CHAPTER 13: FUELING OPERATIONS.

I. Introduction.

Fueling operations, whether conducted by government or vendor personnel, have the potential to result in environmental damages or catastrophic accidents.

It is the responsibility of all personnel, both vendor and government, to ensure that fueling operations are conducted in accordance with procurement document specifications, agency fueling directives, and all other applicable local, state, and federal regulations. Special attention must be paid to federal, state, and local hazardous materials regulations and to agency-specific fuel spill avoidance requirements.

Chapter 15, Helibase and Helispot Management and Operations, contains guidance on location of fueling operations. Appendix I, Remote Fuel Site Reminders List, is a job aid that can be utilized by Helibase Managers and Fueling Specialists.

II. Responsibilities.

A. Management.

Agency heads are ultimately responsible for the management and effective implementation of a Fuel Quality Control Program within their respective agency. Supervisors and managers at all levels are responsible for the safe delivery of uncontaminated fuels during aviation operations under their jurisdiction or control. Within this responsibility is the practical requirement to provide safe working conditions, prevention of injury to persons, and the protection of property.

B. Employees.

To enhance safety, employees of participating agencies who become aware of any fuel-related mishaps (for example, fuel spills, fires, damage to aircraft or fueling facilities or vehicles, incorrect fueling of aircraft, incorrect fuel put in an aircraft, etc.) should report such occurrences utilizing the agency incident/hazard report. Where imminent danger situations exist, the operation should be suspended immediately.

C. Fuel Vendors.

Vendors conducting business for the transportation, storage or dispensing of aviation fuels, including into-aircraft operations, shall adhere to the provisions and specifications for such operations as provided within the procurement document. For the most part, all such operations shall be in accordance with the standards and procedures specified in applicable American National Standards Institute (ANSI) or National Fire Protection Association (NFPA) publications.

D. Pilots.

The Pilot is personally responsible for ensuring that the proper type and grade of clean, dry fuel is pumped into the aircraft.

III. Fuel or Oil Pollution Prevention.

General Environmental Protection Agency (EPA) Requirements. Agencies must be cognizant of the Environmental Protection Agency's (EPA) regulations found in 40 CFR 112.

Regardless of the size or location of an operation, it is necessary that an assessment be made to determine whether or not provisions of the regulations are applicable.

Basically, the criteria is if it can be reasonably expected that a discharge of fuel or oil will enter navigable waters, a facility is subject to the regulations. These regulations require the preparation and implementation of a Spill Prevention Control and Countermeasure (SPCC) Plan. Exceptions to this requirement are:

- Aboveground facilities having a total aboveground storage capacity of 1,320 gallons or less of fuel, provided no single container has a capacity in excess of 660 gallons.

- Underground facilities having a total storage capacity of less than 42,000 gallons.

Agencies are encouraged to contact their local EPA office for detailed information concerning these regulations.

A. Fuel Spill Prevention Guidelines and Requirements in Environmentally-Sensitive Areas.

➔ Check with the local aviation manager for additional fuel spill prevention guidelines and requirements in place for various geographic locations due to local or national environmental concerns and constraints.

Prior to the start of a project or upon arrival at an incident, the air operations staff should consult with the local Resource Advisor regarding any restrictions that may apply.

Restrictions may include, but are not limited to:

- Locating fueling sites at predetermined locations, occasionally at some distance from the helibase. Since this may have a significant impact on operations, additional planning and helicopters may be required.

- Prohibitions on fuel vehicles traveling on certain roads (usually adjacent to streams and rivers).

- Requirements for containment dikes around fueling pads.

- Proper containment and disposal of fuel samples.

IV. Types Of Fuel.

There are currently two categories of aviation fuel in use: aviation gasoline, commonly called AVGAS, and turbine or jet fuel.

A. Aviation Gasoline (AVGAS).
Aviation gasolines are used in reciprocating engine-powered helicopters. There are currently three grades of aviation gasoline in use:

- 80/87
- 100 Low Lead (100 LL)
- 100/130

B. Turbine (Jet) Fuel.
Aviation turbine fuels are used to power turbofan, turbojet, and turboprop aircraft engines. There are two types of turbine fuel in use:

- A kerosene base (Jet A, Jet A-50, JP-8, and Jet A-1)
- A blend of gasoline and kerosene (Jet B and JP-4)

Most commercial operators use Jet A or Jet A-50. The military normally uses JP-4 and JP-8. The specifications for JP-8 are similar to Jet A except that JP-8 has required additives for anti-icing, corrosion inhibitor, and anti-static.

