MCRP 3-40B.5

Petroleum Operations

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FOREWORD

Marine Corps Reference Publication 3-40B.5, *Petroleum Operations*, provides doctrinal guidance for bulk petroleum operations for the Marine air-ground task force. This publication aligns doctrinally with Marine Corps Doctrinal Publication 4, *Logistics*, and tactically with Marine Corps Warfighting Publication 3-40, *Logistic Operations*. It specifically addresses the techniques and procedures for the handling of bulk fuel in a joint/multinational environment.

Additionally, this publication provides information on the bulk liquids mission, organization, and concept. It is intended for Marines involved in the planning or conducting of bulk fuel operations, from commanders to personnel in bulk fuel units.

This publication supersedes Marine Corps Reference Publication 3-40B.5, *Petroleum and Water Logistic Operations*, dated 19 June 2005; change 1, dated 4 April 2018; and erratum, dated 2 May 2016.

Reviewed and approved this date.

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CHAPTER 1
FUNDAMENTALS

Petroleum operations make up one of the greatest quantities of supply required by the Marine air-ground task force (MAGTF) to conduct modern warfare. As petroleum requirements rise above individual or small unit needs, it becomes necessary to handle them in "bulk" form. Bulk handling calls for special equipment, product handling safeguards, and standing operating procedures (SOPs). Permanent facilities are often used at bases, camps, and air stations. However, deploying MAGTFs require special expeditionary systems, such as the tactical fuel systems.

Bulk fuel support is a joint venture and bulk fuel management for joint operations is the ultimate responsibility of the joint force commander (JFC). Each Service is responsible for support of its forces and any other missions assigned by the JFC. The actual procedures used to provide bulk petroleum support to the Services depends on conditions in the area of operations (AO) (a developed theater or an undeveloped theater). Bulk fuel operations should adhere to applicable environmental protection rules and regulations as contained in Marine Corps Order P5090.2A, *Environmental Compliance and Protection Manual*. In the absence of local regulations, refer to guidance contained in Department of Defense (DOD) Publication 4715.5G, *Overseas Environmental Baseline Guidance*.

DEVELOPED THEATER

A mature or developed theater will usually have host nation (HN) infrastructure assets available, such as pipelines, storage facilities, and railways. Management of bulk fuel resupply is conducted by the unified combatant commander (CCDR) joint petroleum office (JPO) or subunified commander subarea petroleum office (SAPO). The CCDR JPO coordinates all agreements concerning bulk fuel support between component commands and HNs. For the majority of places that Marine Corps forces employ, Marines will have to make maximum use of their organic bulk fuel equipment. However, when available, host-nation support (HNS) can be used to receive, store, and provide bulk fuel stocks to the maximum extent possible. Additionally, HNS may augment US transportation and bulk fuel distribution capabilities. Once resupply lines of communications (LOCs) are established, the JPO makes preparations for resupply from the continental United States (CONUS)-pushed stocks and/or from theater-sourced stocks (those contracted from theater refineries), as coordinated by either the joint task force (JTF) or the functional component commander that will help support the bulk petroleum distribution system. Airbases, tactical airfields, and Service beddown sites support HNS, which will extend as far forward as possible, whenever tactically feasible.

UNDEVELOPED THEATER

Since HN or commercial bulk fuel facilities will not normally be available in an undeveloped theater, tactical assets should be used. The bulk fuel supply system in the undeveloped theater may include limited tanker mooring systems, floating or submerged hose lines, and tactical fuel systems.

RESUPPLY

Management of bulk fuel resupply is tasked out by the CCDR JPO or SAPO. The CCDR JPO coordinates all agreements concerning bulk fuel support between component commands and HNs. For a majority of places that Marine Corps forces deploy, Marines Corps forces will have to make maximum use of their organic bulk fuel equipment. However, when available, HNS may be used to receive, store, and provide bulk fuel stocks to the maximum extent possible and to augment US transportation and bulk fuel distribution capabilities. Once resupply LOCs are established, the JPO will make preparations for resupply from CONUS-pushed stocks and/or from theater-sourced stocks, as coordinated by either the JTF or the functional component commander.

MARINE CORPS FORCES

Marine Corps forces may obtain initial petroleum supply support from the following:

- Operating stocks carried aboard maritime prepositioning ships (MPSs).
- Assault echelon and assault follow-on echelon shipping and landing force operational reserve material.
- In-theater petroleum war reserve stocks (PWRS) stored in selected storage depots throughout the theater.

Additionally, maximum use should be made of available HN support bulk fuel supply systems and stocks as negotiated in standing HNS agreements. Due to the lack of tanker offloading facilities in many areas, Navy ship-to-shore (STS) capabilities should be used. Employment of the Navy offshore petroleum discharge system (OPDS) and the amphibious bulk liquid transfer system (ABLTS), in conjunction with the Marine Corps amphibious assault fuel system (AAFS), may be required to meet the needs of Marine Corps forces. The Marine component commander or Marine expeditionary force (MEF) coordinate the arrangements for employment.

INLAND DISTRIBUTION

Pipelines are the most economical and effective method for inland distribution and can be commercially welded or coupled. Tactical distribution or fuel line-hauling is another method, which can also be used. Whenever possible, petroleum distribution to the airfields will be by tactical hose line from the AAFS to the tactical airfield fuel dispensing system (TAFDS). Mobile refuelers (5,000 gallon tankers, such as the MK970) may be used to transport bulk fuel to the airfields. The provision of bulk fuel support is on a push or pull basis to ensure the capability of continuous operations. The basic operating concept is to keep storage tanks full at all times; taking into consideration consumption factors and days of supply (DOS) required. Marine Corps retail bulk fuel operations pumping and transport are from the main AAFS tank farm to other forward locations established in accordance with the scheme of maneuver.

CHAPTER 2
ORGANIZATION

The Defense Logistics Agency (DLA) centrally manages bulk petroleum within the DOD. The DLA Energy, formerly the Defense Energy Support Center (known as DESC, a component of the DLA) was designated to act as the executive agent of DOD bulk petroleum on 11 August 2004 in accordance with Department of Defense Directive (DODD) 5101.8, *DOD Executive Agent (DOD EA) for Bulk Petroleum*. This chapter discusses the operational organizations and capabilities of petroleum agencies throughout the DOD.

ORGANIZATION AND RESPONSIBILITIES

Defense Logistics Agency

The DLA is responsible for procurement of bulk petroleum products and all DOD-related energy services. It maintains the product until it is delivered to the supported Service. To provide timely and efficient support to the Services, the DLA has established regions of responsibility: CONUS (DLA Americas), US Pacific Command (DLA Pacific), US European and African Command (DLA Europe and Africa), and the Middle East (DLA Middle East). These regions maintain close contact and coordination with the Services. In CONUS, DLA personnel order products from contractors, distribute products to the Services, and perform contract administration. Overseas, DLA personnel provide product ordering and contract administration. The missions and general functions of the DLA regions are outlined in detail in DODD Publications 4140.25-M, *DOD Management of Bulk Petroleum Products, Natural Gas, and Coal, Volumes I–IV* and 4140.25, *DOD Management Policy for Energy Commodities and Related Services*.

Unified Commands

In unified commands, the J-4 JPO staff plan and manage bulk petroleum personnel from each department level Military Service that have a mission in the theater. The JPO coordinates the theater petroleum operations and provides the interface between DLA and Service theater bulk petroleum managers. Service theater bulk petroleum managers provide Service bulk petroleum requirements to the JPO. The JPO consolidates the requirements for all the Services and schedules deliveries for the theater. The JPO also advises the theater commander and staff on bulk petroleum logistic planning and policy matters. When required, the JPO advises the CCDR on the allocation of bulk petroleum products and facilities. Bulk petroleum management for the entire theater is the ultimate responsibility of the commander of the unified command through the JPO. The unified command may also establish SAPOs at the subunified command level to provide in-country or regional staff management functions.

Joint Bulk Fuel Support

During joint operations, bulk fuel management for the entire force is the ultimate responsibility of the JFC. The JPO or JTF petroleum staff officers in coordination with the inland distribution manager, Service retail managers, DLA, and applicable HN activities provide daily management. The JFC makes the final decision on appropriate ways to accomplish bulk fuel storage and distribution that includes a mix of Service tactical equipment, DLA contract support, and HNS.

Services are responsible for providing retail fuel support to its forces. Retail bulk fuel is held primarily for direct support to an end-use customer such as aircraft, vehicles, etc.

Joint Task Force

Bulk petroleum management in operations is similar to that in unified commands. The JTF commander establishes a petroleum office within the J-4. This office coordinates the JTF bulk petroleum requirements with the unified commander JPO and the JTF components. Additional functions performed by the JTF petroleum office include—

- Coordinating petroleum planning and operations within the JTF.
- Coordinating with the JPO for bulk petroleum requirements that must be obtained from in-country commercial sources.
- Establishing a bulk petroleum allocation system within the JTF, as required.

The JTF petroleum office will rely on the area-unified command JPO for wholesale bulk petroleum management and support. Personnel for the JTF petroleum office are normally provided by the Services within the JTF.

MILITARY SERVICES

Each Service is responsible for providing retail petroleum support to their own forces. In addition, the Army has the mission of providing overland petroleum support to all US land-based forces overseas except Navy ocean terminals. This mission includes providing the necessary force structure to construct, operate, and maintain overland pipelines in support of the wholesale theater fuel mission.

The Navy, in combination with the DLA, is responsible for the management of Navy ocean terminals and STS petroleum support. In areas without an Army presence, either the dominant user designated by the joint commander, DLA (by contract), or a combination of both will be tasked to operate a bulk fuel distribution system.

Army

The US Army Petroleum Center, staff management for petroleum planning and operations is responsible for—

- Managing daily operational supply of bulk fuel.
- Determining and consolidating fuel requirements.

- Submitting procurement requests to the DLA.
- Maintaining liaisons with the DLA and other Military Services.

Army staff management for petroleum planning and operations, which is in the United States Army Petroleum Center, Office of the Deputy Chief of Logistics, manages daily operational supply of bulk fuel in the Army. Principal duties of the United States Army Petroleum Center include determining and consolidating Army fuel requirements, submitting procurement requests to the DLA, and maintaining liaison with the DLA and other Military Services on operational and policy matters affecting bulk fuel operations. At the Army theater level, the theater Army material management command is the item manager for bulk fuel. In accordance with DODD 4140.25-M, the Army provides overland bulk fuel support to US land-based forces of all Services. The principal organization carrying out the bulk fuels distribution mission in the AO is the petroleum group assigned directly to the theater Army. The petroleum group is responsible for the detailed petroleum distribution planning that is the basis for design, construction, and operation of the distribution system for the theater. The group is responsible for acting as the liaison with HN staffs that includes coordination of allied pipeline and distribution systems. The petroleum group and its subordinate units operate the fuel distribution system extending from ports of entry through the AO and as far into the combat zone as possible.

Air Force

The Air Force Petroleum Office is the Service control point for all DLA fuel-related support issues. The office provides a full range of technical and professional services related to fuels, propellants, chemicals, lubricants, gases, and cryogenics for all aerospace vehicles, systems, and equipment. The office performs the following functions:

- Provides contingency, operational, and technical support to Air Force installations and fuel managers worldwide.
- Develops, evaluates, and recommends new or improved technologies to enhance effectiveness and efficiency of fuel operational support capabilities.
- Oversees and assists commanders in the implementation of fuel product distribution and fuel quality programs.
- Provides specialized capabilities in propellant handling, alternative fuels, suspect product/ systems contamination investigations, and laboratory analyses.
- Develops fuel quality assurance/surveillance standards and fuel product specifications.
- Provides subject matter expertise support to all Air Force fuel flights for equipment accountability, requisitions and allowance standard authorizations.

In-flight refueling operations are not considered bulk fuel operations and are the responsibility of the Air Mobility Command (AMC). Organizations requiring in-flight refueling support should coordinate directly with the AMC.

Navy

Department of the Navy staff management for bulk fuel is within the Navy Energy Office, Deputy Chief of Naval Operations, Logistics. The Naval Supply Center-Energy (NAVSUP-ENERGY) is the control point for bulk fuel requirements and inventory management. The NAVSUP-ENERGY's duties include maintaining liaison with the DLA and the other Services on operational and policy

matters affecting bulk fuel operations. At the Navy major command level, fleet petroleum staff officers provide staff management on bulk fuel matters. In joint operations, the Navy supports the STS bulk fuel mission. The Navy is responsible for getting bulk fuel to the beach high water mark where Army or Marine Corps bulk fuel units receive the fuel. The Navy's shore fuel expeditionary mission is filled by 10 Naval Reserve fuel units, which are equally distributed on both coasts. The NAVSUP-ENERGY and the expeditionary support force manage the units. Each 22-person unit is capable of handling multiple missions, including bulk and retail farm operations, tank-truck, aviation refueling, OPDS, and augmentation of fixed fuel facilities.

Marine Corps

Headquarters, United States Marine Corps responsibility for bulk fuel policy resides in the Logistics Plans, Policies, and Strategic Mobility Division, Deputy Commandant for Installations and Logistics. Collocated with the NAVSUP Energy Office, the Headquarters, US Marine Corps (HQMC) Fuel Liaison Office serves as the service control point and fuels subject matter expert to the USMC Expeditionary Energy Office. This office leverages NAVSUP Energy Office assets—in coordination with naval, DLA Energy, joint, and other organizations—to support USMC operating forces, facilities management, planning and requirements, policy, and compliance inspections worldwide. At the major command level, the Marine Corps component commander (and/or MEF assistant chief of staff G-4) is responsible for bulk fuel management, planning, operations, and policy and maintains liaison with the unified command JPO, NAVSUP-ENERGY, and other Military Services on matters concerning bulk fuel operations and policy. Refer to table 2-1 for Marine Corps forces and MAGTF responsibilities.

