SUBCOURSE **EDITION**

QM 5095 **A**

DIRECT CLASS III OPERATIONS

THE ARMY INSTITUTE FOR PROFESSIONAL DEVELOPMENT

ARMY CORRESPONDENCE COURSE PROGRAM

DIRECT CLASS III OPERATIONS

Subcourse Number QM 5095

EDITION A

United States Army Combined Arms Support Command
Fort Lee, VA 23801-1511

2 Credit Hours
Edition Date: March 1999

SUBCOURSE OVERVIEW

This subcourse was designed to provide the soldier with information on the proper methods for establishing, operating, and relocating a Class III supply point including developing a Class III supply point flow plan, fire plan, equipment-loading plan, defense plan, and a review of safety precautions and identifying environmental impediments and viable resolutions.

There are no prerequisites for this subcourse.

This subject reflects the doctrine which was current at the time it was prepared. In your own work situation, always refer to the latest official publications.

Unless otherwise stated, the masculine gender of singular pronouns is used to refer to both men and women.

TERMINAL LEARNING OBJECTIVE:

ACTION: The soldier will learn to develop a Class III supply point flow plan, fire plan, equipment loading plan, and defense plan, observe fire and safety precautions, and identify environmental considerations.

CONDITION: Given subcourse QM 5095.

STANDARDS: The soldier must score a minimum of 70 percent on the end of subcourse examination.

TABLE OF CONTENTS

ADMINISTRATIVE INSTRUCTIONS

1. Number of lessons in this subcourse: Five.

2. Materials you need in addition to this booklet are a number 2 lead pencil, the ACCP examination response sheet, and the preaddressed envelope you received with this subcourse.

3. Supervisory requirement: None.

GRADING AND CERTIFICATION INSTRUCTIONS

Examination. This subcourse contains a multiple-choice examination covering the material in the six lessons. After studying the lessons and working through the practical exercises, complete the examination. Mark your answers in the subcourse booklet, then transfer them to the ACCP examination response sheet. Completely black-out the lettered oval which corresponds to your selection (A, B, C, or D). Use a number 2 lead pencil to mark your responses. When you have completed the ACCP examination response sheet, mail it in the preaddressed envelope you received with this subcourse. You will receive your examination score by return mail. You will receive two credit hours for successful completion of this examination.

LESSON 1

SUPERVISE THE SELECTION AND PREPARE A CLASS III SITE

Critical Task:

101-519-3304

OVERVIEW

When selecting and preparing a Class III site, an NCO should choose a site that is suitable for the fuel system layout and that is adaptable to factors such as cover and concealment, road nets, dispersion factors, terrain, and site preparation requirements.

Lesson Description:

This lesson covers the principles of selecting a Class III supply point.

Terminal Learning Objective:

Action: The soldier will learn to select a Class III supply point and identify environmental considerations.

Condition: Given subcourse QM 5095.

Standards: The soldier must score a minimum of 70 percent on the end of subcourse examination.

PART A - PREPARATION FOR MOVEMENT

Tactical Operations. As the petroleum section chief, you can expect to be either in the advance party or main body during a movement operation. Since it is the advance party that does the actual on-the-ground site selection, the majority of this block of instruction will be based on your role as a member of the advance party.

As a section chief, the first notice you would receive of an impending move would be a warning order from your platoon leader. The warning order will probably be an oral order with general information on the time and date of the move, information on the destination, and the probable route.

After you get the warning order, the platoon leader will probably leave the area and begin a route and site reconnaissance of the area assigned to him by the battalion S3. While that is occurring, you should be preparing to move. Information needs to be passed out to your section and equipment needs to be checked. PMCS needs to be performed on your equipment, and if you have the time, all of your equipment needs to be laid out and checked for serviceability before it is loaded into the vehicles.

When the platoon leader returns, he should have a sketch map of the route and the site. The map/diagram should show the route to the site and the general location where each section will set up. If at all possible, the site should be as close to supported units as the tactical situation permits. The site should also be large enough to provide for two balanced storage sites because you do not want to put all of your product in one location. By splitting your storage assets, you reduce the possibility of losing all of your product to one accident or attack. The site should also have easy access to road nets with at least one road running through the supply point, but never near populated areas. These conditions should be discussed with the platoon leader prior to you leaving with the advance party because you will be the one making the final site selection from the area allocated to you by the platoon leader.

Advance Party. The platoon leader will make the personnel selection for the advance party. The advance party should consist of at least one member from each section of the company. The XO or senior lieutenant is usually the advance party leader. Your local SOP should detail what equipment should go with the advance party, but at the very least, you will want to bring some engineer tape and marking devices to mark off the areas where you want the equipment to go.

Designated Area. Once you have identified exactly where you want each operation to go, designate the areas with engineer tape and signs. When the main body arrives, you or your representative should personally escort each truck to its designated area.

PART B - PLANNING AND ENGINEER SUPPORT

Planning. Before you begin to move the Class III and FSSP supply point, you must develop a plan. You will need to make sure you have all your personnel and equipment on hand when you begin to move the supply point. Find out how much time you have in which to prepare your crew and equipment for the move. There are some tasks that should be taken care of before you move. These include surveying the area to which you will be moving, coordinated with an engineer unit, and developing a flow plan.

Take an Area Survey. Go over the area where the supply point will be located. Decide where to place the entire supply point. Choose an arrangement for the FSSP that fits the situation and the terrain. Also, decide where you want the truck parking, bulk storage (50,000-gallon collapsible tanks), and bulk reduction storage areas and other bulk reduction equipment.

Coordinate Engineer Support. When you go to look over an area for the first time, take a member of an engineer unit with you. After you choose a site for each part of the supply point, you can give this information to the engineers. With this information, the engineer unit can prepare individual tank sites, remove underbrush from bulk reduction areas, clear truck parking areas, and build an improved road through the site (if one is needed). If you do not have engineer support, your unit needs to prepare the site before you start setting up the equipment at the new site.

Develop a Flow Plan. After you select the specific sites for the parts of the Class III supply point, develop a flow plan so that you do not handle products and containers more than is needed. The flow plan

identifies steps which can be eliminated, combined, or changed to make the operation more efficient. It can also show unnecessary delays in handling and transporting. When developing the plan, consider the location of bulk storage, packaged product storage, bulk reduction, and can and drum cleaning areas. Also consider the flow of traffic through the supply point. Only one-way traffic should be permitted in the supply point. Study the area, and make up a flow plan before the supply point moves to the new location.

PART C - SELECTION OF CLASS III SUPPLY POINT

Layout Design. Once the area has been declared safe for use by the advance party and communication has been established with the main body, actual site selection begins. In determining the layout of the system, you should use some of the factors the commander used in making his site selection such as:

- Adequate space to provide storage space and truck parking requirements for both your vehicles and your customer vehicles.
- A good road net with at least one road running through your operations. A good road is not a trail. A good road is one that will hold up under heavy traffic and will not turn into a mud trap when it rains.
- Location is away from populated areas.

In addition to the above, you need to consider the following when you are making your selection:

- Use vacated forward sites or existing facilities if possible. Many times you will be able to inherit a site that was previously occupied by some other units. Usually they will leave behind many improvements such as fighting positions or improvements to the existing road network that you will be able to use for your operations.
- Avoid low areas so vapors do not get the chance to collect.
- Use reasonably level ground with no more than a 3-degree incline on any surface. If you set up on a larger incline, your storage tanks could roll when you start to fill them.
- Do not set up upstream of troop concentrations. Spills and accidents could pollute their water supply.
- Maximize use of cover and concealment. Often, many of the components of a Class III supply point can be concealed inside a wooded area or along a tree line. Other components can be hardened with sandbags.
- Distance between each storage tank. Forty feet is recommended for safe operations; however, the physical terrain features of the final site will dictate the actual distance between the tanks.
- One-way traffic flow with checkpoints at the entry and exit points.
- Different space requirements for bulk, retail, and packaged operations. The operating space to service retail customers may not be the same as for bulk customers. Usually, you will need a much larger operating space for your bulk customers than your retail customers,
- Availability of other transportation modes. You should always try to take advantage of any rail loading facilities or barge loading points whenever possible.

Site Selection. Select a reasonably level site that can hold container stacks. Choose a site with good drainage so that water does not damage the containers. Avoid low areas because dangerous vapors collect in them. Do not use an area with a cinder base or marshland and wasteland overlaid with peat; they are usually damp. Use such areas only if no other site is available. Be sure the site has natural cover and concealment and is large enough for future expansion. Do not locate near other areas of operation (Figure 1-1). Stay at least 500 feet away for low-flash products and 200 feet for high-flash products. Your site must be away from overhead electric lines so a broken wire cannot fall on the drums. Clear the site of all underbrush that may get in the way or present a fire hazard. Spread sand, gravel, or similar material over areas where you store containers. They help drain the area and provide a more stable base for the stocks. Do not use ashes or cinders because they are corrosive. Build a dike at least 18 inches high around each major storage division in which low-flash products are stored. This dike must be able to hold all the liquid in the drums stored in the area and have a freeboard of at least 6 inches. Choose a site for at least two clearing (incoming and outgoing) areas. These will be used to segregate incoming and outgoing mixed loads (railroad cars or truckloads). Each area should have its own site. The sites should be located next to each other so that the same personnel can operate both areas.

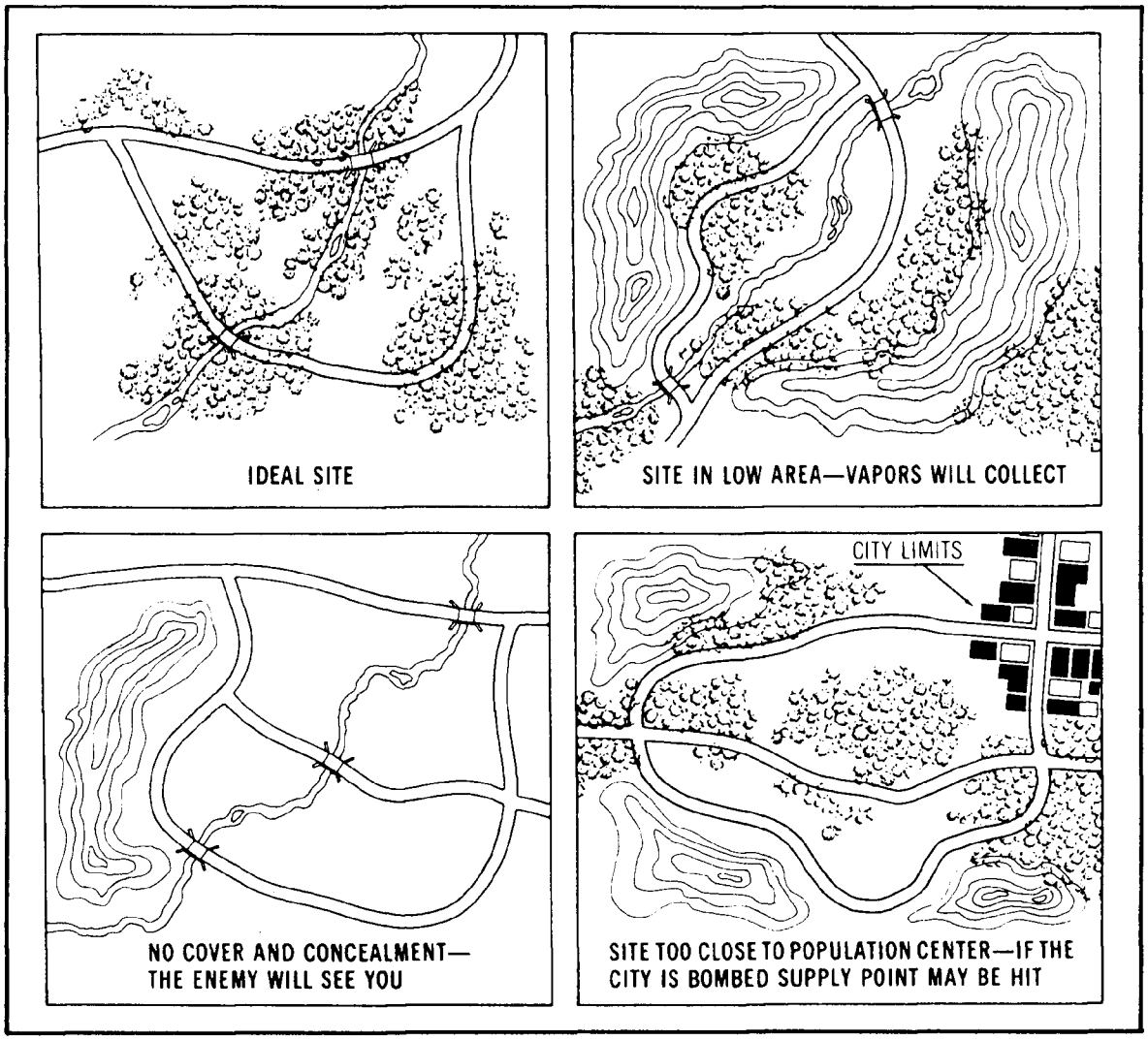

Figure 1-1 Site selection guidelines for a Class III supply point.

Selection Criteria for Equipment. You must also select a site for other equipment in the Class III supply point. This equipment includes 20,000-gallon collapsible tanks, 50,000-gallon collapsible tanks, and 500-gallon collapsible drums.

The site you choose for the 20,000-gallon collapsible tanks should be similar to that for the 10,000-gallon collapsible tanks. Choose a site that is nearly level with a gentle slope toward the manifold end of the tank. Space the tanks about 150 feet apart. Build a fire wall around each tank. Make it large enough to hold the contents of the tank and 1 foot of freeboard. To do this, build the fire wall 4 feet high and 18 inches wide at the top, and make the inside dimensions of the fire wall 35 feet long and 31 feet wide. Maintain a distance of 4 feet from the edge of the tank to the base of the fire wall. If an engineer unit prepares the site, you must ensure they follow these design factors. Place the discharge pumps at a level lower than the tanks to aid pump suction.