V. Requirements for and Methods of Identifying Types of Fuel.

A. By Color.
If sample is not the right color, suspend the operation immediately. The following colors are indicative of the type of fuel:

Aviation Gasoline			Turbine Fuel
80/87	100 Octane Low Lead	100/130	(Jet A, Jet A-50, Jet A-1, Jet B, JP-4, and JP-8)
Red	Blue	Green	Clear or straw-colored

WARNING: The Environmental Protection Agency (EPA) and Internal Revenue Service (IRS) have required that certain types of high- and low-sulphur content diesel fuels be colored blue and red, respectively. Aviation grade 100 LL (low lead) and 80/87 fuels also are colored blue and red, respectively.

The color of the dyed diesel fuel will range in color from light green, to blue, to deep violet. The potential exists for a supplier inadvertently to furnish diesel fuel instead of 100 LL. The FAA has issued a Notice To Airmen (NOTAM) and a special alert bulletin to pilots warning of the color conflict. The agencies involved (FAA, EPA, and IRS) have been in discussion to resolve the conflict.

Until this problem is resolved, maintain awareness of the potential for the wrong fuel (high-sulphur content diesel), with a similar blue dye to 100 LL, to be put in reciprocating-engine-powered helicopters.

B. By Markings of Fuel Type and Grade.
In addition to coloring fuels, a marking and coding system has been adopted to identify the various fuel handling facilities, pieces of equipment, containers, inlet-outlet joints, and aircraft fuel filler openings according to the type and grade of fuel they contain.

1. Fuel Servicing Vehicles. Each aircraft fuel servicing vehicle shall be conspicuously and legibly marked with an identification decal to indicate the product contained in the vehicle. The markings shall be on each side and the rear of the fueler tank in letters at least 3" high. Vehicles must be marked as follows:

   - JET A - Combustible
   - JET B - Flammable
   - AVGAS - Flammable

Decal color markings are as follows:

Aviation Gasoline			Turbine Fuel
80/87	100 Octane Low Lead	100/130	(Jet A, Jet A-50, Jet A-1, Jet B, JP-4, and JP-8)
White Letters On A Red Background	White Letters On A Blue Background	White Letters On A Green Background	White Letters On A Black Background

2. Valves and Piping at Permanent Storage Facilities. Valves, loading and unloading connections, switches, and other control equipment shall be color-coded to identify the grade and type of fuel they control. The fuel in piping is identified by name and by painted color bands, or a decal placed around the pipe at intervals along its length.

3. Hose Lines. Hose lines shall be marked by decals or labeled adjacent to the nozzle to indicate the type of fuel dispensed. Reference the API Bulletin footnoted below.

4. Portable Storage Facilities - Containers.

   a. Bulk Collapsible Tanks (Bladders and Rollagons). Large fixed collapsible tanking facilities, as well as their accessory fueling lines and equipment, shall be marked or decal attached in accordance with the requirements for fuelers in Section V.B.1.

   b. 250- and 500-Gallon Collapsible Rollagons. Each end of a rollagon shall be marked in letters at least 4" high with the type and/or grade of fuel in the container.

   c. 55-Gallon Barrels. The top head or sides of a 55-gallon barrel shall be marked in letters no smaller than 3/4" with the type and/or grade of fuel, filling date, vendor, and any other pertinent information.

REMINDER: Agency authorization is required for use of 55-gallon fuel barrels.

d. 5-Gallon and Smaller Containers. All containers shall be marked with the type and/or grade of fuel contained in the container. In many cases the 5-gallon containers are marked by the fuel manufacturer.

CAUTION: Plastic containers are not to be used for into-aircraft fueling since the static electricity charge potential is sufficient to cause a spark.

5. Aircraft. Various FAR's require that aircraft fuel filler openings be marked to show the word "FUEL," the minimum fuel grade or designation for the engine(s), and the tank capacity. In order that these markings retain their effectiveness, they should be kept fresh and clean.

