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SURVEY OF CURRENT US ARMY POL DOCTRINE, PROCEDURES,
PERSONNEL, AND EQUIPMENT FOR THE
SUPPLY AND INLAND DISTRIBUTION OF BULK POL

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The second half of the report focuses on POL supply in the forward area of the battlefield. It provides a simplified methodology for computing and/or estimating fuel requirements based on the percentage of cross-country versus secondary road travel a tank battalion may experience in a particular operation. Potential areas for future US Army Human Engineering Laboratory effort are also identified. *CF 2-1*

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INTRODUCTION

The Army is continuing to focus its efforts on the modernization of combat and combat support equipment. Modernization of the logistics system is now receiving much higher priority and for the first time, logistics research and development programs are being established. Although the Army 21 logistical requirements have not yet been fully defined, based on today's projections, the demand for ammunition and POL resupply can be expected to grow. The fielding of new weapons like the M1 tank, the Bradley Fighting Vehicles (BFVs) and the Multiple Launch Rocket System (MLRS), all with increased rates of fire over their predecessors, have significantly increased the requirement for ammunition. Similarly, the introduction of large numbers of these and other new and greater fuel consuming vehicles and equipment, when coupled with greater mobility requirements of the expanded battlefield, significantly increases the demand for POL.

The US Army Human Engineering Laboratory, in concert with the US Army Missile and Munitions Center and School, has been studying the ammunition resupply problem for several years. This study effort is now beginning to pay dividends with the establishment of new ammunition resupply concepts which envision the automated handling of ammunition through the use of robots for unloading, sorting, repackaging and uploading of ammunition. A similar effort aimed at increasing the productivity of current POL units is now required.

The combination of existing combat, combat support and combat service support vehicles use a wide variety of commercial and military engines. There is no stringent fuel economy requirement in the procurement of these engines. The Combat Service Support Mission Area Analysis (CSS-MAA) and other recent POL studies question the capability of the current organization and equipment for POL distribution to meet this increased POL demand.

Two methods have been postulated for solving the problems, neither of which are fully acceptable to the user. One would be to increase the support structure by adding personnel and equipment. With the high demand for personnel to meet the many new requirements of the fighting elements of the force structure, it is highly unlikely that additional personnel can be made available to man the additional equipment needed to provide the increased quantities of POL. A second alternative would be to reduce the requirement through the application of technology to improve the efficiency of the engines. Although technology can reduce the rate of growth, it cannot reduce the absolute growth brought about by the increased numbers of vehicles entering the system, and the increased demands on these vehicles in terms of increased mobility required by the Army 21 battlefield concepts.

Within the current research and development program, there is an apparent absence of emphasis on POL consumption rates as compared to range, mobility and overall performance.

BACKGROUND

The Army is responsible for the inland distribution of bulk POL to all services in both a developed and undeveloped theater of operations. The Army's forecasted requirements for inland distribution of POL have increased significantly. With the introduction of new, greater fuel consuming vehicles and equipment, and in greater numbers, this trend can be expected to continue. Under the Army 21 Airland Battle Concept, POL logistics can also be expected to increase because of the greater mobility of forces.

The US Army Army Science Board, Summer 1984 POL Study Group, concluded in its final report that: "If the current trend continues, the vehicle fleet is projected to grow from 240,000 to 340,000 (42%) and annual fuel consumption from 115 million gallons to 283 million (146%).

In view of the above, the US Army Human Engineering Laboratory tasked Armament Systems, Inc. (ASI) to perform a Human Factors Engineering survey of POL support personnel, organization, doctrine, procedures and equipment in order to provide a current POL distribution capabilities baseline.

OBJECTIVE

The objective of this initial report is to present the results of an HFE survey of POL support personnel, organizations, doctrine, procedures and equipment, and to document a current capabilities baseline. This report also identifies some of the doctrinal/procedural and/or equipment shortfalls and problems which adversely impact the inland POL supply and distribution functions.

(NOTE: The US Army is responsible for the inland distribution of all POL. This includes delivery to meet all US Army and US Air Force (USAF) requirements. However in this study, the focus has been limited to the consumption of POL by US Army units. It is currently estimated that the USAF consumes 65% of the inland POL, this figure will not change significantly in the next 10-15 years. Therefore, the reader should keep in mind that the problems discussed in the subsequent pages of this report address only those problems associated with the

Army's POL requirements, and represent only about 35% of the total POL inland distribution problem. Addressing the USAF consumption, both current and projected, is beyond the scope of this effort.)

METHODOLOGY

The initial step was to perform a literature search of Training Manuals (TMs), Field Manuals (FMs), Tables of Organization and Equipment (TO&Es) and related documents concerned with the distribution of POL.

The second step was to extend our knowledge and understanding of the POL inland distribution system through the review of selected Transportation and Quartermaster Schools' Programs of Instruction (POI's) and doctrinal and procedural studies and directives concerned with the in-theater distribution and handling of POL at the retail level, supplemented by discussions with the Schools' instructors and combat developments doctrinal personnel and selected personnel assigned to TO&E POL units. The literature search and discussions served as the basis for the documentation of the current POL baseline capabilities and the identification of problem areas.

DISCUSSION

Current Organizations, Missions and Functions

General

Figure 1 is a schematic of the current distribution and supply system for Class III (POL) for a developed theater of operations. POL comes in to the theater from ocean tankers. If permanent piers are available, they are used. The more likely requirement is to transfer the POL over-the-shore using either floating hoses or, in a more stable environment, sunken or submerged pipelines connected to an onshore POL base terminal. Typically, an existing in-country POL distribution system is normally operating in support of the peacetime civilian economy and military forces. POL doctrine indicates that whenever possible, active duty US Army personnel should be trained to operate these existing distribution systems. However, in time of war, these existing facilities are often partially or completely destroyed and it becomes necessary to modify or renovate the old facilities, and add new or additional facilities to meet the POL requirements.

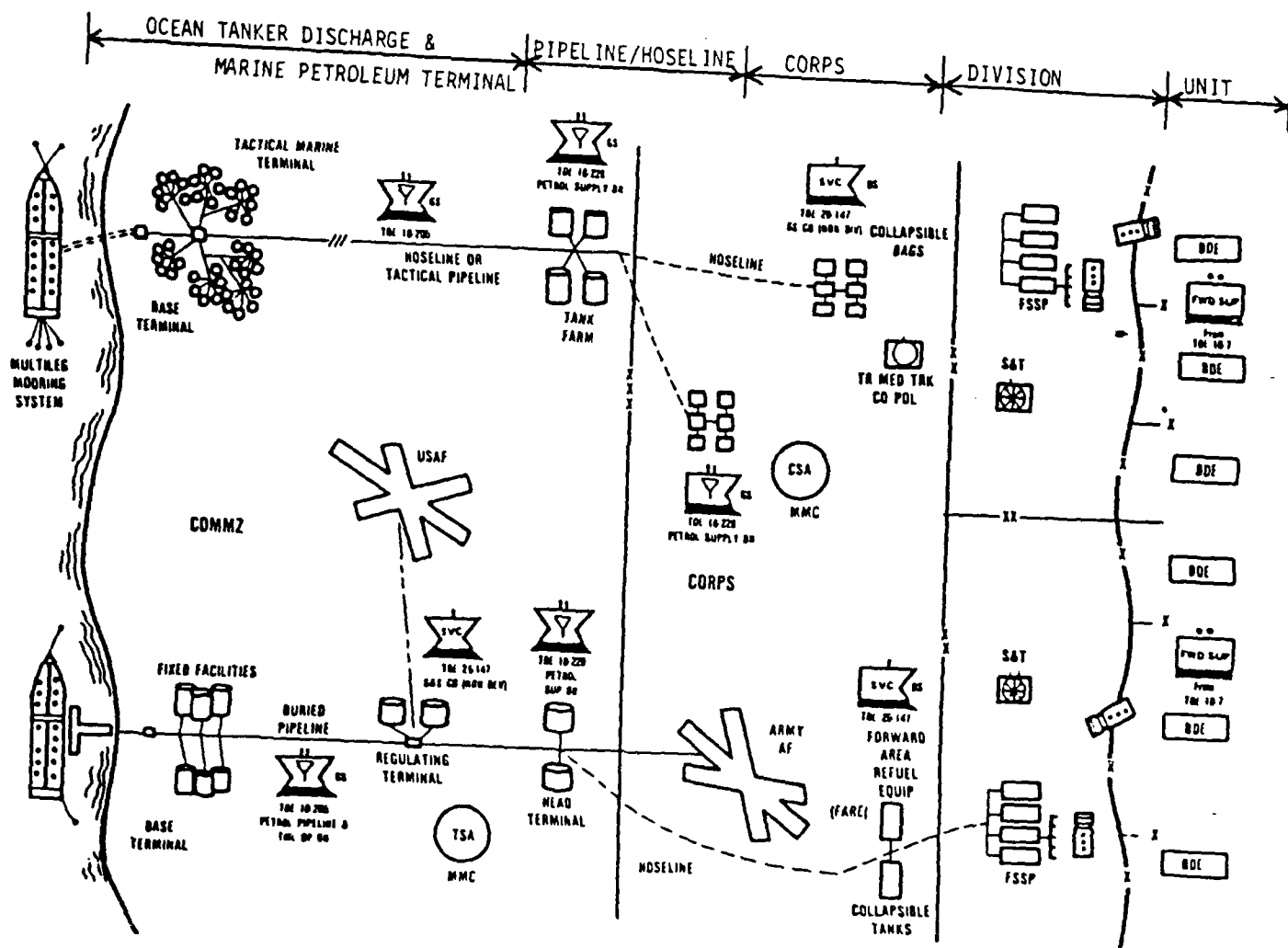


Figure 1. Bulk Petroleum Distribution System in Developed Theaters.

From the base terminal, the POL is moved forward by barges, rail cars, eight inch and six inch tactical pipelines, flexible hoses, and long-haul highway tank trucks. Resupply in the forward areas is accomplished using tactical tank trucks and flexible hoselines. High priority POL requirements are met by aerial delivery (external and internal stores via helicopter) or "wet wing" using fixed wing transport aircraft.

Figure 2 is a schematic of a bulk petroleum distribution system in undeveloped theaters. The primary differences are the lack of permanent type port facilities, permanent pipelines, and a network of existing improved highways and railroads. The Army must construct hoselines and pipelines in greater numbers and a large number of high volume collapsible storage tanks are required to store the POL due to the absence of permanent storage facilities.

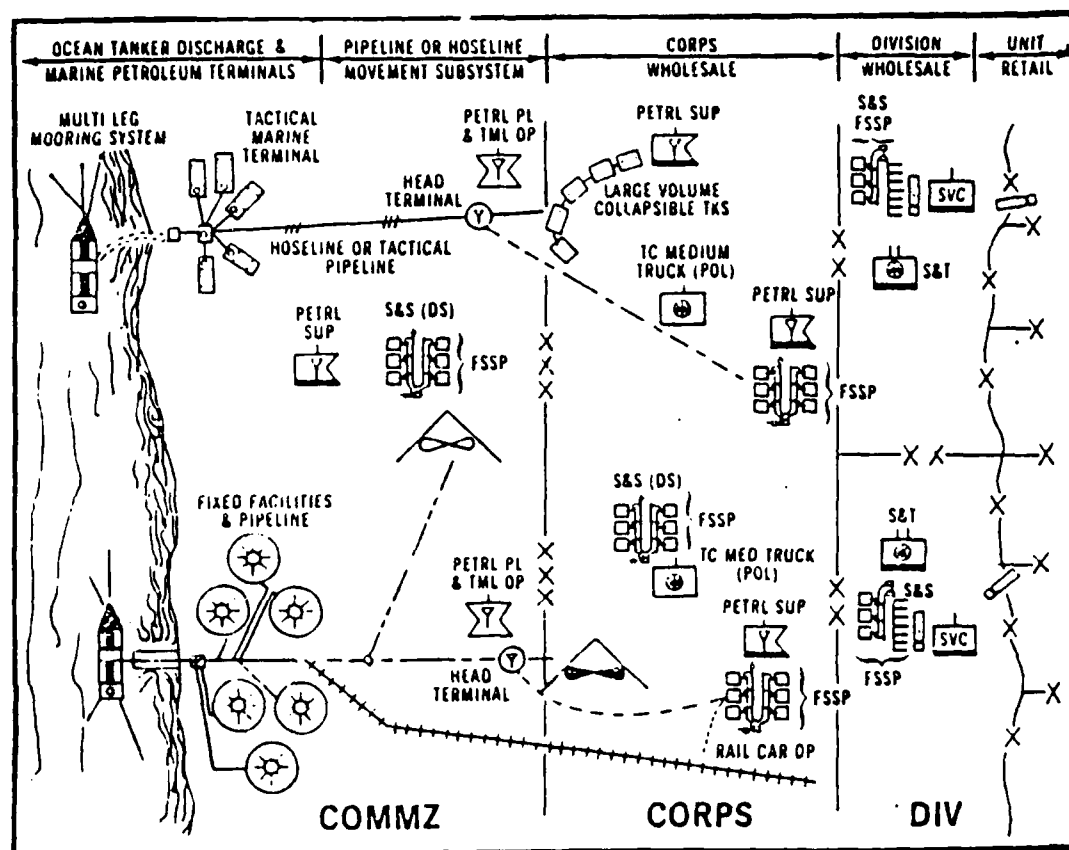


Figure 2. Bulk Petroleum Distribution System in Undeveloped Theaters.

POL Organizations

Developed Theater

Figure 3 is the Petroleum organization for a developed theater of operations.

Theater Petroleum Item Manager

There is a Theater Petroleum Item Manager who controls both bulk and packaged petroleum products and is responsible for all POL operations, including long range petroleum requirements for the theater.

Petroleum Group

The Petroleum Group is the principal organization for carrying out the bulk fuels distribution mission in the Communications Zone (COMMZ) and is assigned directly to the Theater Army. The Petroleum Group and its subordinate units operate the bulk fuel distribution system extending from ports of entry through the COMMZ and as far into the combat zone as practicable. The Petroleum Division of the Materiel Management Center (MMC), Theater Army Area Command (TACCOM) is responsible for receiving requirements for POL supplies and directing provision of wholesale supplies through the Petroleum Supply Battalions to the Supply and Service Companies. The Petroleum Division of the TAACOM MMC also coordinates with the Theater Army MMC for bulk petroleum resupply to the petroleum supply battalion in its area.

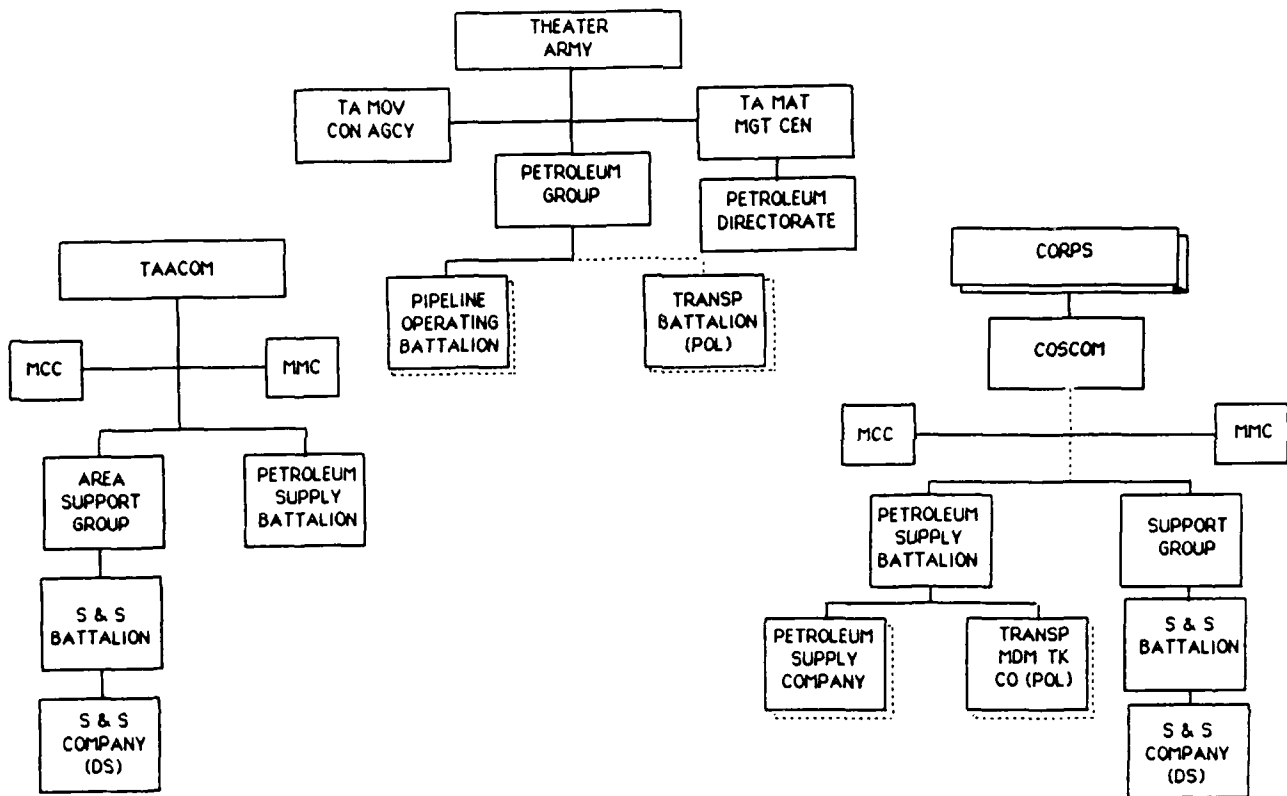


Figure 3. Petroleum Organization in a Developed Theater of Operations.