Marine Corps Component Commander/Marine Expeditionary Force. The Marine Corps component commander is responsible for wholesale logistic support at the Service, theater, CCDR, and HN level. The MEF is responsible for operational and tactical bulk fuel receipt, storage, and distribution. Accordingly, the MEF will work all retail logistic provisioning for major subordinate commands. To this end, the MEF command element (CE) is responsible for the determination of requirements and operations in and forward of the rear combat zone; the Marine Corps component commander is responsible for the AO and supported/supporting CCDR coordination. The MEF bulk fuel officer coordinates all fuel operations in the MEF zone of action or amphibious objective area (AOA). Linkage to the in-theater CCDR JPO, DLA, HN, and other Service components is also a Marine Corps component commander responsibility.

Marine Aircraft Wing. Within the Marine aircraft wing (MAW), the G-4 is responsible for bulk fuel planning and coordination. Fuel support is conducted via support squadrons or detachments located within the Marine wing support group. Bulk fuel operations in support of the MAW are performed as part of aviation ground support efforts, which is provided by the Marine wing support squadrons (MWSS) or Marine wing support detachments. These units provide refueling support for MAW aircraft and ground equipment. They are responsible for the receipt, storage, distribution, and quality surveillance of bulk fuel in support of MAW operations. An MWSS is built to provide fuel support to one forward operating base and two forward arming and refueling points (FARPs).

A Marine division is a fuel user (not a fuel provider) and has limited organic bulk fuel assets to support its own units.

Table 2-1. Marine Corps Forces and Marine Air-Ground Task Force Responsibilities.

Responsibilities	MARFOR	MEF	DIV	MAW	MLG
Plan and estimate petroleum requirements in operational plans	X	X	X	X	X
Coordinate bulk fuel operations to ensure economy of operations and prevent duplication of functions		X			X
Monitor fuel stocks	X	X	X	X	X
Coordinate requirements for HNS with the CCDR/JTF	X	X			
Coordinate bulk fuel support for forces attached to the MEF		X			
Request PWRS release from Joint Chiefs of Staff via CCDR	X	X			
Allocate MEF bulk fuel assets and stocks		X			
Identify bulk fuel shortfalls to the JTF or Marine Corps forces	X	X			
Plan for and establish TAFDS and HERS support at airfields				X	
Establish internal fuel distribution procedures		X	X	X	X
Establish quality control procedures for bulk fuel per MIL-STD-3004-1, MIL-STD-3004-2, and NAVAIR 00-80T-109_				X	X
Establish accounting procedures to record usage data	X	X	X	X	X
Plan for and establish AAFS sites as required to support the MEF	X	X			X
Coordinate STS bulk fuel operations	X	X			X
Plan for and establish distribution of bulk fuel to support the MEF	X	X		X	X
Coordinate bulk fuel requirements with the MEF-G-4. Ensure stocks are sufficient to reach and maintain stockage objectives			X	X	X
Provide bulk fuel laboratory support to the MEF					X
Coordinate bulk fuel supply with HN/other established sources of supply	X	X		X	X
LEGEND Div division					

Marine Logistics Group. The Marine logistics group (MLG) provides bulk fuel supply support to the MEF by—

- Performing planning and coordination.
- Providing fuel support that is beyond the organic capabilities of supported units.
- Using bulk fuel assets from the engineer and motor transport organizations to conduct operations.

Engineer Support Battalion. The engineer support battalion (ESB) is responsible for providing general bulk fuel support to the MEF, which includes receipt, storage, transferring, dispensing, and quality surveillance. The ESB has one bulk fuel company to provide this support. When supporting MAGTF airfields, the ESB is responsible for coordinating and controlling the transfer of fuel to the airfield via a hose line.

Transportation Support Battalion. A general support company and a direct support company in the transportation support battalion provide the transportation and distribution of bulk fuel for the MEF.

CHAPTER 3
TACTICAL FUEL SYSTEMS

Marine Corps bulk fuel equipment has to meet a wide spectrum of requirements from STS operations to aircraft refueling. The Marine Corps has developed a family of tactical fuel systems (TFSs) to meet these requirements. Each system is specifically designed and configured to support a unique mission requirement using similar components. The ability to alter fundamental system configurations along with interchangeable components allows the creation of limitless combinations of tailored systems to meet mission requirements.

The Marine Corps family of TFSs was originally designed and deployed in the 1950s to replace the 55-gallon drum and 5-gallon fuel can as the primary method for Marine Corps forces' bulk fuel support. The basic design of collapsible fuel tanks, trailer-mounted pumps, fuel hoses and valves, filtration vessels, and miscellaneous components has provided a solid foundation for the evolution of the family of TFSs to meet the ever changing operational and tactical fuel support requirements of the MAGTF. Today, the family of TFSs provides a wide range of storage tank sizes ranging from 500-gallon to 50,000-gallon capacities with receipt and pumping rates of up to 600-gallons per minute (GPM).

AMPHIBIOUS ASSAULT FUEL SYSTEM

The AAFS (table of authorized materiel control number [TAMCN] B0685) is the largest TFS. Consisting of many assemblies, the AAFS is used to receive, store, transfer, and dispense various types of fuel. The AAFS supplies bulk fuel to all elements of a MAGTF including distribution by hose line to airfields. The system can receive fuel from offshore vessels, railcars, tank trucks, bulk storage tanks, pipeline/hose line, and drums. Stored fuel can be transferred to another storage site or dispensed to individual containers, vehicles, tank trucks, and other fuel systems. Six assemblies compose the AAFS:

- Beach unloading.
- Receiving.
- Two booster stations.
- Two adapting.
- Two dispensing.
- Six tank farms.

Each AAFS has one beach unloading assembly used for receiving fuel during STS operations. When the distance between storage site is greater than the pumping distance, two booster station assemblies in each AAFS can be utilized. The AAFS storage capacity comes from the six tank farms, with a storage capacity of 1.12 million gallons. One receiving assembly in each AAFS provides the capability to receive fuel from multiple sources. Two dispense assemblies in each AAFS provide the capability to dispense fuel. The AAFS has two adapting assemblies to make the system compatible with commercial and other Services' fuel systems. The AAFS has about five miles of 6-inch assault hose and uses 600-GPM pumping capabilities. Using quick-connect, cam-lock fittings, the AAFS assembles without tools and is compatible with the other Marine Corps TFSs. Versatility is an important part of the AAFS, which can deploy as a whole or as a tailored unit to meet mission requirements, as shown in figure 3-1. Under ideal conditions and with appropriate material handling equipment in place, the average time to setup this system is approximately 96 hours. Terrain, weather conditions, and obstacles may delay construction of the AAFS. An initial operating capability may be set up in less time for the purpose of receiving fuel.

TACTICAL AIRFIELD FUEL DISPENSING SYSTEM

The TAFDS (TAMCN B0675) is similar in design to the AAFS. The use of this system is for receiving, storing, transferring, and dispensing aviation fuel in support of expeditionary airfields. This system is air transportable, versatile, and quickly assembled/disassembled. Compatible with other Marine Corps TFSs, the TAFDS can receive fuel from almost any source with the appropriate adapters. Operators can defuel 55 gallons using the drum-unloading portion of the TAFDS. Taking in consideration the 'single fuel on the battlefield concept' and the preponderance of jet fuels used in the battlefield, the TAFDS is capable to supply aviation and ground fuel for airfields.

As depicted in figure 3-2, the TAFDS consists of six 20,000-gallon and four 50,000-gallon collapsible tanks for a storage capacity of 320,000 gallons. Each TAFDS rates 7 pumps with each pump capable of pushing fuel at a rate of 600-GPM. With its designed pumping rate and equipment to set up 12 dispensing points, the TAFDS has a multiplane fueling capability. The TAFDS may also replenish tanker vehicles to support internal or external resupply operations. To meet naval aviation quality assurance requirements, the TAFDS is equipped with 600-GPM filter separators to ensure fuel filtration is accomplished. In addition, the TAFDS can be employed for hot and cold refueling operations and reconfigured to support multiple requirements.

HOSE REEL SYSTEM

The hose reel system (HRS) provides hose line transfer capabilities within MAGTF elements. The hose connects assemblies within the AAFS and distributes fuel to FOBs and other tactical fuel systems. Each HRS consists of 2 base units, 2 power units, 11 hose reels, control pendant, and additional fittings and connectors. The 6-inch, lightweight lay-flat hose is divided into four, 600-foot sections for a total 2,400 feet per reel. Each HRS contains 5 miles of hose line.

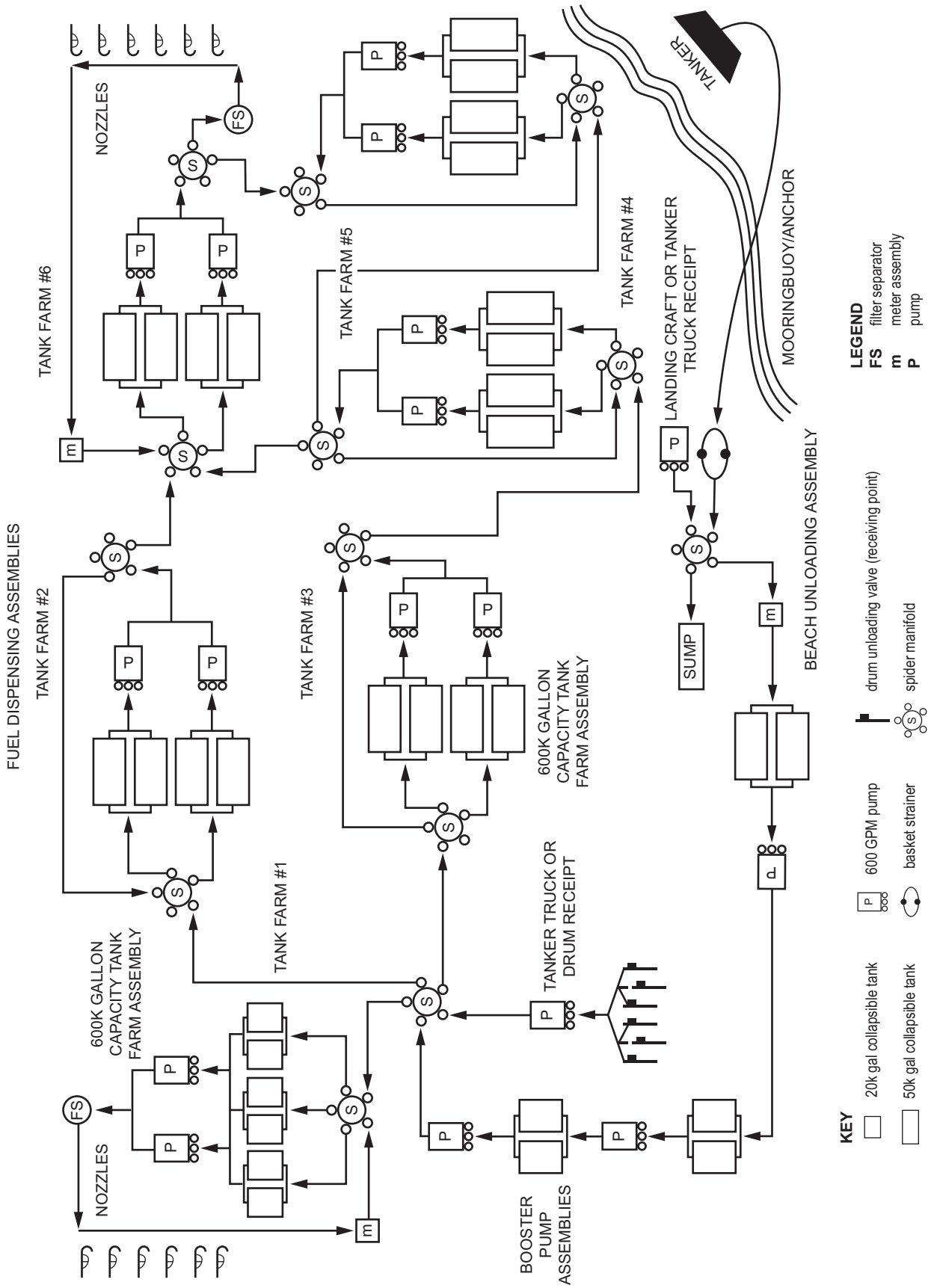


Figure 3-1. Amphibious Assault Fuel System.

