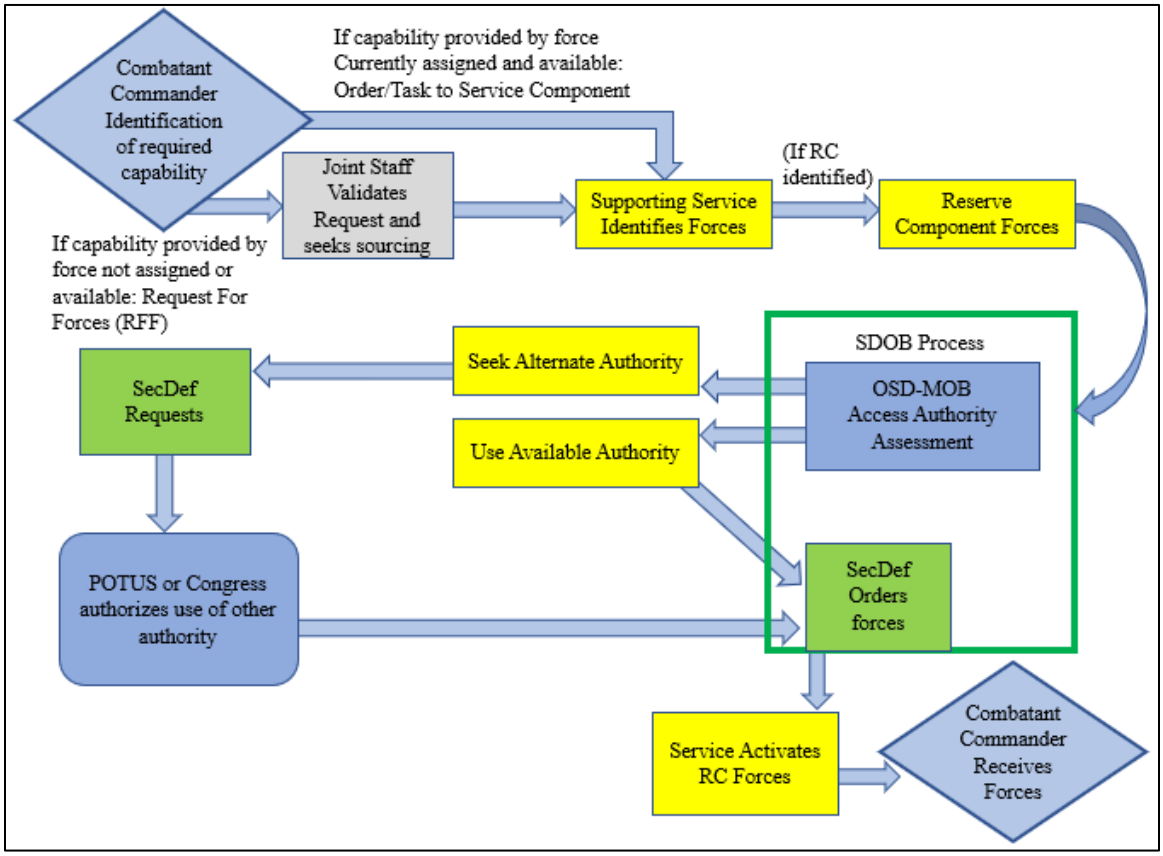

Figure 1. Reserve Component Access Flowchart. US Department of Defense, *Department of Defense Instruction (DODI) 1235.32, Accessing the Reserve Component (RC)* (Washington, DC: Government Printing Office, 2017), 30.

[54] Department of Defense, Joint Staff, *Department of Defense Instruction (DODI) 1235.32, Accessing the Reserve Component (RC)* (Washington, DC: Government Printing Office, 2017), 32.

When the Secretary of Defense requests a reserve component force, they mobilize to support a combatant commander. The US Army defines mobilization as the process of bringing the Army to a state of readiness for war, contingency, or national emergency.[55] This includes activating all or part of the reserve component, as well as assembling and organizing personnel, supplies, and materiel. A key factor in mobilization, is the unit's current state of readiness. Prior to 2017, the US Army used the Army Force Generation Module, with active duty units on a three-year cycle of reset, train and available, where reserve component units were on a five-year cycle of four prepare and one available.[56] In FY17, the Army transitioned active duty units to the Sustainable Readiness Module, which has the goal of maintaining 66 percent of active duty forces ready to respond globally to a crisis.[57] However, reserve component units did not transition to the Sustainable Readiness Module, and are still on a five year cycle of force generation.[58] The US Army Reserves have identified specific units in its "Ready Force X" initiative to combat this problem, stating that selected units are prepared to deploy within thirty days of conflict.[59] Regardless of unit type, reserve component units still utilize the Army Force Generation Module, and have one-fifth of forces available to mobilize.

The Army Force Generation Module directly ties to the mobilization timeline for reserve component units. To support planned operations, the Department of Defense notifies reserve units at least 180 days prior to mobilizing.[60] In certain situations however, reserve component forces may be required immediately. Most USAR forces are given at least thirty days formal notification

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[55] US Department of the Army, *Army Regulation (AR) 500-5, Army Mobilization* (Washington, DC: Government Printing Office, 2015), 1.

[56] Andrew Fieckert, *The Army's Sustainable Readiness Model (SRM)* (Washington, DC: Congressional Research Services, Library of Congress, 2017), 1.

[57] Ibid.

[58] Ibid.

[59] US Department of the Army, *Ready Force X Trifold* (Washington, DC: Government Printing Office, 2018), 1.

[60] Joint Staff, *DODI 1235.32* (2017), 18.

to prepare for activation, pursuant to section 515 of Public Law 110-181.[61] In extreme circumstances, the Secretary of Defense can immediately activate a USAR unit, not waiting for the thirty-day notice. The president can immediately federalize an ARNG unit, pending notification of the state governor.[62]

Mobilization and Execution Process

MOBLIZATION PHASE	PHASE I Pre-Mob	PHASE II Alert	PHASE III Home Station	PHASE IV Mobilization Station (MS)	PHASE V Alert
PRIMARY ACTIVITY LOCATION	Home Station (Armory or USAR Center)	Home Station (Armory or USAR Center)	Home Station (Armory or USAR Center)	MS	Air or Sea Port
ACTIVITY DURATION (DAYS)	As Time Permits	3 to 7 Days	3 Days	10 to 180 Days	1 to 2 Days
PRIMARY ACTIVITY	• Mobilization Planning • Training • SRP	• Unit Recall • Mobilization Order Prep • Personnel Screening • Equip & Records Check	• Continue SRP • Inventory Equipment • Cross-level Personnel & Equipment • Load for Movement • ADVON to MS	• Move to PPP • Complete SRP • Conduct Training • Complete Cross-level • Complete Validation • Load for Movement	• Move to POE • Load Transport • Deploy
OUTCOME	Planning	Notification	Preparation	Validation	Deployment

ADVON: Advance Echelon
USAR: United States Army Reserve
POE: Point of Embarkation
PPP: Power Projection Platforms
SRP: Soldier Readiness Processing

Figure 2. Mobilization and Execution Process. US Department of the Army, *Army Mobilization and Deployment Reference (AMDR)* (Washington, DC: Government Printing Office, 2018), 11.

The notification timeline and current availability status within the five-year cycle can drive the mobilization and execution process. Figure 2 displays mobilization at the unit level, depicting the activity and time associated with each phase. The mobilization activity duration can

[61] Joint Staff, *DODI 1235.32* (2017), 18.

[62] United States Code, Title X, sec. 12406.

vary widely in Phase IV: Mobilization Station. A unit may need to complete additional training, cross level equipment or personnel, and receive unit validation. Depending on the readiness of the reserve component unit, in regards to the five-year cycle, it could take up to one hundred and eighty days to complete Phase IV.[63]

POL Force Structure

To better understand POL unit capabilities and force allocation, this section provides a brief overview of unit equipment sets, specifically looking at the transportation capability of CL III (B) fuel requirements. The transportation capability will determine the type of unit used in the analysis section of this paper, with the total unit allocation found in table 4.

The Petroleum Support Company (PSC) provides wholesale area support, with a limited transportation capability. It is resourced with fifteen M969 5,000-gallon tankers, three 120k gallon and six 300k gallon FSSP distribution systems. The limitation in utilizing an FSSP distribution system is the extended time required for site preparation, emplacement of the collapsible fabric bag, and throughput of fuel to fill the system. Elements of the PSC can be in the brigade support area, but the time required to prepare the FSSP distribution system limits their use below the division level. The PSCs are distributed across active and reserve forces, with four companies in the active duty, and twenty-five companies in the USAR.[64]

The Composite Supply Company (CSC) is a multi-class supply company, that can receive, store, and issue bulk fuel. The CSCs are normally assigned to a Combat Service Support Battalions (CSSB). Their equipment includes one 300k gallon and two 120k gallon FSSP distribution systems. Their CL III (B) transportation include six heavy expanded mobility tactical truck tankers that hold 2,500 gallons, twenty 2,500-gallon trailers referenced as tank rack

[63] US Department of the Army, *Army Mobilization and Deployment Reference (AMDR)* (Washington, DC: Government Printing Office, 2018), 11.