VI. Contamination Testing.

The "Clear and Bright" (Dry) Sampling Test should be utilized be either the vendor or, if government-operated fueling operation, by trained government personnel. This test involves the following steps, in order:

- Collect fuel sample in a clean clear 1-quart glass jar and swirl. Samples are collected from tank and nozzle.
- Check color against the background of the sky. If water is present, free water (water not in solution) will separate and lay in the bottom of the jar.
- Swirl the contents of the jar. Any free water and/or water in solution will cause the color to become cloudy.

IMPORTANT NOTE: If fuel is found or suspected to be contaminated, suspend all operations immediately (including those of other aircraft that may have been fueled from the same source) and contact agency aviation safety representatives.

- If water is detected in the tank sample, sump and continue to test until no more water is detected in sample jar. Do not allow helicopter fueling until the sample is free of contamination.
- If water is detected in the nozzle sample, suspend the operation immediately.
- Particles in the sample can also be visually identified.
- If particles appear in the tank sample, sump tank until sample is clean.
- Do not use fuel if any nozzle sample indicates:
    - Wrong color, not clear or bright
    - Particulates are present

- Water is present

VII. Fueling Hazards.

When service personnel fuel a helicopter, they transfer extremely flammable liquids from a storage or transportation vessel to the fuel tank(s) of a helicopter. Such operations are hazardous if the proper procedures are not followed.

Servicing personnel should follow servicing instructions and use the proper equipment in accordance with established operating procedures.

While fueling aircraft is not unusually hazardous under normal conditions, certain other conditions may increase the hazard. Fueling personnel should be aware of the potential problems caused by fuel vapors in the presence of ignition sources such as static electricity, certain weather conditions, electromagnetic energy, and open flames.

They should also be aware of other conditions that introduce additional sources of ignition and/or increase the likelihood of fuel or fuel vapors escaping.

A. Fuel Vapors.

Fuel vapors create potentially hazardous situations, so fuelers must be sure to follow prescribed procedures.

When fuel is transferred into an aircraft tank, the incoming fuel forces fuel vapors out through tank vents, with an explosive vapor-air mixture formed in the vicinity of the operation. At some point, the escaping fuel vapors will be within explosive limits, depending upon atmospheric conditions and the type of fuel involved.

> WARNING: Because AVGAS has a flash point of about -50° F, sufficient vapors are liberated to produce a flammable vapor-air mixture under almost all conceivable atmospheric conditions. All that is needed to cause a fire or explosion is a source of ignition.

Additionally, because the rate of vapor generation increases as the temperature of the fuel increases, the risk of fire or explosion increases when atmospheric temperatures rise. Because fuel vapors are heavier than air, they will settle to the ground and accumulate in ditches, pits, or other depressions and may travel great distances before coming into contact with an ignition source.

B. Ignition Sources.

In any area in which aircraft are parked or operating, there are numerous ignition sources that may ignite fuel vapors. These sources include static electricity (such as that caused by low-conductivity liquids, refueling vehicles, and clothing), adverse weather conditions (lightning), electromagnetic energy (radar), and open flames.

1. Static Electricity. Static electricity is more difficult to control than any other ignition source. The mechanism responsible for this phenomenon is complex, and there are many variables that may increase and decrease the amount of energy generated.

Static charges may exceed 50,000 volts and may produce sufficient energy to cause an explosion above the liquid surface fuel.

When low-conductivity liquids, such as hydrocarbon fuels, flow through a piping system, they tend to become electrostatically charged. Refueling vehicles have developed measurable electrostatic charges exceeding 50,000 volts during filling operations. This high voltage is partially a result of the insulating effect of the vehicle's rubber tires. To eliminate this insulating effect, the refueling vehicle must be properly bonded to the helicopter during these operations.

During windy conditions, the movement of dust particles and air currents may cause parked helicopter and refueling vehicles to develop larger-than-usual charges of static electricity.

CAUTION: Personnel should exercise caution when there are thunderstorms or electrical storms in the vicinity. The energy generated by these natural phenomena may ignite flammable fuel vapors.

When the atmosphere is unusually dry, certain fabrics are notorious for accumulating a static charge. Therefore, personnel who operate refueling vehicles should avoid wearing materials made of polyester, nylon, rayon, silk, or wool when working in cold, windy weather.