Choose a site for the 50,000-gallon collapsible tanks that is similar to that for the 10,000- and 20,000-gallon collapsible tanks. Build the fire wall 4 feet high and 18 inches wide at the top, and make the inside dimensions of the fire wall 73 feet long and 33 feet wide. Place the discharge pumps at a level lower than the tanks to aid pump suction.

For the 500-gallon collapsible drums, select a firm, level site near the source of supply. Select a site that allows drums to be easily lined up for filling and rolled away after filling.

LESSON 1

PRACTICE EXERCISE

The following items will test your knowledge of the material covered in this lesson. There is only one correct answer for each item. When you complete the exercise, check your answers with the appropriate answer key at the end of this subcourse. If you answer any items incorrectly, go back to the part of the lesson that contains the information involved and study again.

1. You should avoid low areas when selecting a site for a Class III supply point because
   A. They are corrosive.
   B. Underbrush is more difficult to remove.
   C. Dangerous vapors collect in them.
   D. They provide no natural cover and concealment.

2. What does your unit need to do if you have no engineer support?
   A. Spread ashes or cinders over areas where you store containers.
   B. Set up a temporary site until engineer support is available.
   C. Start setting up equipment immediately.
   D. Prepare the site before you start setting up the equipment.

3. When selecting a site, at least how many feet should you stay away for low-flash products?
   A. 75
   B. 100
   C. 350
   D. 500

4. What is the advance party responsible for?
   A. Speed and distance data.
   B. On-the-ground site selection.
   C. In-the-air site selection.
   D. Moving equipment.

5. What should you develop so that you do not have to handle products and containers more than you have to?
   A. Area survey.
   B. Engineer support.
   C. Flow plan.
   D. Designated area.

LESSON 2

SUPERVISE THE MOVEMENT OF A FUEL SYSTEM SUPPLY POINT (FSSP)
Critical Task:
101-519-3304

OVERVIEW

Proper movement and layout of the FSSP is important since it is the source of all petroleum products for a number of divisions stationed in any given area.

Lesson Description:

This lesson covers the movement of the Fuel System Supply Point (FSSP), how to identify the type and number of transporters needed to move equipment, fuel, and personnel, and how to perform supervisory skills required to accomplish this task.

Terminal Learning Objective:

Action: The soldier will learn to identify the number of transporters needed to move equipment, fuel, and personnel, and identify environmental considerations.

Condition: Given subcourse QM 5095.

Standards: The soldier must score a minimum of 70 percent on the end of subcourse examination.

PART A - PLANNING THE MOVEMENT OF THE FSSP

The FSSP is used at distribution points to provide storage facilities for transferring bulk fuel from one means of transport to another and at dispensing facilities for bulk reduction or delivery of fuel to using vehicles. The FSSP can receive product from tank trucks, railway cars, pipelines, hoselines, and aircraft. Since it can also receive fuel from ocean tankers, it is capable of supporting beach operations. It can store 60,000 gallons of bulk petroleum. It can store even more if additional or larger collapsible tanks are added. However, this expansion requires additional hoses, fittings, and valves. The FSSP can be easily moved from one location to another, and it can be divided in half to handle two different types of fuels at two different locations. It can also be changed to a 10-point, rapid-refueling system for rotary aircraft.

The first step in moving an FSSP is to receive the mission. Normally, as a section chief you receive the mission from the platoon sergeant or even the platoon leader. The mission can come in one of three different ways: a warning order, an operation order, or a fragmentary order. Once received, there are some questions you need to ask yourself:

- What is the mission?
- What is known about the enemy?
- How will the terrain affect the operation?
- What troops are available?
- How much time is available?
- What supplies and equipment are needed?
- What special tasks need to be assigned?

Personnel. Make sure that all personnel are on hand for the move to the new site. The usual strength level of a supply section in a petroleum supply company consists of: section chief E7, petroleum heavy vehicle operator E5, petroleum inventory control E5, two petroleum heavy vehicle operators E4, five petroleum supply specialists E4, and ten petroleum supply specialists E3. In some situations, you will have to augment personnel.

Equipment. Make sure your Class III supply point equipment is on hand and ready for use. If any items are not working properly, try to have them repaired or replaced before you move. The equipment may vary according to the situation.

- One Fuel System Supply Point.
- One collapsible fabric tank repair kit.
- Three 500-gallon collapsible drums.
- Three pressure controls for filling nonvented drums.
- One 500-gallon collapsible drum tie-down kit.
- One 500-gallon collapsible drum towing and lifting yoke.
- Six 50,000-gallon collapsible tanks.
- Four 20,000-gallon collapsible tanks.
- Four 10,000-gallon collapsible tanks.
- Ten 350-GPM pumping assemblies.
- One fuel handling hose line outfit (assault hose line).
- One electric floodlight.
- One gas engine generator (3 kW).
- Eight filter/separators.
- One FARE system.

Make sure you have the necessary vehicles needed to transport the equipment to the new site.

- Four semitrailers, stake, 12-ton, with equipment.
- Four tractor trucks and 5-ton, 6x6, long wheelbase, with equipment.
- Two cargo trucks and 5-ton, 6x6, long wheelbase, with equipment.
- Two cargo trailers, 1-1/2 ton, 2-wheel, with equipment.

Loading Plan. Next you must develop a loading plan, a tentative plan, and issue a warning order to give soldiers time to prepare for the mission. Determine the total number and types of fuel transporters needed to move the product on hand. Determine the type and number of transporters needed to move the system. Determine the type and number of transporters needed to move personnel.

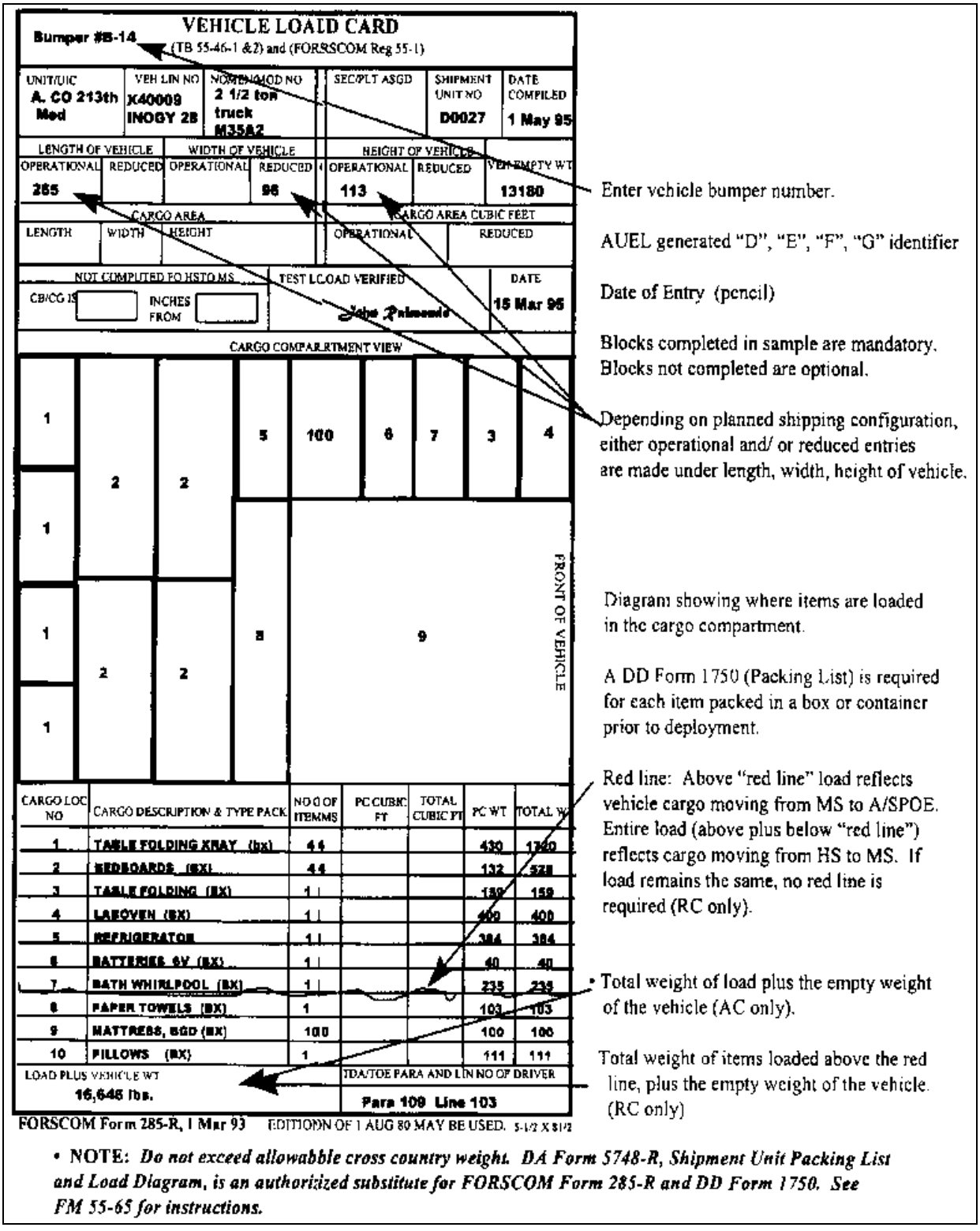

Figure 2-1. FORSCOM Form 285-R (Vehicle Load Card)

SHIPMENT UNIT PACKING LIST AND LOAD DIAGRAM

For use of this form, see FM 55-65; the proponent agency is TRADOC

PAGE _____ OF _____

1 DEPLOYING UNIT: A Co, 1-10 IN WARCAB		2 UIC OR BUMPER NO: A-41	3 TCN OR SEAL NUMBER: AWABCABOOD12340XX
4 SHIPMENT UNIT DESCRIPTION: M923A2, TRK, CGO 5TON X40794-36			5 DATE PACKED:
6 LENGTH: 311	7 WIDTH: 98	8 HEIGHT: 121	12. LOCATION OF CG:
9 CUBE: 2135	10 EMPTY WEIGHT: 20930	11 LOADED WEIGHT: 27904	

13. PACKING LIST

CARGO LOC NO a	CONTENTS (Description and Nomenclature) b	TYPE PKG c	PKG QTY d	PKG WEIGHT e	TOTAL PKG WEIGHT
1	Fuel System Supply Point, J04717		1		
2	Repair Kit Collapsible Fabric Tank: Type II, R73791		1		
3	Fabric Colapsible Liquid Fuel, 500 Gal G68966		1		

14. CERTIFICATION. *This certifies that items listed hereon are contained within the specified packages.*

a TYPED NAME	b GRADE	TITLE
SMITH, JOHN A.	SGT	SQUAD LEADER

c SIGNATURE _____ DATE _____

DA FORM 5748-R, MAR 89

Figure 2-2. DA Form 5748-R (Shipment Unit Packing List and Load Diagram).

Your plans for loading personnel and equipment should apply to every type of transport that may be used in a movement. Make the plan before the move to allow time for packing. Base your plan on the type of transport to be used; the number of persons involved; and the type, size, weight, and quantity of supplies and equipment to be moved. When preparing the plan, consider the priority of loading and the safety of equipment and supplies in transit. Design the plan to permit quick and orderly unloading and regrouping of personnel and equipment. Once the equipment is loaded, make sure it is properly secured and make sure the pumps are braced, blocked, and tied.

Before you complete your plan, you need to have an idea where you will operate and what the terrain looks like. Consult the latest intelligence map or, if possible, conduct a reconnaissance and walk around the area. This will give you an idea about the type of terrain in which you will be working. Information from the reconnaissance can either change or delay the mission.

Once you complete your plan, issue an operation order. Once you complete the operation order, issue your order orally. Whenever possible, issue the order from a location where your soldiers can see their objective. If this cannot be done, use a terrain model or a sketch. When you issue the complete order, make sure your soldiers understand it. Be sure they know how you expect to accomplish the mission and how they fit into the overall plan. Explain to them what to do if you lose communication, and make sure you give the order in language they understand. The final step in troop-leading procedures is supervision. After you issue the warning order, you must diligently and constantly check details, conduct back briefs and rehearsals, and before the operation begins, inspect. Troop-leading procedures help you prepare your soldiers for any type of operation using logical step-by-step procedures. Use it as a mental checklist to make sure you do not overlook anything important. Keep in mind that no single individual can do everything by himself or herself, not even you. Use your subordinates and get the job done right.

Communications and Status Reports. The unit status report produces information to help the Army manage its resources. The payoff is military readiness. The Army wants the company to have its authorized personnel on board, its authorized equipment available in working order, and its required supplies on hand. Additionally, the Army wants the company to do what it is supposed to do--turn out soldiers who assist the unit mission.

The Petroleum Supply Sergeant assists the platoon sergeant by supervising two shift operations and maintains close coordination with the petroleum operations sergeant. Every 24 hours the status report data from the supply sections will be consolidated, and a report will be sent to the supply control section. The format for the status report should be detailed in both the company and battalion SOPs.

PART B - SELECTING THE SITE FOR CLASS III SUPPLY POINT AND FSSP OPERATION

Selection Criteria for FSSP. When you select the FSSP site, consider cover and concealment, road nets, dispersion factors, terrain, and site preparation requirements. Make sure the site is suitable for the fuel system layout (Figure 2-3, Figure 2-4, Table 2-1).

Select a site for the collapsible tanks, pumps, and filter/separators that is in the woods or in a tree line where the natural shadows disguise the telltale shapes. Use camouflage nets if you have them. When you lay hoseline, make use of natural terrain contours and vegetation to break up straight lines. One way to do this is to cut branches, stick them in the earth under the hose, and then weigh them down with the hoseline. Where you have deep grass or other vegetation, bend it over the hoseline to hide the hose so that it is not seen from the air.

Choose a site for the receiving, truck bottom loading, and vehicle refueling points that is next to a road in the Class III supply point. You can then load or unload trucks and refuel vehicles without leaving the road nets in the supply point.

You must consider the distance between items when you select the sites for the equipment in the FSSP. The distances can vary with the terrain, natural cover, concealment, hose available, and road nets. However, you must put the 10,000-gallon collapsible tanks at least 40 feet apart.