Appendix A contains the detailed statement of mission and capabilities for each of the units assigned POL functions within a theater. The POL storage capacities, line haul capabilities and major items of equipment are also included for each type unit. For those units that support other classes of supplies as well as POL, each class of support is identified together with the major items of equipment used for transport.

Undeveloped Theater

Figure 4 is a type corps organization for petroleum operations in an undeveloped theater.

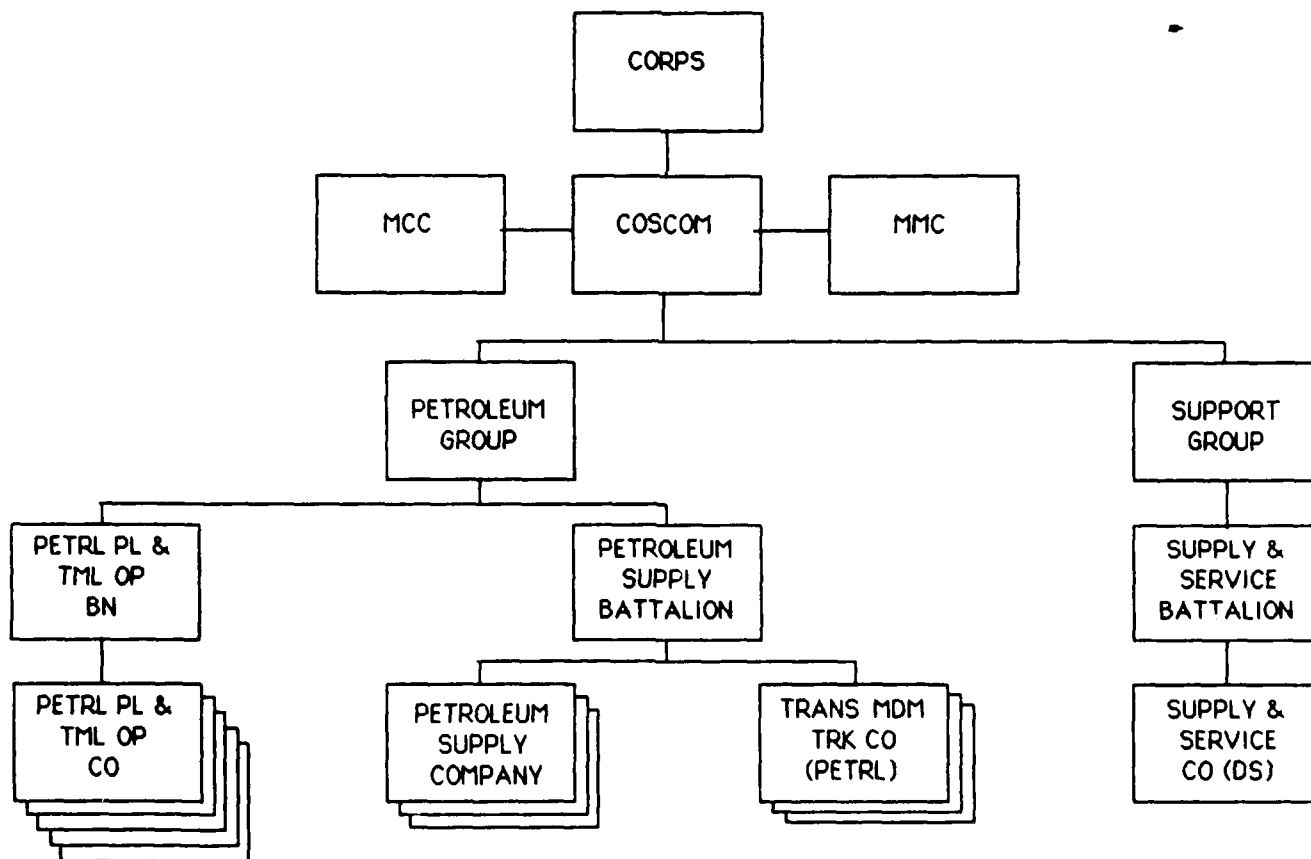


Figure 4. Type Corps Organization for Petroleum Operations in an Undeveloped Theater.

Corps Area POL Operations

Although the petroleum group in the undeveloped theater is at the corps level, it has the same functions as the petroleum group at the theater level, in the developed theater.

Division Area POL Operations

At the division level, the missions and functions of the Petroleum Pipeline and Terminal Operations Battalions and Companies, and Petroleum Supply Battalions and Companies are the same for the undeveloped theater as in the developed theater.

Current TO&E Prescribed Capabilities

Table 1 is a summary of prescribed mission POL storage and handling capabilities for POL units within the force structure up through the Direct Support (DS) units. It does not include the Division Supply and Transportation Units operating in the forward division areas.

TABLE 1.

TO&E POL Units - Prescribed Capabilities

Type Unit	POL Storage Capacity	Daily Local Delivery
Petroleum Pipeline and Terminal Operating Co	5.50 Mil Gal	52,000 Gal
Petroleum Supply Co ^{1/}	1.48 Mil Gal	685,000 Gal
Supply & Svc Co (Non-Div, DS)	.10 Mil Gal	81,000 Gal
Trans Med Tk Co (POL)	--	900,000 Gal ^{2/}

^{1/} With Logistics Unit Productivity Study (LUPS), personnel and equipment augmentation storage capacity increases to 2.52 mil gal and receipts and issues increase to 1.24 mil gal.

^{2/} Operating two shifts--local haul. Line haul is 450,000 gal/day.

Table 2 is a summary of the total POL units by type in the current force structure, stratified by Active Army, Reserve and National Guard. The Petroleum Pipeline & Terminal Operating Battalions and Companies, as well as the petroleum supply battalions, supporting supply companies and medium truck companies are aligned under the two groups. The mobile laboratories are generally assigned on a theater or corps basis. The reserve petroleum groups have active duty as well as reserve POL battalions and companies and medium truck companies are aligned under the two groups. A detailed listing of these units, including their current locations, is contained in Appendix B. As can be seen, 81% of the total POL units are either Reserve or National Guard. The Department of the Army, Deputy Chief of Staff for Logistics (DA,DCSLOG), has stated that the Reserve and National Guard Units are being relied upon to provide 80% to 90% of the POL supply capability for all future conflicts.

TABLE 2.

POL Units in Current Force Structure

Type POL Unit	Active Army	Reserve Units	National Guard	Total
Petroleum Group	0	2	0	2
Petroleum Pipeline and Term Oper Bn	1	2	0	3
Petroleum Pipeline and Term Oper Co	3	5	0	8
Petroleum Supply Battalion	1	6	4	11
Petroleum Supply Company	4	18	0	22
Petroleum Mobile Laboratory	0	3	0	3
Petroleum Medium Truck Company	6	14	9	29

Current Capabilities - Actual

As shown earlier in Table 1, a Petroleum Supply Company is able to store 1.48 million gallons of bulk POL and to receive and issue a maximum of 685,000 gallons per day. Theoretically, if one were to multiply the number of POL supply companies in the

force structure by the quantity of receive and issue gallons per day, and do the same thing with the other POL resupply units, a total POL delivery capability could be estimated. It is recognized, however, that the actual performance capability can, and often does, vary significantly below the calculated capability depending on the condition of the units' operating equipment, the degree of training and experience of unit personnel, and the actual operating conditions or environment within a given tactical area of operations.

The Army Training and Evaluation Programs (ARTEPs) are held periodically to test the actual performance capabilities of a unit and to identify areas where a unit's performance is deficient. A review of ARTEP manual 10-227 and related ARTEP manuals for POL units, revealed that although applicable missions and related tasks are listed, and required times are indicated for the performance of various administrative tasks, there are no standards of performance requirements listed for the basic operating mission of receipt and issue of bulk and packaged POL. A review of studies and reports associated with POL operations, discussions with training personnel, including school instructors, and with TO&E unit officers, revealed that very few ARTEPs or training exercises are being held which actually test the basic capabilities of a POL supply unit to perform under operational or near operational conditions.

Adequacy of Unit Training

Most of the POL units are in the Army's reserve forces and participate in weekend drills. However, they participate in meaningful field exercises on an average of only once in three years.

Adequacy of Formal School (MOS) Training

The Transportation School and Quartermaster School were called and asked to provide their latest Programs of Instruction (POIs) on all of their POL handling and transport MOS courses. These were reviewed in detail to determine the scope of instruction for the handling and transport of POL. The TC school courses pertain primarily to the operation of POL vehicles (MOS 64C30). The POIs were dated October 1983. As such, the training does not include the newer items such as the 2500 gallon Heavy, Expanded Mobility Tactical Truck (HEMTT) POL transporter. Otherwise, the POIs appear to be adequate for training of motor transport operators of POL vehicles and ancillary POL equipment.

POIs from the US Army Quartermaster School for Petroleum Supply Specialist MOS 76W10 and 76W30 dated 31 December 1984 were also reviewed. The technical phase of the 76W30 course represented a reduction of 62 hours from the earlier POI which had been superseded. A review of the equipment list for this course

revealed the same shortfall as the TC course, i.e., the latest equipment which is currently in the process of being fielded such as the 2500 gallon HEMTT POL transporter was not included.

With the exception of training on the latest makes and models of POL equipment, the MOS or "how to" aspects such as "How to process and distribute POL products", "How to lay out and test petroleum pipelines/hoselines", "How to gauge and sample POL storage tanks", etc., are very well covered. As indicated earlier in the report however, little evidence was found of realistic unit training on operating the basic POL system. No evidence was found to indicate that the total system interfaces between the various POL units, i.e., Petroleum Pipeline and Terminal Operating Units, Petroleum Supply Units, Petroleum Medium Truck Units, etc., have ever been exercised.

Lack of Systems Approach

Although the Army has instituted an "Army Energy R&D Plan" and specific programs are in effect in the Army Materiel Command (AMC) aimed at reducing POL usage, **there is little evidence of an integrated systems approach to the solution of POL problems.** The Army continues to focus on weapon system development without commensurate consideration for the system's logistics requirement.

Fuel Consumption Rates

Table 3 provides an example of the increased fuel consumption rates of recently fielded tracked vehicles in comparison with the earlier models they will replace. As can be seen, the M1 tank requires 53% more fuel than the older M60 for idling, and the M2 and M3 vehicles require 17% more fuel than its predecessor, the M113 when operating 50% cross country and 50% secondary roads.

TABLE 3.

POL Consumption Rates - Tracked Vehicles*

Vehicle	Fuel Capacity	Fuel Consumption			Expected Consumption Rate (GAL/MI)**
		X-Country	Secondary Roads	Idle (GAL/HR)	
M1	502	56.6 gal/hr @ 17 MPH (3.33 GPM)	43.8 gal/hr @ 25 MPH (1.75 GPM)	11.2	2.54
M60	385	47.0 gal/hr @ 14.4 MPH (3.26 GPM)	27.5 gal/hr @ 20 MPH (1.38 GPM)	5.3	2.32
M2/M3	175	12.0 gal/hr @ 17 MPH (.71 GPM)	9.4 gal/hr @ 25 MPH (.38 GPM)	1.0	.55
M113	95	8.9 gal/hr @ 14.4 MPH (.62 GPM)	6.2 gal/hr @ 20 MPH (.31 GPM)	1.0	.47

* Data Source: Armor Board, Fort Knox, KY.

** Based on 50% X-Country and 50% Secondary Roads.

Table 4 provides similar information for some of the newer wheeled vehicles entering the inventory.

Table 5 provides similar information for Army helicopters. As can be seen, the newer helicopters, similar to the newer vehicles, consume more fuel than the older models they are replacing.

TABLE 4.

POL Consumption Rates - Wheeled Vehicles (Miles/Gallon)

Vehicle	Fuel Capacity (GAL)	Fuel Consumption		Expected Consumption***
		Highway	X-Country	
HEMTT*	154	4.8	3.2	4.0
HMMWV*	25	11.0	7.1	9.1
CUCV*	20	12.0	7.5	9.8
10-Ton Tractor** M123A1C	83	4.2	-	N/A
5-Ton Cargo M813A1	78	4.5	-	N/A
2 1/2-Ton Cargo** M35	50	7.0	-	N/A

* CSTA, APG, MD, Initial Production Test Reports

** TM 9-2320

*** 50% Cross Country, 50% Highway

TABLE 5.

POL Consumption Rates - Army Helicopters

Type Aircraft	Fuel Consumed (Gal/Hr)	Remarks
AH-1S	123*	Follow-On to AH-1S
AH-64	141*	
UH-1H	80*	
UH-60	169*	Follow-On to UH-1H
CH-47C	497**	Follow-On to CH-47A
CH-47D	497**	Follow-On to CH-47C

* Typical mission fuel consumption rates based on SB 710-2.

** FM 101-20

A final report of the 1984 Army Science Board, Subject: "Technology to Improve Logistics and Weapons support for Army 21", dated December 1984 and published by the Assistant Secretary of the Army, Research, Development and Acquisition states that "Unconstrained, POL consumption will continue to increase." There is not yet a figure of merit developed to define a cap or limit on the projected total fleet size or on the total POL consumption. As an example, the above referenced report states that, "For combat tactical vehicles, today's fleet is projected to grow from 240,000 vehicles to 340,000 (+42%) vehicles from 1982 to 2000 and the annual fuel consumption from today's 115 million gallons to 283 million gallons (146%) if technology advances are **not** made, or to 158 million gallons (+32%) if R&D efforts to increase engine efficiency **are** funded and successful." It is further stated that a typical heavy division (DIV 86 POL Profile), in a mid-intensity European combat scenario, would have a daily planned requirement of 549,308 gallons of which the M1, M2 and M3 combat vehicles would consume 47%. The report concluded that "Army 21 is not supportable unless constraints are placed on POL consumption".

(NOTE: The reader should keep in mind that Army POL requirements represent only about 35% of the total theater requirements.)

Warsaw Pact POL Capabilities

As part of the background literature review in preparation for this POL baseline study, ASI reviewed selected Defense Intelligence Agency (DIA) and US Army Intelligence Agency (USAIA) documents relative to POL requirements and capabilities of the Warsaw Pact countries. These documents include contributions from the Threat Analysis Center, Foreign Science and Technology Center and the Missile Intelligence Agency. They contain, for example, estimates of percent of available transport capability required for transport of POL, basic doctrinal concepts which underline POL logistics operations, selected unit fuel requirements and the system of military controlled POL depot storage requirements and capabilities. Manning levels are also provided. Provision of specific information relative to the above is beyond the scope of this study; however, reference to the Warsaw Pact POL requirements and capabilities is made so that the readers can be made aware of the ready availability of such information in the ASI Aberdeen library should it be required for future related study efforts.

MAJOR PROJECTS IN PROCESS TO IMPROVE POL SUPPLY & DISTRIBUTION CAPABILITIES

Although the lack of a fully integrated and coordinated systems approach to the solution of POL problems is evident,

considerable effort is underway to solve individual problems such as improvements to doctrine, establishment of priorities for equipment procurement, correction or redesign of individual components of a system that are not functioning properly, and improvements in the training activities where deficiencies have been noted. Those actions are being documented in the Master Petroleum Materiel Requirements Plan (MPMRP) and progress is reported during the Annual Petroleum Materiel Requirements Conference.

A series of Logistics Unit Productivity Studies (LUPS) has been performed and others are in process to improve the productivity of CSS units. A petroleum supply company substudy performed by the US Army QM School (report dated 15 December, 1983) concluded that the petroleum supply company per capita productivity output (POL issues) can be increased (approximately 80% increase in total output with a 7% increase in personnel) by changing the types and quantities of key items of POL handling equipment. Some of the major changes include the replacement of Rough Terrain Forklifts (RTFLs) with High Mobility Materiel Handling Equipment (HMMHE), increasing the number of 5000 gallon semitrailers, 5-ton trucks, 22 1/2 ton trailers, and 10,000 and 20,000 gallon storage tanks and by adding 50,000 gallon storage tanks. Final actions relative to the implementation of these recommendations are still pending.