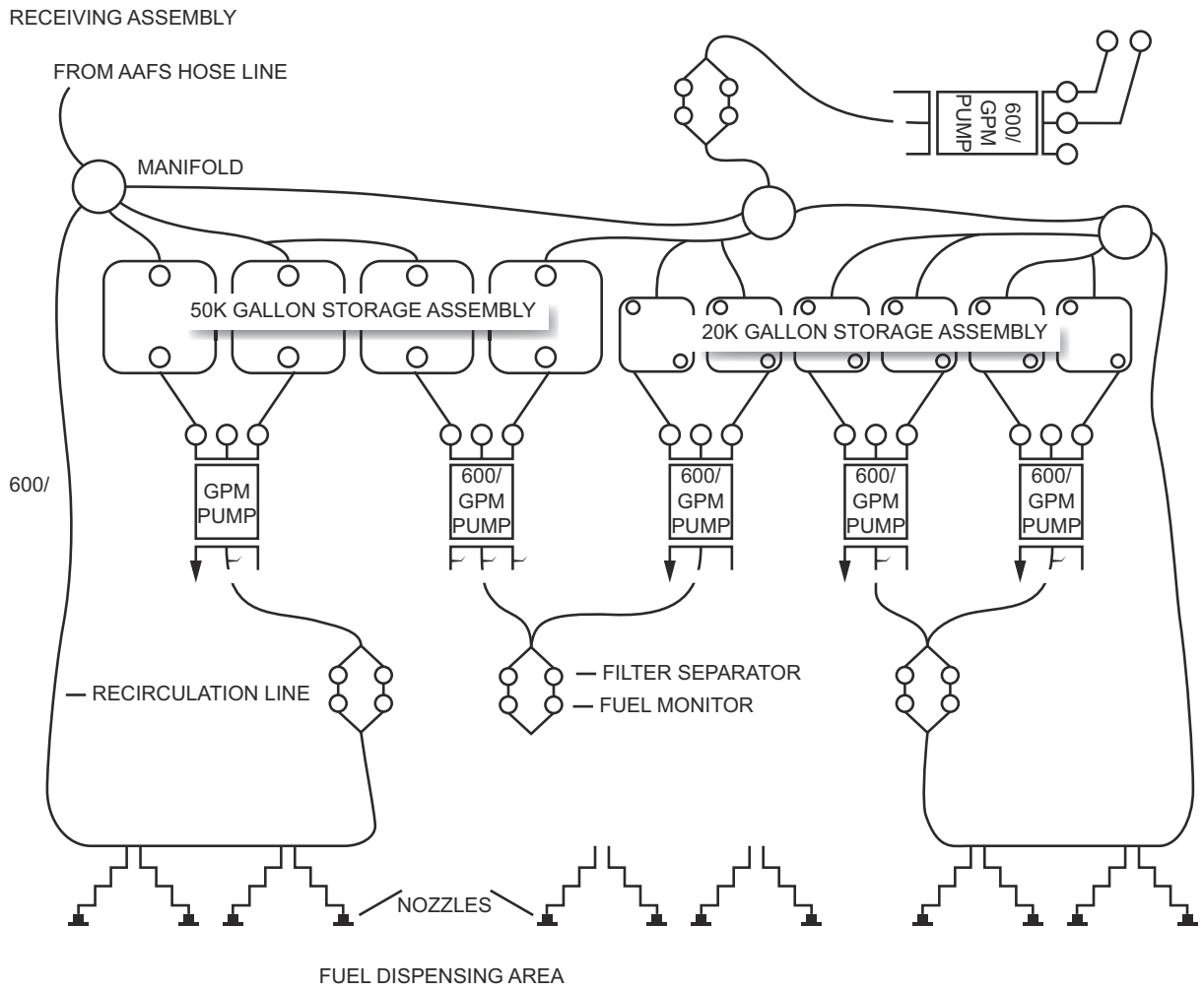


Figure 3-2. Tactical Airfield Fuel Dispensing System.

EXPEDIENT REFUELING SYSTEM

The expedient refueling system (ERS) (TAMCN B1570) supports ground vehicles in advanced positions. The ERS is easily transportable and highly mobile. Typically used with 500-gallon collapsible fuel drums or 3,000-gallon collapsible fuel tanks, it consists of a 150-GPM pump with various 2-inch hoses and fittings for two refueling points. All ERS components have 2-inch couplings. The ERS has no filtration equipment; therefore, it is not used for aircraft refueling.

HELICOPTER EXPEDIENT REFUELING SYSTEM

The helicopter expedient refueling system (HERS) (TAMCN B1135) supports helicopter operations in advanced areas and remote sites. Typically used at FARPs, the HERS key elements

are versatility, transportability, and rapid setup. Equipped with 2-inch hoses and adapters, the HERS is compatible with other Marine Corps TFSs. The HERS has a maximum capacity of 18,000 gallons, utilizing eighteen, 500-gallon collapsible drums and three, 3,000-gallon collapsible tanks. The HERS has four 150-GPM pumps; four, 125-GPM filter separators; and enough components to set up four refueling points. It may deploy whole or in part to meet operational requirements. Due to the limited storage capacity and the flow rate of the HERS (125-GPM), it is best used for attack helicopters to increase their range, but it can also support utility helicopters. See figure 3-3.

SIX CONTAINERS TOGETHER

The Marine Corps liquid storage, transporting, and dispensing system is commonly called a SIXCON (six containers together) and can be transportable by air or ground. Components of the fuel SIXCON system are a fuel pump module and five fuel tank modules; forming a fuel distribution source allowing transport as a unit or individually.

FUEL PUMP MODULE

The SIXCON fuel pump module (TAMCN B1580) consists of a 150-GPM pump, 125-GPM filter separator, meter assembly, and hose reel. The SIXCON fuel pump is designed to be employed with several types of fuel tanks, and has the capability of conducting fueling or de-fueling operations. The rate of transfer for the SIXCON pump module is up to 125-GPM due to the capacity of the filter separator.

FUEL TANK MODULES

Each SIXCON fuel tank module (TAMCN B2085) is made of stainless steel and has a capacity of 900 gallons. A steel frame that allows stacking and connecting to form an 8 by 8 by 20 foot International Organization for Standardization (ISO) container encases the fuel tank. The fuel tank is equipped with all the hoses and adapters to connect the tanks to the pump unit.

ACCESSORIES

Special horizontal and vertical ISO connectors are used to interconnect SIXCONs. Fuel is transferred via 2-inch hoses with dry break couplings, which allows rapid assembly and disassembly without loss of fuel or damage to the environment.

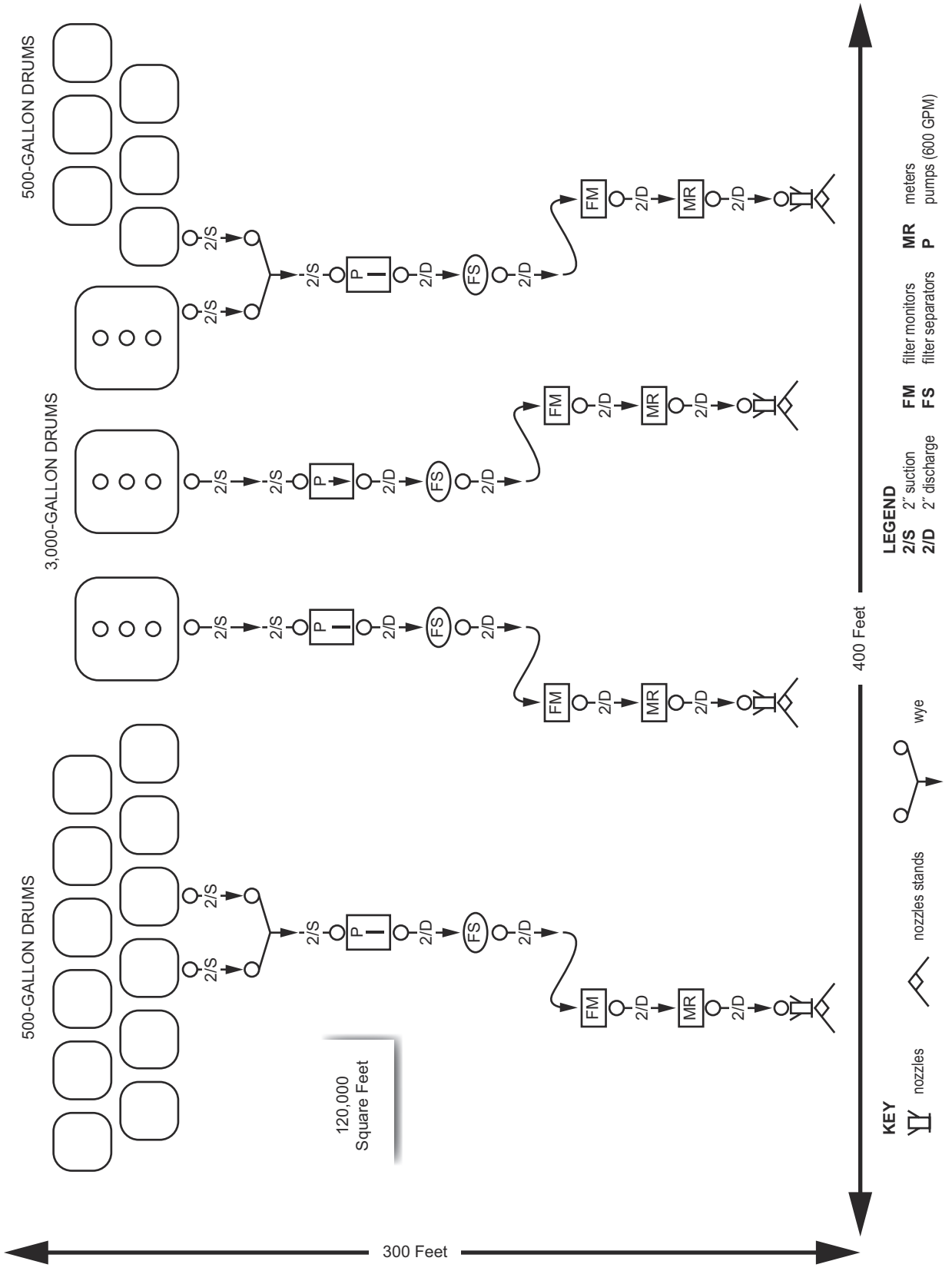


Figure 3-3. Helicopter Expedient Refueling System.

CYCLIC RESUPPLY

The SIXCON modules are assigned to all elements of the MAGTF. Organizations may implement a cyclic resupply procedure where full modules are exchanged for empty ones. Additional SIXCON assignments may be made to using organizations for minimal fuel handling at the operator level.

MK970 MOBILE REFUELER

The MK970 5,000-gallon mobile refueler (TAMCN D0215) provides aircraft refueling/ defueling and over-the-road transportation of bulk fuel. The MK970 is assigned to both the aviation combat element (ACE) and the combat logistic battalion (CLB). Within the ACE, the MK970 is organic to the MWSS and is used primarily to refuel aircraft. Within the CLB, the MK970 is organic to the transportation support battalion. The CLB uses the MK970 to support long-haul distribution of fuel, transporting bulk fuel between storage sites or directly to the customer.

FLATRACK REFUELING CAPABILITY

The flatrack refueling capability (FRC) (D0211) is a self-contained, transportable fueling system integrated within an ISO frame. The primary mission of the FRC is to distribute fuel in MAGTF expeditionary and combat environments. The FRC is equipped with a tank that can hold about 2,500 gallons of fuel and a self-priming, low-pressure, centrifugal pump capable of delivering fuel at 300-GPM for underwing fueling and 100-GPM for overwing fueling.

PETROLEUM QUALITY ANALYSIS SYSTEM-ENHANCED

The PQAS-E is a complete petroleum laboratory capable of conducting B-3 level testing in accordance with MIL-STD-3004-1, *Quality Assurance for Bulk Fuels, Lubricants and Related Products,* and MIL-STD-3004-2, *Quality Assurance for Packaged Fuels, Lubricants and Related Products (Part 2 of 2),* on kerosene based (i.e., JP 5, JP-8, jet A, and jet A-1) and diesel military mobility fuels. The PQAS-E petroleum test equipment is self-diagnostic and both user and equipment fault tolerant. Military and commercial fuels—including captured fuels—can be tested for composition and quality against minimum standards as specified in MIL-STD-3004-1 and MIL-STD-3004-2. The PQAS-E also serves as a primary source for the monthly correlation testing for filter effectiveness in support of the MWSS.

MARINE CORPS AIRCRAFT BULK FUEL HANDLING SYSTEMS

Air-to-air refueling or the transfer of bulk aviation fuel can both extend the range of aircraft and provide a means for the MAGTF to "air deliver" jet fuel to forward operating sites. Table 3-1 lists I/II MEF bulk fuel equipment.

Table 3-1. Authorized Fuel Equipment for a MEF.

	AAFS	TAFDS	HERS	ERS	GERS (m)	GERS (s)	500-Gal. Drums	3K Tank	Pump SIX-CON	Tank SIX-CON	MK970	FRC	PQAS-E
DIV (GCE)	0	0	0	0	18	18	0	0	39	90	0	16	0
MLG (CLB)	4	0	0	33	35	32	116	41	48	212	36	46	2
MAW (ACE)	0	12	12	0	12	12	In HERS	In HERS	22	79	44	16	0
Total	4	12	12	33	65	62	116	41	109	381	80	78	2

LEGEND

DIV Marine infantry division
GCE ground combat element
MAW Marine aircraft wing
ACE aviation combat element

Note: I and II MEF typically mirrored in equipment. III MEF possesses a smaller capability.

MARINE CORPS KC-130J TRANSPORT

The primary mission of the KC-130J transport is air-to-air refueling of tactical Marine fixed-wing aircraft, CH-53 helicopters, and MV-22s. The KC-130J can also land at distant airfields carrying up to 10,000 gallons of jet fuel.

TACTICAL BULK FUEL DISTRIBUTION SYSTEM

The tactical bulk fuel distribution system consists of full-range extension tanks, hoses, and couplings that can be loaded internally on a CH-53 helicopter. This system extends the operating range of the CH-53 or allows for helicopter delivery of fuel to distant forward areas. The tactical bulk fuel distribution system configured CH-53 can refuel aircraft at FARPs or refuel diesel engine ground vehicles and equipment. This system is installed and operated by aircrew personnel. It contains three 800-gallon tanks, for a maximum storage capacity of 2,400 gallons.

JOINT SERVICE INTEROPERABILITY

Joint support to the MAGTF may include providing or receiving fuel support from other Services, foreign forces, or commercial sources. The MAGTF CE is responsible for coordinating bulk fuel support for the MAGTF. Joint Publication 4-03, *Joint Bulk Petroleum and Water Doctrine*, addresses bulk fuel interoperability.