[64] US Army Petroleum Center, *Petroleum Planning and Operations Smart Book,* 6.

modules (TRMs), and twelve M969 5,000-gallon tankers. The CSC are allocated across the formation, with thirteen assigned to the active duty, and eight to the USAR.[65]

The Medium Truck Company (POL, 7.5K) Echelon Above Brigade (EAB) Linehaul unit is normally assigned to a petroleum support battalion, but can be integrated into a sustainment brigade or CSSB.[66] This unit provides a substantial amount of CL III (B) transportation capacity with sixty M1062 7,500-gallon tankers. These large tankers utilize M915 tractors, which are very similar in appearance and capability associated with civilian over the road semi-trucks. Their size and maneuverability limit rough terrain capability, and restrict their movement from the DSA to forward unit locations. All eight of the 7.5k medium truck companies reside in the USAR.[67]

The smaller Medium Truck Company (POL, 5k) EAB Linehaul is also normally assigned to a petroleum support battalion, but can be integrated into a sustainment brigade or CSSB. The MTOE authorizes sixty M967 5,000-gallon tankers, along with sixty M915 tractors. With a shorter trailer and less fuel weight than their 7.5k sister company, the 5k medium truck companies are more maneuverable. But they are still constrained by the same M915 tractors limited off-road ability to transport forward of the DSA. There are twenty companies, two in the ARNG and eighteen in the USAR.[68]

The Medium Truck Company (POL, 5k) EAB Tactical delivers bulk fuel in the corps or division area of operations and are assigned to a sustainment brigade or CSSB. Sixty Medium Tactical Vehicle (MTV) tractors transport sixty M967 5,000-gallon tankers. The MTV provides off-road capability that can deliver fuel directly to the Brigade Support Area in austere environments. There are eight companies, with four active duty and four in the ARNG.[69] The four

[65] US Army Petroleum Center, *Petroleum Planning and Operations Smart Book*, 12.

[66] Ibid., 17.

[67] Ibid.

[68] Ibid., 18.

[69] Ibid., 19.

active duty units are located with two in the continental United States, one in Germany, and one in Korea.[70] Even with the geographic separation, all four active companies could be employed to support operations if required.

Additional fuel assets are internal to brigade level units, located in their respective brigade support battalion. The BCT designation of infantry, airborne, stryker, or armored determines the task organization of the BSB, with armored support units having the ability to transport the most fuel at 240k gallons. The remaining bulk fuel capacities of the various BSBs are infantry with 90k gallons, airborne with 90k gallons, and stryker with 110k gallons. All battalions utilize the heavy expanded mobility tactical truck tankers with TRMs to transport bulk fuel. Though doctrinally a BSB could be task organized to a sustainment brigade or CSSB, they generally remain internal to their supported brigade. There are twenty-eight Infantry, five Airborne, fifteen Armored, and nine Stryker BSBs.[71] The unit allocation is dispersed, with thirty-one active duty, and twenty-six in the ARNG. Additional support battalions are task organized to support brigades like the Maneuver Enhancement Brigade, or the Fires Brigade. They vary in composition, and are resourced to provide logistical support to their modified table of organization and equipment (MTOE) units.

To allow for contingency's, there are a limited number of equipment sets prepositioned in strategic locations around the globe. The Army Prepositioned Stock (APS) program provides the capability to rapidly equip forces until lines of communication are established.[72] The APS are located on land in Korea, Europe, and Southwest Asia, with prepositioned BCT equipment sets, operational project stocks, and sustainment stocks.[73] The APS can also be found at sea, loaded

[70] US Army Petroleum Center, *Petroleum Planning and Operations Smart Book*, 19.

[71] Ibid., 20-23.

[72] US Army, *ADRP 4.0* (2012), 3-6.

[73] Ibid.

primarily with an Infantry Brigade Combat Team, and associated logistical support.[74] There are seven POL transportation company equipment sets distributed across the five APS locations.[75]

Large-Scale Combat Operations

Multi-division and corps operations in LSCO are expected to be on a scale not seen in twenty years. Several considerations of LSCO, regarding logistics, are articulated in FM 3-0. Enemy fires "…combined with long-range rockets, cruise and ballistic missiles with an integrated fires command, challenge the joint force's ability to project into, and operate within, a theater of operations."[76] During offensive operations, US Army forces are expected to maneuver quickly along multiple axis, come together during windows of opportunities to mass effects, then disperse to avoid becoming lucrative targets for enemy fires.[77] Logistics will have to relocate operations more often to survive the increased indirect fires threat, limiting the use of CL III (B) FSSP distribution systems forward of the corps support area. Initially, this would require CL III (B) transportation throughput to brigade units.

Large-scale combat operations will pose a significant sustainment challenge due to the presence of conventional and non-conventional threats.[78] Sustainment requirements will change rapidly due to the enemy threat. This will require that sustainment units operate in a dispersed manner to reduce their vulnerability.[79] The challenge for sustainment planners will be to ensure continuous support to combat formations.[80] This study will disperse units across the CSA, the distances associated with unit placement will be essential to determine operational requirements.

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[74] US Army, *ADRP 4.0* (2012), 3-7.

[75] US Army Petroleum Center, *Petroleum Planning and Operations Smart Book*, 30.

[76] US Army, *FM 3-0* (2017), 1-3.

[77] Ibid., 1-4.

[78] Ibid., 2-62.

[79] Ibid., 7-15.

[80] Ibid., 7-20.

The shift to LSCO will focus on employing forces at the corps and division level.[81] Command and control of logistics at the corps level will require the employment of a Theater Sustainment Command (TSC), or an Expeditionary Sustainment Command (ESC). A Theater Sustainment Command is focused on strategic and operational sustainment management, and can task organize and deploy an ESC to work directly for a corps to conduct sustainment operations.[82] The ESC manages the corps support area with assigned or attached sustainment brigades. Current doctrine states that a "sustainment brigade will typically establish a base within its assigned support area to provide centralized control of operations. Unless a sustainment brigade is in direct support to a division, the area in which a sustainment brigade operates is different than divisional boundaries."[83] The location of the logistical support is at the commander's discretion. He will use variables such as mission, enemy, terrain and weather, troops available, time available, and civil considerations (METT-TC) to determine the optimal distance to support from. The time it takes for support to reach the supported unit is the primary consideration for unit placement. Generally, logistics units should be able to distribute to supported units and return to their point of origin in the same day.[84]

[81] US Army, *FM 3-0* (2017), 1-15.

[82] US Department of the Army, *Army Techniques Publication (ATP) 4-94, Theater Sustainment Command* (Washington, DC: Government Printing Office, 2013), 1-1.

[83] US Department of the Army, *Army Techniques Publication (ATP) 4-93, Sustainment Brigade* (Washington, DC: Government Printing Office, 2016), 5-5.

[84] Ibid., 5-6.