A high priority joint Army/Navy project under the title of "Southwest Asia Petroleum Distribution Operational Project (SWAPDOP)," briefly mentioned earlier in this report, is underway. It consists of two major elements, the Offshore Petroleum Distribution System (OPDS) and the Inland Petroleum Distribution System (IPDS). The US Navy has the lead for the OPDS which is planned as a joint procurement action. The Army has the lead for the IPDS. These off-shore and inland petroleum distribution systems will be used to support contingency operations in Southwest Asia. Primary components of the OPDS are a Single Anchor Leg Mooring System (SALM), a four mile ship-to-shore petroleum discharge line, and warping tugs for emplacement of the system. A joint Army/Navy development effort is also underway to develop a one mile system which uses a Propellant Imbedded Anchor Mooring System (PEAMS). A recent Army/Navy agreement reached on 9 July 1985 provided for assignment to the Navy of total responsibility for off-shore POL discharge systems up to the high water mark at which point the Army assumes responsibility for all Inland POL distribution and storage systems. The interface between the off-shore and inland systems will be a joint effort.

Testing of the OPDS elements is scheduled for the latter part of CY 1985, and testing of the IPDS is scheduled for 1986. Once the IPDS is procured and tested, it will be stored at the Pueblo Army Depot pending outbreak of hostilities in SW Asia. Training modules will be procured and used for training of personnel

required for installation and operation of the IPDS. Of interest is the fact that the OPDS is a Non-Developmental Item (NDI). Installation, operation and maintenance of the system will be accomplished by civilian personnel under the direction of the US Navy. Completion of the OPDS project will increase the Navy's capability for POL operations as follows.

	Current	Projected
Anchor of POL tankers offshore	25,000 DWT	70,000 DWT
Ship-to-Shore POL discharge	1 mile	4 miles
Quantity of POL product discharged	17,000 BPD	34,000 BPD

Legend: DWT = Dead Weight Tons
BPD = Barrels Per Day (20 hours of operation)

Overall management and control of SWAPDOP is being exercised by an Action Officer Workshop (AOW) chaired by a DCSLOG staff officer with membership from all participating Army, Navy and Air Force agencies and activities. A General Officer Steering Group (GOSG) provides guidance for conduct of the total effort.

(NOTE: The AOW appears to be an efficient operation. The recent addition of HEL as a member is paying dividends in terms of calling attention to shortfalls in the total systems program such as the need for improved C³.)

POL PROBLEM AREAS

Based on an extensive review of literature (see partial list of documents reviewed at Appendix C); discussions with key members of the AMC POL Project Manager's Staff, the TRADOC Systems Manager and his staff and other organizations charged with the responsibility for development and procurement of POL distribution equipment; attendance at meetings of the POL Action Officers Workshop (AOW); and discussions with officers and NCO's of TO&E POL units, both active and reserve, a number of problems have been identified. Some of these are understandably hypotheses or assertions at this point in time which should be subjected to further study and verification to assure that they are, in fact, really problems. Others have already been proven to be problems requiring some type of corrective action. As a general statement, it is safe to state that, based on a preponderance of information reviewed, the existing POL structure and operating system does not meet the requirements of the existing or projected POL consuming fleet of ground and air vehicles and stationary equipment. As this demand on POL logistics continues to grow, with greater requirements for mobility, agility and survivability, the gap between demand and supply capability will continue to widen. With these introductory remarks serving as a backdrop, the following

POL problems are presented for consideration and corrective action as may be indicated. (As noted in the **OBJECTIVE** of this study, the US Army only consumes about 35% of the inland POL. The remaining 65% is consumed by the USAF.)

General

a. Clarification of Requirements. A clear definition of the quantities of POL that are required to support both the current and projected military vehicle and equipment fleet is lacking. Also, there is a need for users to state, as part of their requirement for future vehicles, the refueling rate. This would facilitate the design of not only the on board refueling port(s) of the vehicle, but also the design of refueling equipment such as the Forward Area Refueling Equipment (FARE), and it would aid in the decision as to whether the refueling system should be open or closed port, etc.

b. A Systems Approach. Reference to lack of a complete integrated systems approach to the solution of POL problems has been made several times in this report. The importance of this problem cannot be over emphasized. The result is that major efforts are sometimes directed towards the correction of a "bottleneck" at one juncture in a system only to find that it creates an even greater "bottleneck" at another juncture. Priorities under a "fix each weak link as it is discovered" approach becomes meaningless and the entire process is stretched out when it is discovered that one correction may not be compatible with another later correction and the initial one must undergo further design changes resulting in increased costs and delays in time. Is the most serious problem between the off-shore to on-shore terminal capability; is it in the intermediate distribution system from the port forward through the COMMZ; or is it in the forward areas? Is the problem with pipeline laying techniques; with long-haul tank trucks; with shortfalls in pumping substations; or perhaps lack of communications through the various echelons of POL supply operators and/or users? High volume pumps are being procured for movement of POL through the wholesale pipeline system as well as for distribution from tactical POL tank trucks into combat vehicles with little regard as to whether or not the wholesale POL storage facilities can handle the increased flow rates or whether or not the tactical fighting vehicles can accept the faster fill rates of pumps on tactical POL vehicles. It is suggested that until these interfaces of the system have been identified and the problems associated with each such interface placed in proper perspective, it will not be possible to prepare a master program in which concurrent and coordinated corrective actions can be accomplished. Time will not permit the solution of POL problems in a sequential manner, nor can the Army afford the increased costs associated with such an approach.

c. A Master Priority List. The importance of a total systems approach, coupled with a realistic master priority list that interrelates each problem and corrective action with the total systems requirements can be best illustrated through one example. The Director of Logistics, US Mission to NATO has stated that the Central Europe Pipeline System, although chronologically old, is, in a sense, modern and complex in its operation. It cannot, however, meet daily projected combat requirements, either on a storage or throughput basis in its current configuration. Further, the NATO POL distribution system in Turkey is at the other end of the spectrum being comprised of very obsolete, worn out, incomplete subsystems or equipment that is also incapable of meeting the daily requirements either on a storage or throughput basis. The lack of a systems approach supported by a master priority list, makes it difficult if not impossible to answer such questions as: "Should these pipeline systems be upgraded to meet current and projected demands, or should the emphasis be placed on providing a modern vehicle tanker fleet?" If the choice becomes a modern tanker fleet, will the in-theater highway system accommodate such high volume highway movements, particularly in time of major conflict? What about railroads for transport of POL? Today's higher priority project in terms of personnel, dollars and management attention is with the Southwest Asia Petroleum Distribution System Operational Project (SWAPDOP), not with Europe. Of 19 major initiatives dealing with the correction of POL problems, seven have no funding through FY87 even though some of these unfunded projects are identified as high-priority efforts. It is not the purpose of this study to suggest which problem should be given the higher priority. It is the purpose, by citing examples, to stress the importance of a "total systems approach" to include a meaningful master priority list for the correction of POL supply problems.

d. Inadequate POL Units, Personnel, and Equipment. Eighty to 90% of the POL units assigned responsibility for POL supply are in the Reserve and/or National Guard structure. These Reserve and National Guard units will be called upon during time of conflict to provide most of the POL resupply capability. The few POL units within the active force structure are undermanned, undertrained, and have many critical shortages of POL vehicles and equipment similar to the reserve/NG units. The equipment they do have is, in many instances, old and in poor operating condition. Many of the units have never been tested to determine their capability to meet their primary mission requirements.

Specific Problems

a. The Army Research and Development community, to include that part of TRADOC associated with specifying system requirements, is focused on weapons system performance in terms of lethality, speed, survivability, maneuverability, etc., without commensurate consideration for the POL logistics requirements to

support such modern fighting vehicles. Maintenance is beginning to receive appropriate attention in the design and development of a fighting vehicle, yet little, if any, real attention is being given to reducing the POL consumption requirements of such vehicles, or to improved, more rapid refueling conditions.

b. Over-the-shore POL logistics capability during early stages of employment in an undeveloped theater of operations is marginal.

c. Outmoded pipeline technology imposes labor and time-intensive requirements for rapid pipeline deployment.

d. The Current POL highway tanker fleet is slow, vulnerable and plagued with a mix of vehicles and engines. Some are very old and are experiencing high maintenance requirements.

e. Lack of a standardized rapid refueling system has resulted in gross inefficiencies in refueling operations. There is a need for a standardized refueling system (SRS) to accommodate interfaces between wheeled and tracked ground vehicles, aircraft, and the refueling equipment.

f. A tradeoff analysis is needed to determine whether the current FARE should be product improved or whether a new-start program incorporating present state-of-the-art technology for a new FARE is more desirable.

g. A front end analysis (FEA) is required for the automated pipeline equipment system (APES) to insure that it will satisfy all user requirements. HFE interfaces should be carefully analyzed as part of this FEA.

h. There is a need to determine whether the higher priority should be given to the modernization of a wheeled vehicle tanker fleet or to the development and fielding of an armored combat vehicle refueller.

i. The Navy has been given the lead for development of a four mile off-shore to on-shore POL discharge system, to include a single point mooring system with an on-the-bottom POL discharge capability. The Army has been given responsibility for developing a one-mile system. The Army apparently has the lead for the design of the one-mile system and the Navy is responsible for developing alternatives. The Navy is responsible for the tanker ship or barge to POL off-shore pipeline interfaces, and the Army is responsible for the off-shore pipeline to on-shore POL terminal interfaces. From an operational point of view, the Army is responsible for the connection to the Navy installed Beach Termination Unit (BTU) and all operations on-shore. Alternatives for installation and operation of the various off-shore to on-shore POL discharge systems include civilian installation and operation with Navy

control; Army Corps of Engineers installation; and US Navy installation and operation. There is a need to clarify the many interfaces in terms of compatibility and installation/operation responsibilities.

j. There is a need to clarify the requirements for command, control and communications (C³) between off-shore and on-shore operations; between POL terminal facilities and pumping substations along with a POL pipeline; and the intra-POL terminal facility. There is also a need to clarify the communication requirements between the POL operating units up through the Direct Support (DS) level and the combat and combat support users of POL products. Once this command, control and communications requirements network has been defined, there is a need to procure the C³ equipment to provide the required communications capability.

k. Collapsible storage tanks, in capacities of 10,000, 20,000, and 50,000 gallons have an operational (in use) life and a shelf (in storage) life of only one and five years, respectively. Because of the tremendous reliance on these tanks to provide essential POL support, the shelf and operational life should be extended. These collapsible tanks are often the only storage capability available to support combat operations until such time as more permanent facilities can be constructed.

l. Currently there is no capability to quickly determine the type or usability of fuel which has been captured. Airland Battle Concepts envision deep penetrations behind enemy lines where traditional petroleum supply support may not always be possible. As such, there will be a need to identify fuels of opportunity for combat vehicle use in order to complete the mission. By using a small, lightweight, simplified testing kit, it would be possible for combat vehicle crewmen to determine fuel usability in a short period of time.

(NOTE: It is understood that AMC has such a development project ongoing.)

m. The current family of US Army POL equipment assemblies does not include a small, lightweight, easily operated system which armor or mechanized infantry platoon-sized units could carry into battle and use to refuel their vehicles from sources of opportunity under emergency conditions. Without such a system, units operating behind enemy lines are limited by both the amount of fuel they are capable of carrying and by constrained aerial resupply.

n. Of the 25 technical publications on POL that were available for a literature search, 44% (11) were found to be six years old or older from the date of publication; one was found to be 20 years old. Less than a third of these publications have had revisions or changes appended.

o. The current inventory of storage tanks, vehicle tankers and pipelines is highly vulnerable to the wide range of enemy fire from small arms, fragmentation, shrapnel, artillery, rockets and aircraft. Preventive measures that may alleviate this threat to some degree range from self-sealing materials to blanket-type ballistic protection.

p. This document is essentially a status list of hardware that is either presently in the inventory or in the developmental phase of its life cycle. It includes taskings to various commands as a result of a Petroleum Materials Requirement conference as well as a general description of how the POL distribution system functions. The Combat Development Directorate of the Quartermaster School is responsible for its publication and distribution. Revisions and/or reorganization of the document to more directly relate requirements to R&D and procurement programs would improve its utility.

q. Packaged POL products have proliferated over the years to the point that excessive and unnecessary demands have been placed on the logistics system. The entire spectrum of products needs to be analyzed with the thought of modernizing packaging concepts for this expensive commodity.

r. There is a general consensus that there are insufficient resources in terms of trained personnel and adequate equipment available in both the active Army and Reserves to properly staff Petroleum Pipeline and Terminal Operating Units, Petroleum Supply Units and Engineer Pipeline Construction Units. This is particularly acute when these units have the mission to establish a POL distribution system in an undeveloped theater scenario.

s. During tactical operations involving deep penetrations, crew-personnel required for refueling operations may be exposed to a wide range of hostile fire from ground and air delivery systems. Proposals for an armored tracked refuel system, advocated by several Government contractors appear to offer a viable solution to the refueling and rearming problem. However, a detailed Cost and Operational Effectiveness Analysis (COEA) and other types of analyses would be necessary to determine if the proposal has positive merit.

POL RESUPPLY IN FORWARD AREAS

Although, as presented in the paragraph entitled "POL Problem Areas", numerous problems exist throughout the POL supply system, major efforts are either underway or are planned to resolve many of them. There are two major priority efforts, both of which have been mentioned previously.

- First is the Action Officers Workshop (AOW) chaired by a DA, DCSLOG representative with membership from all three services whose primary concern is the Southwest Asia Petroleum Distribution Operational Project (SWAPDOP).

- Second is the Annual Materiel Requirements Conference wherein all petroleum problems/projects are documented, complete with schedules of corrective action in the Master Petroleum Materiel Requirements Plan (MPMRP).

It is noted, however, that the greatest majority of problems, by a large margin, which have been identified and for which corrective action is underway, is within the rear echelons or wholesale area. There are problems associated with the offload of POL from off-shore tankers to on-shore terminals, and with moving the bulk product forward from Theater to Army and from Army to Corps, with little emphasis on the forward areas from the end of the POL pipeline forward.

The doctrine, policies and procedures for the handling and distribution of POL products within the rear areas is considered to be well documented as are the problems associated with this part of the POL system. Likewise, R&D and procurement projects are either underway or planned to resolve many major problems associated with handling and distribution of POL in these areas. Conversely, efforts to identify a systematic or integrated approach to the identification and resolution of POL supply and distribution problems in the forward areas of the battlefield have not been as fruitful. It is strongly suspected that no overall coordinated systems approach to the resolution of POL supply and distribution problems in the forward areas exists at the present time.

Based on the above, ASI focused the remainder of the study research effort on POL supply and distribution in the forward areas (division forward) of the present and projected future battlefield as a potential area wherein the Army's Human Engineering Laboratory might make a greater contribution to the resolution of the forward area POL supply system, particularly the soldier/machine interface problems.

The Forward Area POL Supply System

Bulk fuel, like ammunition, is a continuous supply requirement that increases or decreases according to the combat situation. fuel requirements are based on forecasts provided by combat battalions through supply channels. Brigade logistics personnel forecast the fuel consumption rates for their attached battalions. The forecasts for the Armor, Infantry, Mechanized Infantry, etc., units are consolidated at the brigade level and forwarded to the Division Materiel Management Center (MMC).

(NOTE: When a brigade is not operating under a division, the brigade requirements are forwarded to the Corps Support Command (COSCOM).

In consolidating and refining POL requirements at the brigade, the S-4s must consider special circumstances that could result in unusually high fuel consumption rates such as vehicles operating over hilly terrain which causes higher than normal fuel consumption.

Forward Area POL Resupply

Once fuel requirements are forecast, the brigade S-4s and division G-4 must determine if battalions can carry and distribute their own fuel. Battalions are generally equipped with either tank trucks or with fuel pods mounted on cargo-carrying vehicles and/or trailers. In divisional units, the Supply and Transport (S&T) Battalion has tank trucks and semi-trailers as well as collapsible bulk fuel storage tanks and drums. These are often positioned in the brigade support area or other locations relatively close to using units. QM POL supply companies from COSCOM may provide tankers or collapsible tanks and drums to supply non-divisional battalions.

Table 6 is an extract of the fuel handling equipment and transport vehicles assigned to the S&T battalions of the various type divisions.

The final and perhaps most important node in the POL supply chain is the POL personnel and handling and transport equipment integral to the combat maneuver battalions. Table 7 is an extract of POL handling/transport equipment currently assigned to the four major types of combat maneuver battalions.

TABLE 6.