NAVY SHIP-TO-SHORE SYSTEMS

Initial phases of amphibious or maritime prepositioning force operations may require bulk fuel delivery from STS. Both amphibious ships and maritime prepositioned ships squadrons (MPSRONs) employ floating hose lines to provide bulk fuel issue via STS operations. Additionally, the OPDS employ to support and sustain MAGTF or JTF operations ashore.

Amphibious Bulk Liquids Transfer System

The ABLTS is a self-contained fuel and water system capable of deploying 10,000 feet of 6-inch fuel hose line and 4-inch water hose line from a designated ship to an ABLTS beach interface unit (BIU) ashore. Forces ashore or using Service will interface shoreward to the ABLTS BIU with their ashore bulk fuels system. This system is capable of delivering 720,000 gallons of fuel per day and is deployable in 12 hours. An external fuel source, such as a fuel tanker or barge, is required for use.

Offshore Petroleum Discharge System

The OPDS discharges petroleum products to Marine Corps AAFS, Army tactical petroleum terminals, or Army IPDS pipelines. The OPDS can be installed up to eight statute miles offshore and support STS fuel replenishment rates of up to 1.7 million gallons per day (based on a 20-hour operating day). If the ship standoff distance is less than two statute miles, dual line use may result in faster product transfer.

ARMY PETROLEUM SYSTEM

Theater support provided from Army fuel sources, including interface with Marine Corps TFSs, must be planned and coordinated in advance. The selection of specific systems depends on projected requirements. Equipment employed in this task may include US Army tactical petroleum terminals, IPDS, or line haul vehicles.

AIR FORCE AIR-BASED PETROLEUM SYSTEM

Refueler aircraft and aircraft equipped with aerial bulk fuel delivery systems may be required to support MAGTF operations. Support capabilities range from air delivery of packaged fuel (500-gallon collapsible drums) to bulk fuel pumped from transport aircraft or aircraft internal tanks, as shown in table 3-2. Data in table 3-2 is derived from the 2017 *Joint Petroleum Logistics Guide*. Wet-wing refueling/defueling methods may be used for special mission support operations. These methods may include the transfer of jet fuel from a delivery aircraft to receiving tactical storage systems or into a receiving aircraft.

Table 3-2. Aircraft Fuel Delivery Capability.

Type Aircraft	ABFDS Number of 3K Bladders and Delivery Gallon Capability	500-Gallon Drum Delivery Model and Gallon Capacity	Wet-Wing Delivery Model and Gallon Capacity
C-130	(2) 6,000	5,000	4,400
C-17	(3) 9,000		27,000
C-5A/B	(10) 30,000	27,000	53,000

CHAPTER 4
BULK FUEL PLANNING

Bulk fuel capabilities are spread throughout the MAGTF and is especially true of bulk fuel distribution capabilities. However, with the smaller forces of today, there is often a benefit to consolidating bulk fuel assets. For example, if a mobile refueler is controlled by a central organization, it can support several units and can be used to the maximum extent possible. This is not the case if each unit has its own mobile refueler. The MAGTF has also provided central organizations within the ACE and the CLB for its bulk liquids storage requirements. To be effective, the overall bulk fuel effort needs to be planned and coordinated at the MAGTF level as early as possible and continue throughout the operation.

PLANNING REQUIREMENTS

Planning for bulk fuel support can be a complex and challenging task. Time, space, distance, terrain, resources, and the operating environment are all planning factors, which must be taken into consideration. There are six major elements of bulk fuel planning: requirements, sourcing and procurement, transportation, storage, distribution, and equipment.

Requirements

Determining bulk fuel requirements is one of the most important planning elements for bulk fuel support. Requirements have to be determined before any other elements can be effectively considered. Requirements will be the main factor in deciding equipment, personnel, and stockage objectives. Computation of requirements is the responsibility of each MAGTF element as depicted on table 2-1.

Sourcing and Procurement

Determining the source and provider of bulk fuel stocks to the MAGTF or Marine Corps forces is situationally dependent, but before deploying, the planner needs to coordinate fuel sources and establish resupply procedures.

Transportation

Planning for bulk fuel transportation involves movement of fuel from the fuel source to the bulk fuel sites. Usually this wholesale function is arranged in coordination with the JPO, MAGTF fuels officer, and the theater support command. Transportation methods include ships, railcars, tank trucks, pipeline, and aircraft.

Storage

In addition to elements already discussed, planning for bulk fuel storage requires a consideration of requirements, stockage objectives, and the frequency of resupply. The JFC prescribes bulk fuel supply levels for the theater in DOS. Marine component and/or MAGTF commanders prescribe supply levels for Marine Corps forces based on requirements and equipment availability. When operating in a joint environment, Marine Corps planners must plan for the supply levels of all supported organizations.

Distribution

Distribution consists of transporting fuel from the bulk fuel storage site to the retail end of the using unit's transportation system. For Marine Corps bulk fuel units, the primary mission is to store, receive and dispense bulk fuel. The distribution of bulk fuel is routinely executed by motor transportation units.

Equipment

Planning for bulk fuel equipment includes both stationary and mobile bulk fuel equipment. In addition, each specific operating unit who owns the required bulk fuel handling system should be linked to those systems and identified for movement in the operational plan. Furthermore, to increase efficiency, standardized and interoperable equipment should be considered for planning and execution. This is of important when executing bulk fuel missions with other services and/or international partners.

PLANNING CONSIDERATIONS

The designation of the fuel supply system takes into account the mission, terrain, and climate. The planner must also consider the following:

- Capability of installations and/or units (including HN) to provide the required support.
- Time to construct an operational bulk fuel system.
- Requirements for bulk fuel storage facilities, offshore unloading facilities, pipeline/hose line, and distribution points.
- Availability of bulk fuel units and other units needed to construct, install, operate, and maintain the bulk fuel system.
- Terrain, which impacts both the ability to install the bulk fuel system and fuel usage factors.

PLANNING FOR JOINT BULK FUEL OPERATIONS

The supported CCDR and/or the JFC are responsible for the overall planning of bulk fuel logistical support. The unified or joint command plan is the basis for all subordinate bulk fuel support plans, which establishes concepts, objectives, and missions and allocates available resources. Operation plans (OPLANs) submitted to the joint staff include a petroleum, oils, and

lubricants appendix to the logistic annex of the operation order in the format prescribed in Chairman of the Joint Chiefs of Staff Manual 3122.03A, *Joint Operation Planning and Execution System, Volume II, Planning Formats and Guidance* (see appendix A). Upon approval of the concept by the JFC, the Service components then prepares the implementation of the bulk fuel support plan. During operations, the joint staff and Service bulk fuel planners revise the basic plans, as required to support the mission.

Army Petroleum Group

The Army petroleum group or designated dominant Service is responsible for theater bulk fuel planning and the theater inland petroleum distribution plan. Planning is done in concert with the component Services' bulk fuel plans. The theater inland petroleum distribution plan is prepared and published as an annex to the theater logistic support plan.

Compatibility

During joint operations, compatibility between the Services' bulk fuel systems is a key factor. Compatibility is addressed during the planning cycle with emphasis on the following interfaces: STS offload facilities, land-based distribution systems, and mobile refueling equipment.

CALCULATING REQUIREMENTS

A fundamental tenet to successful planning for bulk petroleum support is the early and accurate identification of requirements enhanced by the bulk fuel planner's complete understanding of the commander's intent and the concept of operations. This knowledge is critical and enhances the ability to direct available bulk fuel resources to support the joint force; allowing for greater flexibility in execution.

Determine Requirements

The first step is to collect fuel requirement data from each element of the MAGTF so the planner can estimate the fuel requirements for Marine Corps forces. While not intended to be an exact figure, fuel requirements need to be as accurate as possible due to the large impact fuel requirements have on other planning elements.

Fuel planners validate data provided by automated systems, such as the Integrated Consumable I System using equipment densities and consumption rates.

Time Phasing. Bulk fuel requirements must be time phased to coordinate transportation, storage, and distribution. Time-phased requirements begin with a determination of daily requirements in the objective area. This includes daily demand, storage capacity, throughput capability, and time delay from initial request until delivery. Initial supporting needs and prioritization of bulk fuel assets must be part of early planning.

Methods of Computing Fuel Requirements. All MAGTF elements are responsible for estimating their fuel requirements and submitting them to the fuel planners in a timely manner. Fuel requirements should be computed at the staff level based on historical data, equipment density,

time, and operational tempo. Fuel planners need to provide specific guidance to the units on the procedures followed. The guidance should provide data concerning hours-per-day, gallons per hour, resupply times, DOS on hand, and operational tempo. The bulk fuel staff officers will review requirements submissions for accuracy.

Most units in the fuel community have developed automated tools, such as spreadsheets to assist in fuel planning. These tools should be available from the MEF bulk fuel sections or the Marine Corps Detachment, Fort Lee, Virginia.

Aviation fuel requirements computation uses aircraft characteristic manuals. This method takes into account the operational tempo, sortie rates, sortie lengths, and fuel rates for each type of aircraft. It is recommended that aviation fuel requirements be computed at the staff level based on the aircraft density and the operational tempo provided from the G-3/S-3. The bulk fuel staff officers will review the submissions of requirements for accuracy.

The MAGTF Bulk Fuel Studies of 2010 and 2017, which created consumption data for principle end items, are used as a resource when calculating consumption factors. For further information see, *MAGTF Bulk Fuel Requirements Study Final Report* (29 October 2010), and *MAGTF Bulk Fuel Study II, 2017*.

Notional MAGTF Bulk Fuel Requirements. Notional fuel requirements are—

- Used during planning, especially before generating or compiling an equipment list.
- Derived from previous studies and provides a quick glance to projected consumption for different elements of the MAGTF.
- For initial planning only; do not use for detailed planning or for procuring fuel stocks.

Table 4-1 lists the notional fuel requirements for various MAGTFs.

Table 4-1. Marine Air-Ground Task Force Notional Fuel Requirements (Gallons).

Force Size	Daily Fuel Requirements (Assault Rate)	Daily Fuel Requirements (Sustained Rate)
MEF	2,109,367	1,763,657
MEB	563,868	443,738
MEU	63,842	48,145
LEGEND MEU Marine expeditionary unit		

Sourcing and Procurement

Marine Corps planners must be aware of the various agencies and procedures for procuring bulk fuel. The sources for bulk fuel procurement are as varied as the possible missions and objectives that may be assigned to a MAGTF. After analyzing fuel requirements, Marine Corps planners turn to the theater petroleum manager or joint staff to coordinate fuel sourcing and transportation.

Transportation

Transportation planning may include commercial contracted hauling, railway tankers, shipping, other Service assets, and pipeline availability. Planners should look at all available transportation assets in the area and plan for adequate tactical transportation assets to be deployed in a timely manner. Transportation assets are also key elements in determining fuel support equipment and personnel required. If the fuel source is close and transportation is readily available, planners may not have to provide as much storage capacity. If the LOCs are long and resupply is not timely, planners may have to increase the stockage objective, which means storage equipment will have to be increased. Transportation often represents the greatest challenge to the logistical field due to the high demand for transportation assets.

Storage

Fuel planners must consider storage and distribution assets required; along with personnel needed to operate and maintain them. Storage requirements are based on the anticipated usage by a supported unit and the stockage objective as established by the commander. Storage stock levels depend on consumption rates, resupply methods, transportation assets, and distribution systems. Storage methods, land requirements, and security are the key factors in storage planning. Appropriate prioritization of fuel storage equipment during planning is key to ensure the availability of fuel capacity early enough to support mission requirements. This allows for installation of the storage systems in time to support the transportation schedule.

Distribution

Distribution is often the most difficult of the bulk fuel missions. Equipment, time-phased requirements, and distance are the main factors affecting fuel distribution. Distribution problems become more complex based on the extended length of an operation, increased fuel consumption rates, and the advancement of the MAGTF inland. Resupply concepts of unit distribution or supply point distribution affects the type and amount of resources needed to support bulk fuel distribution to the MAGTF.

Disposition/Redistribution of Excess Fuel

Although the goal is to consume the fuel as far forward as possible, being able to achieve this in a tactical environment is extremely difficult due to the fluctuation on consumption factors and implementation of risk mitigation measures to prevent running out of fuel. Therefore, re-distribution of fuel should be the primary means to close down tactical fuel sites during operations. While conducting an exercise, planning for redistribution of excess fuel early is key to maintaining redeployment timelines. Environmental considerations and local considerations must also be considered.

When the capture of fuel handling equipment to an enemy is imminent, the responsible unit commander must decide either to destroy the equipment or to render it inoperative. Based on this decision, orders are issued that cover the desired extent of destruction. Unit SOP should have a destruction plan developed to fit the local situation.

Whether the plan is to dispose or redistribute, coordination with higher headquarters is vital to successfully execute and prevent waste. In case the redistribution is part of retrograde or a base realignment and closure plan, we must prioritize the methodical decrease in consumption on the tail end of operations and actively coordinate the bulk transportation of fuel.

WAR RESERVE REQUIREMENTS AND STOCKS

As part of the inventory management plan, it is the responsibility of each CCDR and components to identify the petroleum inventory levels needed to support operations and assist in the determining the operating stocks requirements in order to preposition fuel around the globe or position for future contingencies.