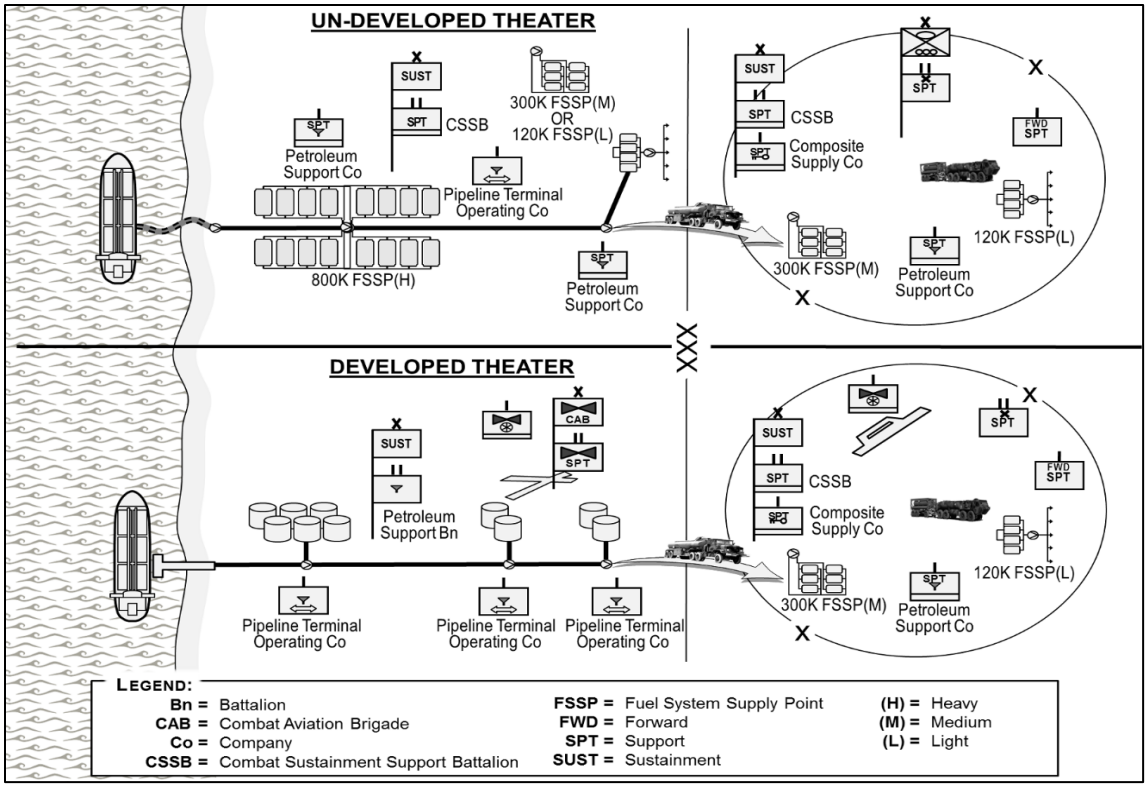

Figure 3. Un-Developed/Developed Petroleum Distribution Network. US Department of the Army, *Army Techniques Publication (ATP) 4-43, Petroleum Supply Operations* (Washington, DC: Government Printing Office, 2015), 1-2.

As previously described, distribution of fuel using CL III (B) transportation assets will be a significant requirement during LSCO, as the employment of corps sized elements will require an extensive distribution network. "There is no particular arrangement of the undeveloped/developed petroleum supply chain layout in a theater of operations. The organizations and equipment involved is determined by the area of operations and the operational environment."[85] Figure 3 is the un-developed and developed theater of operations, the similarities in both petroleum distribution networks is the requirement to distribute from the corps area to the division area of operations.

To determine the fuel distribution required during LSCO, historical doctrine was assessed to determine the associated distances to conduct logistical operations. The *Army Techniques*

[85] US Army, *ATP 4-43* (2015), 1-2.

Publication (ATP) 4-93, Sustainment Brigade in 2013 stated "As a general guideline for planning to ensure timely delivery of support, the distance between sustainment brigade's supporting units should be from 60km to 175 km."[86] To gain greater insight on the distances associated with LSCO, AirLand-Battle doctrine from the 1980s describes large scale operations, with additional logistical considerations outlined in *Field Manual (FM) 63-3J, Combat Service Support Operations- Corps* (figure 4). This doctrine from 1985 provides the operational area of a corps supporting three divisions, and encompasses a potential area of 200 by 100 kilometers. These battlefield distances help predict logistical requirements for large scale operations.

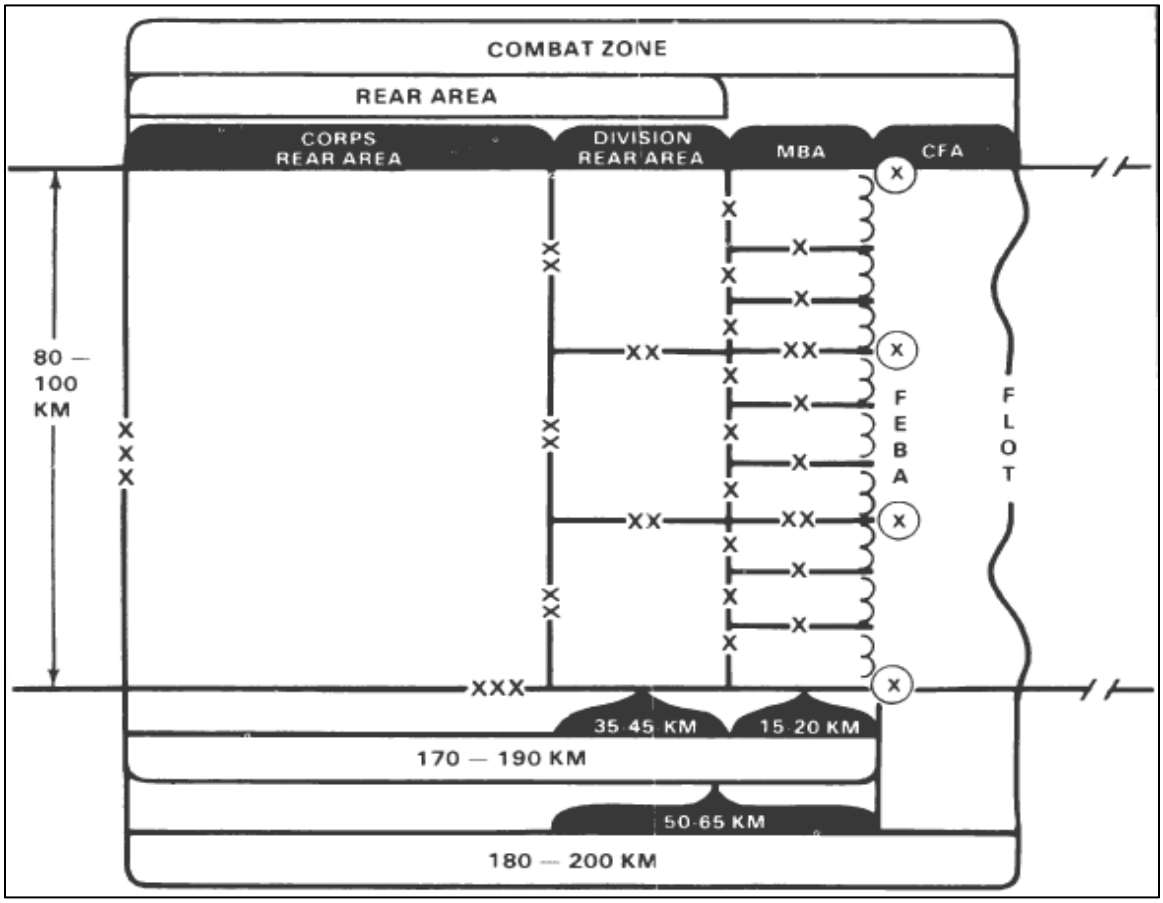

Figure 4. The Corps Battle Area. US Department of the Army, *Field Manual (FM) 63-3J, Combat Service Support Operations-Corps: Logistics* (Washington, DC: Government Printing Office, 1985), 2-7.

[86] US Department of the Army, *Army Techniques Publication (ATP) 4-93, Sustainment Brigade* (Washington, DC: Government Printing Office, 2013), 2-8.

III. Methodology

This study will use a qualitative methodology utilizing current and historical doctrine, and open source information to estimate the CL III (B) transportation requirements in LSCO. To define the daily CL III (B) transportation requirements, this study utilized a corps task organization that is based on 3rd Corps employing three armored divisions, comprised of the 1st Armored, 1st Cavalry, and 1st Infantry Divisions. Additional corps and division enablers, such as Air Defense, Artillery, Aviation, Engineer, Signal, and Maneuver Enhancement Brigades were added to the task organization (see Appendix A). To simplify the math, and acknowledge that the sustainment brigade commander could task organize logistics, unit integrity was maintained, and the division distribution requirement was calculated in accordance with Appendix A.

The expeditionary sustainment command (ESC) will position the required CL III (B) assets in the theater Army Support Area. A petroleum pipeline, or a high-volume source of fuel delivery, will resource the corps support area (CSA), but will not be employed forward of the CSA. The FSSP distribution systems, which are large collapsible fabric bulk fuel storage tanks, are employed. The requirement to fill FSSP distribution systems will not be part of the daily CL III (B) transportation estimates. The daily throughput of CL III (B), using various sustainment nodes from the corps support area to the brigade support area, will be the base estimate used to determine the daily CL III (B) ground transportation requirements. The APS will not be captured in the analysis.[87] All units will be dispersed across the corps support area due to the increased threat of enemy indirect fire, and FOBs will not be a viable option to extend operational reach. The Combined Arms Support Command (CASCOM) approved Quick Logistical Estimation Tool

[87] The utilization of APS could increase the responsiveness of mobilization, if the unit was fully trained and certified. Selecting a unit outside their readiness module window will not guarantee the unit is fully capable to mobilize directly to an APS equipment set to conduct operations.