2. Electromagnetic Energy. Transferring fuels is hazardous within 300 feet of the source of electromagnetic energy such as that created when high-powered radar operates. However, portable and mobile radio equipment may be used safely beyond 10 feet from fuel filler openings and/or vents.

3. Open Flames. Open flames should be strictly controlled or prohibited in aviation operations areas or within 50 feet of any aircraft fueling operation. Open-flame devices include:

   - Lighted smoking materials of any type.

NOTE: "No Smoking" signs should be posted at all entrances to fueling areas. At remote sites (off-airport), pennant-type flagging or other barrier should be utilized when a single-use fueling area is established.

   - Exposed-flame heaters whether liquid, solid, or gas-fired devices, including portable and wheeled gasoline or kerosene heaters and open-element electric heaters.
   - Welding and cutting torches and blowtorches.
   - Grinding equipment, either portable or stationary.
   - Flare pots or other open-flame lights.

4. Other Conditions. There are other normal and accepted fueling operations that are hazardous and may require additional safety precautions. Some of these operations are:

   - Defueling an aircraft that requires fuel to be drained into open drums or containers.
   - Defueling an aircraft that requires an auxiliary power unit or the aircraft engine(s) to be operating during the defueling.
   - Servicing an aircraft fuel system that has undergone maintenance but has not been functionally tested before being serviced.
   - Fueling an aircraft or using systems with which servicing personnel are not thoroughly familiar.
   - Performing other potentially hazardous operations, such as maintenance, power plant operation, and energizing the aircraft electrical system, while the aircraft is being fueled/defueled.

VIII. Safety Precautions.

Aircraft batteries, battery chargers, or other electrical equipment should not be connected, disconnected, or operated during fuel servicing. Radios and electronic flash equipment should not be operated with 10 feet of fueling equipment or of the fill or vent points of the aircraft.

A. Grounding Requirements.

The National Fire Protection Association (NFPA) no longer recommends grounding aircraft during refueling operations. Due to the particular difficulty involved in grounding helicopters at off-airport sites, the recommendation of NFPA (not to require grounding) should be followed by participating agencies.

Grounding may still be required procedure at military or civilian airports or by military helicopter crews. Therefore, grounding should be accomplished when required by local regulation.

B. Bonding Requirements and Procedures.

(See Figure 13-1) Bonding involves connecting two or more metallic objects together by means of a conductor that equalizes the electrostatic potential between the objects. Although some fuels being used in aircraft have additives that inhibit static electricity generation, bonding aircraft to the fuel nozzle is required safe practice.

1. Pre-Bonding Inspection. Check condition of the bonding cable and plug. Procurement document language will usually state required bonding equipment condition.

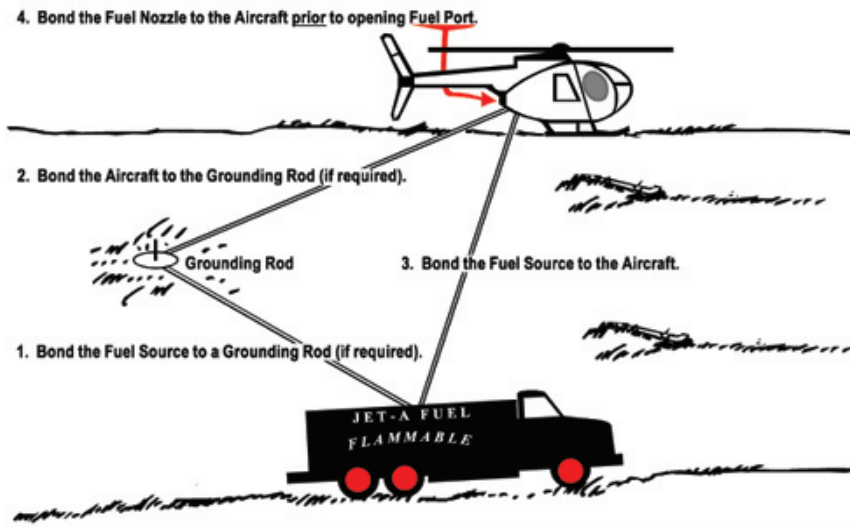
2. Connecting the Bond. Refer to Exhibit 13-1. Bonding must be performed as follows, in order (omit grounding steps if not required):

   - Bond the fuel source to a grounding rod (if available and required).