Select level terrain for the FSSP. Look for a tank site without slopes. A large slope may cause filled tanks to roll sideways, backwards, or forward. Put the pumps and filter/separators on level ground. Try to place the discharge pump at a lower level than the collapsible tanks so that there will be good suction to the pump.

Deal with these three major items of equipment in the FSSP--the collapsible tanks, the pumps, and the filter/separators. Slope the tank sites gently toward the manifold end to help drain the tanks when they are removed. Slope the site for each tank no more than 3 to 6 inches in the direction of the tank's fill port. Build a fire wall around each tank. Make it large enough to hold the contents of the tank and 1 foot of freeboard. To do this, build the fire wall 3 feet high and 18 inches wide at the top. Make the inside dimensions of the fire wall 26 feet by 26 feet and maintain a distance of 3 feet from the edge of the tank to the base of the fire wall. If an engineer unit prepares the site, you must ensure they follow these dimensional and procedural specifications. The pump and filter/separator sites must be cleared of any dry grass, leaves, and trash.

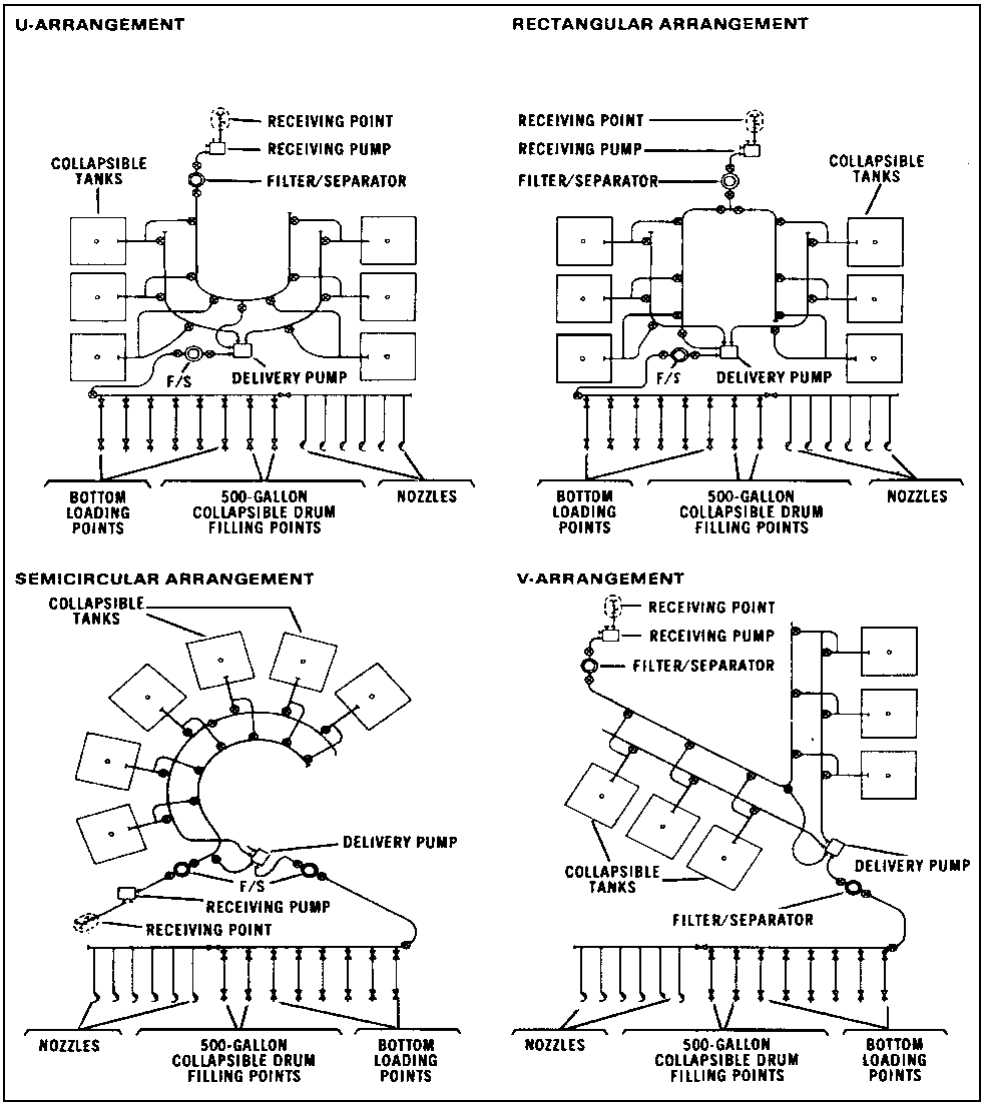

Figure 2-3. Typical FSSP arrangements.

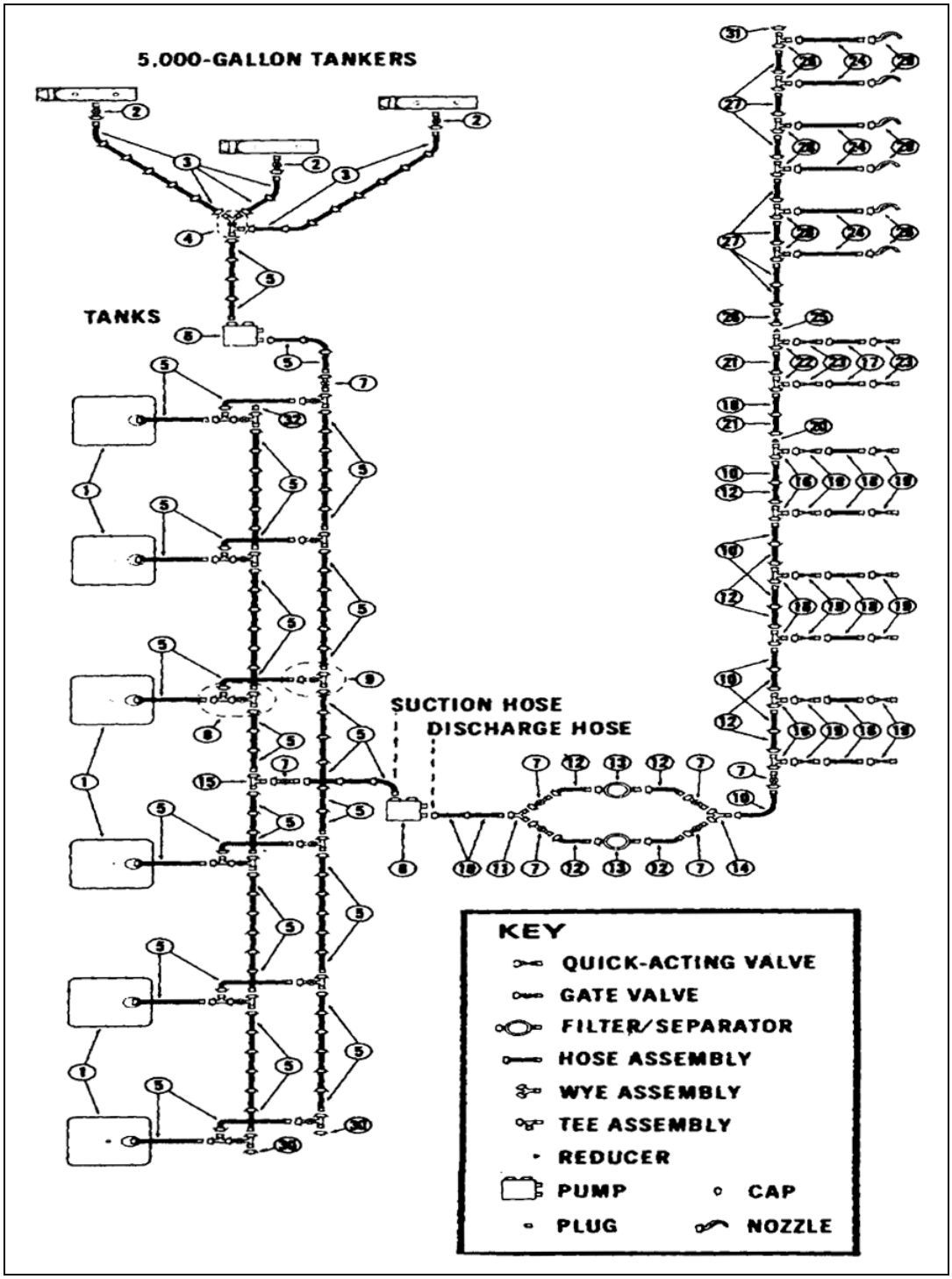

Figure 2-4. Typical layout of the FSSP.

Table 2-1. Components of the FSSP

ITEM	DESCRIPTION	NO REQD
1	Tank, 10,000-gallon, collapsible, petroleum	6
2.	Valve, 3" gate, flanged, with M and F CL	3
3.	Hose, suction, 3" x 12, M CL one end, F CL other	16
4.	Y and T assembly, flanged, M CL 3" and 4"	1
5.	Hose, suction, 4" x 10', M CL one end, F CL other	83*
6.	Pump, 350-GPM, 4", with M and F CL	2
7.	Valve, gage, 4", flanged, with M and F CL	25*
8.	Manifold with two T fittings	00*
9.	Manifold with one T fitting	00*
10.	Hose, discharge, 4" x 50', with M and F CL	8
11.	Y assembly, flanged, 4", with one F CL inlet and 2 M	1
12.	Hose, discharge, 4" x 25', M and F CL	9
13/	Filter/separator, 350-GPM, 4", with M and F CL	2
14.	Y assembly, flanged, 4", with two F CL inlets and one	1
15.	T-assembly, flanged, 4" , with two M CL and one F CL	1
16.	T assembly, flanged, 4" x 3", with one 4" M CL, one	6
17.	Hose, discharge, 1½" x 25', M and F CL	5
18.	Hose discharge, 3" x 25', M and F CL	4
19.	Valve, quick-acting, 3", M and F CL	12
20.	Reducer, 4" F CL x 3" M CL	1
21	Hose, discharge, 3" x 50', M and F CL	2
22.	T assembly, flanged, 3" x ½", with one 3" F CL, one	5
23.	Valve, quick-acting, 1½" M CL	4
24	Hose, discharge, 1" x 25', M and F CL	6
25	Reducer, 3" F CL x 2" M CL	1
26.	Valve, quick-acting, 2", M and F CL	1
27.	Hose, discharge, 2" x 25', M and F CL	7
28.	Tee, reducing, 2" F CL x 2" M CL x 1" M CL	6
29.	Nozzle, 1", with adapter	6
30.	Dust cap for 4" CL	2
31.	Dust cap for 2" CL	1
32.	Dust plug for 4" CL	1

NOTE: *Each of the six storage tanks comes with a manifold consisting of eight lengths of hose, one double T, and one single T, and two 4-inch . gates valves.

GPS Navigation. Each satellite transmits a unique signal that contains data needed by the SLGR to determine your location. The signal cannot penetrate objects such as buildings, metal, mountains or very thick vegetation, and your body tends to block it. Clouds, rain, snow and even severe weather have little effect on it. Canvas and Kevlar covers do not effect it either. If you are not receiving signals from enough satellites, the SLGR will tell you this.

Move to a more open position, away from buildings and steep slopes so the antenna can receive the signals. Since the satellites are always moving, sometimes a short wait is needed until three or four satellites have moved into the view of the receiver.

Operation.

- Inspect the GPS and ensure that all required accessories are available.
- Turn unit on and go to the SETUP Screen.
- Set SV Type to “MIXED” or “ALL-Y” in war time.

- Go to the SETUP UNITS page and set Elevation, MSL, DEG, MAG.
- Go to the SETUP MAGVAR page and set CALC and DEG.
- Set the time.
- Perform the SETUP I/O if required.
- Set the AUTOMARK Mode to OFF.
- Set the BULLSEYE screen as required.
- Set the OPERATOR ID if required.
- Set the APPROACH if required.
- Set the REHEARSAL if required.
- Initialize the unit.
- Obtain a position, record the Estimated Position Error, time, time error, date/day, speed, satellites being tracked, datum, magnetic variation, and if required, the azimuth and range to the bullseye.
- Enter and store waypoints.
- Set the Navigation mode to 2D FAST and DIRECT.
- Select a waypoint.
- Record the distance, tracking azimuth, and azimuth to the waypoint.
- Navigate to a waypoint.

PART C - SUPERVISING THE MOVEMENT OF THE FSSP

Your next task is to direct the preparation of the FSSP equipment for transport. Make sure the system is drained of all product. Ensure that all spills are cleaned up and reported as required by unit policies and procedures and applicable environmental laws. Dispose of contaminated fuel and materials in an environmentally safe way in accordance with unit policies and procedures and applicable environmental laws. Direct personnel to roll or fold all collapsible tanks and put them in their storage containers, attaches all caps and plugs to the hose assemblies as they are dismantled. Make sure equipment is properly loaded and that components are correctly placed, blocked, or braced as needed to prevent damage during transport.

Movement Methods. Moving (or displacing) the supply point consists of taking it down at one place, loading it on transporters, and moving it to the new site. There are two ways you can do this, and the one you use depends on your situation. One way is to move the entire supply point to the new site. The other way is to move by leapfrogging. This means you move one-half of the FSSP to the new site and leave the other half at the old site to give limited service. In this way, support to the user is not interrupted during the move. Divide the system in half. The first thing you do when moving is to transfer product at the supply point to fuel transporters. Tell the drivers of these vehicles how to get to the new site or to meeting points where they can exchange trailers or transfer the load to other tank vehicles. You can also use these transporters to store and issue product on a temporary basis at the old and new supply points. You can start to take down the supply point just as soon as you move the fuel. The sequence in which you take down the equipment should be based on the requirements at the old and new sites. Usually, you dismantle the FSSP first unless you are using the leapfrogging method. In any case, it is important that you work quickly once the order is given. Your main concern is to get to the new site as soon as possible and get set up.