(QLET) was used calculate daily CL III (B) requirements. The QLET is an excel-based program used to establish daily fuel consumption and transportation requirements.[88]

IV. Estimation of the Requirements

Defining the corps area of operation in LSCO is necessary to estimate the operational requirement to transport CL III (B).[89] Operation Desert Storm provides a historical snapshot of a corps support area. On February 24, 1991, the United States launched Operation Desert Storm to remove Iraqi forces from Kuwait.[90] The 2nd Corps Support Command established a corps support area to logistically support operations. The 2nd Corps Support Command supported 7th Corps across an operational width of 140 kilometers and a depth of 190 kilometers. Although 7th Corps was tasked organized with four divisions, the 140 kilometers is the calculated distance of three divisions.[91] Similar to the Desert Storm example, a task organization of 3rd Corps employing three armored divisions, comprised of 1st Armored, 1st Cavalry, and 1st Infantry (Appendix A) was used to determine the daily CL III (B) requirement for this project. The unit locations and associated distances were determined by utilizing AirLand Battle doctrine combined with historical references. This resulted in the estimated LSCO area of operations using 200 by 140 kilometers for planning considerations (figure 5).

[88] Planning Data Branch, "Quick Logistical Estimation Tool (QLET)" (Microsoft Excel Spreadsheet, CASCOM, Ft Lee, VA, January 2019).

[89] The author acknowledges by not fully calculating all logistical requirements, it is not possible to capture the entire CL III (B) requirement. But the intent is to provide a generic overview of the CL III (B) requirement in LSCO., maximum daily CL III (B) is used in calculations to provide flexibility for this.

[90] Institute of Land Warfare, *Operations Desert Shield and Desert Storm: The Logistics Perspective* (Arlington, VA: Association of the United States Army, 1991), 1.

[91] Ibid., 17.

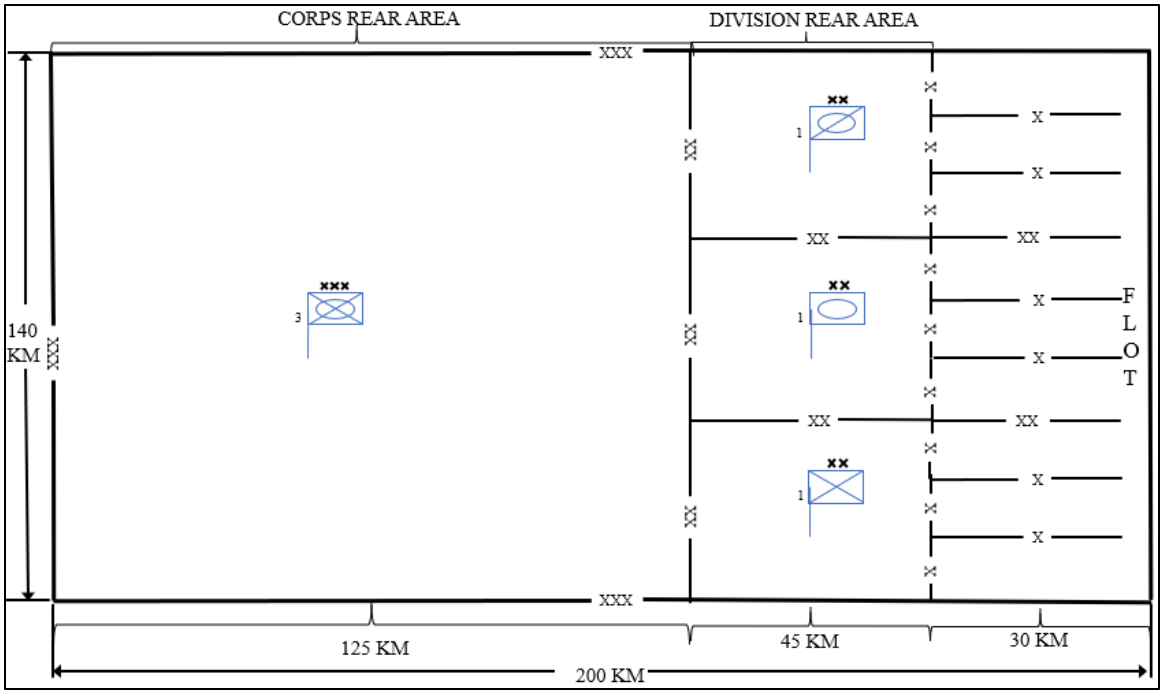

Figure 5. LSCO Corps Area of Operations. Created by author.

With the task organization identified, it was possible to calculate the daily CL III (B) requirement. The daily fuel requirement for each unit was calculated by utilizing the QLET.[92] Each unit was inputted into QLET according to the task organization. Unit requirements were calculated and aggregated into brigades, or if there was no brigade, such as a division headquarters battalion or division enablers, the unit was calculated separately. Figure 6 shows the calculation of an Armored Brigade Combat Team (ABCT), and figure 7 shows the max daily fuel required.[93] A complete rollup of the 3rd Corps CL III (B) daily consumption is found in Appendix B. Table 1 shows the maximum total daily CL III (B) requirement for the 1st Cavalry Division.

[92] Planning Data Branch, "Quick Logistical Estimation Tool (QLET)."

[93] The author utilized the maximum daily amount in the calculations to account for worst case scenario.

SRC	TITLE	Strength	# of Each YOU INPUT!	Fuel III(B) Gallons Fuel Max
87312K000	HEADQUARTERS AND HEADQUARTERS COMPANY, ARMOR	132	1	1999.680948
17315K000	CAVALRY SQUADRON (ABCT)	457	1	15883.11309
07315K000	COMBINED ARMS BATTALION (INF) (ABCT)	513	1	15670.64547
07315K100	COMBINED ARMS BATTALION (ARMOR) (ABCT)	439	2	20673.35449
06385K000	FIELD ARTILLERY BATTALION, 155SP (ABCT)	506	1	8111.042062
05315K500	BRIGADE ENGINEER BATTALION (BEB), ABCT (RECA	459	1	11179.2835
63025K000	BRIGADE SUPPORT BATTALION (ABCT)	1359	1	24826.61909

Instructions | Unit_List | Build_a_Force_File | RequirementsSummary

Figure 6. QLET Screenshot of ABCT unit listing. Planning Data Branch, "Quick Logistical Estimation Tool (QLET)" (Microsoft Excel Spreadsheet, CASCOM, Fort Lee, VA, January 2019).

Total Strength:	4,304			
		Rate	Gallons	LBS
Class I		8.55		36,799
Class II		1.555		6,693
Class III	Bulk	MAX	119,017	
	Package	MAX		22,375
Class IV	Barrier/Fortification	2.34		10,071
	Construction	3.32		14,289
Class V	NOTE: MIN, MAX, AVG are only applicable to MCO	MAX		62,331
Class VI	Basic	0.336		1,446
	Additional	0		0

Figure 7. QLET Daily Max Fuel calculated for ABCT. Planning Data Branch, "Quick Logistical Estimation Tool (QLET)" (Microsoft Excel Spreadsheet, CASCOM, Fort Lee, VA, January 2019).

Table 1. 1st Cavalry Division Maximum Daily CL III (B) Consumption

1st CAV DIV Total Requirement: 523,948g				
Unit	1-1 CAV	2-1 CAV	3-1 CAV	1CD CAB
Requirement	119,017g	119,017g	119,017g	82,020g
Unit	1CD DIV ARTY	1CD SUS BDE	26th MEB	Enablers
Requirement	10,159g	39,856g	25,411g	4,768g

Source: Planning Data Branch, "Quick Logistical Estimation Tool (QLET)" (Microsoft Excel Spreadsheet, CASCOM, Fort Lee, VA, January 2019). Note: Consumption calculated from QLET, referenced units in Appendix A.

By utilizing the task organization to perform bottom up refinement, it was possible to take each brigade and separate unit inside a division to determine the daily CL III (B) requirement. The total daily maximum requirement of CL III (B) for 1st Cavalry Division was 523,948 gallons (table 1). This is the daily amount that required delivery from the corps support area to the sustainment brigade. Though table 1 shows 39,856 gallons required for 1st Cavalry Division Sustainment Brigade, this is the daily requirement to conduct operations internal to that brigade. As the focal point for all sustainment in the division, the sustainment brigade has the daily requirement to distribute CL III (B) to logistically support all attached units.