Petroleum War Reserve Requirement

To ensure the supply of petroleum products in the initial phases of a contingency, the unified commands and the Services develop requirements to size petroleum war reserve stocks properly. Contingency operations are used as the basis of petroleum war reserve requirements (PWRRs), which support specific contingency operations until normal LOCs are established and resupply arrangements are in place. The PWRR are sized by resupply sourcing assumptions included in the DOS factors, which are developed by the joint staff and approved by Office of the Secretary State. Guidelines provide the Services and CCDRs the basis for determining requirements, and developing and applying structured, auditable methods of computing PWRRs for each approved theater/command OPLAN.

Petroleum War Reserve Stocks

Petroleum war reserve stocks are the on-hand product designated to satisfy PWRRs and are usually stored in theater and monitored by the appropriate CCDR JPO/SAPO. This stockage is in addition to the peacetime operating stock for each location. Commanders of unified commands are authorized to release or reallocate PWRS in emergency situations.

Marine Expeditionary Force Petroleum War Reserve Requirement

The MEF computes PWRRs based on the time, contingency location, and type of product required. The joint staff also establishes prepositioning objectives for regions and areas worldwide in the form of DOS maintained in accordance with DODD 4140.25. These objectives consider factors, such as wartime tanker sailing times, in-theater distribution times, attrition factors, and appropriate safety levels. As a result, the amount of bulk fuel PWRR (in DOS) that the MEF can register varies depending on the theater in which the MEF is operating. The MEF will usually have less than 60 DOS of bulk fuel as accompanying supplies or PWRS, and resupply will begin at a date earlier than D+60.

Consolidated Defense Fuel Support Points

The DLA Energy consolidates Military Service petroleum war reserve requirements for storage at fuel support points and assigns maximum and minimum storage levels in the IMP. It is possible that the entire amount of PWRS that the MEF is authorized in a particular theater may not be sourced. If Marine Corps forces have a bulk fuel shortfall, the Marine component commander will notify the appropriate unified commander's JPO. The document that identifies the amount of PWRS allocated to the MEF is the DLA Energy IMP. The IMP contains the MEF petroleum war reserve requirements by location and identifies the sourced PWRS that are to meet that requirement. The Marine component G-4 and MEF bulk liquids section maintain current copies of the IMP, which is available via the classified SECRET Internet Protocol Router Network (referred to as SIPRNET).

Prepositioned Petroleum War Reserve Stocks

The DLA Energy will attempt to preposition PWRS at the terminal location nominated by a Service. When storage or operational conditions are limited, the DLA Energy will locate stocks at the most appropriate alternate terminal, following coordination with the unified command and the requiring Service. Malpositioned stocks will count against the total petroleum war reserve requirements; however, these stocks may not count as DOS available at the point of planned use during assessment of the OPLAN's capability.

CHAPTER 5
BULK FUEL THEATER OPERATIONS

The three main objectives of bulk fuel support are to supply fuel when needed, distribute fuel where needed, and provide fuel resupply on time. When a MAGTF is involved in a sustained operation ashore, bulk fuel operations deploy in three phases: development, lodgment, and build-up. In theater operations, the MAGTF commander may be part of a developed or undeveloped theater, which is addressed in Chapter 4, Bulk Fuel Planning.

DEVELOPED THEATER

In a developed theater, an existing bulk fuel distribution system is usually available to help support Marine Corps forces. The existing system helps offset the requirements for Marine Corps TFSs. A developed theater consists of tanker unloading facilities, terminals, pipelines, pump stations, dispensing facilities, and rail tank car facilities.

Actual procedures for accomplishing the delivery of bulk fuel to the user will vary between theaters. Civilian personnel or the theater Army typically operate these facilities. However, Marine Corps bulk fuel units may be tasked with operating the facilities, particularly during the early phases of operations before the theater Army has all of its assigned forces.

Pipeline System

In a developed theater, the pipeline system usually extends into the Army corps rear area with hose line extensions into Army corps storage sites and Marine Corps force combat service support areas and airfields. When practical, branch lines from the pipeline are to supply major users, such as Marine Corps CLBs and MWSSs. Military tank trucks and commercial vehicles can supplement the pipeline/hose line system, if required and available.

Theater Stockage Objectives

In a developed theater, most of the theater stockage objectives are in fixed facility storage tanks. This reduces the quantity of bulk fuel that Marine Corps forces need to store in tactical bulk fuel systems. Theater stockage objectives will vary between theaters, depending on planned operational contingency anticipated usage rates. Stockage objectives held in tactical fuel systems will depend on resupply times from theater storage and the daily fuel requirement.

UNDEVELOPED THEATER

Providing fuel support in an undeveloped theater presents many problems not faced in a developed theaters. The employment of the larger tactical fuel systems and the potential use of existing mooring facilities, storage facilities and pipelines requires time and detailed planning. Therefore, during the early stages of an operation, Marine Corps forces must rely on organic equipment and personnel. As the operation progresses, additional equipment and personnel expand the fuel system. A TFS capable of supporting the mission develops in the area when practical. Initial fuel storage facilities expand as soon as possible so that floating storage (tankers or barges), which is holding reserve fuel for shore units, may release their reserves. Any available commercial or HNS will be considered for use as part of the bulk fuel system, and should be obtained through DLA Energy contracts, local purchase procedures, or through HNS agreements.

Minimum Bulk Fuel Stockage Objective

The minimum bulk fuel stockage objective for an undeveloped theater is 15 DOS, which includes bulk fuel stored in tactical equipment and offshore shipping or floating dumps. Fuel is distributed from beach storage by hose line, tank vehicles, helicopters, and any other means available. As the fuel system is developed, it will consist of hose lines and collapsible storage tanks. The primary method of receiving bulk fuel in an undeveloped theater will be STS operations using Navy shipping with the ABLTS or the OPDS, tanker vehicles, barges, or any other suitable transportation asset.

Tactical Hose Line

Large users, such as tactical airfields are supplied by tactical hose lines when possible. The tactical hose line or pipeline will extend as far forward as possible, usually into the Army corps rear area, to reduce mobile transport requirements. Although hose lines are the most rapid and easily deployed system, a more permanent system is typically installed if the system must stay in place for long periods. When possible, the rear area communications zone, Army corps support, and force service support areas should be established. In the early stages of an operation in an undeveloped theater, the theater may consist of only a JTF support area, MEF forward area with MLG elements, or Army division support area. Later, an Army corps support area will likely be formed. The rear area communications zone may not form, depending on the operation's duration.

Air Lines of Communications

In the early stages of an undeveloped theater, there is often a requirement to support forces with air lines of communications (ALOCs). The Air Force AMC provides this support with C-130 and C-17 aircraft. Requirements for ALOC support are coordinated through channels established in the OPLAN. If the forces advance using air assets, then usually the ALOC is required to support them. The following types of aerial bulk fuel support are available from the AMC:

- *Packaged products.* Products, such as 5-gallon fuel cans and 55-gallon drums, may be internally loaded into cargo aircraft for delivery to airfields near the supported units. Packaged products are not procured through the bulk fuel chain; they are procured through the supply chain as class IX items.

- *Airdrop.* When suitable aircraft loading and unloading areas are not available, fuel delivery systems may be airdropped or delivered by low-altitude parachute extraction systems. A 500-gallon collapsible drum can be transported internally or externally to deliver fuel.
- *Aerial bulk fuel delivery system*. The Air Force and Marine Corps have aircraft equipped with internal collapsible tanks and a pump for delivery of bulk fuels into areas where suitable landing sites are available.
- *Wet wing refueling.* The C-130 and C-17 aircraft have internal pumps for defueling. Using Marine Corps or Army ground equipment (hoses and nozzles), these aircraft can deliver aviation fuel into Marine Corps or Army storage containers located at suitable landing areas (see table 3-2).
- *Tactical bulk fuel delivery system.* The installation and operation of this system is by aircrew personnel. It contains three 800-gallon tanks, for a maximum storage capacity of 2,400 gallons. It is used at forward sites to dispense fuel to other aircrafts or ground vehicles.

PHASES OF BULK FUEL OPERATIONS

During sustained operations ashore, tactical bulk fuel equipment must be deployed to provide support to the MAGTF. Bulk fuel operations are conducted in three phases: development, lodgment, and build up.

Development

Due to high consumption and limited bulk fuel capabilities, the development phase is often the most critical phase of bulk fuel operations. The commander and staff need to look closely at the full range of the vehicles going ashore, the time-phased resupply available, and the equipment available to support the MAGTF during this phase. The initiation of the development phase may be airborne or through an amphibious assault or an uncontested debarkation at a friendly port.

The first units of the MAGTF entering an operational area will probably carry only enough bulk fuel for immediate purposes. Resupply of these units must begin rapidly. During initial deployment, fuel will be provided in prepackaged containers (drums and cans), 500-gallon tanks, SIXCONs, and a mobile refueler, then delivered to the AOA by surface or air from offshore amphibious ships. These items are continually recovered, reused, or sent back to the source. In this phase, all bulk fuel resources within the AOA should be considered and exploited as needed.

Lodgment

The lodgment phase involves the establishment and expansion of bulk fuel transportation, storage, and distribution systems. Shore-basing the MAGTF, arrival of the assault follow-on echelon, and sustainment operations will increase the demand beyond the capabilities of those systems deployed during the development phase. Larger bulk fuel systems will have to be established ashore to handle the requirements of the MAGTF.

Build-Up

Once the lodgment phase is established, build-up of the bulk fuel systems can begin. The mission and the commander's intent as to the required stockage objectives on the ground dictate the final requirement for the bulk fuel systems.

BULK FUEL OPERATIONS WITHIN THE MARINE AIR-GROUND TASK FORCE

The emphasis on expeditionary capabilities includes a refinement of over-the-horizon amphibious assault capabilities, increased flexibility of maritime prepositioning forces, fast and flexible schemes of maneuver for the ground combat element (GCE), and development of an ACE composed predominantly of short takeoff and vertical landing aircraft. Fuel planners must be able to identify, assess and articulate operational risk associated with bulk fuel operations, and recommend appropriate courses of action to commanders for managing that risk. This requires updated unit/equipment consumption data sets, as well as the development of comprehensive fuel planning and command and control capabilities. Furthermore, MAGTF bulk fuel capabilities should be woven into all naval and MAGTF exercises to ensure that bulk fuel planners and operators are adequately prepared to support dynamic MAGTF operations. Expeditionary operations require compatible concepts of bulk fuel support. For example, when conducting bulk fuel supply operations with only a minimal build-up ashore, the emphasis should be on proper planning and operational management. Employing the most compatible concept, along with accurate planning and efficient operations, should ensure the units ashore do not run out of fuel. In addition, units should not have excess bulk fuel stocks and equipment.

The MAGTF may require a partial, complete, or multiple fuel systems. When using a partial system, commanders need to ensure they have adequate equipment to perform the unit's bulk fuel mission. For example, if the mission only requires one tank farm from an AAFS but also has a requirement or possibility for STS operations, the beach unloading assembly must also be taken.

Command Element

The CE, in conjunction with the CLB, plans and coordinates bulk fuel support for the MAGTF. The CE coordinates the MAGTF bulk fuel concept with the theater planner to ensure that the MAGTF is prepared to meet any special bulk fuel tasking from the theater commander. Additional tasks for the CE may include coordinating area support to other Services. Normally, the CE will consolidate all the MAGTF fuel requirements and submit them to the appropriate component headquarters or the JTF. Although other MAGTF elements conduct daily bulk fuel management, the CE should ensure economy of effort for bulk fuel support. The CE is also responsible for setting the MAGTF bulk fuel stockage objective and for allocation of bulk fuel within the MAGTF. If requirements exceed availability, a petroleum allocation report is used to record excess. The CE will ensure that all bulk fuel reporting requirements established in the OPLAN are met. See appendix B for a sample report format.

Combat Logistics Battalion

The CLB is responsible for bulk fuel support and daily management of bulk fuel equipment, with the exception of tactical aviation fuel systems. In order for the CLB to carry out this responsibility, exercises and OPLANs should address procedures and coordination requirements for fuel support in detail. The CLB then consolidates the requirements and passes them to the CE for sourcing. Depending on the size of the MAGTF and the geographical area, the CE may task the CLB with sourcing the consolidated requirements with theater agencies. The MAGTF elements receiving direct fuel support from the CLB must coordinate their fuel and support requirements (e.g., fuel deliveries, storage). Typically, bulk fuel management is the responsibility of the CLB's G-3/S-3 and G-4 supply support. The CLB bulk fuel units can range from a complete bulk fuel company to a small section, depending on the mission.

Aviation Combat Element

The ACE is responsible for bulk fuel support and daily management of bulk fuel for all tactical aviation fuel systems at the airfields and FARPs. These responsibilities are performed by the ACE G-4/S-4 or within the airfield operations division of the MWSS. The ACE provides bulk fuel support to organizations within the boundaries of the airfield, including to other Services' aircraft if directed in the theater bulk fuel plan. For ground equipment fuel support, the ACE is primarily equipped to be self-sufficient. If ground fuel support requirements within the boundaries of an airfield exceed ACE capabilities, the CLB will provide any additional support requested.

Bulk fuel sourcing and support procedures for ACE airfields vary depending on the situation. If the airfields receive bulk fuel directly from theater sources, the CE may task the ACE with coordinating its fuel requirements directly with the theater agency. If the airfield receives fuel support from the CLB, the ACE will coordinate its fuel requirements directly with the CLB.

Ground Combat Element

The GCE is primarily a bulk fuel user, not a provider. However, the GCE does have mobile fuel equipment to provide direct support to division units. The GCE coordinates fuel support requirements with the CLB that is providing direct support. Normally the GCE will use SIXCONs and mobile refuelers for fuel support to its end users, such as tanks and vehicles. A typical planning factor for the GCE is three DOS of self-support. If GCE fuel requirements exceed the GCE's fuel support capability, the GCE will request fuel support from the CLB.