Bulk Reduction Storage Area. Set up, in the bulk reduction storage area, a separate stocking area for each product and type of package. If you have an area for each, you can inventory and control the stock more easily, and you are not as likely to identify the product incorrectly. Use a block system to separate large amounts of stored supplies so that the entire stock of one product is not lost if there is an enemy attack or a fire. Plan the exact layout and size of the stacking area according to local conditions and safety requirements. Aisles between double rows of drums (units) are usually 9 to 10 feet wide. You can reduce the width to 4 feet if this leaves you enough room to handle the product. Allow 15 to 30 feet for aisles between sections of containers and 50 to 150 feet between blocks. A specific layout of a stacking area for 5-gallon cans is suggested.

PART D - ENVIRONMENTAL CONSIDERATIONS

Supply and storage facilities often contain HM. You must take precautions when storing and transporting these materials. Keep a copy of the applicable MSDS for each HM on hand in a binder in the storage area. You can support your installation's environmental goals in supply areas by doing the following:

- Compliance. Store materials according to the manufacturer's guidelines, as stated on the MSDS.
- Prevention. Reduce the amount of solid wastes and HW in the supply room by avoiding stockpiling or keeping items around "just in case they are needed." Reuse containers whenever possible. Recycle materials as required by your installation's recycling program.
- Conservation. Dispose of all solid wastes and HW according to local policy.

LESSON 2

PRACTICE EXERCISE

The following items will test your knowledge of the material covered in this lesson. There is only one correct answer for each item. When you complete the exercise, check your answers with the appropriate answer key at the end of this subcourse. If you answer any items incorrectly, go back to the part of the lesson that contains the information involved and study again.

1. When directing the preparation of the FSSP equipment for transport, what should you do first?
   A. Make sure the system is drained of all product.
   B. Make sure equipment is properly loaded.
   C. Direct personnel to roll all collapsible tanks.
   D. Dispose of contaminated fuel.

2. The first notification that the FSSP is to be moved can come as which of the following?
   A. A caution order.
   B. A preparation order.
   C. An operation order only.
   D. A warning order, an operation order, or a fragmentary order.

3. When creating a loading plan for movement of the FSSP, what factors should the plan be based on?
   A. Amount of contaminated fuel to be moved and distance to new site.
   B. Weight of transport and availability of suspension kits.
   C. Type of transport to be used and quantity of supplies.
   D. Operation order guidelines and reconnaissance results.

4. The last thing you should do as an NCOIC before a FSSP movement operation begins is _____.
   A. Prepare a loading plan.
   B. Conduct a reconnaissance of the new site.
   C. Issue the operation order.
   D. Inspect all aspects of the plan including all equipment to be used for the movement and operation of the FSSP.

5. Where should you issue your oral operation order for movement of the FSSP whenever possible?
   A. From a position of concealment.
   B. From a location where your soldiers can see their objective.
   C. On the reconnaissance site.
   D. Close enough to your soldiers so they can continue preparing for movement.

LESSON 3

SUPERVISE THE OPERATION OF THE FSSP
Critical Task:
101-519-3304

OVERVIEW

Proper operation and maintenance of the FSSP is important since it is the source of all petroleum products to a number of divisions stationed in any given area.

Lesson Description:

This lesson covers supervising the operation and performance of operator maintenance on the pumps and filter/separators of the Fuel System Supply Point (FSSP), including the preparation of advance sheets and proper safety precautions.

Terminal Learning Objective:

Action: The soldier will learn to supervise the operation of the FSSP and performance of operator maintenance on pumps, filter/separators, and related equipment.

Condition: Given subcourse QM 5095.

Standards: The soldier must score a minimum of 70 percent on the end of subcourse examination.

PART A - SUPERVISING THE OPERATION OF THE FSSP

Flow Through the FSSP. Inspect the fuel when it arrives. The product then enters the system through the receiving manifold. It usually moves under suction from one of the 350-GPM pumps used as a receiving pump. The product may also move under positive pressure from a transporter, pipeline, or hoseline. When you have both filter/separators installed on the delivery side of the system, the receiving pump distributes the product directly to the tanks through the hoseline manifold. The other 350-GPM pump is used to draw fuel from the tanks and discharge it through the two filter/separators into the hose header system. When you leave one filter/separator installed on the receiving side of the system, the receiving pump distributes the product to the receiving filter/separator and then to the collapsible tanks. After that, the flow of product is the same, except the fuel is drawn through only one filter/separator on the discharge side of the system instead of two. You can also draw from the supply source directly to the discharge side of the system. This procedure bypasses the storage tanks. You need only one pump and one filter/separator for this operation.

Flow Through the 50,000-Gallon Collapsible Tank. The first step is the inspection of the product. The fuel then enters from the transporter through a receiving manifold made up of a suction hose and gate valve. The product usually moves under suction from a 350-GPM pumping assembly that distributes it into the 50,000-gallon collapsible tank. Another 350-GPM pumping assembly acts as a discharge pump and distributes the fuel from the tank to the discharge hose assembly. The discharge hose assembly consists of a gate valve and discharge hose. From the discharge hose assembly, the product moves into a transporter (Figure 3-1).

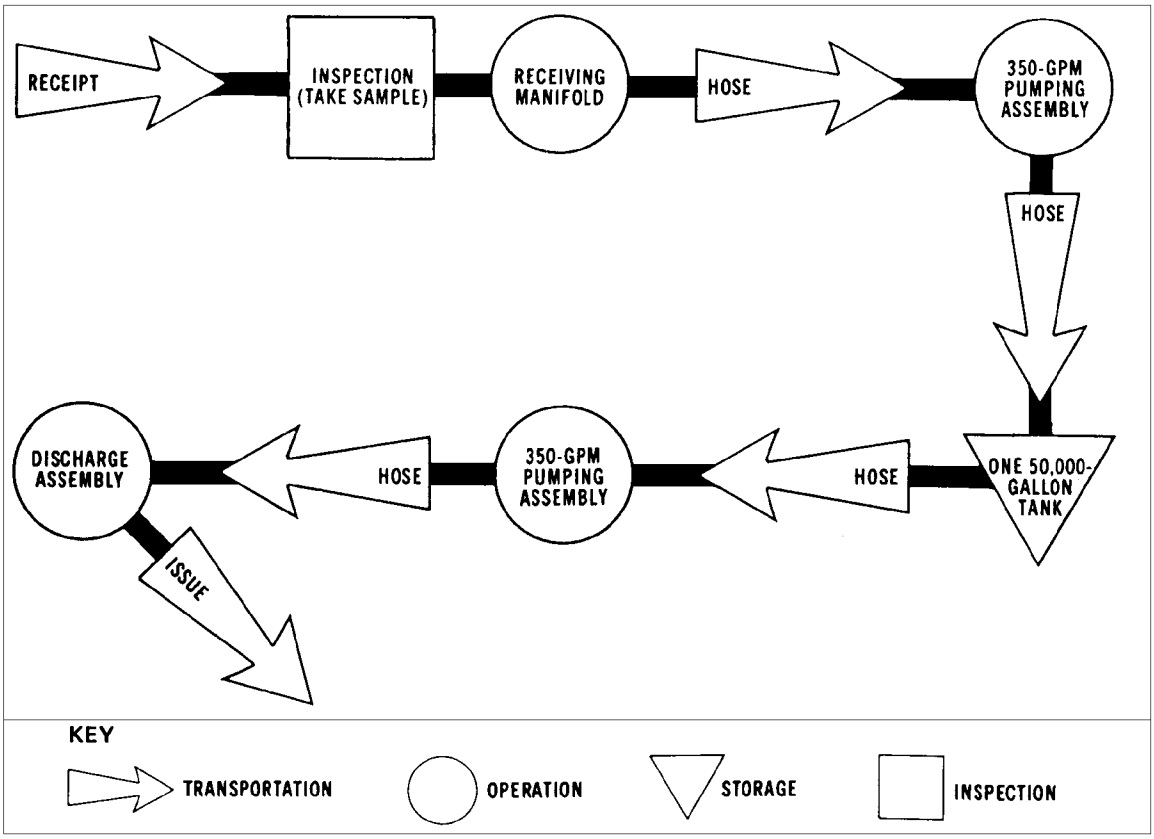

Figure 3-1. Flow process chart for a 50,000-gallon collapsible tank.

Personnel. How you use your personnel is one of the most important parts of managing a Class III supply point. In other words, how many do you need for a specific operation? Where should you place them in relation to the equipment? What tasks should you give them to do? It is important that you assign specific tasks to your personnel at the Class III supply point, but you should also try to be flexible. The best way to use

all of your personnel wisely is to let the job determine the assignment. For example, if you have no issues scheduled for the FSSP, you can use the workers assigned there to improve the fire walls around the collapsible tanks. There may be a time when the supply point, or a section of it, is not busy. You may then use your workers to improve the camouflage and concealment of the area, improve drainage ditches and roadways, make sure the safety equipment is serviceable, and do operator and organizational maintenance on the equipment in the supply point. Although the number of persons you assign to a specific task may vary greatly with your mission, it is still possible to obtain an average number for each operation.

FSSP Operations. For a single shift, you need eight workers to operate the FSSP efficiently. Place them at certain strategic points in the operation as described below.

- Receiving Side. Assign two workers to the receiving manifold. Make them responsible for transferring bulk petroleum from the transporter to the fuel system. They operate all valves at the receiving point and make all necessary hose connections.
- Pumps and Valves. Assign three workers to the pumps and control valves. Have one worker operate each pump, and have the third worker control the valves on the discharge and receiving manifold of the collapsible tanks. Once the pumps are started, they can be monitored by one worker. This enables two workers to devote their full time to valve control and fuel flow problems.
- Dispensing Side. Assign three workers to the delivery side of the system (six 5-gallon can and 55-gallon drum filling points and two 500-gallon collapsible drum filling points). Make them responsible for dispensing petroleum and controlling the flow. They prepare the various filling points, operate the control valves, and make all necessary hose connections. When tank vehicles are filled, have the truck driver help dispense the fuel.

The 50,000-Gallon Collapsible Tank Operations. For a single shift, you need four workers to operate one 50,000 gallon collapsible tank. You generally have one 50,000-gallon collapsible tank, two 350-GPM pumping assemblies (one receiving and one discharge pump), and one dispensing line. In the Class III supply point, you use the 50,000-gallon collapsible tank mainly for large volume distribution of bulk petroleum. Place the workers as follows.

- Place one worker at the receiving point. Make this worker responsible for transferring bulk petroleum from the transporter to the tank. Have the worker operate the valves and make all necessary hose connections.
- Place one worker at each of the two 350-GPM pumping assemblies. Make each worker responsible for coordinating the flow of petroleum.
- Place one worker at the dispensing line. Make this worker responsible for issuing bulk petroleum and controlling the fuel flow in the dispensing line.

The 500-Gallon Collapsible Drum Filling Operations. You need only two workers to do this job efficiently. However, there are several methods of filling 500-gallon collapsible drums. Two of the most commonly used methods are to fill the drums directly from the FSSP or to use the 50-GPM pumping assembly. The positioning and the tasking of the crew vary with each of these methods. When drums are filled directly from the FSSP, assign one worker to control the valves of the filling point. Make this worker responsible for controlling the flow of petroleum to the drums. Assign the other worker to the drums. Make this worker responsible for preparing the drums for filling, making all connections, and monitoring the filling operation. When the 50-GPM pumping assembly is used, you still need two workers for the filling operation. Have one worker operate the 50-GPM pumping assembly and control the flow of petroleum. Assign the other to the drums with the same responsibility as in the method described before. For both methods, you need a vehicle to remove the filled drums to the bulk reduction storage area.

The 55-Gallon Drum Filling Operations. Although you usually fill 55-gallon drums directly from the FSSP, you can also use the 50-GPM pumping assembly with the hose and fitting kit. When you use six fuel- and oil-servicing nozzles on the FSSP, you need 1 workers at each nozzle. You also need two workers to bring empty drums to the filling points and two workers to remove filled drums to the bulk reduction storage area. Make the six workers at the servicing nozzles responsible for bonding the nozzles to the containers and filling the drums to the proper level. If you have a forklift, use it to move the filled drums to the storage area.

The 5-Gallon Can Filling Operations. There are two methods of filling 5-gallon cans. You can use the fuel- and oil-servicing nozzles at the FSSP or the 50-GPM pumping assembly with the hose and fitting kit. The number of workers you need to fill the cans varies with the method you use. When the cans are filled directly from the FSSP, the operation is essentially the same as for the 55-gallon drum. When the cans are filled using the 50-GPM pumping assembly with the hose and fitting kit, you need seven workers. Because this method is usually conducted near the bulk reduction storage area, you need only one worker to bring empty cans and one to remove the filled ones. Also, have one worker operate the 50-GPM pumping assembly and control the flow of petroleum. Place one worker at each of the four dispensing nozzles of the hose and fitting kit. Have them bond the nozzles to the cans and fill them to their proper level.

Receipt. Before a product arrives, you should be notified of the type and amount of product and the approximate date and time it will arrive. This will give you time to prepare a delivery schedule to avoid delays and interruptions at a Class III supply point.

Storage. At the tactical Class III supply point, you should always store bulk petroleum in collapsible tanks. If you are in a supply section of a petroleum supply company, you can store up to 420,000 gallons of bulk petroleum (120,000 gallons in the FSSP and 300,000 gallons in the six 50,000 gallon collapsible tanks.) But storage is much more than putting product in a tank. It involves such things as inspections, product circulation, tank repair, and even the disposal of excess product. The storage of bulk petroleum can be as dangerous as its receipt and issue, so always follow applicable procedures.

Inspection. Inspections are the key to finding out how well your Class III supply point is performing. They give you firsthand information on how the equipment and products are maintained from day to day. Inspections let you make on-the-spot corrections. They also give you information on the availability of required publications, accuracy of supply records and procedures, supply economy practices, care of tools and equipment, and status of authorized stock levels of equipment and repair parts.