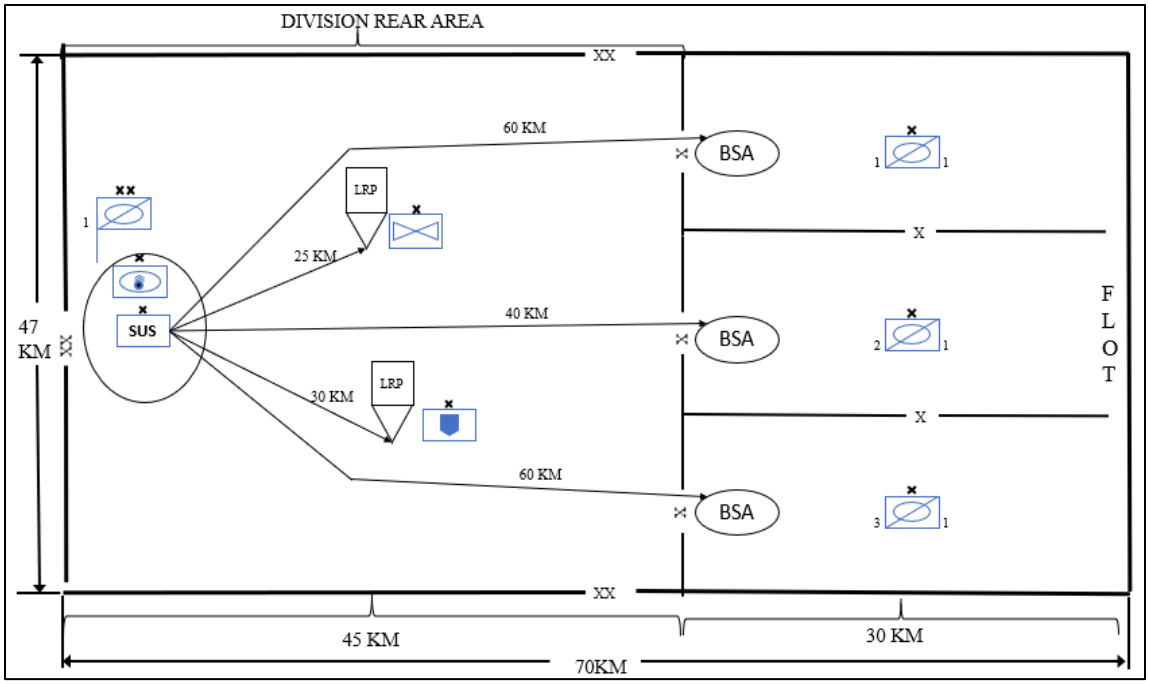

Figure 8. Generic Simulated Division Logistics Distribution Plan. Created by author.

By estimating the doctrinal distance associated with each unit location, figure 8 shows the distribution network necessary for the 1st CD Sustainment Brigade to transport the daily CL III (B). The sustainment brigade provides unit distribution to the supported maneuver brigades (ABCT), the aviation brigade, and the maneuver enhancement brigade. The division artillery brigade, division enablers, and the division headquarters battalion conducted supply point distribution from the DSA. The sustainment brigade delivered to five customers daily, covering over 215 kilometers (see table 2). Appendix B has each division sustainment brigades' daily requirements broken down by customer.

The distance traveled from the sustainment brigade to the supported unit determined the number of trips conducted per day using local or line haul calculations. Based on doctrine, the distance for local haul is thirty-two kilometers one way, or sixty-four kilometers round trip.[94] Line haul planning factors use a one-way distance of 144 kilometers.[95] This was based on a duty

[94] US Army, *FM 55-15* (1997), 3-12.

[95] Ibid.

day of twenty hours broken up into two ten-hour shifts, with four hours for scheduled maintenance.[96] The ability to conduct local or line haul heavily influenced the transportation assets needed to deliver CL III (B), with local haul doubling the amount of fuel delivered daily. Table 2 defines each mission by the 1st Cavalry Division Sustainment Brigade, the distance required to deliver the CL III (B), and if multiple trips per day were possible by doctrine. The entire 3rd Corps data calculations are found in Appendix B.

Table 2. 1st CAV DIV CL (III) B Origin/Destination in relation to Distance/Requirement

Mission	Distance/CL III (B) Req	Local/Line Haul
1CD SUS to 1-1CAV	60 km/119,017 gal	Line Haul
1CD SUS to 2-1CAV	40 km/119,017 gal	Line Haul
1CD SUS to 3-1CAV	60 km/119,017 gal	Line Haul
1CD SUS to 1CD CAB	25 km/82,020 gal	Local Haul
1CD SUS to 26th MEB	30 km/25,411 gal	Local Haul

Source: Created by author, using Planning Data Branch, "Quick Logistical Estimation Tool (QLET)" (Microsoft Excel Spreadsheet, CASCOM, Fort Lee, VA, January 2019). Note: Distance referenced from figure 8, daily fuel calculated from QLET.

The sustainment brigade had one assigned composite supply company located in the combat service support battalion to conduct CL III (B) distribution. This force structure was adequate to support division operations in garrison, because the brigade support battalions can use supply point distribution. However, in LSCO there will be a requirement to augment the sustainment brigade. The CSC has an internal capability to transport 105k gallons of fuel, this is 15k gallons short of supporting even one brigade, justifying the additional requirement for transportation assets.

With division requirements calculated (Appendix B), the corps support area geometry was defined. To place units in the corps area of operations, to determine distance factors, there

[96] US Army, *FM 55-15* (1997), 3-12.

were some doctrinal assumptions made of unit locations. The fires brigade was postured forward inside the corps rear area to facilitate operational reach, and received unit distribution of support requirements. The maneuver enhancement, aviation, and air defense brigades remained centrally located in the corps area and received unit distribution of support requirements. The medical, signal and headquarter units were in the vicinity of the ESC and utilized supply point distribution (figure 9).

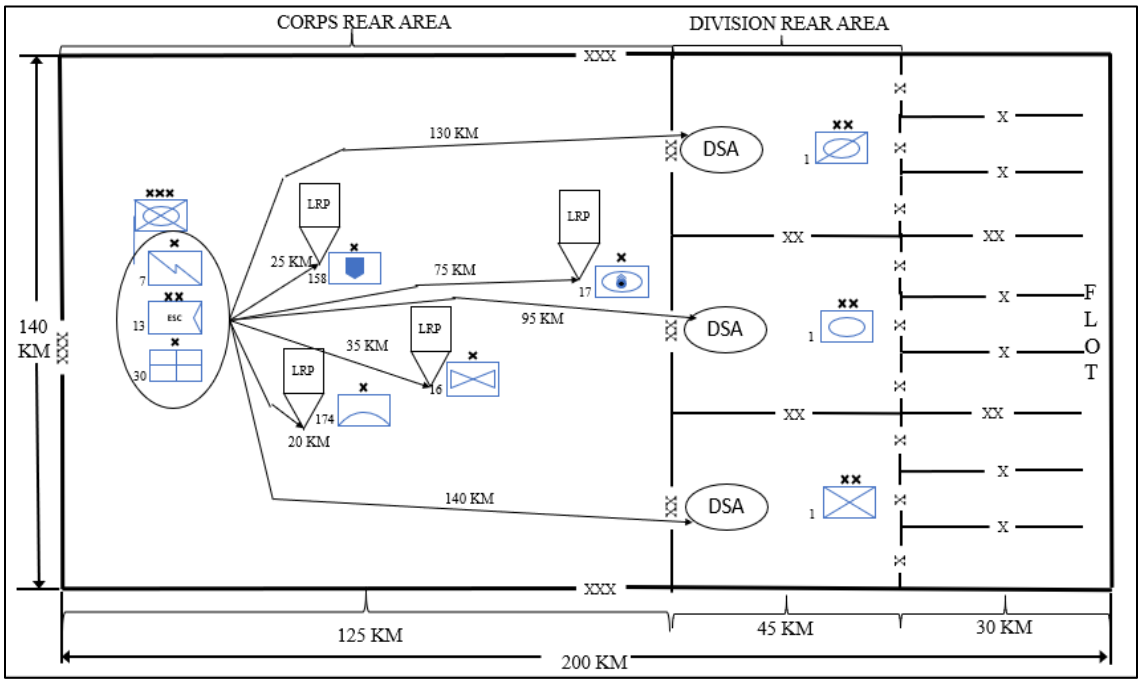

Figure 9. Generic Simulated Corps Logistics Distribution Plan. Created by author.

With the corps and divisions unit locations identified, and logistical distribution plan depicted, the complete CL III (B) daily requirement for transportation was estimated. The total daily requirement from the corps support area is portrayed in table 3, showing the distribution of over 1.6 million gallons of fuel along a network that stretches 520 kilometers.