Fuel Handling Equipment & Transport Vehicles
Assigned to S&T Battalions

Type Unit	5,000 Gal Semi-Tlrs	10,000 Gal Collapsible Tanks	5,000 Gal Collapsible Drums	FARE	FSSP
S & T Bn, Air Assault Div	10	36	304	18	6
S & T Bn, Armored Div	34	12	27	5	2
S & T Bn, Inf Div, Mech	29	12	27	5	2
S & T Bn, Inf Div	16	6	27	5	1

Source: "H" Series TO&Es.

TABLE 7.

POL Handling/Transport Equipment
Combat Maneuver Battalions

Type Unit	TO&E No.	TRK, Tank Fuel Svc, 2500 Gal	Tank & Pump Unit, TRK Mtd	Tank Unit Liquid, TLR Mtd	65 GPM Pump, Gas Driven Frame Mtd
FA Bn, SP, Heavy Div	06356J410	3			2
M1 Tank Bn	17236J210	12			2
Mech Inf Bn W/BFVS	07245J210		7	7	2
FA Bn, 8 In/MLRS	03395J200	4	3	4	

Source: "J" Series TO&Es.

It should be noted that all but the mechanized infantry battalions with the BFVS will be equipped with the new HEMTT 2500 gallon fuel trucks. It is understood that the mechanized infantry battalions have expressed a preference to retain the truck mounted tank and pump units and trailer mounted tank units in lieu of the HEMTT. Based on the fuel consumption rates for the various combat vehicles as shown in Tables 3 and 4, and assuming, for example, that a tank battalion will travel approximately 100 km per day, an M1 tank battalion consisting of 58 M1 tanks would require refueling once a day ($3.33 \text{ gal/mi} \times 100 \text{ mi} = 333 \text{ gal per tank} \times 58 \text{ tanks} = 19,314 \text{ gal}$). Twelve 2500 gallon tankers can carry 30,000 gallons and would therefore have to pick up fuel at an FSSP only once a day. Similar computations for the other types of units also indicate that the quantity of POL handling and transport equipment assigned to the combat maneuver battalions appears to be adequate to perform the POL resupply mission under a variety of scenarios. The reader must remember, however, that these computations assume all of the POL vehicles, like the combat vehicles, are operational and will be able to rendezvous at a designated point to refuel the combat vehicles. The proponents of armored POL resupply vehicles will argue that the unarmored POL resupply vehicle on a future battlefield will have an unacceptably high mortality rate. Also, resupply of POL to combat units engaged in a "deep penetration" scenario behind enemy lines as visualized by Army 21, would also present a challenge to both an armored and unarmored POL resupply vehicle.

(NOTE: Appendix A contains complete lists of fuel handling, fuel transport, storage capabilities and other POL information for each type POL unit responsible for the handling/transport of POL from the port, forward to division trains. The question that must be answered is: "Are these units capable of providing the required quantities of POL at the right place and at the right time to the combat forces?")

Computing Unit Fuel Consumption Rates

Just as was found with the study of Class V, there are a myriad of POL consumption planning factors and models for computing fuel consumption rates. Prior to 1973, the military had the luxury of estimating POL requirements and adding a "fudge factor" which increased the total quantity necessary to complete an assigned mission. Since that time, the shortage of crude oil, the increased numbers and rates of consumption of military vehicles, and limitations on the capability to transport and distribute fuel to highly maneuvering units on a highly mobile battlefield have all but eliminated the luxury of overestimating refined petroleum products to meet a particular mission need.

Methods presently available to calculate fuel consumption/ planning factors include:

FM 101-10-1, July 1976

FM 10-17, June 1979

STANAG 2115

CAA FASTALS Model (short tons per soldier per day)

SB 710-2 (gallons per soldier per day)

SB 710-2 (gallons per mile/kilometer traveled per day)

Gallons per hour

Pounds per soldier per day

Fuel consuming items combat profile

Source: CSS-MAA, Supply Substudy, Part 3,
USA QM School, Ft. Lee, Virginia

The M1 tank is one of the largest consumers of fuel on the battlefield today. Studies performed by the QM school have determined that it is impractical to conceptualize fuel consumption based on a number of miles traveled when dealing with a tank deployed on a battlefield. The amount of maneuvering and jockeying of a tank in a combat situation may cover considerable distance and consume considerable fuel without any appreciable advance or withdrawal. The study states that "A tank engine will probably operate for at least 10 to 12 hours per day on a battlefield environment". During the extremely intense Yom Kippur War, the Israelis reported tank engine operation averaging about 20 hours per combat day. In this regard, the Israelis use the single figure of approximately 60 liters (15.85 gallons) per hour as a consumption planning factor which proved to be extremely accurate for their M60 tanks. Although US planners are reluctant to use a general consumption factor such as 100 miles of estimated travel for a tank for a typical combat day, such a figure would equate to less than 8 hours of tank road movement time when using the Israeli planning factor.

Table 3, presented earlier on page 13 of this report, showed that the fuel consumption rates for selected combat vehicles, including the M1 tank, varied significantly depending on whether a vehicle was moving across country, on secondary roads, or simply standing still with the engine idling. Figure 5 represents a model for computing the fuel consumption for the M1 tank using the same POL consumption rates as shown in Table 3 (converted to gallons/mile). In this model, the S-4 POL planner can vary the percentage of time the tank travels cross country with the time traveled on secondary roads and select from the graph an estimated fuel consumption rate for an M1 tank battalion operating on the battlefield for a 24 hour period. For example the graph shows that if 50% was cross country and 50% was on secondary roads, the consumption would be 14,732 gallons per M1 tank battalion per day. Note that this model assumes a 100 mile distance traveled or equivalent hours of operation,

similar to the Israeli approach, the accuracy of which was validated during the Yom Kippur War.

METHOD FOR COMPUTING FUEL CONSUMPTION RATE FOR M1 TANK

(1 BN - 58 TANKS. 100 MILES PER 24 HOUR PERIOD)

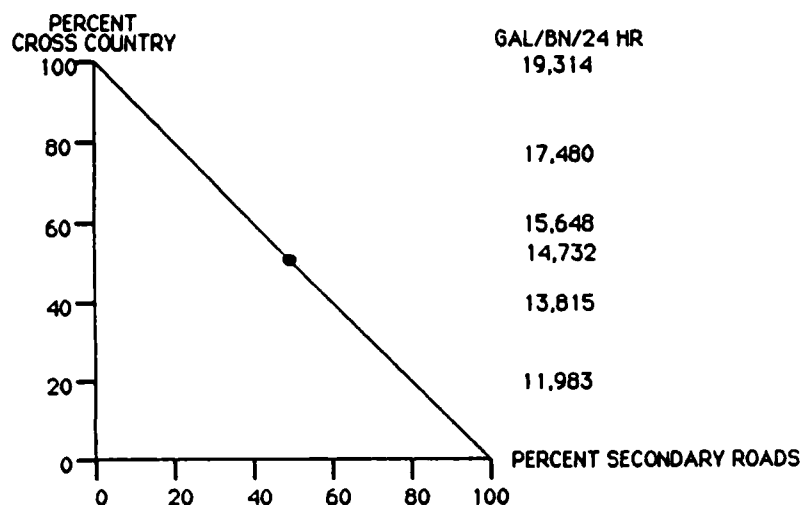


Figure 5. M1 Tank Battalion (58 Tanks) Fuel Consumption Rates.

As a matter of comparison, during the Operational Test III (OT III) of the M1 tank at Fort Knox, it was reported that fuel consumption was 3.5 gallons/mile. The same fuel consumption was reported for the OT III portion of the tests performed at Fort Hood. When new trainees were trained on the M1 tank at Fort Knox however, and it is understood that the majority of the training was performed on cross country type terrain, fuel consumption jumped to 8.0 gallons/mile. Considering the Fort Knox OT III testing as a conservative estimate of fuel consumption for an M1 tank battalion (which is similar to the estimate shown in Figure 5), and the fuel consumption based on the preliminary driver training for tank drivers as representing the "worst case" as shown by the two diagonal lines in Figure 6, one can see the wide divergence in estimating fuel consumption for a one-day operation of an M1 Tank Battalion.

IMPORTANCE OF AN ACCURATE PLANNING FACTOR FOR POL CONSUMPTION

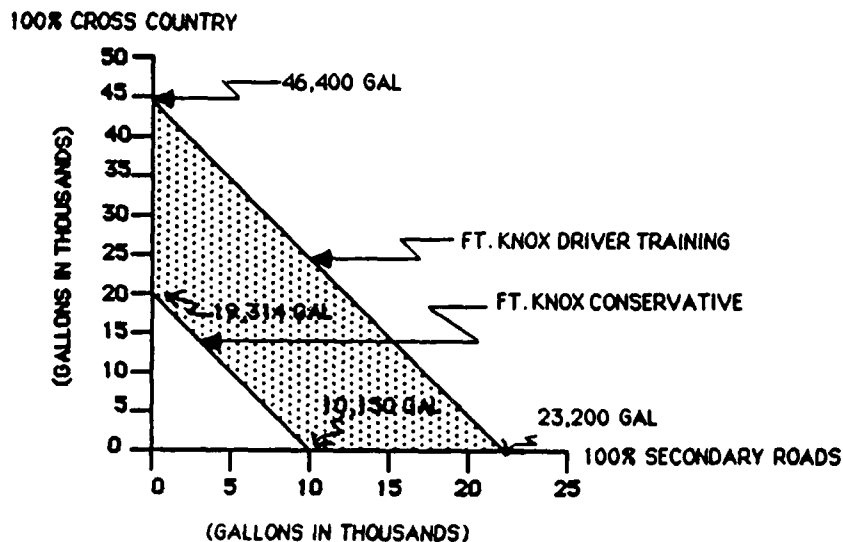


Figure 6. M1 Tank Battalion (58 Tanks) Fuel Consumption: Fort Knox Conservative Vs. Fort Knox Driver Training.

For example, using the worst case presented in Figure 6., i.e., 100% cross country at 8 gallons/mile versus the best case of 100% secondary road travel at 3.5 gallons/mile, the variance is 357% ($46,400 - 10,150 = 36,250 \div 10,150 = 357\%$). A more realistic comparison might be to assume a 50% cross country - 50% secondary roads for both the 3.5 gallons/mile Ft. Knox DT III test experience and the gal/mi Ft. Knox Driver Training experience (14,732 gallons/24 hours versus 34,800 gallons/24 hours in which case the variance would be 136%). Hopefully, this illustrates the importance of providing a realistic planning factor to tank commanders for accurately estimating fuel requirements in support of a Heavy Armored Division operating in an Airland Battle or Army 21 battlefield environment.

FINDINGS

POL Unit Force Structure

1. Eighty-one percent of the POL units and approximately 80-90% of POL supply and transport capability rests with the Reserve and National Guard.

2. The Army Science Board 1984 Summer Study "Technology to Improve Logistics and Weapons Support for Army 21" concluded that: "Army 21 is not supportable unless significant constraints

are placed on POL consumption." This conclusion cannot be fully verified until Army 21 operational concepts have been fully defined and an accurate Day of Supply (DOS) methodology is available for computing quantitative requirements.

POL Policy, Doctrine and Concepts

3. The policy, doctrine, organizations, methods and procedures for the movement and distribution of bulk POL from the port to the using units is well documented and appears to be adequate with some exceptions as follows:

a. Currently, there exists eight military approved and documented sources and nine methods for the computation of a POL Day of Supply (DOS), none of which are universally accepted as the best or most accurate method.

b. Current DoD doctrine results in an overlap of responsibility between Army and Navy for movement of POL from an offshore tanker to an onshore facility. The Navy has primary responsibility for this mission in support of the US Marine Corps and the Army has primary responsibility for support of the Army and Air Force.

(NOTE: A Memorandum of Agreement (MOA) was signed on 9 July 1985 tasking a Joint Army/Navy study group to clarify this mission assignment and develop doctrine which will assign primary responsibility to the US Navy for movement of all POL from offshore to onshore (Logistics Over-the-shore [LOTS]) up to the high water mark. This does not include off-load of POL from tankers moored to a pier in a developed theater of operations which will remain a US Army responsibility.)

c. Operational concepts for conduct of future warfare are out of phase with logistical concepts. For example, Army 21 tactics and strategy call for a "deep penetration: in which sizeable forces are deployed deep into enemy territory. Yet, there are no companion tactics and strategy for the resupply of these forces which may not be able to return to friendly areas without resupply (see paragraph 2 above).

POL Quantitative Requirements

4. In addition to the need for the clarification of doctrine relative to the methodology for computing POL requirements, there is a need to clarify the requirements in terms of "how rapidly does a user need his fighting vehicles refueled?". Times can vary from a few minutes per vehicle to in excess of thirty minutes depending on the type vehicle and conditions under which refueling is being accomplished.

Systems Versus "Fix Weakest Link" Approach

5. Although many actions are either planned or in process to correct POL supply and distribution shortfall, there is little evidence of a totally integrated systems approach to the resolution of POL problems. For example, high volume pumps are being procured for movement of POL through the wholesale pipeline system as well as for distribution from tactical POL tank trucks into combat vehicles with little regard as to whether or not the wholesale POL storage facilities can handle the increased flow rates or whether or not the tactical fighting vehicles can accept the faster fill rates of pumps on tactical POL vehicles.

Master Priority List

6. The Master Priority List is inconsistent with program execution. For example, of nineteen major initiatives dealing with the correction of POL problems, seven have no funding through FY 87 even though some of these unfunded projects are identified as high-priority efforts.

Personnel and Training

7. POL unit training is minimal within both the reserve and active units due to the shortages of equipment and environmental restrictions. Reserve units have the opportunity to participate in major field exercises on an average of only once in three years and the benefits of such exercises are significantly degraded due to equipment shortages and environmental restrictions in designated training areas which preclude meaningful training with POL products.

Technical Publications

8. A review was made of TMs, FMs and other technical publications dealing with POL maintenance and operations. Forty-four percent were found to be six or more years old. With the many changes that are occurring not only in tactics and doctrine relative to Airland Battle/Army 21, but also in the fielding of new equipment, the need for updating POL technical publications is apparent.

Other Problems

A number of problems identified in earlier studies that were also noted during the conduct of this study, but for which little evidence of corrective action was either planned or underway, are listed below. When corrective action was identified, such information is also provided.

9. The Army is focussed on weapons system performance in terms of lethality, speed, survivability, maneuverability, etc., without commensurate consideration for fuel economy requirements.

Corrective Action: AMC identified 4 initiatives in the Army Energy R&D Plan for 1983 including fleet dieselization, M1 tank engine improvement, advanced integration propulsion system for the next generation tank, and micro-processor control. It remains to be seen whether such programs will fall into a category like the NBC initiatives, many of which are first to be reduced or eliminated by a project manager when funding shortages or program delays occur, or whether they will, in fact, be executed as part of the basic project effort.

10. Over-the-shore POL logistics capability during early stages of employment in an undeveloped theater of operations is marginal.

Corrective Action: A joint Army/Navy procurement program is in process to increase distance by which over-the-shore POL off-loading can be performed from one to four miles. Also, by use of the SALM, off-loading can be continued during Sea State 3 and higher (previously limited to Sea State 2).

11. Outmoded pipeline technology imposes labor and time intensive requirements for rapid pipeline deployment.

Corrective Action: An AMC R&D project is underway for an automated pipeline laying system (APES) to increase capability from as little as one mile per day to up to three miles per hour.

12. Current POL highway tanker vehicle fleet is slow, vulnerable and plagued with a mix of vehicles and engines. Some are very old and are experiencing high maintenance requirements.

13. Lack of a standardized refueling system has resulted in gross inefficiencies in refueling operations. Some of the new tactical vehicles recently fielded have multi-refueling ports with no cross leveling capability and utilize the slow "open port" method of refueling.

14. Some of the Forward Area Refueling Equipment (FARE) units are old and in need of repair. When used for multi-vehicle refueling (4 vehicles at a time), rate of refueling is sometimes less than 25 GPM per vehicle.

15. Command, Control and Communications (C³) capabilities for both intra-POL terminals and inter-POL pipeline pumping stations are considered to be grossly inadequate. This seriously degrades POL system operations.

Corrective Action: During the AOW 11 Conference, 9 June 1985, the Army Signal Center and School representative was tasked to define a communications system capable of meeting C³ requirements for the Southwest Asia Petroleum Distribution Operational Program (SWAPDOP) which represents the most critical and most challenging C³ requirements.

16. Operational life of the collapsible POL storage tanks, the main and often the sole item used for storage of POL in operating head terminals, is only one year.

17. There is currently no capability to quickly determine the type or useability of fuel which has been captured.

Corrective Action: An AMC R&D project is underway to develop a small lightweight kit for rapid analysis of captured enemy POL products.