Product Consolidation and Circulation. When you consolidate or circulate product, you simply move it from one storage tank in the supply point to another. You should consolidate your stock so that several storage tanks are filled with product and several are empty. This way you can be ready to receive and issue large quantities of bulk petroleum on short notice. You also cut down on the number of tank switches you have to make during receipt and issue. Circulate the stock in your supply point so that the heavier portions of the product do not settle to the bottom of the tank and the light ends do not come to the top. Also, circulation ensures a good mixture of all the additives in the fuel.

Disposal of Excess. If you are in CONUS or an overseas activity and you have an excess in bulk or packaged fuels of 500 gallons or more per product grade, report the excess by sending a message to the Commander, USAPC. Include in your message the quantity, type of product, NSN, and the latest laboratory test results. If you are in an overseas command, also report the excess to the appropriate DFSC field office or the JPO.

Issue Considerations. Issuing bulk petroleum is perhaps the most important responsibility you have at the Class III supply point. The reason you are in the field is to get large quantities of petroleum to the units you support. In the theater of operations, you issue liquid petroleum in bulk as far forward as the tactical situation permits. Usually the units you support pick up the bulk petroleum from the supply point in their own vehicles. When you use the FSSP, make your bulk issues from the bottom loading points. Before issuing bulk petroleum from your Class III supply point, preferably before any transporters arrive, you must prepare an issue schedule. Start by telling your customer how much and what type of product you have on hand and when he can pick it up. If your transporters are delivering the product, tell the customer when it will arrive at his supply point. Try to avoid delays and interruptions when you are scheduling issues; that is, do not schedule more transporters to arrive at your supply point than you can handle at one time. Also, ensure that you have enough product on hand to fill all scheduled issues.

Safety and Security Items. Once your supply point is set up, you must take steps to make sure it is safe and secure. Set up a checkpoint at the entrance and one at the exit of the operating area. Give personnel coming to the area a safety briefing at the entrance checkpoint. Use the checkpoints not only to

control the vehicles going in and out, but also to account for the receipt and issue of petroleum in the supply point. Develop a fire plan. You must set up many different types of signs in the area of operation. Place stock locator signs at petroleum storage areas, including bulk reduction storage sites. Place signs identifying NO SMOKING areas and dangerous areas throughout the supply point. You must also set up speed control and traffic direction signs.

PART B - DEFENSE PLAN

Rear Area Protection (RAP). Rear area protection operations may be defined as all actions taken to prevent or neutralize localized enemy threats to units, activities, and installations in the rear area. It includes area damage control (ADC) prevention and control measures which are taken before, during, and after an attack or natural disaster to minimize its effects. Together, these actions represent an added dimension to the responsibilities of theater army area command (TAACOM), corps support command (COSCOM), and division support command (DISCOM) commanders. Thus, combat service support units may have to be diverted temporarily from their primary missions to rear area protection tasks such as local security, base defense, fire fighting, decontamination, emergency medical treatment, and traffic control. The commander responsible for rear area protection operations determines the manner and extent to which these units will be diverted.

The theater army commander has overall responsibility for RAP operations within the COMMZ. In the corps, the deputy corps commander is the RAP officer who directs the rear area battle. To assist these individuals in defining and assigning RAP responsibilities, a rear area operations center (RAOC) is assigned to each TAACOM, area support group, and corps. The RAOC's mission is to plan, coordinate, advise, monitor, and assist in directing the execution of the rear area battle. Petroleum units interface with the RAOC.

Phases. Rear area protection may be divided into two phases -- the preparation phase and the operational phase.

The preparation phase includes preventative readiness measures taken before an enemy attack. These operations range from the initial planning to the actual reconnaissance, surveillance, and counterintelligence operations. Measures taken during this phase include establishing local security elements; organizing, equipping, and training units specifically designed for these missions; assigning area responsibilities; and establishing communications and warning systems. SOPs are written and rehearsed, and route patrolling and convoy escorting are carried out.

The operational phase includes measures taken during or after an attack or a natural disaster. These actions begin when an incident occurs and include units sending reports to the commander concerned on the nature and extent of the damage. These reports allow for necessary estimates and orders for establishing route clearances and redirecting supply flow. Thus, interruption of support to combat forces is reduced. Combat forces receive data in time to change priorities and tactical plans if needed. Fire prevention and fire fighting actions are conducted. Salvage and search and recovery operations begin on order. Traffic and personnel movement controls are established. If necessary, nuclear, biological, chemical (NBC) decontamination is begun. Emergency supplies are distributed, and communications are reestablished.

Petroleum Group. The extent to which the petroleum group becomes involved in rear area protection is prescribed by higher authority. The group and its units stand ready to participate in these operations as directed. Consequently, the group security officer stays in close contact with the RAOC. The group security officer also supervises development of petroleum group rear area protection plans and procedures. He directs implementation of plans and procedures by subordinate elements.

Protection of Petroleum Supplies. Protective measures for petroleum supplies include special packaging, proper storage, dispersion of supplies and installations protection against chemical contamination and nuclear fallout, and maximum use of natural and artificial protective shelters or other shielding devices. Every advantage is taken of natural cover and camouflage for pipelines located above ground. Underground pipelines are used whenever possible. Embankments and underground storage facilities can be effectively used to reduce blast damage. Dispersion of packaged supplies limits and keeps under control fires that start as a result of a nuclear explosion. Care is taken to keep combustible materials to a minimum in and around petroleum supply installations.

Demolition. Demolition is a command responsibility. It is performed only as a last resort and only to prevent supplies and equipment from falling into enemy hands. Except in emergencies, demolition is

performed only on orders from higher headquarters. Unless otherwise specified, petroleum stocks are destroyed by burning.

PART C - ENVIRONMENTAL CONSIDERATIONS

Supply and storage facilities often contain HM. You must take precautions when storing and transporting these materials. Keep a copy of the applicable MSDS for each HM on hand in a binder in the storage area. You can support your installation's environmental goals in supply areas by doing the following:

- Compliance. Store materials according to the manufacturer's guidelines, as stated on the MSDS.
- Prevention. Reduce the amount of solid wastes and HW in the supply room by avoiding stockpiling or keeping items around "just in case they are needed." Reuse containers whenever possible. Recycle materials as required by your installation's recycling program.
- Conservation. Dispose of all solid wastes and HW according to local policy.

PART D - PMCS

Emergency Tank Repair. If any of the collapsible tanks develop a leak, repair them at once with emergency repair items (Figure 3-2 and Figure 3-3). There are two methods of repair: one uses sealing plugs (Figure. 3-4) and one uses sealing clamps (Figure 3-5). The one you use depends on the size of the rupture. Use a sealing plug if the hole in the tank is 3/8 of an inch or smaller. Use a sealing clamp if the hole is larger than 3/8 of an inch. Whatever method you use, ensure you put on rubber gloves and the protective hood before
starting the repair operation.

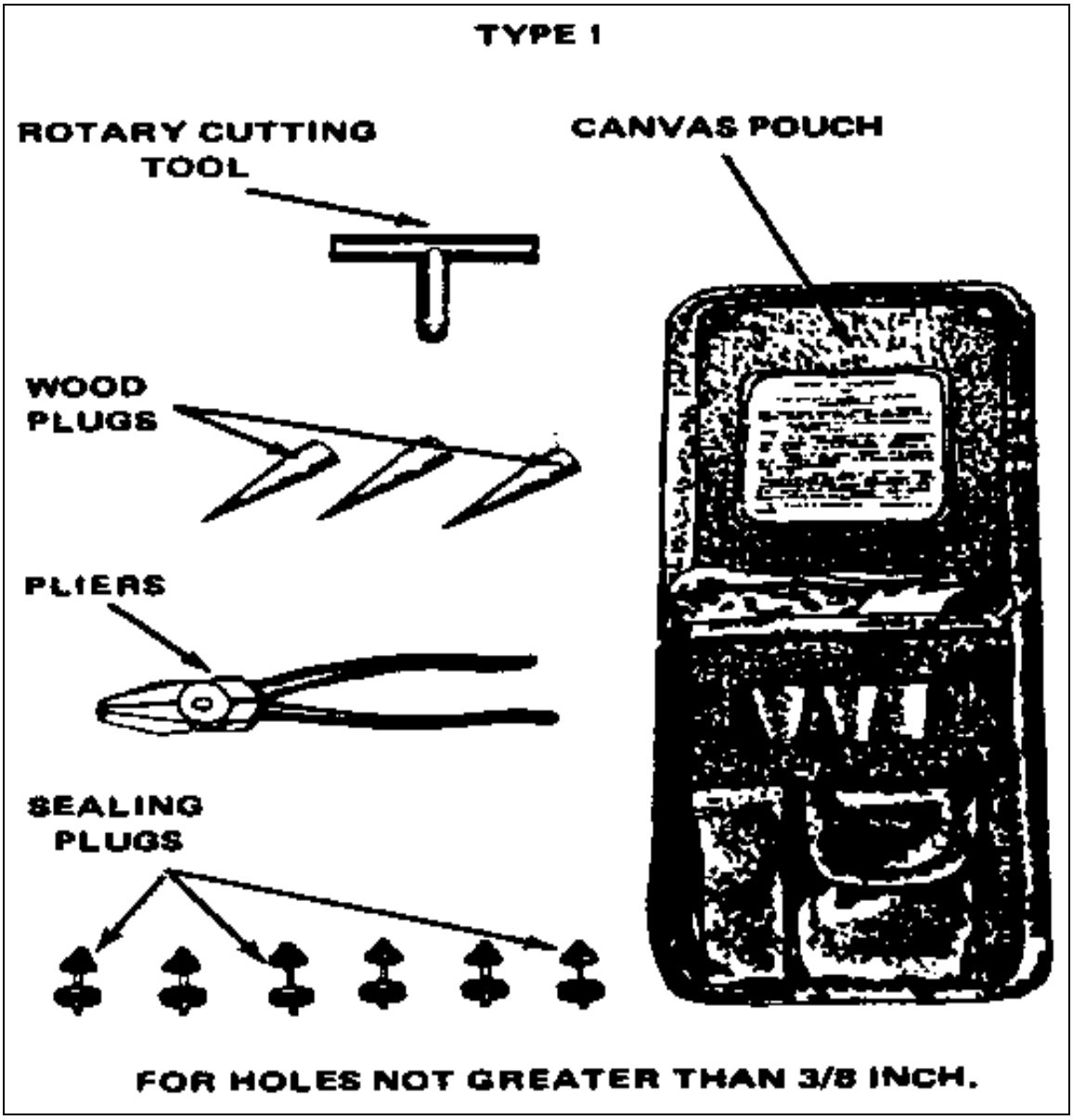

Figure 3-2. Type I repair kit.

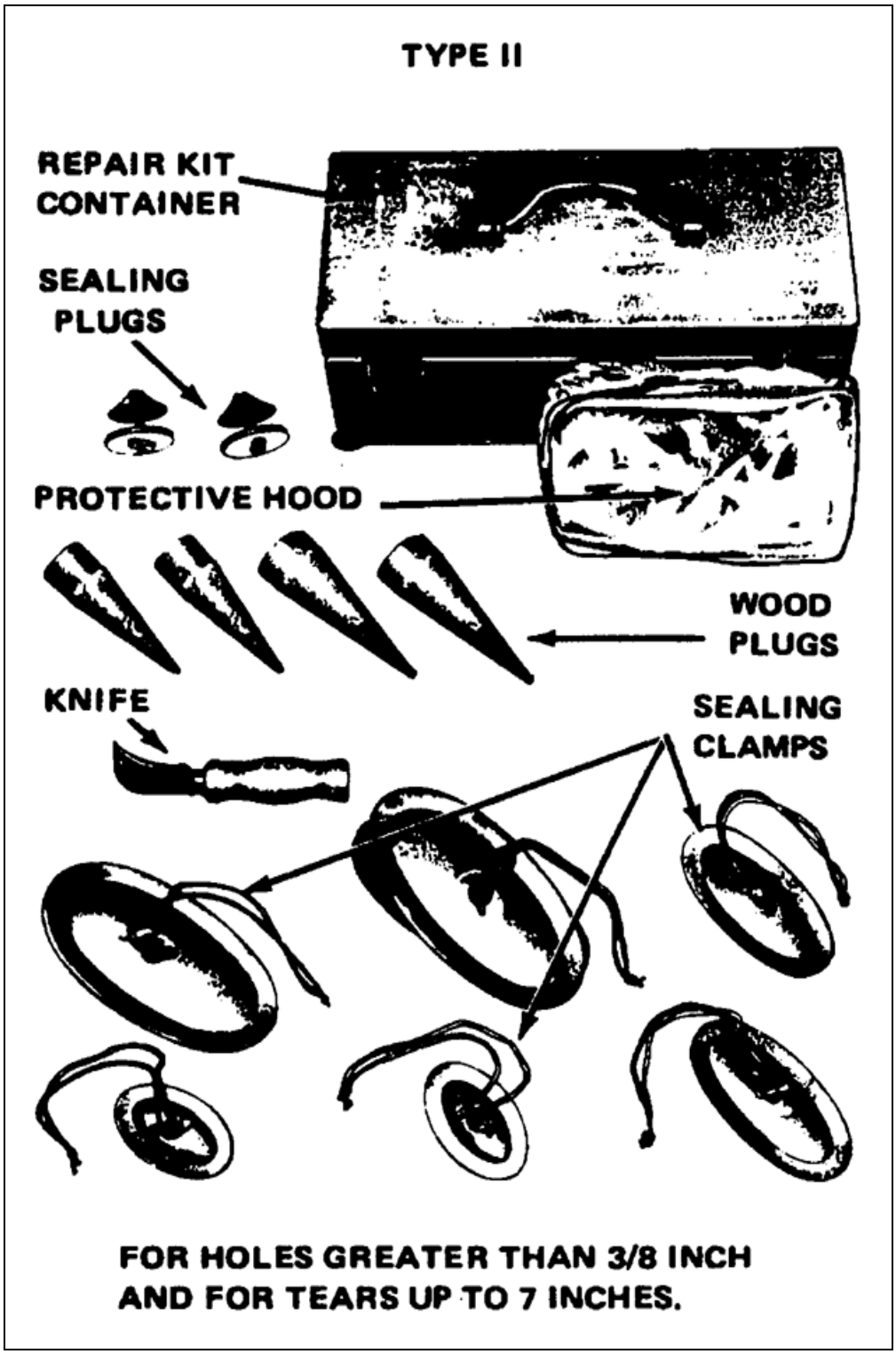

Figure 3-3, Type II repair kit.