Table 3. 13th ESC CL (III) B Origin/Destination in relation to Distance/Requirement

Mission	Distance/CL III (B) Req	Local/Line Haul
13 ESC to 1 CD	130 km/523,948 gal	Line Haul
13 ESC to 1 AD	95 km/535,403 gal	Line Haul
13 ESC to 1 ID	140 km/426,119 gal	Line Haul
13 ESC to 158 MEB	25 km/62,900 gal	Short Haul
13 ESC to 17 FA BDE	75 km/14,026 gal	Line Haul
13ESC to 16 CAB	35 km/52,936 gal	Short Haul
13ESC to 174 ADA BDE	20 km/12,430 gal	Short Haul

Source: Created by author, data from Planning Data Branch, "Quick Logistical Estimation Tool (QLET)" (Microsoft Excel Spreadsheet, CASCOM, Fort Lee, VA, January 2019). Note: Distance referenced from figure 9, daily fuel calculated from QLET.

V. Analysis

With the estimated daily maximum requirement of CL III (B) for the corps area of operations determined, the total number of transportation and POL logistic companies required to support the daily fuel infrastructure was calculated. The variables used to calculate the number of companies required to support distribution from the corps, division, or brigade support areas were required CL III (B) gallons, divided by the number of vehicles multiplied by tank holding capacity, and multiplied by the Total Vehicle Availability Rate (TVAR). This formula was expressed as:

$$\left(\frac{\text{Gallon Requirement}}{(\#\ \text{Vehicles x Gal Capacity}) \text{ x } (\text{TVAR}/100)} \right) = \%\ \text{of Company Utilized}$$

Figure 10. Formula to Calculate percentage of Company Utilized. Created by author.

If the requirement was a local haul, the percentage of company utilized was divided by half to represent one leg of a potential multiple leg day. Line haul was a direct reflection of the

percentage of the company utilized. The type of vehicle was dependent on which unit was assigned to perform the task. If a 7.5k gallon unit was selected, sixty M915 tractors with a 7,500-gallon trailer was inputted. When considering what type of unit to select, the following framework was used. The utilization of active duty units first due to the responsiveness to mobilize, with echelon above brigade units used in the corps rear area due to the decreased maneuverability of the vehicles.[97] Any tactical units were used in the division area or forward due to increased maneuverability. With reserve component units having only one-fifth of their forces available immediately, utilizing only 20 percent of each type of reserve component unit was attempted. Any delivery forward of the DSA would potentially be in an austere off-road environment, and the M969/M67 trailer capacity would drop from 5,000 to 3,000 gallons.[98] A roll-up of available units available and distribution capability is below in table 4.

Table 4. Total Army POL Unit Allocation and Distribution Capability

Unit Type	Active Duty	ARNG	USAR	TOT # CO	Truck	# TRK's	Trailer	Capacity On/Off Road
Petr Supp CO (PSC)	4	0	25	29	M915	15	M969	5000/3000
Composite Supply CO	13	8	0	21	HEMTT	6	SEE TRM	2500/2500
					TRM	20	TRM	2500/2500
					MTV	12	M969	5000/3000
MED TRK (POL,7.5k) EAB	0	0	8	8	M915	60	M1062	7500/NA
MED TRK (POL,5k) EAB	0	2	18	20	M915	60	M967	5000/3000
MED TRK (POL,5k) EAB TAC	4	4	0	8	MTV	60	M967	5000/3000

Source: US Army Petroleum Center, *Petroleum Planning and Operations Smart Book* (Washington, DC: Government Printing Office, 2017), 6-18.

[97] Unit integrity was maintained, the intent was not to strip five vehicles from several companies to make up an ad-hoc unit. Administrative and maintenance issues could result from this action.

[98] US Army, *ATP 4-43* (2015), N-1.

Using the formula from figure 10, the requirement to deliver CL III (B) from the 13th ESC to the 1st CD Sustainment Brigade was 523,948 gallons. This was over 130 kilometers, and required a long-haul trip. Delivery was accomplished using a Medium Truck Company (POL, 7.5k) EAB. A TVAR value of 87.5 percent is associated with the M915 used by that company.[99]

$$\left(\frac{523{,}948 \text{ gal}}{(60 \text{ M915} \times 7{,}500 \text{ gal}) \times (87.5/100)} \right) = 1.33 \text{ MED TRK CO (POL 7.5k) EAB Required}$$

Figure 11. Calculated percent of unit's requirement to deliver from 13ESC to 1CD SUS. Created by author.

The calculated unit percentage was 1.33 7.5k Medium truck companies necessary to sustain the daily requirement of CL III (B) from the 13th ESC to the 1st Cavalry Division. The aggregate for the entire daily requirement from 13th ESC to all three divisions was calculated at 3.77 7.5k Medium Truck Companies required. Rounding this requirement up to four medium truck companies are required daily to execute delivery to all three division support areas. The four 7.5k Medium Truck Companies reflected 50 percent of units found in the USAR, and exceeded the USAR five-year cycle availability of 20 percent. This created a logistical puzzle selecting units, while keeping the total percentage of employed units low. Through trial and error, it was possible to shift requirements across all available units, keeping the overall calculated percentage of reserve component unit utilization low. Calculating the total requirement to distribute CL III (B) to all the units in the 3rd corps resulted in seventeen companies, one petroleum support company, three composite supply companies, three 7.5k Medium Truck Companies, six 5k Medium Truck Companies EAB, and four 5k Medium Truck Companies EAB Tactical (Appendix C).

[99] US Army, *FM 55-15* (1997), C-3.

Table 5. CL III (B) Units required to support operations by Company.

Unit Type	Active Duty (REQ/TOT)	ARNG (REQ/TOT)	USAR (REQ/TOT)
Petroleum Support CO (PSC)	1/4	0	0/25
Composite Supply CO (CSC)	3/13	0/8	0/0
MED TRK CO (POL,7.5k) EAB	0/0	0/0	**3/8**
MED TRK CO (POL,5k) EAB	0/0	0/2	**6/18**
MED TRK CO (POL,5k) EAB TAC	4/4	0/4	0/0

Source: Created by author. Note: Calculated using equation in figure 10, shown in Appendix C.

The units required to support 3rd Corps CL III (B) transportation are in table 5. The highlighted units in the USAR column are required capabilities that will exceed the five-year cycle availability of 20 percent. The 7.5k Medium Truck Company EAB will use three USAR companies, or 38 percent of available forces, requiring the additional two companies mobilized out of cycle. The 5k Medium Truck Company EAB will use six USAR units, or 33 percent of available forces, requiring three companies that must be mobilized outside the five-year cycle.[100]

Twelve of the seventeen units required to support the 3rd Corps would have to either come from active duty forces, or within the five-year cycle of the reserve component, to mobilize and deploy within thirty days of notification. The remaining five USAR companies could mobilize upon receipt of official notification, and potentially take up to 180 days depending on the current readiness status inside their fiver-year training cycle.[101]

[100] For note, if the same calculation for the Corps sustainment is applied using the average fuel consumption, with a non-doctrinal TVAR value of 75 percent (CGSC Student Text 4-2) the overall change is four Medium Truck Company (POL, 5k) EAB instead of six.

[101] The reason that ARNG units are not selected is regardless of utilizing a Medium Truck Company (POL, 5k) EAB or EAB TAC to augment active forces, they immediately exceed the 20 percent utilization rate. The author believes capturing the requirement within the USAR conveys the same point.

VI. Conclusion and Recommendations

In the future, LSCO will focus on employing forces at the corps and division level.[102] This change in focus has created a shift from a brigade logistical infrastructure, to a corps and division-based system. This will create several challenges in logistical support because the total force policies adopted after the Vietnam War shifted 70 percent of the combat service support units to the USAR. The transfer of logistical units due to force structure changes from the organizational restructuring of the US Army, along with the shift from division to brigade centric operations to support COIN has made the active force heavily reliant on the reserve component. The mobilization timelines for reserve component units can range from 30 to 180 days, which may not be responsive enough. Allocating the preponderance of bulk fuel transportation capability to the reserve component is a challenge to support LSCO.

The overarching research question was defining the corps support area and determining the transportation requirements to support Corps operations within 90 days. The corps sustainment battlefield geometry used for this project was determined using past doctrine and historical references. This battlefield geometry allowed the estimation of the daily CL III (B) requirements for the corps, including three armored divisions with associated enablers. Using the daily estimated CL III (B) requirement, it showed that seventeen petroleum companies were necessary to provide the daily transportation of fuel. Of the seventeen units, five USAR companies were outside the five-year training cycle deploy ability window. Without these forces available, the US Army may not be able to conduct operations as outlined in this paper within ninety days.