- Bond the helicopter to the grounding rod (if available and required).
- Bond the fuel source to the helicopter.
- Bond the fuel nozzle to the helicopter prior to opening the fuel port.

3. Disconnecting the Bond. Disconnect the bond in reverse order (omit grounding steps if not required):
   - Disconnect the fuel nozzle bond from the helicopter after closing the fuel port.
   - Disconnect the fuel source bond from the helicopter.
   - Disconnect the helicopter from the grounding rod (if used).
   - Disconnect the fuel source from the grounding rod (if used).

Exhibit 13-1: Correct Bonding Procedure



NOTE: Bonding to grounding rod may not be required.

C. Rapid Refueling.

➔ Hot refueling of helicopters is permitted if requested by the Government.

➔ Review the procurement document for requirements prior to any hot refueling operations.

Government personnel shall not refuel Contract aircraft unless the pilot requests Government assistance due to an emergency situation; or when the Government provides the fuel servicing system and dispensing personnel.

IX. Vendor Fueling Operations.

A. Vendor Responsibility.

Vendors are responsible for maintaining equipment and conducting refueling operations in accordance with the procurement document and, when appropriate and when not in conflict with the procurement document, in accordance with the safety procedures stated in this guide.

B. Government Responsibility.

The government representative (for example, the Helicopter Manager, Helibase Manager) is responsible for ensuring that:

- Vendor equipment meets specifications and is correctly maintained in accordance with the procurement document; and
- Fueling operations are conducted in accordance with the procurement document and, when appropriate and when not in conflict with the procurement document, in accordance with the safety procedures stated in this guide.

C. Government Participation.

The government shall not participate in vendor fueling operations. Personnel shall maintain a distance of at least 50 feet from the fueling site until such time as the operation is completed. A “fire guard” (for example, a Parking Tender with fire extinguisher) may be posted at the edge of this 50-foot safety circle.

D. Vendor Service Truck Requirements and Specifications.

It is essential that the government representative ensures that all fueling operations involving a service truck are conducted in accordance with the procurement document. The following is provided as a guide only. For specific requirements, each individual procurement document must be consulted. Procurement documents usually contain the following requirements.

- An approved service truck is provided with each helicopter.
- The service truck is suitable for and capable of handling the terrain encountered (e.g. mountainous roads).

- The service truck meets the licensing criteria of each individual state in which they travel. This requirement can result in delays in arrival of the service truck if not anticipated in advance.

- For fire, the service truck tank capacity is usually required to be able to sustain 8 hours of flight (14 hours when a two or more Pilot crew is required). For projects, this requirement may be adjusted according to local need.

- The service truck is properly maintained, clean and reliable. Tanks, plumbing, filters, and other required equipment should be free of rust, scale, dirt, and other contaminants. A trailer used for storage and transport of fuel is usually required to have an effective wheel braking system.

- Spare filters, seals, and other components of the service truck filtering system are stored in a clean dry area. (A minimum of one set is usually required.)

- All tanks are securely fastened to the truck bed and has a sump or sediment settling area of adequate capacity to provide uncontaminated fuel to the filter.

- A 10-gallon-per-minute filter and pump is usually the minimum size acceptable. Filter and pump systems sizes should be compatible with the helicopter being serviced.

- The filter manufacturer's Operating, Installation and Service Manual is available with the service truck.

- Gasoline engine driven pumps have a shielded ignition system and a spark arrestor.

- Tanks erected for above-ground storage and tanks mounted on trucks are equipped with a sump drain valve at the lowest point.

- Only hoses designed for dispensing of fuel should be used. Hoses should be kept in good repair.

- The fuel nozzle should include a 100-micron or finer screen, a dust protective device and a bonding clip or plug. Except for Wiggin closed-circuit nozzles, no hold-open devices be permitted.

- An accurate fuel metering device for registering quantities in U.S. gallons of fuel pumped is provided. The meter shall be positioned in full view of the fuel handler while fueling the helicopter.

- The service truck has bonding cables, and, when required, grounding cables.

- Fire extinguisher is mounted in a manner to make it readily available at all times.

- Fire extinguishers should be provided as specified in the procurement document and in accordance with NFPA 10, Standards for Portable Fire Extinguishers.

- Each fuel servicing vehicle should have “NO SMOKING” signs with 3-inch minimum letters visible from both sides and rear of truck.