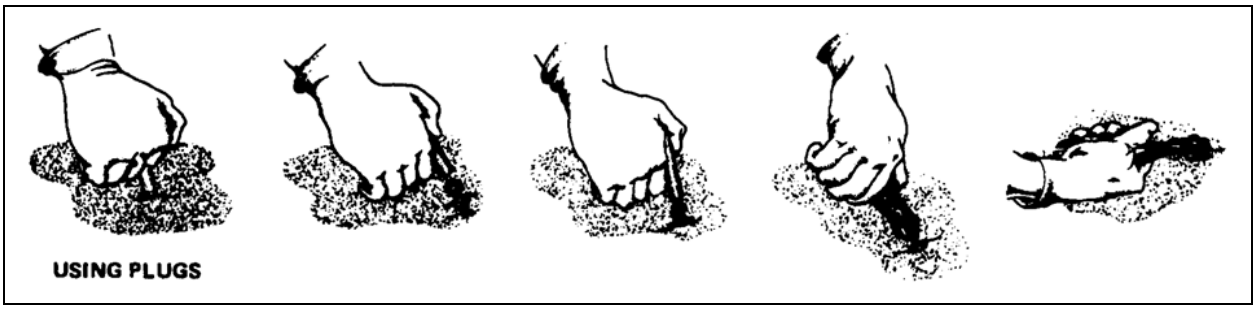

Figure 3-4. Repairing a collapsible tank using plugs.

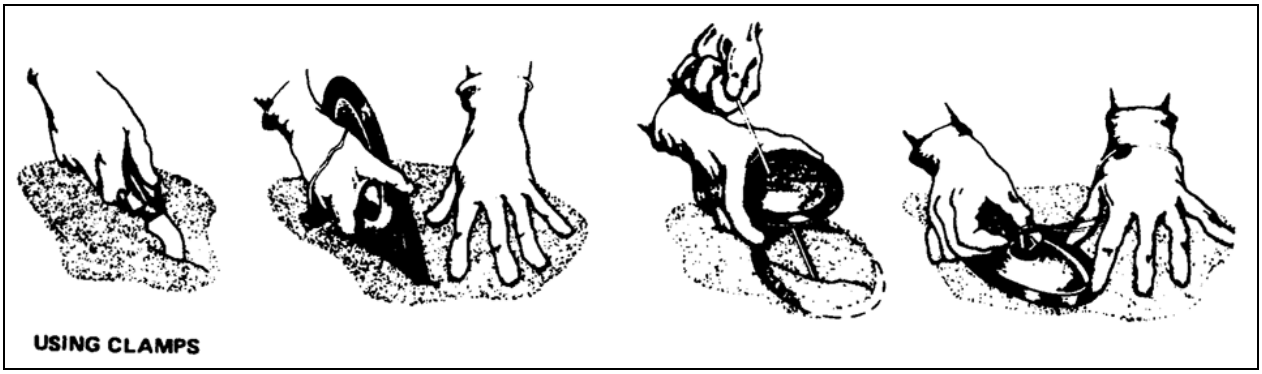

Figure 3-5. Repairing a collapsible tank using clamps

Forms. During operation of the FSSP, operator maintenance is performed on pumps, filter/separators, and related equipment. Forms are prepared to schedule inspections and preventive maintenance and to record the results of inspections and the need for repairs. They are also used to report preventative maintenance performed, to note repairs made, and to request services of support maintenance. In addition, forms are used to keep track of the time equipment is in use or out of service and to provide data for reports on the condition and status of equipment.

- DD Form 314 (Preventive Maintenance Schedule and Record) is used to show when equipment is scheduled for periodic preventive maintenance and when maintenance has been performed.
- DA Form 2404 (Equipment Maintenance and Inspection Worksheet) is used to report faults or malfunctions discovered by an equipment operator.
- DA Form 2407 (Maintenance Request) is used by organizational maintenance personnel mainly to request support maintenance.
- DA Form 2409 (Equipment Maintenance Log (Consolidated)) is used to keep a complete maintenance history on a piece of equipment.
- DA Form 4177 (Utilities Inspection and Service Record) is used to schedule inspections and preventive maintenance on a fixed utility or structure such as a storage tank.

LESSON 3

PRACTICE EXERCISE

The following items will test your knowledge of the material covered in this lesson. There is only one correct answer for each item. When you complete the exercise, check your answers with the appropriate answer key at the end of this subcourse. If you answer any items incorrectly, go back to the part of the lesson that contains the information involved and study again.

1. For a single shift, how many workers do you need to operate the FSSP efficiently?
   A. Four.
   B. Six.
   C. Eight.
   D. Ten.

2. What are the three workers on the delivery side of the FSSP system responsible for?
   A. Making all necessary hose connections.
   B. Dispensing petroleum and controlling the fuel flow.
   C. Operating each pump.
   D. Operating the discharge and receiving manifold of the collapsible tanks.

3. Which phase of a RAP includes measures taken during an attack ?
   A. Preparation.
   B. Combat service support.
   C. Operational.
   D. RAOC.

4. Which of the following is a method of supporting your installation's environmental goals in supply areas?
   A. Avoid stockpiling or keeping items around just in case they are needed.
   B. Store all HMs in one centralized, controlled location.
   C. Replace containers whenever possible.
   D. Recycle all solid wastes.

5. When supervising operator PMCS on the FSSP, what information does DA Form 2404 provide?
   A. Inspection schedules.
   B. Requests for support maintenance.
   C. Faults or malfunctions discovered by an equipment operator.
   D. Complete maintenance history on a piece of equipment.

LESSON 4

DIRECT ASSAULT HOSELINE OPERATIONS
Critical Task:
101-519-3315

OVERVIEW

The assault hoseline can be considered a major artery of the Army mobile forces. It is used to supply petroleum products quickly to forward areas. Proper handling and operation of the hoseline is essential for the successful outcome of many missions.

Lesson Description:

This lesson covers the procedures to lay out, operate, perform PMCS, and retrieve the assault hoseline.

Terminal Learning Objective:

Action: The soldier will learn to supervise the layout, assembly, testing, and repair of the assault hoseline and use evacuation and displacement for retrieving the assault hoseline.

Condition: Given subcourse QM 5095.

Standards: The soldier must score a minimum of 70 percent on the end of subcourse examination.

INTRODUCTION

The assault hoseline system is intended to be used as a temporary pipeline and can transport fuel at a maximum rate of 500 to 550 barrels per hour across 10 miles of flat terrain. The use of the assault hoseline for transportation of bulk petroleum has become increasingly important as an expedient means of providing adequate quantities of bulk petroleum in the shortest time possible.

PART A - THE ASSAULT HOSELINE SYSTEM

Refer to FM 10-67-1 (Concepts and Equipment of Petroleum Operations), Chapter 27, for illustrations and a more detailed description of the assault hoseline equipment. Six soldiers and the following equipment are needed to lay out and assemble the hoseline:

- Thirteen flaking boxes – The 4-inch, lightweight, collapsible rubber hose is packed into the flaking boxes with 1,000 feet to a box.
- One 350-gallon-per-minute (GPM) pumping assembly – The 350-GPM pump is equipped with a pressure regulator that controls the idle of the pump and adjusts the pressure if there is a significant decrease in pressure in the hoseline.
- A flow control kit – The flow control kit consists of two 4-inch gate valves; one 4-inch T; two check valves; two 4-inch hose assemblies; one strainer assembly; one roll of electrician's tape; and couplings, nipples, adapters, and coupling halves.
- Ten steel roadway crossing guards – The roadway crossing guard must be installed to protect the hoseline when it crosses a roadway.
- A hose suspension kit – The hoseline suspension kit consists of 350 feet of wire rope, 350 feet of manila rope, 25 wire-rope clips, 60 shackles, 60 hose saddles, 14 steel pickets, 4 steel blocks, 4 turnbuckles, and 4 wire-rope thimbles.
- A hoseline displacement and evacuation kit – The hoseline displacement and evacuation kit consists of a ball injector, a ball receiver, a displacement ball, an air eductor, 8 grooved couplings, and 16 pipe caps.
- A hoseline packing kit – The hoseline packing kit consists of a chain hoist, a hose puller, two hose clamps, and a metal storage chest.
- A hose repair kit – The repair kit contains tools and materials needed to repair the hoseline system.

PART B - SAFETY AND ENVIRONMENTAL CONSIDERATIONS

Prior to the start of the mission, the troops must be briefed on any safety or environmental hazards they may encounter. The briefing should include the proper response to such hazards and other information which will enable them to correctly address less serious infractions independently. Each mission encompasses different situations and unit interactions so you need to develop a mission-specific briefing for each; therefore no one solution can or will be presented in this lesson. If your experience does not afford you a basis for preparing a briefing, a supervisor should be contacted for additional information.

PART C - SUPERVISING THE LAYOUT, ASSEMBLY, AND TESTING OF THE ASSAULT HOSELINE

Choosing a Route. Select a direct route which is free of obstacles. If possible, try to parallel an existing road to aid construction, operation, and security. A route parallel to a secondary all-weather road is better than a heavily traveled main supply route. Take advantage of natural cover such as fencelines, woods, and hedgerows. However, do not disturb the natural cover by grading or leveling. Try to avoid rocky areas which might damage the hose.

It is possible to distribute the hose at speeds up to 35 MPH. However, the recommended maximum speed is 20 MPH. As the hose is distributed, men spread out along the route (at least two each 1/4 mile), walk the line to straighten out undesirable kinks or bends, and remove small obstructions which might cause damage when the hose is pressurized. When distributed on a road, the hose must be picked up from the roadway itself and moved to a position in the road ditch (Figure 4-1).

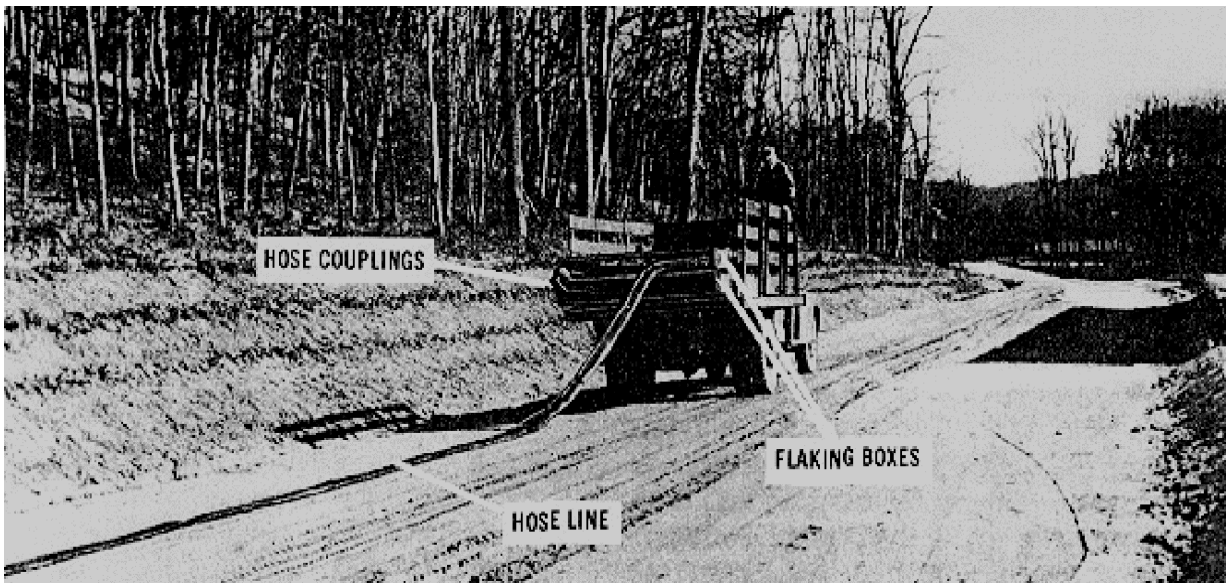

Figure 4-1, Laying the assault hoseline on a road.

Crossing Streams. There are several ways you can lay the hoseline across a stream or water course. If there is a bridge, suspend the hoseline on improvised brackets outside the bridge railing. If there is no bridge, you may lay the hoseline directly in the streambed if it is narrow and not apt to flood. Use the hoseline suspension kit to cross a wide stream. Fabric saddles, with eyes for easy wire attachment, come with the kit.

Crossing Gaps. You should also use the hoseline suspension kit to span small gaps with steep sides. For a wide crossing, build a suspension bridge with a flat deck or floor to hold the hose. This eliminates the sags that occur when the suspension kit is used.

Crossing Roads. To cross a highway or railroad, run the hoseline under a bridge or through a culvert, if possible. You can pull the hoseline through the culvert with a rope or push it through with a piece of lumber or a small-diameter pipe. If there is no bridge, install the roadway crossing guard to protect the hoseline. Never bury unprotected hoseline in a railbed. When crossing a railbed, you can either install a piece of heavy wall pipe in a shallow ditch under the rails or suspend the hose over the railbed at a suitable height. As soon as possible, replace the hoseline at a railway crossing with welded pipeline because of the fire hazards caused by trains.

Pumping Stations. Assault hoseline pumping stations have one 350-GPM pumping assembly. If you are using only one hoseline outfit, place the pumping assembly at the beginning of the hoseline system. Because this pump does not have a pressure-regulating device, you must monitor it at all times for changes in hoseline pressure. You must set up pumping stations when you connect hoseline outfits together. There is a formula you can use to locate pumping stations on level ground using motor gasoline in the hoseline. If you use a product other than motor gasoline, the distance between pumping stations (given by this formula) changes. For example, if you use a product heavier than motor gasoline, the pumping stations should be closer together. if the product you use is lighter than motor gasoline, the pumping stations should be further apart. The distance between pumping stations (given by this formula) also changes with the height of the terrain. For example, if you place the hoseline on an uphill slope, the pumping stations should be closer together. If you place the hoseline on a downhill slope, the pumping stations should be farther apart.