To logistically support a corps fight with multiple divisions, it will be necessary to increase the operational readiness and availability of POL bulk transportation companies in the US Army. There are two recommendations to mitigate this problem. The first would require a

[102] US Army, *FM 3-0* (2017), 1-15.

change in force structure. With the addition of three Medium Truck Company (POL, 5k) EAB Tactical units to the Active Duty force structure, and four Medium Truck Company (POL, 5k) EAB Tactical to the Reserves. This would significantly improve the responsiveness of sustainment units to support the distribution of CL III (B) in LSCO. The EAB Tactical unit, utilizing the MTV prime mover will allow greater flexibility to logistically support austere environments if required. The second recommendation would be to change the USAR readiness to the Sustained Readiness Module program, with the goal to achieve a 50 percent readiness to support LSCO. This would ensure the ability to rapidly mobilize sufficient sustainment capability to support the readiness of the US Army as it moves from COIN to LSCO.

Appendix A-Task Organiziation

III Corps
- HHBN, 52400K300
- 109th MI INTEL BN, 34425K000

1st CAV DIV
- HHBN, 87000K100

1-1 CAV
- HHC, 87312K000
- 1-12 CAV, 07315K100
- 2-5 CAV, 07315K000
- 2-8 CAV, 07315K100
- 1-7 CAV, 17315K000
- 1-82 FA, 06385K000
- 91 EN, 05315K500
- 115 BSB, 63025K000

2-1 CAV
- HHC, 87312K000
- 4-9 CAV, 17315K000
- 1-5 CAV, 07315K000
- 1-8 CAV, 07315K100
- 1-9 CAV, 07315K100
- 3-16 FA, 06385K000
- 8 EN, 05315K500
- 15 BSB, 63025K000

3-1 CAV
- HHC, 87312K000
- 6-9 CAV, 17315K000
- 3-8 CAV, 07315K000
- 1-12 CAV, 07315K000
- 2-7 CAV, 07315K000
- 2-82 FA, 06385K000
- 3 EN, 05315K500
- 215 BSB, 63025K000

1st CD CAB
- HHC, 01302K000
- 1-227 AV, 01285K000
- 2-227 AV, 01225K000
- 3-227 AV, 01205K000
- 7-17 CAV, 01285K100
- 615th ASB, 63375K000
- F Co- 227 AV, 01707K000

1st CAV DIVARTY
- HHB, 06333K000
- 1-181 FA, 06475K000
  - 181st FSC, 63447K000
- 1-142 FA, 06465K000
  - 936th FSC, 63407K000
- 217th BSB, 63406K000

1st CAV SUS BDE
- HQSTB, 63302K000
- 502nd PER CO, 12410K100
- 15th FMSU, 14420K000
- 207th SC CO, 11307K600
- 81st AG DET, 12567KA00
- 553RD CSSB
  - HHD, 63426K000
  - 664th OD CO, 09410K000
  - 120th QM CO, 10450K000
  - 289th QM CO, 10473K000
  - 96th TC CO, 55663K000
  - 154th TC CO, 55433K000
  - 602nd MNT CO, 43430K000

26th MEB
- HHC, 37342K000
- 26th SC CO, 11307K600
- 211th MP BN
  - HHD, 19476K000
  - 772 MP CO, 19463K000
  - 972 MP CO, 19463K000
- 391st MP BN
  - HHC, 19646K000
  - 342nd MP CO, 19463K000
  - 375th MP DET, 19883K000
  - 447th MP CO, 19463K000
  - 256th MP CO, 19653K000
- 101st EN BN,
  - HHC, 05435K000
  - 181st EN CO, 05420K000
  - 182nd EN CO, 05330K200
  - 188th EN CO, 05420K000
  - 379th EN CO, 05340K000
  - 126th BSB, 63455K000

2-174 ADA, 44615K600
744th OD CO (EOD), 09440K000
401st CA BN, 41745K000
13th PSYOP BN, 33736K100
2225th MOBILE PUBLIC AFFAIRS DET, 45607K000

1st AR DIV
HHBN, 87000K100

1-1 AD
HHC, 87312K000
6-1 CAV, 17315K000
1-36 IN, 07315K000
4-17 IN, 07315K100
3-41 IN, 07315K100
2-3 FA, 06385K000
16th EN, 05315K500
501st BSB, 63025K000

2-1 AD
HHC, 87312K000
1-1 CAV, 17315K000
1-6 IN, 07315K000
1-35 AR, 07315K100
1-37 AR, 07315K100
4-27 FA, 06385K000
40th EN, 05315K500
47th BSB, 63025K000

3-1 AD
HHC, 87312K000
2-13 CAV, 17315K000
4-6 IN, 07315K000
1-77 AR, 07315K100
1-67 AR, 07315K100
4-1 FA, 06385K000
2nd EN, 05315K500
123rd BSB, 63025K000

1st AD CAB
HHC, 01302K000
3-6 CAV, 01285K100
1-501 AV, 01285K000
2-501 AV, 01225K000
3-501 AV, 01205K000
127th ASB, 63375K000
E CO- 501 AV, 01707K000

1st AD DIVARTY
HHB, 06333K000
24th PAD, 45423K000
3-197 FA, 06475K000
774th FSC, 63447K000
2-18 FA, 06465K000
69th FSC, 63407K000
372nd SC CO, 11307K500
3643rd BSB, 63406K000

1st AD SUS BDE
- HQSTB, 63302K000
- 178th PER CO, 12410K100
- 261st SC CO, 11307K600
- 4th FMSU, 14420K000
- 142nd CSSB
  - HHC, 63426K000
  - 153rd QM CO, 10450K000
  - 504th QM CO, 10473K000
  - 47th TC CO, 55433K000
  - 377th TC CO, 55663K000
  - 606th TC DET, 55508KA00
  - 147th MAINT CO, 43430K000

404th MEB
- HHC, 37342K000
- 33rd MP BN
  - HHD, 19476K000
  - 233rd MP CO, 19463K000
  - 333rd MP CO, 19463K000
  - 933rd MP CO, 19463K000
  - 406th SC CO, 11307K600
- 117th MP BN
  - HHD, 19476K000
  - 252nd MP CO, 19463K000
  - 253rd MP CO, 19463K000
  - 269th MP CO, 19463K000
- 201st EN BN
  - HHC, 05435K000
  - 149th EN CO, 05420K000
  - 1438th EN CO, 05473K000
  - 207th EN CO, 05340K000
  - 220th EN CO, 05340K000
  - 235th EN CO, 05330K200
  - 577th EN CO, 05340K000
- 130th EN BN
  - HHC, 05435K000
  - 55th EN CO, 05330K400
  - 1138th EN CO, 05330K200
  - 1141st EN CO, 05330K200
  - 569th EN CO, 05330K400
- 489th BSB, 63455K000

3-265 ADA, 44615K600
21st OD CO (EOD), 09743K000
414th CA BN, 41745K000
15th PSYOP BN, 33736K400
1064th MOBILE PUBLIC AFFAIRS DET, 45607K000

1st IN DIV

HHBN, 87000K100

1-1 ID

HHC, 87312K000
1-4 CAV, 17315K000
1-16 IN, 07315K000
2-34 AR, 07315K100
3-66 AR, 07315K100
1-5 FA, 06385K000
1st EN, 05315K500
101st BSB, 63025K000

2-1 ID

HHC, 87312K000
5-4 CAV, 17315K000
1-18 IN, 07315K000
1-63 AR, 07315K100
2-70 AR, 07315K100
1-7 FA, 06385K000
82nd EN, 05315K500
299th BSB, 63025K000

2nd SCR (SBCT)

HHT, 47112K000
4-2 CAV, 17195K000
1-2 CAV, 07195K000
2-2 CAV, 07195K000
3-2 CAV, 07195K000
FAS-2 CAV, 06325K000
EN-2 CAV, 05315K700
SS-2 CAV, 63055K000

1st ID DIVARTY

HHB, 06333K000
1-14 FA, 06475K000
578th FSC, 63447K000
3-157 FA, 06475K000
188th FSC, 63447K000
100th BSB, 63406K000

1st ID CAB

HHC, 01302K000
1-6 CAV, 01285K100
1-1 AV, 01285K000
2-1 AV, 01225K000
3-1 AV, 01205K000
601st ASB, 63375K000
F CO- 1 AV, 01707K000

1st ID SUS BDE
HQSTB, 63302K000
258th PER CO, 12410K100
9th FMSU, 14420K000
267th SC CO, 11307K600
541st CSSB
HHC, 63426K000
511th QM CO, 10450K000
526th QM CO, 10473K000
24th TC CO, 55433K000
266th TC DET, 55508KA00
1st MNT CO, 43430K000