18. Current family of US Army POL equipment assemblages does not include a small, lightweight, easily operated system which armor or mechanized infantry platoon-sized units can carry into battle and use to refuel their vehicles from sources of opportunity under emergency conditions.

19. The current inventory of storage tanks, vehicle tankers and pipelines are highly vulnerable to a wide range of enemy fire from small arms, fragments, shrapnel, artillery, rockets and aircraft weapons. Little project effort can be found to improve survivability of this equipment.

20. The Master Petroleum Materiel Requirements Plan is generally devoid of timely combat development input from QM School, i.e., requirements information. This unnecessarily limits its usefulness.

21. There is limited crew protection for forward area refueling operations.

Corrective Action: Proposals for an armored tracked refueling system have been advocated by Government contractors; however, no known COEA or similar Government sponsored type of analysis has been performed to determine the merits of such a proposal.

POTENTIAL AREAS FOR FUTURE USA HEL EFFORT

Based on a review of the above findings and on the authors' understanding and background knowledge of the experience and capabilities of the US Army Human Engineering Laboratory (USAHEL), the following is a list of some of the areas in which it is felt

the USAHEL can make the greatest contributions in terms of improving the POL supply and distribution system and primarily its performance capabilities.

Field Data Collection, Study and Analysis

- Time Trials - Time to refuel selected combat vehicles. (BFVs, M1, M60, etc.)
- Concurrent rearm and refuel of combat vehicles is not done. "Refuel and rearm procedures and times" is a valid issue.
- POL consumption rates
- Concurrent versus sequential vehicle refueling/rearming
- Queuing of vehicles for rearming/refueling--
2500 gallon HEMTT tankers versus FARE units
versus new technology items.

FSSP Operations, Study and Experimental Field Trials

- Where to establish an FSSP
- How much POL on ground versus on tankers/trailers
- FSSP night operations
- Replace or PIP the FARE
- How to reduce signature of an FSSP
- Hot refueling/rapid refueling
- Open versus closed port refueling

Requirement for Refueling Under Armor

- Robotic refueler

APPENDIX A

POL Unit Missions and Capabilities

POL ORGANIZATIONS WITHIN A THEATER OF OPERATIONS

C. DOCTRINE:

The following doctrinal publications are applicable to the operation of this unit:

FM 10-7, Supply and Service Company, Supply and Transport Battalion.

FM 10-24, Ration Breakdown Point Operations.

FM 10-30, Central Issue Facility.

FM 10-60, Subsistence Supply and Management in Theaters of Operations.

FM 10-63, Handling of Deceased Personnel in Theaters of Operations.

FM 10-69, Petroleum Supply Point and Equipment Operations.

FM 10-70, Inspecting and Testing Petroleum Products.

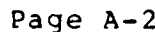
FM 10-286, Identification of Deceased Personnel .

FM 29-50, Supply and Services in Divisions and Separate Brigades.

FM 55-30, Army Motor Transport Operations.

FM 55-31, Army Motor Transport Units.

FM 100-10, Combat Service Support.



ORGANIZATION, MISSION AND FUNCTIONS CHART

POL ORGANIZATIONS WITHIN A THEATER OF OPERATIONS

ORGANIZATION	TOBE #	MISSION	FUNCTIONS/ CAPABILITIES	PARENT ORGANIZATION	BASIS OF ALLOCATION	GENERAL LOCATION	SUPPORT (TYPE & UNIT)	STORAGE CAPACITY CL III	LINE HAUL CAPABILITY CL III	REMARKS
Supply & Service Co., S&T Bn, Mech and Armored Div.	10007H020	See A Below	See B Below	S&T Bn, Mech & Armored Div	One per Div	Division and Brigade Support Areas	CL I, II, III, IV & VII Supplies, ATP's	Store & Issue 133,500 gallons bulk POL per day	None. Line Haul Capability Provided by Trans. Mtr Co. S&T Bn..With 29 - 5000 Gal Semitrailers	5 - FARE's 2 - FSSP's 220 Person- nel

A. MISSIONS:

- To support the division and attached units by providing Class I, II, III, IV, and VII supplies, ammunition transfer points in brigade areas, and limited salvage classification and disposal service.
- To provide CEB and GRREG services when authorized appropriate augmentation.
- To operate the division central issue facility (CIF).

B. CAPABILITIES:

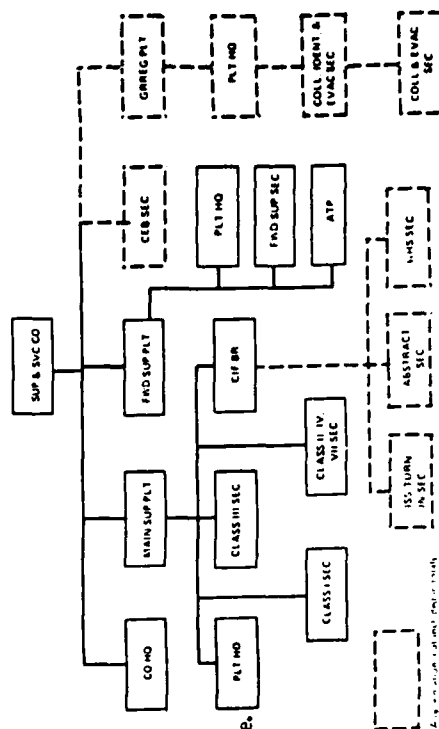
When organized under SRC 10007H020, the company:

- Operates supply and distribution points in the division support area and in the brigade support areas.
- Receives, provides temporary storage for, and issues 61.98 short tons of Class I; 30.16 short tons of Class II; 11.56 short tons of Class III (packaged); 78.63 short tons of Class IV (except operational project supplies); and 39.5 short tons of Class VII supplies, except COMSEC supplies, aircraft, ADPE, classified maps, and airdrop equipment.
- Is capable of storing and issuing 133,500 gallons of Class III bulk petroleum per day.
- Provides salvage service for materiel and supplies of all types, except COSMEC supplies, toxic agents, radioactive materials, vehicles, aircraft, ammunition and explosives, and medical supplies.
- Provides a nucleus for a CIF for the stockage, issue, exchange, inspection, and turn-in of organizational clothing and equipment.
- Coordinates and transmits requests for Class I supplies from user to the DMMC.
- Provides emergency water distribution for supported units unable to pick up water at the water points.
- Maintains the division reserve of supplies and equipment for which the company is responsible.
- Provides up to five FARE filling station operations for ground vehicles.

C. DOCTRINE:

The following doctrinal publications are applicable to the operation of this unit:

- FM 10-7, Supply and Service Company, Supply and Transport Battalion.
- FM 10-60, Subsistence Supply and Management in Theaters of Operation.
- FM 10-63, Handling of Deceased Personnel in Theaters of Operation.
- FM 10-68, Aircraft Refueling.
- FM 10-69, Petroleum Supply Point and Equipment Operations.
- FM 10-70, Inspecting and Testing Petroleum Products.
- FM 10-286, Identification of Deceased Personnel.
- FM 29-50, Supply & Services in Div and Separate Brigades.



ORGANIZATION, MISSION AND FUNCTIONS CHART

POL ORGANIZATIONS WITHIN A THEATER OF OPERATIONS

ORGANIZATION	TO&E #	MISSION	FUNCTIONS/ CAPABILITIES	PARENT ORGANIZATION	BASIS OF ALLOCATION	GENERAL LOCATION	SUPPORT (TYPE & UNIT)	STORAGE CAPACITY CL III	LINE HAUL CAPABILITY CL III	REMARKS
S&T Bn., Air Assault Div, 29095J000		See A Below	See B Below	Div Support Command, Air Assault Div	One Per DISCOM an Assault Div	Division and Brigade Support Areas	CL I, II, III, IV, V & VII Supplies, Limited Motor Transport CEB, GREG & CIF Services	36-10,000 Gallon Collapsible Tanks	10 - 5,000 Gallon Semitrailers	18 FARE's 6 FSSP's

A. MISSION: To provide CL I, II, III, IV, V, and VII supplies except communications security (COMSEC), aircraft, automatic data processing equipment (ADPE), air-drop equipment, and classified maps, to all organic and attached elements of the division; limited motor transport service for logistical support; and clothing exchange and bath service, graves registration service, and a central issue facility.

B. CAPABILITIES: At Level 1, this unit:

- (1) Establishes and operates division and brigade supply and distribution points providing for receipt, temporary storage and issue of all classes of supply and equipment for which the battalion has been assigned responsibility.
- (2) Establishes and operates ammunition transfer points in brigade areas.
- (3) Prepares sling loads of supplies and equipment for helicopter lift.
- (4) Plans and coordinates requirements for, and utilization of, air and ground transport to support the battalion supply and distribution mission.
- (5) Provides and operates limited motor transport service for logistical support.
- (6) Plans and coordinates division support requirements laundry, renovation, and the evacuation of salvage property (exclusive of toxic agents and radio active material, ammunition, vehicles, medical materiel, explosives, aircraft, and COMSEC equipment) provided by nondivisional units.
- (7) Provides emergency water supply when supported units are unable to pick up water from the water point.
- (8) Provides unclassified map supply service to the division and attached unit.
- (9) Provides and maintains division reserve of supplies and equipment for which the battalion is responsible.

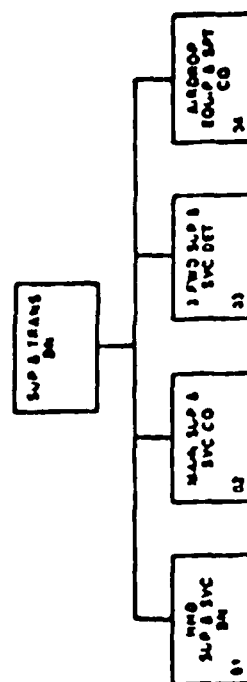
(10) Coordinates and supervises the following service functions:

- (A) Central issue facility (when authorized augmentation).
- (B) Clothing exchange and bath service (when authorized augmentation).
- (C) Graves registration service (when authorized augmentation).
- (D) Clearing airfields/heliports of supplies and equipment.

C. DOCTRINE:

The following doctrinal publications are applicable to the operation of this unit:

- FM 10-19, Airmobile Aviation Fuel Laboratory.
- FM 10-24, Ration Breakdown Point Operations.
- FM 10-30, Central Issue Facility.
- FM 10-60, Subsistence Supply and Management in Theaters of Operations.
- FM 10-63, Handling of Deceased Personnel in Theaters of Operations.
- FM 10-68, Aircraft Refueling.
- FM 10-69, Petroleum Supply Point Equipment and Operations.
- FM 10-70, Inspecting and Testing Petroleum Products.
- FM 10-286, Identification of Deceased Personnel.
- FM 29-50, Supply and Service in Division and Separate Brigades.
- FM 29-96, Supply and Service Battalion, Airmobile Division.
- FM 55-30, Army Motor Transport Operations.
- FM 100-10, Combat Service Support.



ORGANIZATION, MISSION AND FUNCTIONS CHART

POL ORGANIZATIONS WITHIN A THEATER OF OPERATIONS

ORGANIZATION	TO&E #	MISSION	FUNCTIONS/ CAPABILITIES	PARENT ORGANIZATION	BASIS OF ALLOCATION	GENERAL LOCATION	SUPPORT (TYPE & UNIT)	STORAGE CAPACITY CL III	LINE HAUL CAPABILITY CL III	REMARKS
S&T Bn., Inf Div	29005H000	See A Below	See B Below	Division Support Command	One Per DISCOM Inf Div	Division & Brigade Support Areas	All Classes of Supply, Operate ATP, Motor Transport for Division Assets	27 - 500 Gal Col- apsible Drums 6 - 10,000 Collapsible Tanks	16 - 5,000 Gal Semitrailers	5 - FARE's 1 - FSSP

A. MISSION: To provide combat service support, commensurate with stated capabilities, to all organic and attached elements of the division.

B. CAPABILITIES:

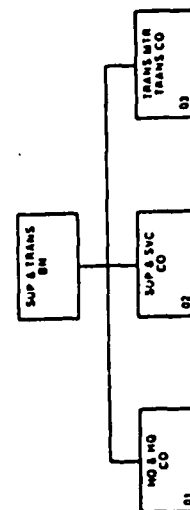
At Level 1, this unit provides:

- (1) Division and brigade supply and distribution points for receipt, temporary storage, and issue of all classes of supply for which the battalion has been assigned responsibility.
- (2) Ground transportation for unit distribution of supplies for which the bat-talion is responsible and supplemental transportation in support of organic elements of the division.
- (3) Maintenance of and transportation for moving the division reserve supplies for which the battalion is responsible.
- (4) Unclassified map supply service to the division and attached units.
- (5) Salvage service for materiel and supplies except ammunition, explosives, toxic agents and radioactive materials, vehicles, aircraft, COMSEC supplies, and medical supplies.
- (6) The command and control headquarters for the Supply and Transport Bat-talion's organic and attached units.
- (7) Brigade ammunition transfer points (ATP).
- (8) Emergency water distribution when supported units are unable to pick up water from water points.
- (9) When augmented, the unit provides clothing exchange and bath (CEB), graves registration and a central issue facility.

C. DOCTRINE:

The following doctrinal publications are applicable to the operation of this battalion:

- FM 10-7, Supply and Service Company, Supply and Transport Battalion.
- FM 10-24, Ration Breakdown Point Operations.
- FM 10-30, Central Issue Facility.
- FM 10-60, Subsistence Supply and Management in Theaters of Operations.
- FM 10-63, Handling of Deceased Personnel in Theaters of Operations.
- FM 10-69, Petroleum Supply Point and Equipment Operations.
- FM 10-70, Inspecting and Testing Petroleum Products.
- FM 10-286, Identification of Deceased Personnel
- FM 29-50, Supply and Services in Divisions and Separate Brigade.
- FM 55-30, Army Motor Transport Operations.
- FM 55-31, Army Motor Transport Units.
- FM 100-10, Combat Service Support.



ORGANIZATION, MISSION AND FUNCTIONS CHART
POL ORGANIZATIONS WITHIN A THEATER OF OPERATIONS

ORGANIZATION	TO&E #	MISSION	FUNCTIONS/ CAPABILITIES	PARENT ORGANIZATION	BASIS OF ALLOCATION	GENERAL LOCATION	SUPPORT (TYPE & UNIT)	STORAGE CAPACITY CL III	LINE HAUL CAPABILITY CL III	REMARKS
S&T Bn., Inf Div. (Mech)	29065H000	See A Below	See B Below	DISCOM, Inf Div (Mech)	One Per DISCOM	Division & Brigade Support Areas	All Classes of Supply Bde ATP's	27 - 500 Gal Collapsible Drums 12 - 10,000 Gal Col- lapsible Tanks	29 - 5000 Gal Semitrainers	5- FARE's 2- FSSP's

A. MISSION: To provide combat service support, commensurate with stated capabilities, to all organic and attached elements of the division.

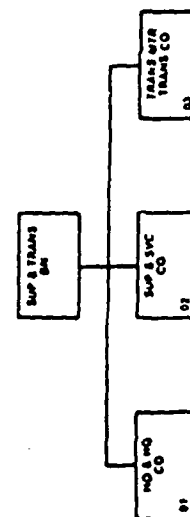
B. CAPABILITIES: This unit provides:

- (1) Division and brigade supply and distribution points for receipt, temporary storage, and issue of all classes of supply for which the battalion has been assigned responsibility.
- (2) Ground transportation for unit distribution of supplies for which the bat-talion is responsible and supplemental transportation in support of organic elements of the division.
- (3) Maintenance of and transportation for moving the division reserve supplies for which the battalion is responsible.
- (4) Unclassified map supply service to the division and attached units.
- (5) Salvage service for materiel and supplies except ammunition, explosives, toxic agents and radioactive materials, vehicles, aircraft, COMSEC supplies, and medical supplies.
- (6) The Command and Control Headquarters for the Supply and Transport Battalion's organic and attached units.
- (7) Brigade ammunition transfer points (ATP).
- (8) Emergency water distribution when supported units are unable to pick up water from water points.
- (9) When augmented, the unit provides clothing exchange and bath (CEB), graves regis-tration and a central issue facility.

C. DOCTRINE:

The following doctrinal publications are applicable to the operations of this unit:

- FM 10-7, Supply and Service Company, Supply and Transport Battalion.
- FM 10-24, Ration Breakdown Point Operations.
- FM 10-30, Central Issue Facility.
- FM 10-60, Subsistence Supply and Management in Theaters of Operations.
- FM 10-63, Handling of Deceased Personnel in Theaters of Operations.
- FM 10-69, Petroleum Supply Point and Equipment Operations.
- FM 10-70, Inspecting and Testing Petroleum Products.
- FM 10-286, Identification of Deceased Personnel in Theaters of Operations.
- FM 29-50, Supply and Services in Divisions and Separate Brigades.
- FM 55-30, Army Motor Transport Operations.
- FM 55-31, Army Motor Transport Units.
- FM 100-10, Combat Service Support.