- Each vehicle be conspicuously and legibly placarded and marked according to the requirements in Section V.B to indicate the nature of the fuel.

- The first and third stage elements of a three-stage system and the elements of a single-stage system should be new and installed by the contract start or during the annual inspection; the separator element (teflon screen) of the three-stage system should be inspected and tested as prescribed by the manufacturer during the inspection; and the filter assembly must be placarded with that data.

- For three-stage filters, the bottom of the filter assembly should be mounted to allow room for at least a quart size jar to be inserted under the drain for draining and pressure flushing of the unit or may be drained overboard clear of the truck wheels and exhaust system; water sight gauge balls be visible.

- Depending on whether the system is a single- or three-stage (coalescer, water separator, monitor) systems, specific pumps and monitor systems are usually specified.

E. Fuel Servicing Vehicle Driver Qualifications:
Fuel servicing vehicle drivers shall comply with Department of Transportation Safety Regulation Part 390-399, and any duty limitations imposed by the helicopter procurement document (contract). Refer to the appropriate procurement document for specific requirements.

X. Government Fueling Operations.

There are situations, especially in Alaska, where the government is responsible for supplying fuel and a government-operated fueling operation must be set up to accommodate refueling needs. There may be other situations where the government, though not responsible for supplying fuel, must do so. An example would be an incident so remote, or where helibases have no road access, that the government is supplying fuel via aerial delivery.

A. General Guidance and Requirements.

- Prior to the start of operations, the manager of the refueling site (for example, Fueling Specialist) may utilize the Remote Fuel Site Reminders List in Appendix I to ensure that operations are set up and are being conducted correctly. Parts of the Reminders List may also be used by Helibase Managers to correctly locate fueling pads and to monitor vendor refueling operations.

- Minimizing ground time of both the helicopter and of the service truck in close proximity to other helicopters in the refueling area or on the helibase is important to minimize exposure and risk.

- Refer to Aviation Fuel Management Handbook for additional information.

B. ➔ Personnel Requirements at a Government-Operated Fueling Site.
The following personnel are required on a government operated fueling site:

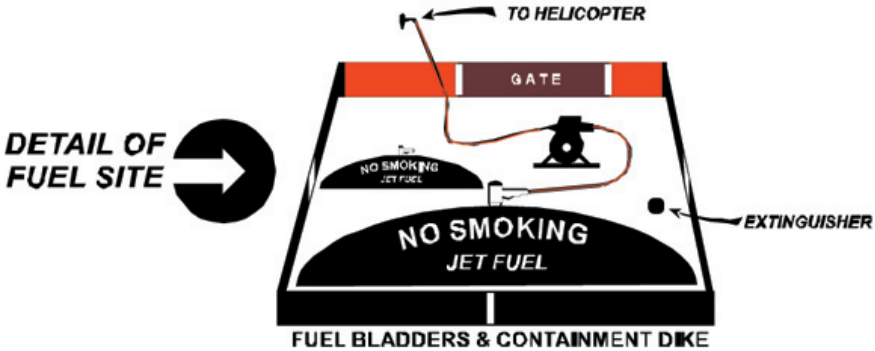
- Two people are required to conduct the actual refueling of the aircraft (one may be the Fueling Specialist). One person operates the fuel nozzle; the other is required to be near the emergency fuel shutoff valve.
- Depending on the size of the operation, the fueling operation may also require the following:
- An Aircraft Base Radio Operator
- A Parking Tender

C. ➔ Personal Protective Equipment.
Government fuelers shall wear protective clothing as required in Chapter 9.

D. ➔ Fueling Site Layout.
Fueling sites should be laid out according to the following general guidelines: (See Aviation Fuel Management Handbook for additional information)

- The fueling site should be separate from the main area of helicopter operations.
- There should be a minimum of 140 ft separation between Type 1 helicopters if the aircraft are parked nose to tail and 200 ft of separation if parked side by side.
- There should be a minimum of 90 feet of separation between aircraft for Type 2 or 3 helicopters.
- The fueling equipment at a fixed fueling site (pump, fuel source) should be at least 25 feet outside the rotor disk of the nearest helicopter.
- The wind direction must be considered when setting up refueling points. Landing and takeoff directions must be selected to provide a direct or quartering head wind.
- Fueling activities generate a considerable amount of vapor. Because the vapor is an explosive hazard, the fueling activity should be situated to allow vapors to be dispersed by the prevailing wind.