BULK FUEL SUPPORT FOR THE MARINE AIR-GROUND TASK FORCE

Most bulk fuel support for the MAGTF is located within the MLG, and most bulk fuel assets are located within the ESBs. Transportation assets are located within the transportation support battalion. The MAW has organic assets as well, designed to support airfield operations.

Resupply

The MAGTF bulk fuel distribution system is a push-pull resupply system. Bulk fuel moves forward (is pushed) throughout the MAGTF bulk fuel system based on storage space available and anticipated customer demands. The basic principle is to keep storage tanks full. Customers

request (pull) fuel from the bulk fuel system based on their demands. The CE monitors the push and pull sides of the resupply system to ensure fuel movement throughout the system is coordinated with the OPLAN. For example, if a CLB with a fuel storage system moves to another location, its fuel stocks are reduced, so it can move its equipment. In that case, the CE would not push fuel to the empty storage. During the drawdown, the CE would ensure continuous fuel support to the units being supported.

Storage

Typically, bulk fuel for MAGTF operations is stored ashore in tactical fuel systems. A bulk fuel company can install and operate four AAFSs with a storage capacity of 4.48 million gallons. Aircraft are not typically brought ashore until adequate fuel stocks are available. However, refueling operations may commence by relying on afloat storage once the STS pumping rate meets the daily requirement. Another option is to have the aircraft refuel from ships or theater airfields not in the AOA, thus reducing the shore based requirement. At issue is the tradeoff between start dates for shore-based air operations and the risk of a fuel cutoff. Any interruption in sea-based fuel support would create a fuel shortage without adequate fuel ashore. Table 5-1 shows the DOS that four AAFSs can provide to various MAGTFs based on the following assumptions:

- Ground forces consuming fuel at assault rate.
- ACE requiring shore-based fuel.
- Aircraft sorties being flown at a sustained rate.

MARITIME PREPOSITIONING SHIPS

Rapid offloading and availability of bulk fuel is essential to MPS operations; each MPSRON currently carries AAFSs, TAFDSs, and HERSs. The TFSs are spread loaded among the various ships so that each ship has a bulk fuel capability. They must be established ashore before the ships can offload their cargo fuel. Therefore, the AAFSs and TAFDSs embark in a manner that allows them to be among the first items of equipment offloaded. The MPSs have the capability to carry cargo bulk fuel. Depending on the type of ship, each MPSRON can carry up to 2.5 million gallons of JP-5 and up to 114,000 gallons of motor gasoline (MOGAS).

Fuel Offload

An MPS can offload fuel using a single 6-inch diameter hose line at 600-GPM from a distance of up to two miles. An MPS can also offload fuel at pier side or in-stream. At the flow rate of 600-GPM, it takes approximately 36 hours to offload JP-5, and five hours to offload MOGAS from a single ship, which requires separate lines and storage facilities. Fuel is pumped ashore through the amphibious bulk liquid transfer system carried aboard an MPS. The system consists of 10,000 feet of 6-inch diameter hose mounted on a powered hose reel. For installation, the hose reel is loaded on to a landing craft utility or a side loadable warping tug and installed from the beach to the ship. The shore end of the hose connects to the AAFS, with the BIU supplied by the amphibious construction battalion. Under favorable conditions, the hose line system may be installed in 8 to 10 hours and retrieved in 10 to 16 hours.

Table 5-1. Marine Air-Ground Task Force Storage Capability (Gallons).

LCE				ACE				LCE/ ACE Total Storage
	Unit/TFS System	**Qty**	**Storage Capability**		**Unit/TFS System**	**Qty**	**Storage Capability**	
MEF	Bulk Fuel Company	1	—	MEF	MWSS	3	—	MEF
	AAFS	4	4,480,000		MWSD	1	—	
	3,000-gal tank	41	123,000		TAFDS	11	3,520,000	
	500-gal bladder	116	58,000		HERS	12	216,000	
Total			**4,661,000**	**Total**			**3,736,000**	**8,457,000**
	Unit/TFS System	**Qty**	**Storage Capability**		**Unit/TFS System**	**Qty**	**Storage Capability**	
MEB	Bulk Fuel Company	1	—	MEB	MWSS	1	—	MEB
	AAFS	4	4,480,000		TAFDS	7	2,240,000	
	3,000-gal tank	4	12,000		HERS	8	144,000	
	500-gal bladder	56	28,000					
Total			**4,520,000**				**2,384,000**	**6,904,000**
	Unit/TFS System	**Qty**	**Storage Capability**		**Unit/TFS System**	**Qty**	**Storage Capability**	
MEU	CLB	1	—	MEU	MWSS (RW) Fuel Section	1	—	MEU
	ERS	~4	—					
	3,000-gal tank	~6	18,000		HERS	1	18,000	
	500-gal bladder	~18	18,000					
Total			**36,000**	**Total**			**18,000**	**146,000**

LEGEND

gal gallon
LCE logistics combat element
MEU Marine expeditionary unit
Qty quantity
RW rotary wing

Note: Since an MPSRON is designed to support a Marine expeditionary brigade (MEB), the MEB totals were derived from NAVMC 2907, *Maritime Prepositioning Force (MPF) Prepositioning Objective*, and current allowances submitted to Total Force Structure. Composition of the MAGTF may change depending on mission and aggregate forces; calculation of storage capacity will depend on equipment density and composition of forces.

Unloading Fuel Systems

Early unloading of the fuel systems allows for the installation to begin while the remaining equipment is being offloaded. All fuel-consuming equipment should be filled before offloading on the ships. This will reduce the immediate need for shore-based fuel support. Mobile refuelers should also be filled before offloading so that they can provide required fuel support ashore. Once the ship has offloaded its cargo, it should be positioned to deploy the hose reel and offload its cargo fuel to the AAFS.

In the time it takes to offload the equipment from the ship and deploy the hose reel, the AAFS installation should be to the point where it can start receiving fuel. During site selection for MPs, operational planners need to consider terrain requirements and locations for the bulk fuel systems and the STS fuel transfer.

BULK FUEL REPORTS

Bulk fuel reporting requirements and procedures will vary depending on the exercise or operation. Appendices B and C are examples of bulk fuel reports that may be required from the MAGTF in a joint environment. The example in appendix B is from the defense message system.

CHAPTER 6 BULK FUEL INVENTORY MANAGEMENT

The management of fuel inventories involves a full range of actions associated with orders/ requisitions, receipt, transfer, issue, and storage of fuel. Bulk fuel support must be planned so that product quantities maintained support planned operations.

INVENTORY MANAGEMENT

The major objectives of an inventory management program are to—

- Properly document all orders, receipts, transfers, issues, losses, gains, and adjustments.
- Maintain accountable records on all products.
- Ensure an audit trail of fuel transactions is kept.
- Maintain control over the physical environment to ensure proper product storage can take place with minimal fuel losses.

REFERENCE

The requirements and procedures for the accountability of petroleum products are in DOD Manual 4140.25-M. This reference provides policy and guidance for the accountability of petroleum products by Marine Corps activities. Regardless of the type of fuel equipment used, units must maintain accounting procedures and records as accurately as possible. This applies to tactical situations using mobile refueling equipment and TFSs. Accounting for fuel in fixed facilities and commercial mobile equipment must be accurate. However, when bulk fuel units perform a physical inventory for TFSs, the physical inventory becomes more difficult and less accurate due to the use of collapsible tanks and miles of tactical hose that may be employed. The key to more accurate accounting for TFSs is for commanders to ensure that local bulk fuel SOPs address unit procedures and requirements for fuel accountability.

PROCEDURES

The DLA purchases DOD fuel at the wholesale level for direct delivery to the customers. When a Service orders and receives fuel from a defense fuel supply point or a DLA contract, a “sale”

may take place if the fuel is transferred to a single-user unit. When the transfer of fuel is to a multi-user unit holding DLA-owned (capitalized) fuel, a "sale" takes place upon fuel issue into the consumer's equipment or aircraft.

Whether a Service is holding wholesale or retail bulk fuel stocks, certain rules of accounting apply to all Services. All bulk fuel-holding activities should maintain a current inventory using a property book or logbook and a physical record. A property book record is an administrative record of all receipts, transfers, and issues of bulk fuel. It provides an estimate of the fuel inventory on hand and should be maintained on a daily basis.

A physical inventory is a measurement of the actual fuel on hand using volume correction to 60 degrees Fahrenheit (°F). It is conducted periodically (i.e., daily, weekly, monthly) depending on the situation. If the difference between the property book records and the physical inventory exceed the allowable loss/gain, it must be reported through the chain of command.

FUEL ACCOUNTABILITY

As with all supplies, the commander considers the accountability of bulk fuel essential. Procedures and requirements for bulk fuel accountability will vary depending on the operation, the type of fuel equipment being used, and the situation (e.g., combat, training exercise, joint operation). To ensure proper and sound accounting procedures are being followed, the commander and staff need to ensure that accounting procedures are contained in the OPLAN and letters of instruction. However, due to the nature of fuel, certain losses will occur as a result of evaporation, transportation, storage, and handling. The American Petroleum Institute (API) establishes allowable tolerances adopted by the DOD for these losses.

REPORTS

Status reports, daily/weekly/monthly fuels issue reports, and monthly bulk fuel accounting summaries are used to maintain accountability of bulk fuel receipts, issues, and stocks on hand. Report content should include the following:

- Opening and closing balances.
- Total issues.
- Total receipts.
- Physical inventory.
- Property book inventory.
- Losses/gains.
- Other applicable information regarding accounting or operational capability.

Completing daily status reports, including the bulk petroleum contingency report (REPOL), is per the local commander's SOP. See appendix C for a REPOL example.

Reports can include DOS levels status to assist in providing commanders a common operational fuel status picture, as shown in table 6-1. A black-red-amber-green (known as BRAG) system is commonly used to quickly identify fuel levels in an AO. At the staff level, a common operational picture is derived from daily REPOLs to track the overall levels, as shown in the figure 6-1.

Table 6-1. Employment of BRAG System.

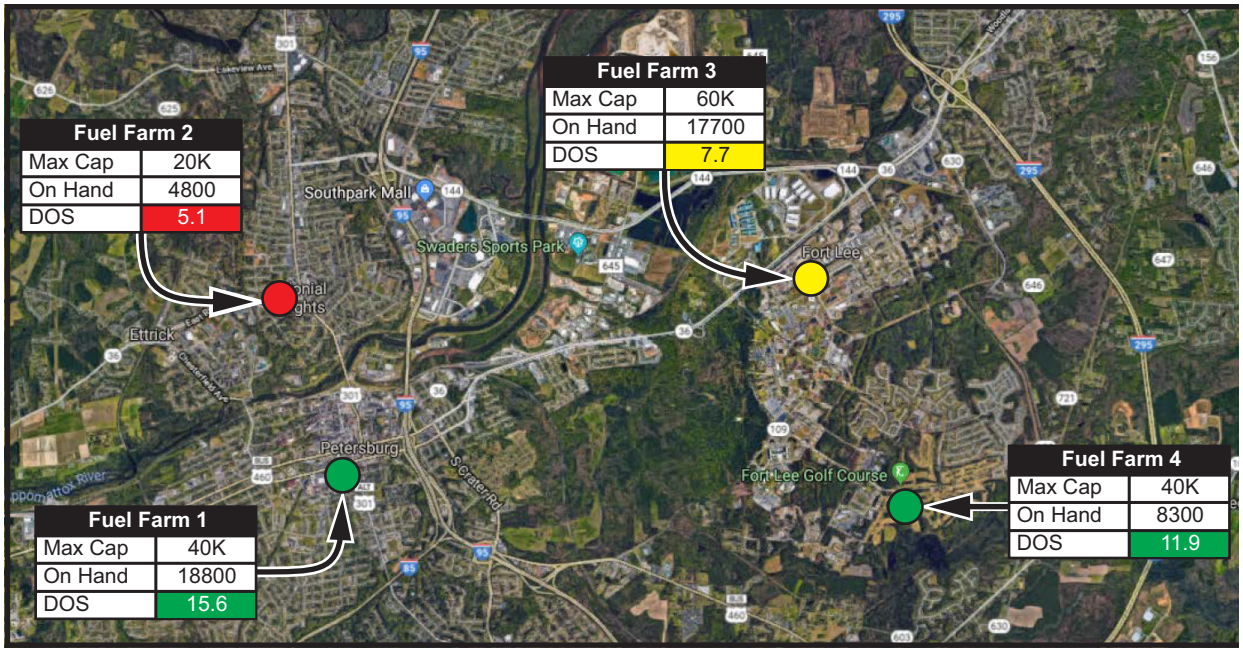
Black	**3 or below**
Red	**3-6.9 DOS**
Amber	**7-9.9 DOS**
Green	**10-15 DOS**

Site	C/F in gal	Opening	Issued	Received	Closing	DOS
Fuel Farm 1	1200	20000	1200	0	18800	15.6666667
Fuel Farm 2	950	4000	200	1000	4800	5.05263158
Fuel Farm 3	2300	15000	2300	5000	17700	7.69565217
Fuel Farm 4	700	8000	700	1000	8300	11.8571429

LEGEND

C/F consumption factor
gal gallon

.



LEGEND

Max maximum
Cap capacity

Figure 6-1. Common Operational Picture.

CHAPTER 7
BULK FUEL QUALITY SURVEILLANCE PROGRAM

Quality surveillance is the process of determining and maintaining the quality of petroleum and related products to ensure these products are suitable for their intended use. The DLA controls the quality of petroleum at the origin. After receipt of petroleum products, each Service is responsible for continued surveillance to maintain the quality of petroleum products. Further, the agency having physical possession of a product is responsible for quality surveillance.