157th MEB
HHC, 37342K000
93rd MP BN
HHD, 19476K000
202nd MP CO, 19463K000
212th MP CO, 19463K000
591st MP CO, 19463K000
978th MP CO, 19463K000
430th MP DET, 19713K000
844th EN BN
HHC, 05435K000
41st EN CO, 05330K310
316th EN CO, 05330K400
365th EN CO, 05330K000
9088th EN CO, 05340K000
218th BSB, 63455K000
625th SC CO, 11307K600

1-174 ADA, 44615K600
55th OD CO (EOD), 09843K000
16th PSYOP BN, 33736K400
422nd CA BN, 41745K000
345th PUPLIC AFFAIRS DET, 45503KB00

17th FA BDE
HHB, 06433K000
1-94 FA, 06475K000
125th FSC, 63447K000
5-3 FA, 06475K000
657th FSC, 63447K000
2-4 FA, 06465K000
696th FSC, 63407K000
308th SPT BN, 63406K000
256th SC CO, 11307K500

16th CAB
- HHC, 01302K000
- 4-6 CAV, 01285K100
- 1-229 AV, 01285K000
- 2-158 AV, 01205K000
- 46th ASB, 63375K000

30th MED BDE
- HHC, 08420K000
- 865th CSH, 08945K000
- 212th CSH, 08945K000
- 47th CSH, 08945K000

158th MEB
- HHC, 37342K000
- 1-158 IN, 07215K000
- 850th MP BN
  - HHD, 19476K000
  - 860th MP CO, 19463K000
  - 856th MP CO, 19463K000
  - 855th MP CO, 19463K000
- 387th MP BN
  - HHD, 19476K000
  - 235th MP CO, 19653K000
  - 56th MP CO, 19463K000
  - 447th MP CO, 19463K000
- 153 Engineer Battalion
  - HHC, 05435K000
  - 155th EN CO, 05430K000
  - 200th EN CO, 05473K000
  - 211th EN CO, 05330K400
  - 842nd EN CO, 05340K000
  - 922nd EN CO, 05420K000
  - 235th EN DET, 05611KF00
- 111th Engineer Battalion
  - HHC, 05435K000
  - 772nd EN CO, 05330K400
  - 87th EN CO, 05330K000
  - 1013rd EN CO, 05330K200
  - 287th EN CO, 05330K400
- 139th BSB, 63455K000
- 365th SC CO, 11307K600
- 1-201st FA, 06455K100
- 2-44th ADA, 44655K000

174th ADA BDE
- HHB, 44602K000
- 1-7 ADA, 44635K000
- 3-4 ADA, 44645K100

7th SIG BDE
HHC, 11902R000
44th SIGNAL BN, 11975K000
62nd SIGNAL BN, 11975K000
51st SIGNAL BN, 11975K000

13th ESC
HHC, 63602K000

Source: Modified by author from Advanced Military Studies Program, Student Handout, Fort Leavenworth, KS, AY 2019.

Appendix B-Daily CL III (B) Calculations

Calculated CL III (B) Per Day By Unit				Calculated Maximum CL III (B) Distribution Requirement with Distance Per Day				
Unit	MAX Fuel	AVG Fuel		Unit	Customer	Requirement	Distance (KM)	LH/SH
III CORPS	5280	4420		1CD SUS	1-1CAV	119017	60	LH
1CD	4683	3478			2-1CAV	119017	40	LH
1-1 CAV	119017	76328			3-1CAV	119017	60	LH
2-1 CAV	119017	76328			1CD CAB	82020	25	SH
3-1 CAV	119017	76328			26th MEB	25411	30	SH
1CD CAB	82020	75078						
1CD DA	10159	8489		1AD SUS	1-1 AD	119017	60	LH
1CD SUS	39856	34391			2-1 AD	119017	40	LH
26th MEB	25411	21489			3-2 AD	119017	60	LH
1CD Enabler	4768	3688			1AD CAB	82020	25	SH
1AD	4683	3478			404th MEB	39396	30	SH
1-1 AD	119017	76328						
2-1 AD	119017	76328		1ID SUS	1-1 ID	119017	60	LH
3-2 AD	119017	76328			2-1 ID	119017	40	LH
1AD CAB	82020	75078			2 SCR	42544	60	LH
1AD DA	10634	8953			1ID CAB	82020	25	SH
1AD SUS	37565	32521			157th MEB	25707	30	SH
404th MEB	39396	33219						
1AD Enablers	4054	3157						
1ID	4683	3478		13ESC	1CD	523948	130	LH
1-1 ID	119017	76328			1AD	535403	95	LH
2-1 ID	119017	76328			1ID	426119	140	LH
2 SCR	42544	20191			17th FA BDE	14026	75	LH
1ID DA	9145	7735			16th CAB	52936	35	SH
1ID CAB	82020	75078			158th MEB	62900	25	SH
1ID SUS	19802	17951			174th ADA BDE	12430	20	SH
157th MEB	25707	21876						
1ID Enablers	4184	3255						
17th FA BDE	14026	11853						
16th CAB	52936	47684						
30th MED BDE	1096	878						
158th MEB	62900	55592						
174th ADA BDE	12430	11329						
7th SIG BDE	16074	15737						
13th ESC	521	521						
total	1650733	1211221						

Source: Created by author using Planning Data Branch, "Quick Logistical Estimation Tool (QLET)" (Microsoft Excel Spreadsheet, CASCOM, Fort Lee, VA, January 2019). Note: Distance referenced from figure 9, daily fuel calculated from QLET.

Appendix C-Calculation of Units Required to Logistically Support III Corps CL III (B) distribution in LSCO

Unit Type	Active Duty	National Guard	USAR	TOT # CO	Truck	# TRK's	Trailer	Capacity On/Off Road	TVAR
Petroleum Support CO (PSC)	4	0	25	29		15	M969	5000/3000	87.5
Composite Supply CO	13	0	8	23	HEMTT	6		2500/2500	80
					TRM	20	TRM	2500/2500	90
						12	M969	5000/3000	87.5
MED TRK CO (POL,7.5k) EAB	0	0	8	8	915	60	M1062	7500/NA	87.5
MED TRK CO (POL,5k) EAB	0	2	18	20	915	60	M967	5000/3000	87.5
MED TRK CO (POL,5k) EAB TAC	4	4	0	8	M1088	60	M967	5000/3000	90

SUS BDE NODE	Unit	Gal	Dist	LH/SH	year Cycle using 20% Reserves			
					Tasked Unit	% Per trip	% TOT	# Units
13ESC	1CD	523948	130	LH	POL, 7.5k	1.330661587		
	1AD	535403	95	LH	POL, 7.5k	1.359753651	2.690415238	3
	1ID	426119	140	LH	POL, 5k	1.623310476		
	17th FA BDE	14026	75	LH	POL, 5k	0.053432381	1.676742857	2
	16th CAB	52936	35	SH	PSC	0.403321905		
	158th MEB	62900	25	SH	PSC	0.479238095	0.977264762	1
	174th ADA BDE	12430	20	SH	PSC	0.094704762		
1CD SUS	1-1CAV	119017	60	LH	POL, 5k TAC	0.73467284		
	2-1CAV	119017	40	LH	POL, 5k TAC	0.73467284		
	3-1CAV	119017	60	LH	POL, 5k TAC	0.73467284	2.204018519	3
	1CD CAB	82020	25	SH	CSC (ORG)	0.607555556		
	26th MEB	25411	30	SH	CSC (ORG)	0.18822963	0.795785185	1
1AD SUS	1-1 AD	119017	60	LH	POL, 5k TAC	0.73467284	0.73467284	1
	2-1 AD	119017	40	LH	POL, 5k	0.73467284		
	3-2 AD	119017	60	LH	POL, 5k	0.73467284	1.469345679	2
	1AD CAB	82020	25	SH	CSC (ORG)	0.607555556		
	404th MEB	39396	30	SH	CSC (ORG)	0.291822222	0.899377778	1
1ID SUS	1-1 ID	119017	60	LH	POL, 5k	0.73467284		
	2-1 ID	119017	40	LH	POL, 5k	0.73467284		2
	2 SCR	42544	60	LH	POL, 5k	0.262617284	1.731962963	
	1ID CAB	82020	25	SH	CSC (ORG)	0.607555556		
	157th MEB	25707	30	SH	CSC (ORG)	0.190422222	0.797977778	1
							TOTAL	17

Source: Created by author, calculations from Planning Data Branch, "Quick Logistical Estimation Tool (QLET)" (Microsoft Excel Spreadsheet, CASCOM, Fort Lee, VA, January 2019). Note: Distance referenced from figure 9, daily fuel calculated from QLET, unit percentage calculated using formula from figure 10.

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