Hoseline Testing. Once you have set up the assault hoseline, fill it, pressurize it, and check the hoseline for leaks. Start the pumps slowly and raise the fluid pressure in the system gradually in increments of 50 PSI. Hold the pressure each time you raise it, and inspect the hoseline for leaks. Keep doing this up to and including 150 PSI. Even though the design burst pressure of the hose is higher, your test should not exceed the rated safe-working pressure of 150 PSI. If the line pressure does not build up, stop and check the hoseline for a leak. You can usually fix leaks at couplings, fittings, or valves by tightening, adjusting, or replacing gaskets.

Observe operations for safety and environmental infractions. Immediately shut down operations and correct any problems detected.

PART D - SUPERVISING THE EVACUATION AND DISPLACEMENT OF THE ASSAULT HOSELINE

Removing fuel, vapor, and air from the hoseline causes the hoseline to collapse into a flat ribbon-like form. This allows for the most compact storage of the hose for transportation to the next site. The hoseline is evacuated as follows:

- Remove the ball from the ball receiver; replace it with an airtight cap (use a blank cap with grooved coupling).
- On the inlet end, disconnect the compressor hose from the ball injector.
- Attach the suction connection of air eductor.
- Attach the air compressor hose to the inlet side of the eductor, and set the pressure at 20 to 25 PSI.
- Operate the eductor approximately 10 minutes for each 1,000 feet of hoseline.
- When the hose has flattened as much as possible, fold it back and tie a knot.
- Remove the ball injector and eductor.

When displacing the assault hoseline, pack the hose into the flaking box making successive folds from left to right until you reach the front. Be sure to bend the hose so that it fills the entire width of the box. Also, make sure the folds are packed tightly together so that you can get 1,000 feet of hose in the box. If the temperature is below 40 degrees Fahrenheit, you may have to use the hoseline packing kit to get the hose in the flaking box.

PART E - MAINTAINING COMMUNICATIONS

Communication breakdown is the single non-equipment-related item which can start a domino effect capable of bringing an entire mission literally to a halt. A missed communication regarding the emergency shutdown of the assault hoseline could leave an FSSP or FARE system without a source of fuel and strand dozens of aircraft and vehicles miles from a secondary source of fuel. The vulnerability of such vehicles and the loss of them to the enemy cannot be overstated. Accurate and timely communications with all levels of the supply team and command headquarters is imperative for the success of any mission requiring the use of the FSSP, FARE, and assault hoseline.

An efficient communication system is a must for the operation and maintenance of military pipelines. The system must be separate, continuous, and dependable. The communications system must have high-quality transmission to keep errors to a minimum, enough channels or circuits to carry the traffic load efficiently, prompt connections to avoid delays, and immediate alternate systems so there will be no interruptions in pipeline operations.

LESSON 4

PRACTICE EXERCISE

The following items will test your knowledge of the material covered in this lesson. There is only one correct answer for each item. When you complete the exercise, check your answers with the appropriate answer key at the end of this subcourse. If you answer any items incorrectly, go back to the part of the lesson that contains the information involved and study again.

1. How many soldiers are needed to lay out and assemble the assault hose line?
   A. Six.
   B. Eight.
   C. Ten.
   D. Thirteen.

2. What should the safety briefing held prior to the start of the mission include?
   A. Procedures for guarding against tampering or pilferage.
   B. The standardized safety briefing provided in the unit SOP.
   C. Proper responses to any safety or environmental hazards.
   D. Detailed scenarios and solutions for all possible hazard situations.

3. If the temperature is below 40 degrees Fahrenheit, you may have to_____.
   A. Apply heat tape to the length of the hoseline.
   B. Use the hoseline packing kit to get the hose in the flaking box.
   C. Decrease the distance between pumping units.
   D. Increase the distance between pumping units.

4. When testing the assault hoseline prior to use, you should increase the pressure in increments of _____.
   A. 20 PSI.
   B. 30 PSI.
   C. 40 PSI.
   D. 50 PSI.

5. What qualities should an efficient communication system have for the operation and maintenance of military pipelines?
   A. The system must keep traffic to a minimum to avoid enemy interception.
   B. The system must be easy to disassemble and prepare for movement.
   C. The system must be dependable, separate, and continuous.
   D. The system must be monitored constantly for encryption purposes.

LESSON 5

DIRECT THE ASSEMBLY, OPERATION, PMCS, AND DISASSEMBLY OF THE FORWARD AREA REFUELING EQUIPMENT (FARE)
Critical Tasks:
101-519-3215
101-519-3317

OVERVIEW

All Army mobile forces must be ready to mobilize at all times. As a Petroleum Supply Specialist you are responsible for the delivery of sufficient quantities of high quality petroleum products to all forward areas. Proper operation and maintenance of the FARE system is therefore extremely important.

Lesson Description:

This lesson covers the use of the Forward Area Refueling Equipment (FARE) system, hot refueling of aircraft, and proper safety and environmental procedures.

Terminal Learning Objective:

Action: The soldier will learn to direct the placement, assembly, and operation of the FARE system.

Condition: Given subcourse QM 5095.

Standards: The soldier must score a minimum of 70 percent on the end of subcourse examination.

INTRODUCTION

Unit-level refueling operations in theaters of operation are usually carried out by individual aviation units. A lightweight, air-transportable, refueling system is used at the unit level. At present, the system authorized to most units that have the mission to refuel aircraft in forward areas is the Forward Area Refueling Equipment (FARE) system. This system can be set up by skilled personnel within 15 minutes of delivery to a site.

The FARE system is designed for refueling helicopters in forward areas. It is lightweight and can be flown to the refueling point by helicopter or fixed wing aircraft. The fuel for the system is usually flown to the site in 500-gallon collapsible drums. The FARE system can also use various size collapsible tanks, tank vehicles, or semitrailers as fuel sources.

PART A - FARE COMPONENTS

Components. The FARE system consists of a pumping assembly, filter/separator, and valves and fittings.

Pumping Assembly. The pumping assembly is made up of a 100 GPM centrifugal pump and a two-cylinder, four-cycle, 3-horsepower gasoline engine that powers the pump. The inlet and outlet connections are 2 inches in diameter. The pump has a priming port on the top of the pump casing. The pumping assembly and the engine's fuel tank are all housed in a tubular aluminum frame.

Filter/Separator. The 100 GPM filter/separator is an aluminum tank with a removable cover. Five filter elements, each in a canister, are set in a mounting plate near the bottom of the tank. The filter/separator has an air vent valve, a pressure differential indicator, a water sight glass, and a water drain valve that is turned by hand. The flow rate of the filter/separator is 100-GPM, and its top working pressure is 75 PSI. The filter/separator is mounted in a frame of tubular aluminum.

Discharge Hose, Suction Hose, and Fittings. The FARE system has two sets of discharge hose, fittings, and nozzles. Each set is mounted in a tubular frame. Two canvas carrying cases hold the suction hose and their fittings.

Fire extinguishers are not components of the FARE system. Providing the extinguishers is a command responsibility. Three fire extinguishers are required for each FARE system used in aircraft refueling--one to be within reach of the pump operator and one for use at each nozzle. The recommended fire extinguisher is the 20-pound Halon 1211.

No fuel source is provided as a component of the FARE system. Generally, 500-gallon collapsible drums are used because they can be airlifted, full, to the FARE point. But the FARE system can also be adapted to use larger fuel reservoirs. The number of drums and tanks, as well as the type of fuel to be used, is determined by the number and type of aircraft the FARE point is to support.

PART B- FARE LAYOUT

Planning. The S3 of the aviation battalion or the operations officer of an aviation company plans the unit operations. As part of these plans, he chooses the general area for a refueling point and specifies the amount and type of refueling support needed. He or a pathfinder team must choose a site that has enough open ground for the aircraft to land and lift off safely. The site must be flat or have only a slight grade. When planning the layout of a FARE system, five factors must be considered.

- **Spacing Between Aircraft:** There must be at least 100 feet of space between these aircraft (center rotor to center rotor).
- **Wind Direction:** Lay out the FARE system so that the helicopter can land, refuel, and take off into direct head wind or a left or right quartering head wind.
- **Vapor Collection:** The system should beat right angles to the wind for helicopter landing and takeoff, allowing wind to carry the fuel vapors away from the site.
- **Drainage:** Do not put the equipment in a place where a spill will drain into a stream or river. Choose a part of the site that is firm enough to support the weight of the aircraft and the fuel drums.
- **Camouflage:** Camouflage is the only protection at a FARE point in a combat zone. Site features are depended upon because airlifting in camouflage materials is not practical.

Site Preparation. All sticks, stones, and debris should be cleared from the area. To prevent fires, clear dry grass, leaves, and brush away from the pumping assembly. In some cases, engineer personnel prepare the site.

Layout. Once all equipment is on-site, lay out the FARE system in the way that is best for the specific situation. Tailor the layout to avoid obstacles, take advantage of terrain features, achieve maximum dispersion, and operate with a restricted amount of space. The only mandatory feature of the FARE system is the spacing between the aircraft (Figure 5-1). The suggested sequence of setup is as follows.

- Position pump and filter/separator.
- Ground pump and filter/separator.
- Assemble discharge hose.
- Assemble dispensing points.
- Connect to two 500-gallon collapsible drums.
- Position fire extinguishers.

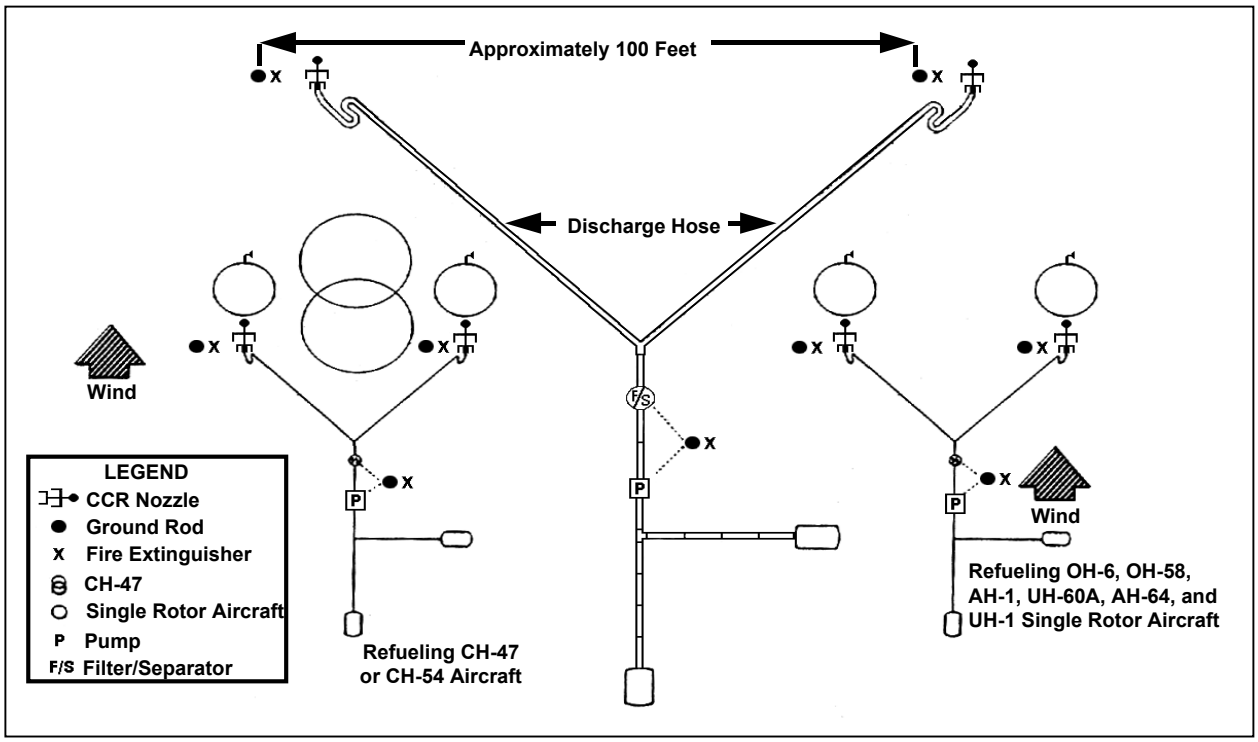

Figure 5-1. Typical FARE layout.

PART C - QUALITY SURVEILLANCE

The quality and cleanliness of turbine fuel are vital to the safety of turbine-engine-powered aircraft. Turbine engines have more stringent cleanliness requirements than do reciprocating engines. Because turbine engines have high fuel consumption rates, contaminants accumulate in them rapidly. Turbine engine filters cannot remove fine sediment, excess amounts of sediment, or water from the fuel. Separating the contaminants from JP-5 and JP-8 is time-consuming and further complicated by their high viscosity and specific gravity. Any unit or organization that has military-owned aviation fuel in its physical possession is responsible for establishing and maintaining an adequate quality surveillance program. Each person involved in aircraft refueling is responsible for ensuring that the fuel pumped into an aircraft is clean, bright, on specification, and does not contain any free water or sediment.

Quality surveillance testing and sampling are used to find common contamination hazards. The hazards that may affect aircraft are sediment, water, microbiological growth, and commingled fuel. Since each aircraft engine is designed to burn one particular type and grade of fuel, the consequences of using a mixture of

different fuels can range from small variations in engine performance to total loss of power and engine failure. The consequences of commingling depend on the physical properties of the fuel.