To meet specifications set by DOD, petroleum products undergo quality surveillance from the time of purchase until it is used. The JPO, responsible to the JFC, ensures there is a quality surveillance program within the command then monitors and assists Service components in this program. The theater Army command is responsible for setting up and maintaining a quality surveillance program to support theater Army users. Each Service component is responsible for establishing and maintaining a quality surveillance program for Service-held petroleum stocks.

A vigilant quality surveillance program implemented by properly trained personnel is necessary to protect the original product quality. Fuel systems will not function properly if they are contaminated with dirt, water, other fuel, or any foreign matter. Operators must take action to ensure that the product conforms to established technical specifications. These actions include preventive maintenance of equipment; mandatory use of filter separators for aviation fuels (also highly recommended for ground fuels); daily recirculation and visual examination of the product; proper storage, handling, and drainage of water bottoms; and monitoring proper concentrations of additives. MIL-STD-3004-1, MIL-STD-3004-2, and Naval Air Systems Command (NAVAIR) Publication 00-80T-109, *Aircraft Refueling Naval Air Training and Operating Procedures Standardization (NATOPS) Manual*, are the approved references for quality surveillance.

PERSONNEL

The bulk fuel officer (military occupational specialty 1390) or the bulk fuel staff non-commissioned officer (military occupational specialty 1391) is responsible for establishing procedures that ensure the quality of bulk fuel products that are stored and issued. All fuel-handling personnel are responsible for following established procedures and ensuring the required steps are taken to deliver clean fuel to vehicles and aircraft. An effective quality surveillance program requires properly trained personnel. Training is a requirement for every Marine involved in handling petroleum products. A petroleum quality assurance and additization specialist is

responsible to oversee, maintain and manage a bulk fuel unit's quality assurance/surveillance responsibilities. Additionally, they are primarily responsible for the operation of the Petroleum Quality Analysis System Enhanced (PQAS-E) and establishing internal procedures to properly use field testing kits for both ground and aviation units.

SPECIFICATIONS

Different fuels have critical properties and requirements, as determined by testing. Each petroleum product has a specification that lists chemical and physical requirements of the fuel. The specifications listed in table 7-1 are for commonly-used fuels.

TESTING KITS AND METHODS

The following subparagraphs describe equipment, test kits and approaches used to determine the quality of petroleum products. Fuel units conduct daily/weekly testing using the applicable test equipment. Only specially trained personnel are qualified to use the test kits. Petroleum Laboratory Specialists are the only qualified Marines to operate the PQAS-E.

Petroleum Quality Analysis System–Enhanced

The PQAS-E (USMC TAMCN B0087) is a complete petroleum laboratory capable of conducting B-3 level testing in accordance with MIL-STD-3004-1 and MIL-STD-3004-2 on kerosene based (i.e., JP-5, JP-8, jet A, jet A-1, and F-24) and diesel military mobility fuels. The PQAS-E petroleum test equipment is self-diagnostic and both user and equipment fault tolerant. Military and commercial fuels (to include captured fuels) can be tested for composition and quality against minimum standards.

Petroleum Testing Kit

The petroleum testing kit is a portable petroleum quality surveillance kit consisting of components and testing equipment capable of determining contamination levels in aviation fuels. The kit has the capability to take in-line samples in tactical fuel systems, mobile refueling equipment, and commercial refueling equipment. The kit can test for specific gravity, free water, and particulate contamination in aviation fuel samples. The petroleum testing kit is associated with the TAFDS and AAFS.

B2 Test Kit

The B2 fuel system icing inhibitor test kit measures the levels of fuel system icing inhibitor additive in aviation fuels. The kit consists of a refractometer, testing apparatus, and other accessories all stored in a custom-padded briefcase.

Table 7-1. Fuel Specifications.

Property	Specification Requirement	Use Limit[1]	ASTM Test Method
All Turbine Fuels (JP-5, JP-8, JP-4, F-24)			
Existent Gum, mg/100 ml, max	7	14	D 381
Corrosion, Copper Strip, 2 hours at 100 °C (212 °F), max	1	Note 2	D 130
Sediment/Particulate Matter, mg/l, max	1.0	2.0	D 2276, D5452 or CFD
Distillation Residue, % max, V/V	1.5	2.0	D 86
FSII, %Volume	0.10 – 0.15	0.04 – 0.20[3]	D 5006[4]
JP-5, NATO Code F-44			
Flash Point °C (°F), min	60 (140)	60 (140)[5]	D 93 or D6450
API Gravity, °API, min – max	36.0 – 48.0	36.0 – 48.0	D 1298 or D4052
Distillation, % fuel recovered at 205 °C (400 °F)	10	7	D 86
Peroxide number, ppm, max	8.0	16.0	D 3703
WSIM, min	Note 6	Note 7	D 3948
Filtration time, minutes, max	15	30[8]	Note 9
JP-8, NATO Code F-34, F-24 (NATO Code F-24)			
Flash Point °C (°F), min	38 (100)	32 (90)	D 93 or D6450
API Gravity, °API, min – max	37.0 – 51.0	37.0 – 51.0	D 1298 or D4052
WSIM, min	Note 10	Note 7	D 2550
Electrical Conductivity pS/m, allowable range	150 - 600	100 – 700	D 2624 or D 4308
Filtration time, minutes, max	15	20[8]	Note 9
JP-4, NATO Code F-40			
API Gravity, °API, min – max	45.0 – 57.0	45.0 – 57.0	D 1298 or D4052
RVP @ 37.8 °C kPa (psi @ 100 °F)	14.0 – 21.0 (2.0 – 3.0)	10.4 – 22.5 (1.5 – 3.2)	D 323, D4953, D5190 or D5191
JP-4, NATO Code F-40			
WSIM, min	Note 10	Note 7	D2550
Electrical Conductivity pS/m, allowable range	150 – 600	100 – 700	D 2624 or D 4308

LEGEND

ASTM	American Society of Testing and Materials	°C	degrees Celsius
CFD	contaminated fuel detector	kPa	kilopascal
mg	milligrams	max	maximum
mg/l	milligrams per liter	min	minimum
ppm	parts per million	ml	milliliters
psi	pounds per square inch	pS/m	picosiemens per meter
NATO	North Atlantic Treaty Organization	RVP	Reid Vapor Pressure
WSIM	water separation index modified	NSN	national stock number
V/V	volume to volume		

Note: This table does not list all the specifications for each product type and should be referenced individually when interpreting test results.

Flashpoint Test Kit

Each type of fuel ignites or flashes at a unique temperature. The flashpoint test kit is used to determine the temperature a fuel will ignite in a controlled environment or if a fuel is within specification limits. The kit is a self-contained unit that provides all the hardware necessary to conduct flashpoint testing in austere environments at expeditionary airfields or forward operating bases.

Combined Contaminated Fuel Detector Kit

The combined contaminated fuel detector kit is a combined portable unit capable of measuring both solid contaminants and free water (undissolved water) in aircraft fuel. The maximum allowable limit of solid contamination for Navy and Marine Corps aviation fuel is two milligrams per liter.

D-2 Hydro-Light

The D-2 hydro-light kit uses the sampling bomb from the petroleum test kit to pull an inline fuel sample in tactical fuel systems, mobile refueling equipment, and commercial refueling equipment to test for free water (undissolved water). The maximum allowable limit of free water in fuel at aircraft dispensing points is five parts per million in accordance with NAVAIR 00-80T-109.

Correlation Testing

Each activity shall take a series of routine, duplicate correlation samples to verify in-house testing procedures and properly working equipment. At a minimum, correlation samples are sent once a month for testing; however, this does not preclude sending correlation samples more frequently if concerns arise about the results being obtained with local equipment. Although this is typically a requirement for shore activities and stations, not tactical units, correlation samples can be procured by any unit if inconsistent variations in readings are discovered.

DETERIORATION/RECEIPT LIMITS

Fuel deteriorates when it is subjected to long periods of storage. Therefore, it is important that fuel is issued on a first-in, first-out basis or as quality surveillance indicates. Deterioration occurs when one or more characteristics of the product change to a level outside the specification limits. Examples of deterioration are weathering, oxidation, or loss of additives.

Deterioration/receipt limits are established to permit use of products that do not fully meet specifications. When petroleum products do not meet the deterioration limits, quality surveillance personnel report the circumstances and recommend alternative use or disposition to the commanding officer. If appropriate, proposed recovery measures should be reported.

TESTING PROPERTIES

Fossil fuels are a complex mixture of hydrocarbons produced by the distillation of crude oil. The actual composition and properties of fuel vary depending upon the source of crude oil, the refinement process, and product specifications. To help identify the type of fuel, qualified laboratory technicians look at the physical and chemical properties of the fuel (e.g., color, flashpoint, density, thermal capacity, vapor pressure, chemical formula, etc.). To identify properties specific to each type of duel refer to MIL-STD-3004-1 and MIL-STD-3004-2.

Color

Color may be an aid for identifying fuels, such as aviation and automotive gasoline, that have characteristic colors. Failure of fuel to meet its color requirement may indicate the possibility of contamination or deterioration. Darkening of the color of jet fuel may indicate the formation of insoluble gums. If a color range of a particular product is known, a variation outside the established range may indicate possible contamination with another product. Continuous color comparison of fuel samples will lead to possible chemical changes or contamination occurring within your fuel system.

Flashpoint

The flashpoint is the lowest temperature at which vapors rising from a petroleum product ignite momentarily (flash) on application of a high voltage arc. The flashpoint of a petroleum product indicates the fire hazard in handling and storage. It applies to fuel oils, diesel fuels, JP-5, JP-8, jet A/A1, F-24, F76, RP2, TS1, and B20. The flashpoint test also indicates the combination of a product. The flashpoint of new lubricating oil is primarily for identification and classification. The flashpoint of the oil must be above the operating temperature of the engine used.

APPENDIX A
PETROLEUM, OILS, AND LUBRICANTS
APPENDIX TO THE LOGISTICS ANNEX

This appendix contains the format for the petroleum, oils, and lubricants (POL) appendix for CCDR, JTF, and MAGTF OPLANs and operation orders.

CLASSIFICATION

Copy no. __ of __ copies
OFFICIAL DESIGNATION OF COMMAND
PLACE OF ISSUE
Date-time group
Message reference number

APPENDIX 1 TO ANNEX D TO OPLAN/PETROLEUM, OILS, AND LUBRICANTS SUPPLY (U)

(U) REFERENCES: List documents necessary for a complete understanding of this appendix; include current petroleum studies, joint agreements, and other relevant guidance as applicable.

1. (U) General

a. (U) Purpose. State the purpose of this appendix.

b. (U) Users. Describe the concept of petroleum supply operations by designating the supported users, including allied forces and civilian requirements, where applicable. Identify the agreements whereby support for the latter users would be undertaken.

2. (U) Concept of Operations

a. (U) Describe the availability and suitability of commercial petroleum products, petroleum storage, tanker unloading facilities, and petroleum distribution systems within the AO.

b. (U) List tanker offloading facilities and terminal facilities needed to meet US military requirements for petroleum support.

c. (U) Detail the concept of inland distribution.

d. (U) Describe the requirements for intertheater or intratheater movement of bulk petroleum to include points of origin, destination, type, and facilities available or required to receive this type of product. List POL data by product upon fielding of new time-phased force and deployment data format. The Joint Operation Planning and Execution System produced listing will be used.

e. (U) List requirement for local procurement of commercial petroleum products and petroleum distribution and storage services within the AO.

f. (U) Establish quality control activity within the AO.

Page number

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CLASSIFICATION

3. (U) Responsibilities

a. (U) Assign specific tasks to military organizations, including the component commanders, when appropriate.

b. (U) Delineate support responsibilities of the JPO, JTF, component commanders, SAPOs, appropriate unified commands, or their components for the supply of petroleum, including responsibility for its transportation.

4. (U) Limiting Factors. Describe limitations that could adversely affect petroleum supply operations, such as inadequate air and ocean terminal capacity, lack of storage facilities, malpositioned storage, inadequate transportation, inadequate in-theater stocks, lack of alternate facilities, and similar logistic constraints.

5. (U) Estimate of POL Support Requirements. Refer to Tab A, if applicable. Describe methodology used to compute requirements if Service planning factors were not applicable or consideration of unique factors.

ACKNOWLEDGE RECEIPT

Name
Rank and Service
Title

Page number

CLASSIFICATION

APPENDIX B
PETROLEUM ALLOCATION:
DEFENSE MESSAGE SYSTEM

The following is a message text format report used to identify bulk petroleum allocations when required. The report may be used by the CCDR (to the component commands) and by the MEF (to the major subordinate commands) when bulk petroleum stocks or support cannot meet all the requirements. For instructions and codes, refer to the defense message system.