ORGANIZATION, MISSION AND FUNCTIONS CHART

POL ORGANIZATIONS WITHIN A THEATER OF OPERATIONS

ORGANIZATION	TO&E #	MISSION	FUNCTIONS/ CAPABILITIES	PARENT ORGANIZATION	BASIS OF ALLOCATION	GENERAL LOCATION	SUPPORT (TYPE & UNIT)	STORAGE CAPACITY CL III	LINE HAUL CAPABILITY CL III	REMARKS
Transportation Medium Truck Co.(Petroleum)	*55018H620 **55018H650	See A Below	See B Below	Normally At- tached to Petrol Supply Bn	One Per the Require- ment to line- haul (*450,000) or (**225,000) Gallons of Bulk POL	Division, Corps or Theater Army Sup- port Area	Line-haul and Local Transpor- tation of Bulk POL	None	80 - 5000 Gal Semitrailers	* 178 per- sonnel ** 109 per- sonnel

A. MISSION: To provide transportation for the movement of bulk petroleum products

by motor transport.

B. CAPABILITIES:

(1) Operating two shifts with 75% vehicle availability (45 semitrailer combinations), four round trips per day (two per operating shift) in local hauls or two round trips per day (one per operating shift) in line hauls, has the following capabilities:

When equipped with 5000-gallon tank, fuel semitrailer (SRC 55018H620): *

1 - Local Hauls - 900,000 gallons

2 - Line Hauls - 450,000 gallons

(2) Operating one shift with 75% vehicle availability (45 semitrailer combinations), two round trips per day (per one operating shift) in local hauls or one round trip per day (per one operating shift) in line hauls, has the following capabilities:

When equipped with 5000-gallon tank, fuel semitrailer (SRC 55018H650): **

1 - Local Hauls - 450,000 gallons

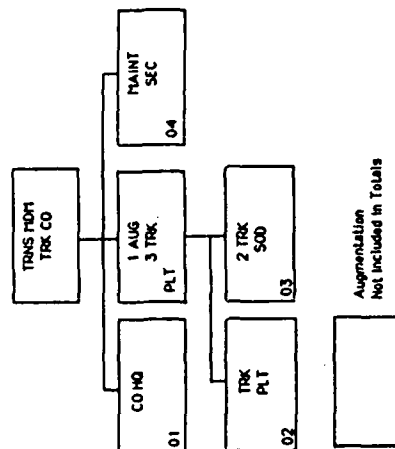
2 - Line Hauls - 225,000 gallons

C. DOCTRINE:

The following doctrinal publications are applicable to the operation of this unit:

FM 55-30, Army Motor Transport Operations.

FM 55-31, Army Motor Transport Units Equipment.



Augmentation
Not included in Totals

ORGANIZATION, MISSION AND FUNCTIONS CHART

POL ORGANIZATIONS WITHIN A THEATER OF OPERATIONS

ORGANIZATION	TO&E #	MISSION	FUNCTIONS/ CAPABILITIES	PARENT ORGANIZATION	BASIS OF ALLOCATION	GENERAL LOCATION	SUPPORT (TYPE & UNIT)	STORAGE CAPACITY CL III	LINE HAUL CAPABILITY CL III	REMARKS
Petroleum Pipeline and Terminal Operating Co.	10207H300	See A Below	See B Below	Petroleum Pipeline and Terminal Operating Bn.	One Co. for One Tactical Petroleum Terminal or One Co. per 500,000 Barrel Storage Capacity and 100 Kilometers Pipeline	In the COMMZ at a Tactical Petroleum Terminal	Supports the POL Inland Distribution System	Operates a Two Tank Farm With a Total Capacity of 500,000 Barrels of Bulk POL. 7 - 5,000 Gal Can Store Semitrailers 45,000 Gals in Collapsible Tanks	Operates a Loading Facility with 52,000 Gal Capacity on a Daily Basis	1 - FARE 1 - FSSP 183 Personnel

A. MISSION: To operate military petroleum terminal and pipeline facilities for the storage and distribution of bulk petroleum products.

B. CAPABILITIES:

(1) Operate petroleum terminal facilities for the receipt, storage, bulk transfer, issue and distribution of petroleum products to include:

(A) Operation of a tank farm complex for storage of 100,000 to 500,000 barrels of bulk petroleum depending upon capacity and type of storage facilities available. The complex of two tank farms, each with a capacity ranging from 50,000 to 250,000 barrels, and

(B) Operation of loading facilities for shipment of products by coastal tanker, barge, rail tank cars and tank trucks based on 75% availability of organic vehicles, provides for local delivery of 52,000 gallons of bulk products daily, and

(C) Limited bulk reduction capabilities and local delivery of packaged products.

(2) Operates four pump stations for delivery of bulk petroleum via six or eight-inch multiproduct pipeline. On level terrain, this constitutes the operation of approximately 100 kilometers (60 miles) of pipeline.

(3) Maintains a prescribed reserve of bulk petroleum products for the theater.

(4) Provides storage for 45,000 gallons of bulk fuel in collapsible tanks, based on a 75% inservice available storage capacity.

(5) Has capacity to operate a tactical marine petroleum terminal.

C. DOCTRINE:

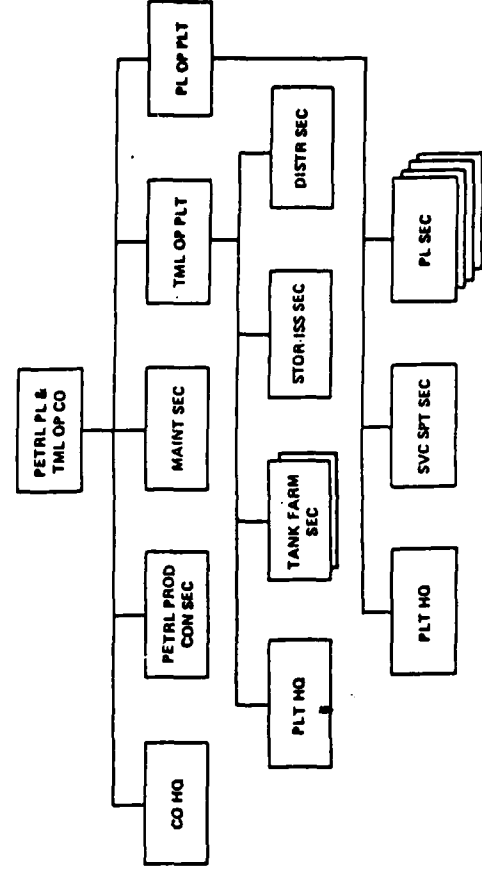
The following doctrinal publications are applicable to the operation of this unit:

FM 10-18, Petroleum Terminal and Pipeline Operations.

FM 10-20, Organizational Maintenance-Military Petroleum Pipeline, Tanks and Related Equipment.

FM 10-69, Petroleum Supply Point Equipment and Operations.

FM 5-343, Military Petroleum Pipeline Systems.



POL ORGANIZATIONS WITHIN A THEATER OF OPERATIONS

ORGANIZATION	TO&E #	MISSION	FUNCTIONS/ CAPABILITIES	PARENT ORGANIZATION	BASIS OF ALLOCATION	GENERAL LOCATION	SUPPORT (TYPE & UNIT)	STORAGE CAPACITY CL III	LINE HAUL CAPABILITY CL III	REMARKS
Supply & Service Co., Direct Support Non-divisional	29147H520	See A Below	See B Below	Corps or Theater Army Support Command	Variable - Mission Dependent (1 Unit/ 15,000 Troops)	Division, Corps, or Theater Army Support Area	CL I, II, III, IV & VII Supplies	100,000 Gals Per Day	9 - 5000 Gal Semitrailers	2 - FSSP's 284 Person- nel

C. DOCTRINE:

The following doctrinal publications are applicable to the operation of this unit:

FM 10-60, Subsistence Supply and Management in Theater of Operations.

FM 10-63, Handling of Deceased Personnel in Theaters of Operations.

FM 10-68, Aircraft Refueling.

FM 10-69, Petroleum Supply Point and Equipment Operations.

FM 10-70. Inspecting and Testing Petroleum Products.

EM 10-267 General Repair for Clothing and Textiles.

FM 10-287, General Report for Survivors
FM 10-286 Identification of Deceased Personnel.

FM 10-280, Identification of Personnel and Equipment
FM 29-147, Supply and Service Company, Direct Support.

FM 38-725-1. Direct Support System. Commander's Handbook.

FM 38-723-1, Direct support system, command.

FM 38-741, PS Support Unit Storage Operations.

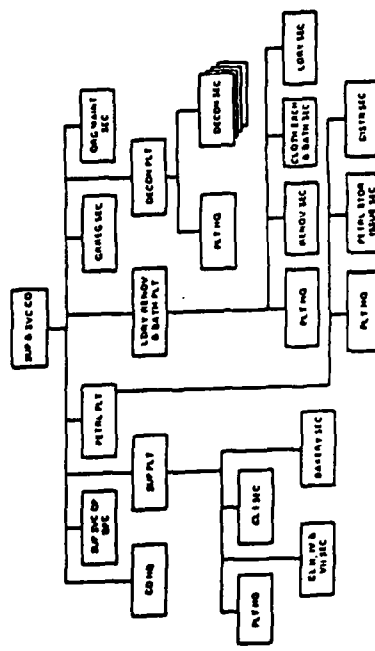
FM 54-7. Theater Army Logistics.

FM 54-9. Corps Support Command.

A. MISSION: To operate a direct support supply and service facility in support of non-divisional troops.

B. CAPABILITIES:

- (1) When organized under TOE 29147HS20: Requisitioning, receiving, storing and issuing 40,725 short tons of Class I supplies; 52,275 short tons of Class II supplies; 9,375 short tons of Class III (packaged) supplies; 63.75 short tons of Class IV supplies (less operational project supplies); 20.08 short tons of Class VII supplies.
- (2) Class III POL storage and distribution based on 83% availability of tanks and 75% availability of fuel dispensing trucks and fuel servicing trailers.
- (a) Storing 100,000 gallons of bulk petroleum a day.
- (b) Distributing 81,900 gallons of bulk petroleum a day.
- (3) Graves registration: 50 remains handled per month.
- (4) One-half pound of fresh bread per man per day for 15,000 troops per day.
- (5) Bulk laundry service at the rate 6 pounds of laundry per man per week for 15,000 non-divisional troops.
- (6) Bath and clothing exchange service for 15,000 non-divisional troops per week.
- (7) Potable water support as follows:
- (a) On a 2-shift basis, produces 180,000 gallons of potable water per day at up to six locations.
- (b) Treats nuclear, chemical, biological (NBC) contaminated water at a rate of 180,000 gallons per hour (GPH) when augmentation equipment is provided.



ORGANIZATION, MISSION AND FUNCTIONS CHART
POL ORGANIZATIONS WITHIN A THEATER OF OPERATIONS

ORGANIZATION	TOE #	MISSION	FUNCTIONS/ CAPABILITIES	PARENT ORGANIZATION	BASIS OF ALLOCATION	GENERAL LOCATION	SUPPORT (TYPE & UNIT)	STORAGE CAPACITY CL III	LINE HAUL CAPABILITY CL III	REMARKS
HHD, Petroleum Group	102024200	See A Below	See B Below	Theater Army or Corps Support Command	One per Theater Army or Independent Corps	Theater Army or Corps Support Area	Provides Command and Control for all Theater/ Corps POL Units	None	None	

A. MISSION: To plan and manage petroleum distribution for the theater to provide liaison to host nation staffs for coordination of petroleum logistics support and command of interzonal pipelines to command and control assigned and attached units.

B. CAPABILITIES:

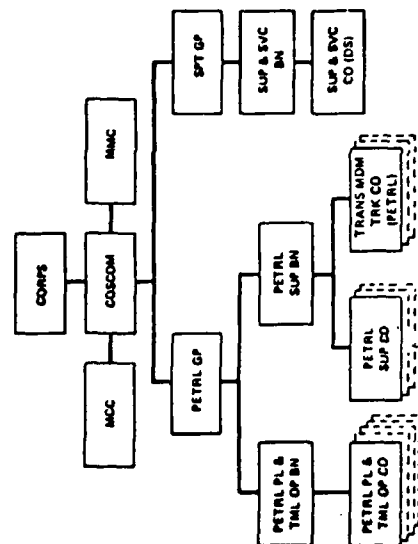
- (1) Provides command, administrative, technical, and operational supervision for petroleum pipeline and terminal operating battalions and other assigned or attached units required for the operation and maintenance of intersectional military petroleum distribution systems.
- (2) Conducts operational planning for the development, rehabilitation, and extension of the petroleum distribution system(s).
- (3) Coordinates requirements for construction, rehabilitation and maintenance of POL facilities with the Engineer Command.
- (4) Establishes and manages theater petroleum quality surveillance program.
- (5) Develops detailed plans for receipt, storage, and distribution of petroleum.
- (6) Conducts liaison with host nation staffs for coordination of US/Allied distribution support.
- (7) Receives and consolidates fuel requirements for US Army, US Navy, US Air Force and other supported activities and forwards them to the Joint Petroleum Office.

C. The following organizations may be assigned or attached to this headquarters:

- (1) TOE 10-206, Headquarters and Headquarters Company Petroleum Pipeline and Terminal Operating Battalion.
- (2) TOE 10-207, Petroleum Pipeline and Terminal Operating Company.
- (3) TOE 55-16, Headquarters and Headquarters Detachment, Transportation Motor Transport Battalion.
- (4) TOE 55-18, Transportation Medium Truck Company.
- (5) TOE 10-226, Headquarters and Headquarters Detachment, Petroleum Supply Battalion.
- (6) TOE 10-227, Petroleum Supply Company.

D. DOCTRINE: The following doctrinal publications are applicable to the operation of this unit:

- FM 10-67, Petroleum Supply in Theaters of Operations.
- FM 100-10, Combat Service Supply.
- FM 100-16, Echelons Above Corps.



ORGANIZATION, MISSION AND FUNCTIONS CHART
POL ORGANIZATIONS WITHIN A THEATER OF OPERATIONS

ORGANIZATION	TO&E #	MISSION	FUNCTIONS/ CAPABILITIES	PARENT ORGANIZATION	BASIS OF ALLOCATION	GENERAL LOCATION	SUPPORT (TYPE & UNIT)	STORAGE CAPACITY CL III	LINE HAUL CAPABILITY CL III	REMARKS
Petrol Supply Co (LUPS) (Logistic Unit Pro- ductivity Study)	10227H500	See A Below	See B Below	Petrol Supply Bn or COSCOM	**	Corps or Theater Army Support Area	Receives, Stores, and Issues CL III Bulk POL	1,244,558 Gallons Per Day	12 - 5000 Gal Semitrailers	6 - FARE's 6 - FSSP's (Improved) 202 Personnel

A. MISSION:

- (1) Establish and operate temporary petroleum storage facilities for general support of divisional and nondivisional units at no more than two locations.
- (2) Lay, operate and retrieve petroleum hoses.
- (3) Maintain a portion of the command bulk petroleum reserve stock.

B. CAPABILITIES:

- (1) Receive or issue a total of 1,244,558 gallons while maintaining a pure reserve stock.
- (2) Operate collapsible bulk petroleum storage facilities as follows:

STORAGE CAPABILITY (GALLONS) AT 100% AVAILABILITY

COLLAPSIBLE TANKS	COMPANY	PLATOON	SECTION
36 Ea 50,000 Gal	1,800,000	900,000	300,000
24 Ea 20,000 Gal	480,000	240,000	80,000
24 Ea 10,000 Gal	240,000	120,000	40,000
TOTAL	*2,520,000	1,260,000	420,000

*Includes a portion of the command reserve stock.

- (3) Store a portion of the command reserve stock up to 2,520,000 gallons.
- (4) Lay and operate approximately 16KM (10 miles) of collapsible hose line.
- (5) Provide limited mobile filling station support.
- (6) Establish and operate bulk Class III supply points at no more than two locations.

- ** a. Corps. One per armor or mechanized division 86 and one per two air-borne, air assault or infantry divisions or combinations thereof.
- b. COMMZ (LR3) One per 1,244,558 gallon daily requirement or fraction thereof for issue of bulk petroleum.