Exhibit 13-2: Government Fueling Site Layout



E. ➔ Equipment Required.
Equipment at the typical fueling site consists of the following:

- A fuel source, which may consist of 55-gallon drum(s), three 500-gallon collapsible fuel bladders, permanent or temporary tanks, or a fuel tanker.
- Pump Assembly.
- Filter and separator unit. The filter and the separator must be compatible with the pump assembly.
- Hoses, fittings, valves and nozzles. Enough equipment must be available to support the refueling setup that is envisioned; for example a one-point, two-point, three-point or four point set-up.
- Support equipment. This equipment will include items such as fire extinguishers, grounding rods, waste pans, five gallon containers of water, and absorbent material.
- Fuel sampling kit.
- Fire extinguishers should be located at each refueling nozzle and at the pump and filter assembly.
- A waste fuel pan should be located at each refueling point to wash dirt off the nozzles. The waste fuel pan or barrel is required to limit fuel spillage. Fuel spills should be handled according to the procedures outlined later in this chapter.

F. ➔ Equipment Setup.

1. Distances.

   - As stated, the fueling equipment (pump, fuel source) should be at least 25 feet outside the rotor disk of the nearest helicopter.

   - The fuel source should be downwind of the aircraft exhaust to reduce the explosion hazard.

2. Pump Assembly

   - The pump assembly and filter separator must be properly grounded and checked for leaks before operation.

   - Fittings should be properly sealed and free of cracks.

   - Sandbags should be used to elevate the fittings to facilitate pre-operational checks and detection of fuel leaks.

   - Hose clamps should be checked for proper fit.

   - All shutoff valves should be serviceable and properly in place.

G. Equipment Checks.

These checks should be made for fueling operations conducted by the government. Some, but not all, may be applicable per the procurement document for vendor fueling operations.

1. Aviation Fuel Nozzle Requirements. (See Exhibit 13-3.) If all of these items are not present and in good condition, discontinue the operation until corrected:

   - A non-locking discharge lever

   - A bonding cable with plug

   - A brass or aluminum nozzle

   - A 100-micron screen in nozzle

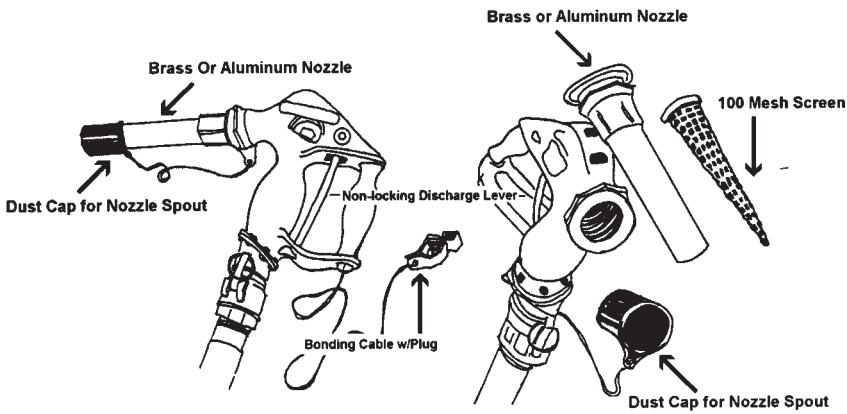
   - A serviceable dust cap for nozzle spout

   - For government-operated fueling operations, it is advantageous if each nozzle has all fittings needed to conduct both closed-circuit and open-port fueling.

WARNING: Static electricity builds up on an aircraft as the aircraft moves through the air. Static electricity also builds up on the refueling equipment when the fuel is pumped through the hoses. The aircraft, fuel nozzle, and pump assembly must be bonded to prevent sparks and explosions. Additionally, static electricity buildup is greater in cold, dry air than in warm, moist air.

- Each nozzle has two ground wires (not a procurement document requirement). One wire has an alligator clip on the end of it; the other wire should have a plug. These wires are used to bond the aircraft to a grounded 5-foot grounding rod (if available; not mandatory). The nozzle can be kept off the ground by hanging it on the grounding rod.