FM JTF/COMMARFOR TO II MEF

CG MAW//G4/G3//

CG MARDIV//G4/G3// CG FSSG//G3/G4//

CC (AS REQUIRED) BT UNCLAS//N04020// EXER//OPER//

MSGID/POLALOT/MEF G4/0001/NOV// REF//

AMPN// NARR// PERID/150500Z/TO:160500Z/ASOF:141800Z//

6POL/

CMPCMD /FUELTYP/QTY /UOVOLM/POLDELMD/DELPOS/

MAW	/JP5	/100K/GAL/TKRTRK/LZ BLUEBIRD/
MAW	/MUR	/5K/GAL/TKRTRK/LZ BLUEBIRD /
MLG	/DF2	/20K/GAL/BARGE/LZ BLUEDIRD /
MLG	/MUR	/10K/GAL/TKRTRK/LZ FALCON /
MLG	/JP8	/50K/GAL/TKRTRK/LZ FALCON /
MLG	/JP5	/600K/GAL/TKRSHP/ONSLOW BEACH /
MARDIV	/DF2	/25K/GAL/TKRTRK/GRID 432756 /
MARDIV	/DF2	/5K/GAL/TKRAC/GRID 479832//
BT#		

APPENDIX C
BULK PETROLEUM CONTINGENCY REPORT

The following report provides summary information on bulk fuel inventories, damage, and damage assessment on bulk fuel distribution systems. The CCDR, JPO, or SAPO typically submits the REPOL. The MEF will submit REPOL feeder reports as required by the combatant commander to the appropriate agency. The following format is a basic example; REPOLs will be tailored to mission and commander's requirements.

Bulk Petroleum Contingency Report.
(Insert date here)

A	B	C	D	E
PART I Location				
Insert town or city and grid				
Product	Issued Last 24 Hours	Receipts Last 24 Hours	On-Hand Inventory	Storage Capacity
JP-8	X	X	X	X
AVGAS	X	X	X	X
MOGAS	X	X	X	X
PART II Forecast				
	24 Hours	48 Hours	72 Hours	96 Hours
JP-8	X	X	X	X
AVGAS	X	X	X	X
MOGAS	X	X	X	X
PART III Equipment				
TYPE SYSTEM (capacity)	On Hand	In-Service	Notes	Storage Per
AAFS (1.2 million)	X	X		1,200,000
TAFDS (320K)	X	X		320,000
TAFDS (120K)	X	X		120,000
HERS (9K/18K)	X	X		9,000/18,000
ARC (5K)	X	X		5,000
MK970	X	X		5,000
PART IV Personnel				
	On Hand			
Enlisted Petroleum Supply Spec	X			
MK970 Driver/mechanic	X			
Petroleum Officer	X			
PART V Remarks				
Prepared by: Rank and name	XXXXXXXXX			
Telephone #: Valid/accurate telephone#	XXXXXXXX			

Note: Report becomes SECRET when filled out with factual information.

GLOSSARY

Part I. Acronyms and Abbreviations

ABLTS ..... amphibious bulk liquid transfer system
AAFS ..... amphibious assault fuel system (USMC)
ACE ..... aviation combat element
ALOC ..... air line of communications
AMC ..... Air Mobility Command
AO ..... area of operations
AOA ..... amphibious objective area
API ..... American Petroleum Institute
AVGAS ..... aviation gasoline

BIU ..... beach interface unit

CCDR ..... combatant commander
CE ..... command element
CONUS ..... continental United States
CLB ..... combat logistics battalion

DLA ..... Defense Logistics Agency
DOD ..... Department of Defense
DODD ..... Department of Defense directive
DOS ..... days of supply

ERS ..... expedient refueling system
ESB ..... engineer support battalion

°F ..... degrees Fahrenheit
FARP ..... forward arming and refueling point
FW ..... fixed-wing
FRC ..... flatrack refueling capability

G-3 ..... assistant chief of staff, operations
G-4 ..... assistant chief of staff logistics/logistics staff section
GCE ..... ground combat element
GPM ..... gallons per minute

HERS ..... helicopter expedient refueling system
HN ..... host nation
HNS ..... host-nation support
HRS ..... hose reel system

IPDS ..... inland petroleum distribution system (Army)
ISO ..... International Organization for Standardization

J-4.....logistics directorate of a joint staff
JFC ..... .joint force commander
JP-4 ..... jet propulsion fuel, type 4
JP-5 ..... jet propulsion fuel, type 5
JP-8 ..... jet propulsion fuel, type 8
JPO.....joint petroleum office
JTF .....joint task force

LOC .....lines of communication

MAGTF .....Marine air-ground task force
MAW ..... Marine aircraft wing
MEB..... Marine expeditionary brigade
MEF .....Marine expeditionary force
MIL-STD ..... .military standard
MLG..... Marine logistics group
MOGAS .....motor gasoline
MPS ..... maritime pre-positioning ship
MPSRON .....maritime pre-positioning ships squadron
MWSD ..... Marine wing support detachments
MWSS..... Marine wing support squadron

NAVAIR. .....Naval Air Systems Command
NAVSUP-ENERGY ..... Naval Supply Center-Energy

OPDS ..... offshore petroleum discharge system (Navy)
OPLAN .....operation plan

POL ..... petroleum, oils, and lubricants
PQAS-E ..... Petroleum Quality Analysis System-Enhanced
PWRR .....petroleum war reserve requirement
PWRS.....petroleum war reserve stocks

REPOL..... bulk petroleum contingency report

S-3 .....operations and training officer/operations and training office
S-4 .....logistics officer/logistics office
SAPO .....subarea petroleum office
SIXCON..... six containers together
SOP .....standing operating procedure
STS..... ship-to-shore

TAFDS..... tactical airfield fuel dispensing system
TAMCN .....table of authorized materiel control number
TFS.....tactical fuel system

US ..... United States

Section II. Terms and Definitions

additive—An agent used for improving existing characteristics or for giving new characteristics to certain petroleum products. (FM 10-67)

American Petroleum Institute—The institute that represents and is supported by the petroleum industry. It standardizes the tools and equipment used by the industry and promotes the advancement of research in the petroleum field. Also called **API**. (FM 10-67-1)

American Society for Testing and Materials—A national scientific and technical organization formed for the development of standards or characteristics and performance of materials, products, systems, and services and the promotion of related knowledge. Also called **ASTM**. (As contained in this glossary, this term and its definition are applicable to this publication only.)

amphibious assault fuel system—The Marine Corps' primary fuel storage system used to support amphibious operations. This system is composed of a number of components capable of receiving, transferring, and dispensing motor gasoline, diesel, or aviation fuels. The system can be set up in a wide variety of configurations to meet varying operational requirements. Also called **AAFS**. (MCRP 1-10.2)

amphibious objective area—A geographical area of sufficient size for conducting necessary sea, air, and land operations and within which is located the objective(s) to be secured by the amphibious force. Also called **AOA**. See also **amphibious force; mission**. (JP 3-02).

API gravity—An arbitrary scale expressing the gravity or density of liquid petroleum products. The measuring scale calibrated in terms of degrees API. The gravity of any petroleum product incorrected to 60 degrees F (16 degrees C). (FM 10-67-1)

appearance—Refers to the visual examination of fuels. The terms used to describe appearance are clear and bright, hazy and cloudy. (FM 10-67-1)

bulk fuel company—A unit that performs all functions incident to the supply of class III and class III (A) to elements of a MAGTF, to include distribution to, but not within, air bases during an amphibious assault and subsequent operations ashore; to ensure that class III (A) products distributed to supported air elements are of the required type, quality, and purity. (MCRP 1-10.2)

bulk liquid—Fuel or water itself, not inclusive of the container or handling apparatus. A term also used to define quantities of fuel or water above either 55 gallons or 500 gallons; the former when handling product in 55-gallon metal drums is common, the latter when 500-gallon collapsible water drums or 500-gallon collapsible fuel drums are in use. (As contained in this glossary, this term and its definition are applicable to this publication only.)

bulk petroleum products—Those petroleum products (fuels, lubricants) which are normally transported by pipeline, rail tank car, tank truck, barge, or tanker and stored in tanks or containers having a capacity of more than 55 gallons, except fuels in 500-gallon collapsible containers, which are considered to be packaged. (DOD Dictionary of Military and Associated Terms)

contaminant—A foreign substance in a product. (FM 10-67-1)

Defense Logistics Agency-Energy—an activity under the Defense Logistics Agency with responsibility as the integrated material manager for wholesale bulk petroleum products until their delivery to the point of sale; this responsibility includes contract administration in an oversee area. Also called **DLA-E**. (FM 10-67-1)

defense fuel supply point—any military or commercial bulk fuel terminal storing products owned by the Defense Logistics Agency. Also called **DFSP**. (FM 10-67-1)

Defense Logistics Agency—The agency, at the Department of Defense level, charged with providing the most effective and economical support of common supplies and services to the Military Departments and other designated Department of Defense components. Defense Energy Support Center operates under the agency also. (As contained in this glossary, this term and its definition are applicable to this publication only.)

drum—A 16- or 18-gauge steel cylindrical container (generally, 55-gallon size) or 500-gallon collapsible fuel containers. (As contained in this glossary, this term and its definition are applicable to this publication only.)

flashpoint—The temperature at which a fuel will "flash" when exposed to test flame diameter of approximately 1/ 8 inch , i.e., a butane lighter flame adjusted as low as possible; also a test performed per the American Society for Testing and Materials. (As contained in this glossary, this term and its definition are applicable to this publication only.)

forward arming and refueling point—A temporary facility—organized, equipped, and deployed by an aviation commander, and normally located in the main battle area closer to the area of operation than the aviation unit's combat service area— to provide fuel and ammunition necessary for the employment of aviation maneuver units in combat. The forward arming and refueling point permits combat aircraft to rapidly refuel and rearm simultaneously. Also called **FARP**. (DOD Dictionary of Military and Associated Terms)

inventory—Bulk tankage contents measured to current product level; includes tank bottoms and associated pipeline fill. (FM 10-67-1)

joint petroleum office—An office established by the Joint Chiefs of Staff with petroleum logistics responsibilities in a unified command in overseas areas. (FM 10-67-1)

Marine logistics group (MLG)—Provides bulk fuel supply support for the sustainment of the MEF. (FM 10-67-1)

petroleum—Crude oil. Petroleum is a mixture of gaseous, liquid, and semisolid hydrocarbons varying widely in gravity and complexity. Petroleum can be removed as a liquid from under- ground reservoirs, and it can be separated into various fractions by distillation and recovery. Petroleum is a general term that includes all petroleum fuels, lubricants, and specialties. (FM 10-67-1)

sortie—In air operations, an operational flight by one aircraft. (DOD Dictionary of Military and Associated Terms)

specification—Prescribed limits of control tests used to maintain uniformity of a specific product. (FM 10-67-1)

storage capacity—Total of existing bulk tankage assigned for product storage. Capacity is measured to maximum fill level for each tank and includes non-recoverable tank bottoms. (FM 10-67-1)

subarea petroleum office—A sub-office of a JPO established by the JPO to fulfill petroleum logistics responsibilities in a section of the geographical area for which the JPO is responsible. Also called **SAPO**. (FM 10-67-1)

tactical airfield fuel dispensing system—An expeditionary system providing bulk fuel storage and dispensing facilities at airfields not having permanently installed fuel systems; also used to support fuel dispensing at established airfields. Also called **TAFDS**. (MCRP 1-10.2)

tank—A storage container for liquid products. (As contained in this glossary, this term and its definition are applicable to this publication only.)

tanker—A seagoing vessel for transporting liquids. Coastal tankers have less draft (depth of a ship below the waterline) than oceangoing tankers. (FM 10-67-1)

terminal—A bulk facility for receipt, storage, transportation, and issue of petroleum products. The facility may be a base terminal for receipt and shipment of product by tanker, a *pipe head terminal (head terminal)* at the downstream end of the pipeline, or an *intermediate terminal* on the pipeline. The terminal consists of a tank farm or tank farm complex, tank farm manifold, and central pump station area. (FM 10-67-1).

REFERENCES AND RELATED PUBLICATIONS

Department of Defense Issuances

Military Standard (MIL-STD)

3004-1	Quality Assurance for Bulk Fuels, Lubricants and Related Products
3004-2	Quality Assurance for Packaged Fuels, Lubricants and Related Products (Part 2 of 2)

Military Specification (MILSPEC)

DTL-5624_	Turbine Fuel, Aviation, Grades JP-4 and JP-5
DTL-83133_	Turbine Fuel, Aviation, Kerosene Type, JP-8 (NATO F-34), NATO F-35, and JP-8+100 (NATO F-37)

Department of Defense Directive (DODD)

4140.25	DOD Management Policy for Energy Commodities and Related Services
4140.25-M	DOD Management of Bulk Petroleum Products, Natural Gas, and Coal (Volumes I-IV)
5101.8	DOD Executive Agent (EA) for Bulk Petroleum

Department of Defense Publication (DOD)

4715.5G	Overseas Environmental Baseline Guidance Document

Chairman of the Joint Chiefs of Staff Issuances

Chairman of the Joint Chiefs of Staff Manual (CJCSM)

3122.03A	Joint Operation Planning and Execution System, Volume II, Planning Formats and Guidance

Joint Publication (JP)

4-03	Joint Bulk Petroleum and Water Doctrine

Army Field Manuals (FMs)

10-67	Petroleum Supply in Theaters of Operations
10-67.1	Concepts and Equipment of Petroleum Operations

Marine Corps Publications

Marine Corps Doctrinal Publication (MCDP)
4 Logistics

Marine Corps Reference Publication (MCRP)
1-10.2 Marine Corps Supplement to the DOD Dictionary of Military and Associated Terms

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P5090.2_ Environmental Compliance and Protection Manual

Miscellaneous
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Navy Publications

Naval Air Systems Command (NAVAIR) Publication
00-80T-109 Aircraft Refueling NATOPS Manual

Navy Marine Corps Doctrinal Publication (NAVMC)
2907 Maritime Prepositioning Force (MPF) Prepositioning Objective

American Society for Testing and Materials (ASTM) Specifications

D-1655-04 Standard Specification for Aviation Turbine Fuels

D-4814 Standard Specifications for Automotive Spark-Ignition Engine Fuel

D-910 Standard Specification for Aviation Gasolines

D-975 Standard Specification for Diesel Fuel Oils