C. DOCTRINE:

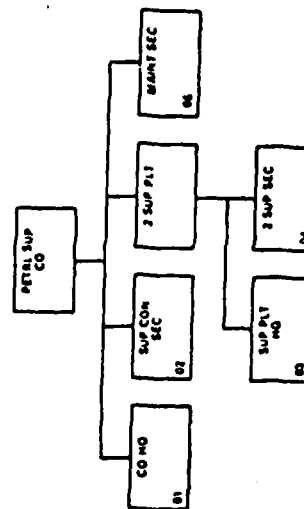
The following doctrinal publications are applicable to the operation of this unit:

FM 10-67, Petroleum Supply in Theater of Operations.

FM 10-69, Petroleum Supply Point Equipment and Operations.

FM 10-227, Petroleum Supply Company.

Logistic Unit Productivity Study, USAQMS, Dec 83.



ORGANIZATION, MISSION AND FUNCTIONS CHART POL ORGANIZATIONS WITHIN A THEATER OF OPERATIONS

ORGANIZATION	TO&E #	MISSION	FUNCTIONS/ CAPABILITIES	PARENT ORGANIZATION	BASIS OF ALLOCATION	GENERAL LOCATION	SUPPORT (TYPE & UNIT)	STORAGE CAPACITY CL III	LINE HAUL CAPABILITY CL III	REMARKS
Petrol Supply Co.	10227H500	See A Below	See B Below	Petrol Supply Bn	One Per 685,000 Gallons Daily POL Require- ment or one Division Slice	Corps or Theater Army Support Area	Receives, Stores and Issues CL III Bulk POL	1,480,000 Gallons (See Para B. Below) Receives & Issues 685,000 Gal Per Day	8 - 5000 Gal Semitralllers	4 - FSSP's 4 - FARE's 189 Person- nel

A. MISSION:

- (1) To establish and operate temporary petroleum storage facilities for general support transfer operations in support of divisional and nondivisional units.
- (2) To lay, operate, and retrieve petroleum hoseslines.
- (3) To maintain a portion of the command bulk petroleum reserve stocks.

B. CAPABILITIES:

- (1) Receive and issue a total of 685,000 gallons of bulk petroleum per day.
- (2) Operate collapsible bulk petroleum storage facilities as follows:

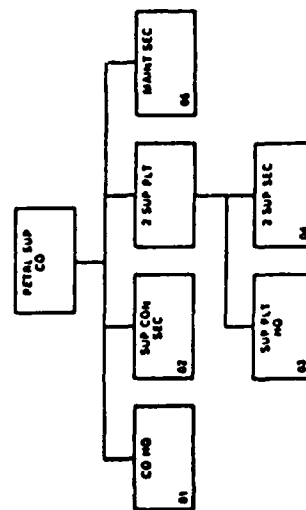
STORAGE CAPABILITY (GALLONS) AT 100% AVAILABILITY			
COLLAPSIBLE TANKS	COMPANY	PLATOON	SECTION
24 Ea 50,000 Gal	1,200,000	600,000	300,000
28 Ea 10,000 Gal	280,000	140,000	70,000
TOTAL	1,480,000	740,000	370,000

- (3) Store a prescribed portion of the command petroleum reserve stock.
- (4) Install and operate approximately 16KM (10 miles) of collapsible hosesline.
- (5) Provide limited mobile filling station service.
- (6) Establish and operate supply points at two locations.

C. DOCTRINE:

The following doctrinal publications are applicable to the operation of this unit:

- FM 10-67, Petroleum Supply in Theater of Operations.
FM 10-69, Petroleum Supply Point Equipment and Operations.
FM 10-227, Petroleum Supply Company.



ORGANIZATION, MISSION AND FUNCTIONS CHART

POL ORGANIZATIONS WITHIN A THEATER OF OPERATIONS

ORGANIZATION	TOE #	MISSION	FUNCTIONS/ CAPABILITIES	PARENT ORGANIZATION	BASIS OF ALLOCATION	GENERAL LOCATION	SUPPORT (TYPE & UNIT)	STORAGE CAPACITY CL III	LINE HAUL CAPABILITY CL III	REMARKS
MHC, Petroleum Pipeline and Terminal Operating Bn.	10206H400	See A Below	See B Below	Normally Assigned to Petroleum Gp or Attached to an Independent Corps	One per Petroleum Port of Entry	Communications Zone or Theater Army or Corps Rear Area	Provides Command and Control for Theater or Corps POL Distribution System	None	None	

A. MISSION: To provide command administrative technical and operational supervision for the operation and maintenance of a military petroleum distribution system or portion thereof to command and control assigned and detached units.

B. CAPABILITIES:

(1) Commands two to five petroleum pipeline and terminal operating companies. TOE 10-207, and other assigned and attached units supporting the pipeline and terminal operations.

(2) Plans, controls, and supervises the operation and maintenance of a military petroleum distribution system consisting of approximately 500 kilometers (300 miles) of multiproduct petroleum pipelines and related terminal facilities.

(3) Supervises a program for quality surveillance of petroleum products and

(A) When organized under SRC 10206H400, operates a base petroleum products laboratory.

(B) When organized under SRC 10206H420, operates a mobile petroleum products laboratory.

(4) Operates a central dispatching agency to schedule and direct the flow of bulk petroleum through the multiproject military pipeline.

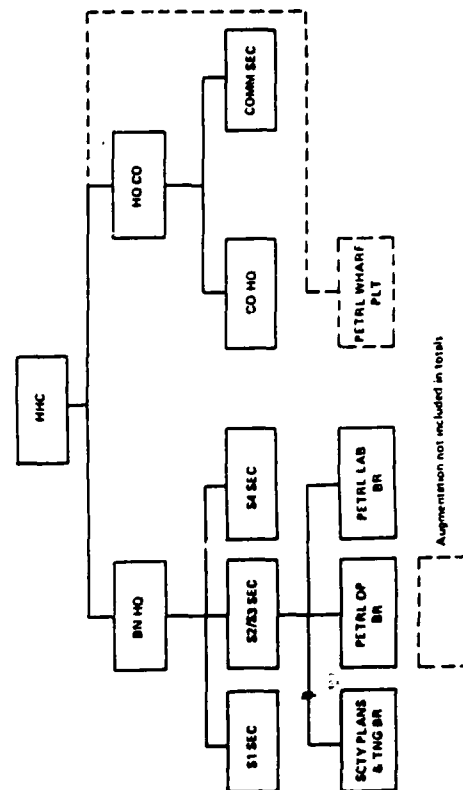
C. DOCTRINE:

The following doctrinal publications are applicable to the operation of this unit:

FM 10-18, Petroleum Terminal and Pipeline Operations.

FM 10-67, Petroleum Supply in Theater of Operations.

FM 5-343, Military Petroleum Pipeline Systems.



POL ORGANIZATIONS WITHIN A THEATER OF OPERATIONS

ORGANIZATION	TO&E #	MISSION	FUNCTIONS/ CAPABILITIES	PARENT ORGANIZATION	BASIS OF ALLOCATION	GENERAL LOCATION	SUPPORT (TYPE & UNIT)	STORAGE CAPACITY CL III	LINE MAIL CAPABILITY CL III	REMARKS
H&H Det, Petrol Supply Bn.	10226H500	See A Below	See B Below	Petrol Gp or COSCOM	One Per Two to Six Petrol Supply Companies & Trans Med Trk Compa- nies (POL)	Corps or Theater Army Support Area	Command & Control & Admin, Tech & Operational Supervision	N/A	N/A	

C. DOCTRINE:

(1) To provide command and control, administrative, technical and operational supervision over assigned or attached petroleum supply companies and transportation medium truck companies (petroleum).

The following doctrinal publications are applicable to the operation of this unit:

(2) Supervise the command petroleum quality surveillance program.

FM 10-69, Petroleum Supply Point Equipment and Operations.

FM 10-71, Petroleum Tank Vehicle Operations.

(1) Commands two to six petroleum supply and medium truck companies (petroleum).

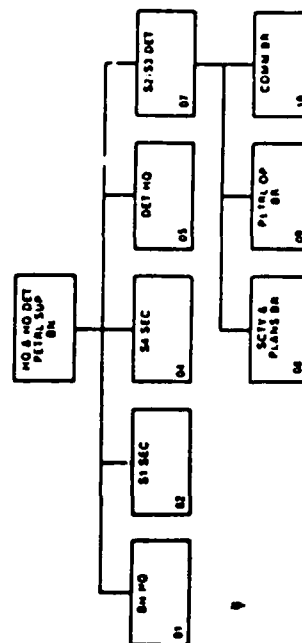
FFM 10-226, Petroleum Supply Battalion.

(2) Plans for the storage, distribution and quality surveillance of bulk petroleum products required by divisional and nondivisional support (DS) units in the Corps/TACOM areas.

FM 10-226, Petroleum Supply Battalion.

(3) Insures that a prescribed portion of the Corps/TACOM petroleum reserve is maintained by attached petroleum supply units.

FFM 10-227, Petroleum Supply Company.



ORGANIZATION, MISSION AND FUNCTIONS CHART
POL ORGANIZATIONS WITHIN A THEATER OF OPERATIONS

ORGANIZATION	TO&E #	MISSION	FUNCTIONS/ CAPABILITIES	PARENT ORGANIZATION	BASIS OF ALLOCATION	GENERAL LOCATION	SUPPORT (TYPE & UNIT)	STORAGE CAPACITY CL III	LINE HAUL CAPABILITY CL III	REMARKS
Supply & Service Co., S&T Bn, Inf Div	10007H000	See A Below	See B Below	S&T Bn, Inf Div	One per Inf Div	Division & Brigade Support Areas	CL I, II, III, IV & VII Supplies, ATP's	Store & Issue 73,500 gal per day	None. Line Haul Capability provided by Trans. Mtr Co., S&T Bn. With 16 - 5000 Gal Semitrailers	5 - FARE's 1 - FSSP

A. MISSIONS:

- a. To support the division and attached units by providing Class I, II, III, IV, and VII supplies, ammunition transfer points in brigade areas, and limited salvage classification and disposal service.
- b. To provide CEB and GREG services when authorized appropriate augmentation.
- c. To operate the division central issue facility (CIF).

B. CAPABILITIES:

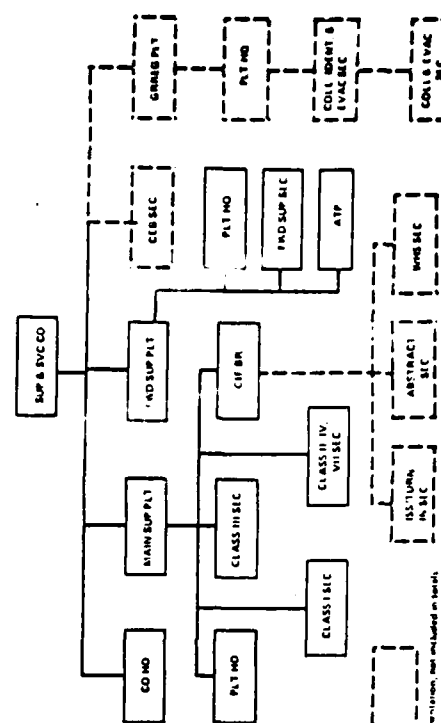
When organized under SRC 10007H000, the company:

- a. Operates supply and distribution points in the division support area and in the brigade support areas.
- b. Receives, provides temporary storage for, and issues 61.98 short tons of class I; 30.16 short tons of Class II; 11.56 short tons of Class III (packaged); 78.63 short tons of Class IV (except operational project supplies); and 39.5 short tons of Class VII supplies, except communication security (COMSEC) supplies, aircraft, automatic data processing equipment (ADPE), classified maps, and airdrop equipment.
- c. Is capable of storing and issuing 73,500 gallons of Class III bulk petroleum per day.
- d. Provides salvage service for material and supplies of all types except COMSEC supplies, toxic agents, radioactive materials, vehicles, aircraft, ammunition and explosives, and medical supplies.
- e. Provides a nucleus for a CIF for the stockage, issue, exchange, inspection, and turn-in of organizational clothing and equipment.
- f. Coordinates and transmits requests for Class I supplies from user to the division materiel management center (DMC).
- g. Provides emergency water distribution for supported units unable to pick up water at water points.
- h. Maintains the division reserve of supplies and equipment for which the company is responsible.
- i. Provides up to five forward area refueling equipment (FARE) filling station operations for ground vehicles.
- j. Provides ammunition transfer points in the brigade areas.

C. DOCTRINE:

The following doctrinal publications are applicable to the operation of this unit:

- FM 10-7, Supply and Service Company, Supply and Transport Battalion.
- FM 10-60, Subsistence Supply and Management in Theaters of Operation.
- FM 10-63, Handling of Deceased Personnel in Theaters of Operation.
- FM 10-68, Aircraft Refueling.
- FM 10-69, Petroleum Supply Point and Equipment Operations.
- FM 10-70, Inspecting and Testing Petroleum Products.
- FM 10-286, Identification of Deceased Personnel.
- FM 29-50, Supply and Service in Division and Separate Brigades.



ORGANIZATION, MISSION AND FUNCTIONS CHART POL ORGANIZATIONS WITHIN A THEATER OF OPERATIONS

ORGANIZATION	TO&E #	MISSION	FUNCTIONS/ CAPABILITIES	PARENT ORGANIZATION	BASIS OF ALLOCATION	GENERAL LOCATION	SUPPORT (TYPE & UNIT)	STORAGE CAPACITY CL III	LINE HAUL CAPABILITY CL III	REMARKS
Supply & Service Co., Direct Support (Non-divisional)	29147H500	See A Below	See B Below	Corps or Theater Army Support Command	Variable - Mission Dependent (1 Unit/ 8000 Troops)	Division, Corps, or Theater Army Support Area	CL I, II, III, IV & VII Supplies Day Issues 39,300 Gals Per Day	5 - 5000 Gal Semitrailer	1 - FSSP 186 Person- nel	

A. MISSION: To operate a direct support supply and service facility in support of non-divisional troops.

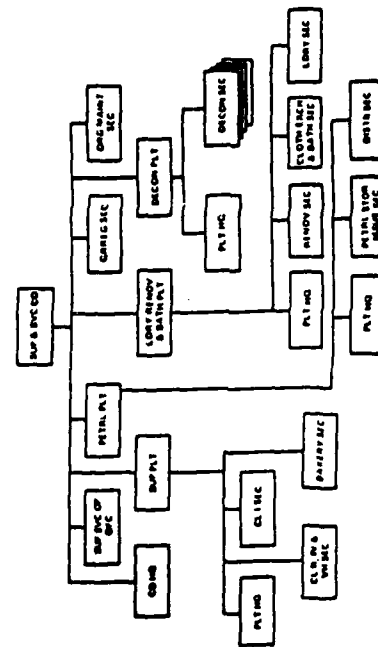
B. CAPABILITIES:

- (1) When organized under TOE 29147H500: Requisitioning, receiving, storing and issuing 21.72 short tons of Class I supplies; 27.88 short tons of Class II supplies; 5 short tons of Class III (packaged) supplies; 34 short tons of Class IV supplies (less operational project supplies); 10.71 short tons of Class VII supplies.
- (2) Class III POL storage and distribution based on 83% availability of tanks and 75% availability of fuel dispensing trucks and fuel servicing trailers.
 - (a) Storing 49,800 gallons of bulk petroleum a day.
 - (b) Distributing 39,300 gallons of bulk petroleum a day.
- (3) Graves registration: 24 remains handled per month.
- (4) One-half pound of fresh bread per man per day for 8,000 troops.
- (5) Bulk laundry service at the rate 6 pounds of laundry per man per week for 8,000 individual troops.
- (6) Bath and clothing exchange service for 8,000 non-divisional troops per week.
- (7) Potable water support as follows:
 - (a) On a 2-shift basis, produces 120,000 gallons of potable water per day up to four locations.
 - (b) Treats nuclear, chemical, biological (NBC) contaminated water at a rate of 12,000 gallons per hour (GPH) when augmentation equipment is provided.
 - (c) Provides storage for 180,000 gallons of potable water.

C. DOCTRINE:

The following doctrinal publications are applicable to the operation of this unit:

- FM 10-60, Subsistence Supply and Management in Theater of Operations.
- FM 10-63, Handling of Deceased Personnel in Theaters of Operations.
- FM 10-68, Aircraft Refueling.
- FM 10-69, Petroleum Supply Point and Equipment Operations.
- FM 10-70, Inspecting and Testing Petroleum Products.
- FM 10-267, General Repair for Clothing and Textiles.
- FM 10-286, Identification of Deceased Personnel.
- FM 29-147, Supply and Service Company, Direct Support.
- FM 38-725-1, Direct Support System, Commander's Handbook.
- FM 38-741, DS Support Unit Storage Operations.
- FM 54-7, Theater Army Logistics.
- FM 54-9, Corps Support Command.