Sampling and Testing. How often aviation fuels are sampled and tested depends on several factors. It depends upon whether the fuel is taken from a fuel source, a system or refueler, or an aircraft tank. Fuel supplies must be tested to confirm their identities (API gravity test) and detect water (Aqua-Glo test) and particulate contaminant by color comparator ratings. Samples of fuel to be dispensed to aircraft should contain no more than 10 fibers when a 1-quart sample is visually examined. The aviation fuel contamination test kit is designed to provide a final check on aviation fuel just before the fueling of an aircraft. It includes the API gravity test, the Aqua-Glo test, and the Millipore test (a test for particulate contaminants). Fuel in aircraft tanks must be checked by the aircraft crew before flight operations begin. Taking a preflight sample is the only way of ensuring that the fuel on board does not contain water or other visible contaminants. Any fuel that fails a visual check should be segregated and held until laboratory test results are received. To check a fuel, choose a clean sample bottle, draw a fresh sample, visually inspect it, and test it for debris, foreign matter, or water. Laboratory testing ensures that the fuel's quality meets specifications, unknown products and existing or potential contaminating causes are identified, unfavorable field test results are corroborated, and off-specification fuels are not used.

PART D - MAINTAINING COMMUNICATIONS

Communication is the single non-equipment-related item that can enable the FARE site to be a major factor in the successful mission. This communication is multilevel. Unless otherwise directed, you are responsible for informing the chain of command of the following:

- When the site becomes operational.
- When the site is shut down for any reason before the scheduled shutdown time.
- Report status of operations and any problems encountered as required by unit policy and procedures.
- When the site is shut down as indicated in the operations orders.

PART E - SUPERVISING THE OPERATION OF THE FARE

The FARE system should be primed and ready for operation as soon as it is laid out and the fuel has been sampled. There should be at least three people in addition to the ATC or pathfinder present during refueling operations. At least two of these people should hold MOS 77F. The proper procedures for the refueling of aircraft are as follows:

- Land aircraft. Check to see that the armaments aboard the aircraft have been set to SAFE.
- Deplane crew and passengers. Only the pilot may remain in the aircraft during refueling. If required, a crew member may assist with the refueling by manning the fire extinguisher.
- Position fire extinguisher on the side of the aircraft by the fill port.
- Turn off radios. The pilot may monitor the radio used for air traffic control, but must not transmit while actual refueling is taking place. The pilot and crew chief may talk by intercom during refueling.
- Ground and bound the nozzle to the aircraft. It should never be attached to the radio antenna or to a propeller.
- Remove dust cap from the nozzle, and remove the plug from the aircraft fill port.
- Begin refueling. Be certain to observe the safety precautions associated with closed-circuit or open-port refueling, as the case may be.
- Replace aircraft fill port plug, and replace nozzle caps/plugs.
- Remove nozzle bond. Carry the nozzle back to its hanger.
- Remove fire extinguisher.
- Board crew and passengers.
- Direct aircraft to lift-off.

Additionally, you are required to monitor fuel stocks and accountability procedures and render status reports as required by unit policy. If any leaks or hazardous conditions are found the system must be shut down and the problem corrected before resuming operations. All spills must be cleaned up and reported as required by unit policies and procedures and applicable environmental laws. Dispose of contaminated fuel and materials in an environmentally safe way in accordance with unit policies and procedures and applicable environmental laws. You must also ensure that during and after PMCS are done and that DA Form 2404 or DA Form 5988-E

(Equipment Inspection Maintenance Worksheet) is annotated with any faults or deficiencies found. The completed DA Form 2404 or DA Form 5988-E is returned to the motor pool with the equipment.

PART F - SAFETY

Switch Fueling. Switch fueling means supplying an aircraft with fuel that has flammability characteristics different from that which is already in the tank. The flammability characteristics of the mixed fuel will be different from the two fuels involved. The danger is that if a spark should occur in the tank, the vapor-air mixture above the fuel may be in the flammable range and an explosion could result. If an aircraft is to be switch fueled, the rate of flow at the nozzle should not exceed 50 percent of the rated flow. Changing to JP-4 after using a kerosene-grade fuel also constitutes switch fueling.

Heat. Aircraft, vehicles, and engine-powered equipment generate heat by burning fuel. They also generate static electricity because of friction between moving parts. The engine heat of an idling aircraft turbine engine is in the auto-ignition range of JP-4. Poorly maintained vehicle engines may backfire or discharge sparks. Do not allow any work to be done on an aircraft's batteries while the aircraft is being refueled. Aircraft radios may operate to receive messages during refueling, but radio transmissions from the aircraft are not allowed because of the danger from arcing. Do not use flashlights within 50 feet of the refueling operation unless they are approved explosion-proof type. Do not allow electric handtools to be used in the refueling area. The electric circuits of tools used in refueling operations must be maintained in top condition to prevent short circuits around defects. And in addition, the beam of high-frequency radar equipment can ignite a flammable vapor-air mixture.

Open Flame. The danger of an open flame is that it will ignite fuel or a flammable vapor-air mixture. Do not allow any type of open flame, or any flame-producing device within 50 feet of an aircraft refueling operation.

Static Electricity. There are two ways to prevent static electricity from sparking. The charges on different materials can be equalized by connecting them with a conductor (bonding). Also, a way can be provided for the charges to dissipate harmlessly (grounding). The Army uses both of these methods to control static electricity.

Bonding is the process through which two conductive objects are connected to lessen their potential differences. Bonding does not dissipate the static electricity. It equalizes the charges on two unlike objects (an aircraft and a refueling nozzle) in order to preclude arcing as the two objects are joined. A nozzle-to-aircraft bond is required. This bond is made before the nozzle dust cap or fuel tank cap is removed. Likewise, do not disconnect the bond until refueling is complete and the fuel tank cap and nozzle dust cap are replaced.

Grounding is the process that provides a conductive path into the ground so that a static charge is not trapped on the surface of the equipment where it can discharge as a spark. This conductive path is made by connecting a conductive cable from the piece of equipment to a conductive metal rod that is driven into the earth to reach the level of permanent moisture. Common sources of static electricity are identified as follows:

- Vehicles.
- Human body.
- Lightning.

Air Traffic Control. Air traffic control (ATC) is required for safe refueling operations. An air traffic controller or some other adequately trained person is required at each refueling point that serves more than one aircraft. This person controls and directs refueling traffic and resupply aircraft. He provides flight personnel with information such as wind direction and velocity, remaining fuel supply, enemy activity in the immediate area, hazards or obstructions to landing, and emergency situations. At a fixed airfield, full radio communication equipment is provided for controlling air traffic. At a large semipermanent or temporary refueling point a radio control tower should be used whenever aircraft are being refueled. In forward areas, personnel controlling air traffic should have an FM radio suitable for ground-to-air or ground-to-ground communication. Aircraft marshaling signals and landing aids are necessary at semipermanent and forward refueling points. In marking landing and refueling areas in the field, procedural principles should be followed closely, especially in forward tactical areas.

PART G - ENVIRONMENTAL CONSIDERATIONS

You must pay close attention during refueling operations because of the potential for spills and fires. If you take simple precautions you will prevent large pollution problems. During refueling you can protect the environment by doing the following:

- Compliance. Follow your unit SOP concerning the types and quantities of items you can store at a fuel point.
- Prevention. Reduce the amount of soil contaminated during refueling by being careful not to spill fuel. Reuse rags and absorbent materials. Recycle used or contaminated petroleum, oil, and lubricant (POL) products.
- Conservation. Dispose of contaminated soil and absorbents according to the installation's policy and the unit's SOP.

LESSON 5

PRACTICE EXERCISE

The following items will test your knowledge of the material covered in this lesson. There is only one correct answer for each item. When you complete the exercise, check your answers with the answer key at the end of the subcourse. If you answer any items incorrectly, go back to the part of the lesson that contains the information involved and study again.

1. What is the required spacing between aircraft at a FARE point?
   A. 75 feet.
   B. 100 feet.
   C. 150 feet.
   D. 200 feet.

2. Unless otherwise directed, you are responsible for informing the chain of command of which of the following?
   A. When PMCS is performed.
   B. When the site becomes operational.
   C. When fuel fails a visual check.
   D. When contaminated fuel has been disposed of.

3. During operation of the FARE, what are you required to monitor?
   A. Air traffic control transmissions.
   B. That crew and passengers remain on board the plane during refueling.
   C. Fuel stocks and accountability procedures.
   D. That there are at least five people in addition to the ATC or pathfinder present during refueling operations.

4. What is the greatest danger to personnel in refueling operations?
   A. Jet engine exhaust.
   B. Fire.
   C. Live armaments.
   D. Rotor blades.

5. During refueling operations, which of the following can be reused in order to protect the environment?
   A. Rags and absorbent materials.
   B. Contaminated POL products.
   C. Contaminated soil.
   D. Old containers.

Lesson 1 Practice Exercise Answer Key and Feedback

Item	Correct Answer and Feedback
1. C.	Part C, page 1-3
2. D.	Part B, page 1-2
3. D.	Part C, page 1-3
4. B.	Part A, page 1-2
5. C.	Part B, page 1-2

Lesson 2 Practice Exercise Answer Key and Feedback

Item	Correct Answer and Feedback
1. A.	Part C, page 2-9
2. D.	Part A, page 2-2
3. C.	Part A, page 2-2
4. D.	Part A, page 2-5
5. B.	Part A, page 2-5

Lesson 3 Practice Exercise Answer Key and Feedback

Item	Correct Answer and Feedback
1. C.	Part A, page 3-3
2. B.	Part A, page 3-3
3. C.	Part B, page 3-5
4. A.	Part C, page 3-6
5. C.	Part D, page 3-9

Lesson 4 Practice Exercise Answer Key and Feedback

Item	Correct Answer and Feedback
1. A.	Part A, page 4-2
2. C.	Part B, page 4-2
3. B.	Part D, page 4-4
4. D.	Part C, page 4-3
5. C.	Part E, page 4-4

Lesson 5 Practice Exercise Answer Key and Feedback

Item	Correct Answer and Feedback
1. B.	Part B, page 5-2
2. B.	Part D, page 5-4
3. C.	Part E, page 5-4
4. B.	Part F, page 5-5
5. A.	Part G, page 5-6

Section I

GLOSSARY

Acronyms and Abbreviations

API	American Petroleum Institute	kw	kilowatt(s)
ACCP	Army correspondence course program	MPH	miles per hour
ADC	Area damage control	MSDS	Material Safety Data Sheet
AIPD	Army Institute for Professional Development		
ATC	air traffic control, air traffic controller	NBC	Nuclear, Biological, Chemical
AUEL	Automated Unit Equipment List	NCO	noncommissioned officer
CONUS	Continental U.S.	NCOIC	noncommissioned officer in charge
		NSN	National Stock Number
COSCOM	Corps support command	Para	paragraph
COMMZ	Communications zone	PMCS	preventive maintenance checks and
DA	Department of the Army	POL	petroleum, oils, lubricants
DD	Department of Defense	PSI	pounds per square inch
DETC	Distance Education and Training Council		
DFSC	defense fuel supply center	RAOC	Rear area operations center
DISCOM	division support Command	SLGR	Small Lightweight Global Positioning Receiver
DOD	Department of defense		
F	Fahrenheit	SOP	standing operating procedure
FARE	Forward Area Refueling Equipment	S3	Operations officer
FM	Frequency Modulation	TRADOC	Training and Doctrine Command
FORSCOM	Forces Command, Army		
FSSP	Fuel System Supply Point	XO	Executive Officer
GPM	gallons per minute		
GPS	Global Positioning System		
HM	hazardous material		
HW	hazardous waste		
ICE	Interservice Correspondence Exchange		

American Petroleum Institute (API) The institute 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.

API Gravity An arbitrary scale expressing the gravity or density of liquid petroleum products. The measuring scale is calibrated in terms of degrees API. The gravity of any petroleum product is corrected to 60'F (16'C). *(See Specific Gravity.)*

API gravity test A test to confirm the identities of fuel supplies.

Aqua-Glo test A test to detect water in fuel supplies.

Section II

Terms

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.

Class III (POL) Petroleum fuels: lubricants, hydraulic and insulating oils, preservatives, liquid and compressed gases, chemical products, coolants, deicing and antifreeze compounds, together with components and additives of such products and coal.

contaminant A foreign substance in a product.

contaminated product A product in which one or more grades or types of products have been inadvertently mixed, or a product containing foreign matter, such as dust, dirt, rust water, or emulsions.

contamination The addition to a petroleum product of some material not normally present. Common contaminants are water, dirt, sand, rust, mill scale, and other petroleum products.

diesel fuel A hydrocarbon fuel used in diesel engines. Diesel fuels used by the armed forces are manufactured under two specifications: W-F-800 and MIL-F16884.

filter/separator A device used to separate both solid contaminants and water from a petroleum fuel.

flammable A term describing any combustible material which can be ignited easily and which will burn rapidly. Petroleum products which have flash points of WOO Fahrenheit (37.80 Celsius) or lower are classed as flammable.

flash point The lowest temperature at which a liquid petroleum product gives off vapor in sufficient concentration to ignite (that is, flash) on application of a flame under specified conditions.

jet fuel Fuel meeting the required properties for use in jet engines and aircraft turbine engines. Jet fuels are procured for the armed forces in several grades. The most important grades are JP-4 (low vapor pressure), JP-5 (high flash point), and JP-8.

kerosene A refined petroleum distillate used in space heating units, in wick-fed lamps, bomb-type flares, for cleaning certain machinery and tools, and as a base for liquid insecticide sprays. A single multiple-use type is procured under Federal Specification VV-K-21 1. A deodorized type, which is used as a base for insecticide sprays, is procured under Specification VV-K-220.

Millipore test A test for particulate contaminants in fuel supplies.

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 underground 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.

POL Petroleum, Oils, and Lubricants. Included are petroleum fuels, lubricants, hydraulic and insulating oils, temporary protectives, liquid and compressed gases, chemical products, liquid coolants, deicing and antifreeze compounds, together with components and additives of such products.

specific gravity The ratio of the weight of any quantity of matter, a petroleum product for example, to the weight of an equal quantity of water; usually determined by use of a hydrometer.

static electricity Electricity generated by friction between unlike substances and in the atmosphere; contrasted with voltaic or current electricity.

vapor Any gas-like form of a substance that is normally a solid or a liquid; any gaseous substance that can be condensed by cooling or compression.