POL ORGANIZATIONS WITHIN A THEATER OF OPERATIONS

ORGANIZATION	TO&E #	MISSION	FUNCTIONS/ CAPABILITIES	PARENT ORGANIZATION	BASIS OF ALLOCATION	GENERAL LOCATION	SUPPORT (TYPE & UNIT)	STORAGE CAPACITY CL III	LINE HAUL CAPABILITY CL III	REMARKS
Supply & Service Co., S&T Bn..Air Assault Div.	29097J000	See A Below	See B Below	S&T Bn, Air Assault Div	One Per S&T Bn,Air Assault Div.	Division & Brigade Support Areas	CL I, II, III, IV, V, & VII, Supplies, CEB, GREG & CIF Services	Stores & Issues 317,600 Gal Per Day at 3 Different Locations	None	18 - FARE's 6 - FSSP's 186 Person- nel

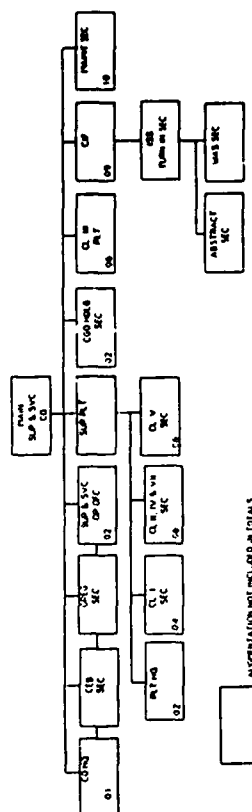
C. DOCTRINE:

A. MISSION: To support the division and attached units by providing CL I, II, III, IV, V and VII supplies and to provide clothing exchange and bath service, graves registration service, and a central issue facility when authorized appropriate augmentation.

The following doctrinal publications are applicable to the operation of this unit:

B. CAPABILITIES: This unit:

- (1) Operates supply and distribution points in the division support area and supports the brigade supply and distribution points.
- (2) Receives, provides temporary storage for and issues 60.97 short tons of Class I supplies; 29.66 short tons of Class II supplies; 11.65 short tons of Class III (packaged) supplies; 77.35 short tons of Class IV supplies (less operational project supplies); 200 to 300 short tons of Class V supplies; and 38.55 short tons of Class VII supplies (less communications security (COMSEC) supplies, aircraft, automatic data processing equipment (ADPE), air-drop equipment, and classified maps).
- (3) Is capable of storing and issuing 317,600 gallons of bulk petroleum per day at three different locations.
- (4) Provides a nucleus for a central issue facility for the stockage, issue, exchange, inspection, and turn-in of organizational clothing and equipment.
- (5) Coordinates and transmits requests for Class I supplies from user to the division



SPECIAL REPORT

(7) Maintains the division reserve of supplies and equipment for which the company is responsible.

- (8) Operates six forward area refueling equipment (FARE) for refueling ground vehicles.
- (9) Provides bulk POL for support of forward area rearm and refuel point (FARRP).

(10) Unloads and loads aircraft, clears airfields and heliports of supplies and equipment, and prepares sling loads of supplies and equipment for helicopter lift.

(111) Provides a nucleus for graves registration service within the division.

(12) Provides food service support for Headquarters & Headquarters Detachment, TOE 29-96, for the Main Supply & Service Company, TOE 29-97, and for the Transportation Motor Transport Company, TOE 55-69.

(13) Provides organizational maintenance of organic equipment (less CE) for communications-electronics (C-E) for Headquarters & Headquarters Detachment, TOE 29-96.

APPENDIX B

Roster of Military POL Units

Petroleum Group

RESERVE

469th QM Group (Petroleum)
400 Wyoming Blvd. NE
Albuquerque, NM 87123

Com: 505-292-4664

475th QM Group (Petroleum)
950 New Castle Road
Farrell, PA 16121

Com: 412-981-2021

Petroleum Pipeline & Terminal Operating Battalion

ACTIVE ARMY

240th Petroleum Pipeline & Terminal Operating Bn
Building 9203
Fort Lee, VA 23801

AV: 687-4012

RESERVE

259th Petroleum Pipeline & Terminal Operating Bn
635 South Locust Avenue
Pleasant Grove, UT 84062

Com: 801-225-6073/328-4727

383d Petroleum Pipeline & Terminal Operating Bn
301 Ascarate Park Road
El Paso, TX 79905

Com: 915-772-3238

Petroleum Supply Battalion

ACTIVE ARMY

260th Petroleum Supply Bn
Hunter Army Airfield, GA 31409

AV: 971-5143/5144/5145

RESERVE

316th Petroleum Supply Bn
Drawer E
Steigler, OK 74462

Com: 918-967-3321

319th Petroleum Supply Bn
25445 Harvard Road
Cleveland, OH 44122

Com: 216-464-8724

325th Petroleum Supply Bn
Building 330
Richards Gebaur AFB, MO 64030

Com: 816-348-2227/2326

362nd Petroleum Supply Bn
Rt. 7, Box 89-E
Kinston, NC 28501

Com: 919-522-0001

372d Petroleum Supply Bn
400 Wyoming Blvd. NE
Albuquerque, NM 87123

Com: 505-292-4667

402d Petroleum Supply Bn
950 New Castle Road
Farrell, PA 16121

Com: 412-981-9933

NATIONAL GUARD

30th Petroleum Supply Bn
P. O. Box 190
Tullahoma, TN 37388

Com: 615-455-0656

150th Petroleum Supply Bn
P. O. Box 4098
Meridian, MS 38301

AV: 363-9287

540th Petroleum Supply Bn
P. O. Box 1830
Lenoir, NC 28645

Com: 704-754-2876

1120th Petroleum Supply Bn
1614 W. Roosevelt Street
Phoenix, AZ 85007

Com: 602-225-4891

Petroleum Pipeline & Terminal Operating Company

ACTIVE ARMY

109th Petroleum Pipeline & Terminal Operating Co.
Building 9303
Fort Lee, VA 23801

AV: 687-2751/2491

267th Petroleum Pipeline & Terminal Operating Co.
Building 9302
Fort Lee, VA 23801

AV: 687-2128

549th Petroleum Pipeline & Terminal Operating Co.
Fort Story, VA 23459

AV: 927-9652/9692/9632

RESERVE

173d Petroleum Pipeline & Terminal Operating Co.
P. O. Box 1380
Greenwood, MS 38930

Com: 601-453-1865

347th Petroleum Pipeline & Terminal Operating Co.

950 New Castle Road

Farrell, PA 16121

Com: 412-981-2021

380th Petroleum Pipeline & Terminal Operating Co.

2900 Division Street

Evansville, IN 47714

Com: 812-476-1357

417th Petroleum Pipeline & Terminal Operating Co.

Armor Drive & Hazzard Street

Scottsburg, IN 47170

Com: 812-752-3665

646th Petroleum Pipeline & Terminal Operating Co.

P. O. Box 626/Kingston Road

Kingwood, WV 26537

Com: 304-329-1680

Petroleum Supply Company

ACTIVE ARMY

53d Petroleum Supply Company

Fort Hood, TX 76544

AV: 737-1310

102th Petroleum Supply Company

Fort Campbell, KY 44223

AV: 635-3029/5190

108th Petroleum Supply Company

Fort Rucker, AL 33662

AV: 558-2505/5493/3590

110th Petroleum Supply Company

Hunter Army Airfield, GA 31409

AV: 971-5143

RESERVE

104th Petroleum Supply Company

13th & Richey Streets, Box 829

Artesia, NM 88210

Com: 505-746-3791

175th Petroleum Supply Company

450 Pennsylvania Avenue

Delaware, OH 43015

Com: 614-369-3264

192d Petroleum Supply Company

1119 W. Mason Road

Milan, OH 44846

Com: 419-359-1317

277th Petroleum Supply Company

9400 Porter Road

Niagra Falls, NY 14304

Com: 716-694-6642

352d Petroleum Supply Company 206 Park Avenue Oil City, PA 16301	Com: 814-676-9521
377th Petroleum Supply Company 212 N. Victory Drive Tifton, GA 31794	Com: 912-382-7412
387th Petroleum Supply Company 2408 East Main Street Danville, IN 61832	Com: 217-446-7114
425th Petroleum Supply Company 11th & Pen Streets Jeffersonville, IN 41730	Com: 812-288-3254
439th Petroleum Supply Company 200 Wintergreen Avenue New Haven, CT 06515	Com: 203-387-4357
444th Petroleum Supply Company P. O. Box 3008 Warren, OH 44485	Com: 216-394-9409
449th Petroleum Supply Company Building 131 Fort Douglas, UT 84113	AV: 924-5964 Com: 801-582-1441
475th Petroleum Supply Company 150 Janet Street Beaver Falls, PA 15010	Com: 412-846-2810
786th Petroleum Supply Company 1355 North 2nd West Provo, UT 84604	Com: 801-374-0288
842th Petroleum Supply Company 1325 North 78th Street Kansas City, KS 66112	Com: 913-299-6030
858th Petroleum Supply Company 950 New Castle Road Farrell, PA 16121	Com: 412-981-2021
894th Petroleum Supply Company 4350 South Drive Jackson, MS 39209	Com: 601-355-3327
900th Petroleum Supply Company 301 Ascarate Park Road El Paso, TX 79905	Com: 915-772-3238

941st Petroleum Supply Company
P. O. Box 7601
Ponce, PR 00732

Com: 809-840-4165/842-4165

Petroleum Lab (Mobile)

RESERVE

401st Petroleum Lab (Mobile)
1020 Sandy Street
Norristown, PA 19401

Com: 215-279-0232

690th Petroleum Lab (Mobile)
2900 Division Street
Evansville, IN 47714

Com: 812-476-1357

935th Petroleum Lab (Mobile)
2300 Tenth Street
Lake Charles, LA 70601

Com: 318-439-9000/9009

Petroleum Medium Truck Company

ACTIVE ARMY

40th Petroleum Medium Truck Company
APO New York 09166

AV: 434-8264/7123

109th Petroleum Medium Truck Company
APO New York 09166

AV: 434-8109/7113

360th Petroleum Medium Truck Company
Fort Carson, CO 80913

AV: 691-2927/2837

416th Petroleum Medium Truck Company
Fort Rucker, AL 33662

AV: 558-4307/5596

418th Petroleum Medium Truck Company
Fort Hood, TX 76544

AV: 737-5041/7469

541st Petroleum Medium Truck Company
Fort Campbell, KY 44223

AV: 635-7606

RESERVES

182d Petroleum Medium Truck Company
901 Airport Access Road
Traverse City, MI 49684

Com: 616-946-6756

281st Petroleum Medium Truck Company 1300 W. Brown Road Las Cruces, NM 88004	Com: 505-526-6321
296th Petroleum Medium Truck Company 917 Highway 51 North Brookhaven, MS 39601	Com: 601-833-6101
298th Petroleum Medium Truck Company 1545 Airport Road Franklin, PA 16323	Com: 814-432-5422
419th Petroleum Medium Truck Company 4550 South 1300 East Salt Lake City, UT 84117	Com: 801-266-2749
425th Petroleum Medium Truck Company 1700 South Broadway Salina, KS 67401	Com: 913-827-2302
495th Petroleum Medium Truck Company 905 North Ingraham Avenue Lakeland, FL 33801	Com: 813-687-8700
656th Petroleum Medium Truck Company 1515 West High Street Springfield, OH 45506	Com: 513-323-1088
705th Petroleum Medium Truck Company 38 North Woodman Drive Dayton, OH 45431	
724th Petroleum Medium Truck Company 1429 Northmoor Road Peoria, IL 61614	Com: 309-691-3411
737th Petroleum Medium Truck Company Route 3, Box 706B Yakima, WA 98901	Com: 509-575-6880
773rd Petroleum Medium Truck Company 180 High Street Fairfield, CT 06430	Com: 203-259-7819
920th Petroleum Medium Truck Company 1 Chapel Avenue Jersey City, NJ 07305	AV: 247-6269 Com: 201-333-0360
941st Petroleum Medium Truck Company P. O. Box 9188 Charleston, SC 29410	AV: 794-2924/2925

NATIONAL GUARD

222d Petroleum Medium Truck Company
1614 West Roosevelt Street
Phoenix, AZ 85007 Com: 602-225-5134

319th Petroleum Medium Truck Company
3311 Wrightsboro Road
Augusta, GA 30909 Com: 404-736-0265

781st Petroleum Medium Truck Company
P. O. Drawer M
Fort Deposit, AL 36032 Com: 205-227-4346

786th Petroleum Medium Truck Company
P. O. Box 587
Lucedale, MS 39452 Com: 601-947-2751

1032d Petroleum Medium Truck Company
2100 East Shawnee Avenue
Big Stone Gap, VA 24219 Com: 703-523-1330

1148th Petroleum Medium Truck Company
P. O. Box 3509
Augusta, GA 30904 Com: 404-733-1050

1174th Petroleum Medium Truck Company
P. O. Box 260
Dresden, TN 38225 Com: 901-364-3691

1450th Petroleum Medium Truck Company
P. O. Box 623
Jefferson, NC 28640 Com: 919-982-3777

2222d Petroleum Medium Truck Company
P. O. Box 66
Douglas, AZ 85607 Com: 602-364-3931

APPENDIX C

References

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10-7	Supply & Service Company, Supply & Transport Battalion, AIM
10-18	Petroleum Terminal & Pipeline Operations
10-67	Petroleum Supply in Theater of Operations
10-68	Aircraft Refueling
10-69	Petroleum Supply Point Equipment & Operations
10-70	Inspecting & Testing Petroleum Products
10-70-1	Petroleum Reference Data
10-71	Petroleum Tank Vehicle Operations, C1
10-72	Petroleum Testing Facilities: Laboratories and Kits
10-76W	Soldiers Manual, 76W Petroleum Supply Specialist
10-200	Headquarters & Headquarters Units Petroleum Distribution Organization
10-207	Petroleum Pipeline & Terminal Operating Company
10-227	Petroleum Supply Company
29-118	General Supply Company, General Support
29-147	Supply & Service Company, Direct Support
54-8	Division Materiel Management Center
54-9	Corps Support Command
54-10	Logistics: An Overview of Total System
55-30	Army Motor Transportation Units & Operations
63-1	Combat Service Support, Brigade
63-2	Combat Service Support, Division
63-3	Combat Service Support, Corps

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71-1	Combat Service Support
100-10	Combat Service Support
101-5	Staff Officer Field Manual - Staff Organizational, Technical & Logistics Data
101-10-1	Staff Officer Field Manual: Organization, Technical and Logistis Data
700-80	Logistics
701-58	Planning Logistic Support for Military Operations

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5-343	Military Petroleum Pipeline Systems
5-678	Repair & Utilities: POL
5-848-2	Storage, Distributing & Dispensing Aircraft & Automobile Fuels

Supply Bulletins

710-2	Supply Control: Combat Rates for Ground and Aviation POL Products
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TO&E's

5-115E000	Engineer Construction Battalion
5-177H400	Engineer Pipeline Construction Support Company
10-7H000	Supply & Service Company, Supply & Transport Battalion, AIM
10-202H200	Headquarters & Headquarters Petroleum Group
10-206H400	Headquarters & Headquarters Petroleum Pipeline & Terminal Operating Battalion
10-207H300	Petroleum Pipeline & Terminal Operating Company
10-226H500	Headquarters & Headquarters Company Petroleum Supply Battalion

TO&E's (Contd.)

10-227H500	Petroleum Supply Company
10-560H6JA	Petroleum Supply & Operation Teams
29-1H000	DISCOM, Infantry Division
29-11H000	DISCOM, Mechanized Division
29-21H000	DISCOM, Armored Division
29-41H000	DISCOM, Air Assault Division
29-5H000	Supply & Transport Battalion, DISCOM, Infantry Division
29-65H000	Supply & Transport Battalion, DISCOM, Mechanized Division
29-115H000	Supply & Transport Battalion, DISCOM, Armored Division
29-95J000	Supply & Service Battalion, DISCOM, Air Assault Division
29-97J000	Main Supply & Service Company, Supply & Transport Battalion, Air Assault Division
29-118H100	(PACK III) (Ground Support Unit)
29-147H500	Supply & Service Company (Non-Divisional)
55-18H610	Transportation Medium Truck Company (POL)

Army Regulations

703-1 w/Ch 3	Coal & Petroleum Products Supply & Management Activities
710-2 w/Ch2	Supply Policies Below Wholesale Level

STANAG's

1135	Introduction of Fuels, Lubricants and Oils in NATO
2924	POL Handling in the Field
2946	Forward Area Refueling Equipment

Program of Instruction (POI)

Petroleum Supply Specialist MOS 76W10, September 1983, US Army QM School, Ft. Lee, VA.

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(U) POL Supply Operations Within A Warsaw Pact Front(S), DIA - November 1983.

(U) The Soviet Battlefield Development Plan, Executive Summary(S),
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