Exhibit 13-3: Fuel Nozzle Requirements



2. Nozzle Spout Screen. Check for cleanliness by:

    - Unscrewing nozzle spout and remove screen
    - Tapping screen and collecting contents (if any) for indication of filter by-pass debris or hose deterioration.

3. Portable Fueling Equipment Pressure Differential Gauge(s). When this gauge is installed, check the pressure difference between the inlet side of filter (high psi) and the outlet side (low psi). Perform the following test:

    - Recirculate fuel through the nozzle into the tank at maximum flow rate and note the difference. Some use two gauges, which requires that the operator perform mathematical calculations. Others use a single gauge, allowing a direct differential reading.
    - ➔ When pressure differentials are at, or exceeding the manufacturer's recommendations, there is cause for concern. It is a very good indication the filter is holding back water and/or particles. The following should be performed:
        - Sample fuel in tank
        - Replace the element
        - Recheck the pressure differential with new element in place.

4. ➔ Flow Rate. Per specification on pump rating, determine flow rate in gallons per minute (GPM):

    - Recirculate fuel through the nozzle and into the tank, and time the GPM.
    - Substantially reduced flow rates from the minimum specified may be a good indication of a restriction in the element caused by particulate or water contamination. The following should be considered:
        - The filter may need to be changed.
        - The pump may not meet specifications.
    - Remove filter element in the single cartridge Velcon or the monitor 3rd stage (inside the Teflon screen) and replace with new element.

CAUTION: When changing elements, do not touch elements with dirty hands or gloves. Use clean gloves. Leave new element in package until the last step of placing element in canister.

- Re-check the GPM flow.

- While recirculating check total system for leaks.

H. ➔ Inspections and Quality Control.

Every possible precaution must be taken to maintain quality assurance for fuel. Items which must be checked and maintained on a daily, weekly, monthly, annual, or as-needed basis are covered in the discussion of Form HCM-3, Aircraft Fuel Facility Inspection Log (in Appendix A). Inspections must be performed on the required basis, unless this is not feasible due to the remote location and infrequent use of a fueling site. In that case, a combination daily, weekly, and monthly inspection shall be performed prior to each use of the fueling site.

1. Daily Inspections. Fuel site and equipment must be visually checked daily for leaks. If found, local procedures for hazardous materials spills should be followed. In addition, check for water or particulate contamination in the fuel source by:

   - Checking the bottom of storage facilities tanks for water, using water draw-off connections (sumps) and a visual test on a water-finding paste (allow the paste to remain in contact with the fuel for 30 seconds). Look for paste to change colors.

   - Checking for and removing any water from fueler tanks. A water check should also be performed after every reloading of the fuel container, washing of equipment, and after a heavy rain or snowstorm. Utilize the “clear and bright” test explained earlier in this chapter.

   - Visually checking for particulates as explained earlier in this chapter.

   - Checking all three-stage and Velcon filter/separator manual water drains for water and other contaminants after each receipt of fuel, as well as on a daily basis. Draw off any accumulation of water.

   - Checking and recording all fueler and fixed filter and filter/separator differential pressures while under full flow conditions. A graph-type log may be used in plotting differential pressure daily. Any sudden change or decrease in pressure differential may indicate a ruptured filter.

   - Visually inspecting fueler and storage facilities, pumps, valves, and pipelines for leaks.

   - Checking and cleaning hose nozzle screens, and if breaks are found, replacing the screens.

   - Inspect all hoses for abrasions, separations, or soft spots. Weak hoses should be replaced.

- Drawing off a sample daily from the downstream side of the filter. Sample should be collected in a clean, clear glass bottle and examined visually. Any visual water, dirt or filter fibers is not acceptable.

- Checking that dust caps are in place.

2. Weekly Inspections. All of the daily inspections, plus:

   - Inspect all fire extinguishers for broken seals, proper pressure, and recharge date. Recharge as necessary.

   - Check fuel flow rate GPM to nearest 1/10 gallon.

3. Monthly Inspections. All of the daily and weekly inspections, plus:

   - Check the condition of bonding and grounding wires, grounding clips, jacks and bonds.

   - Check condition of pumps, motors, and valves.

   - Check fuel source and fueling facilities for general condition, safety and appearance.

4. Annual Inspections. All of the daily, weekly, and monthly inspections, plus:

   - Check electrical continuity with an ohmmeter

I. Record Keeping.

See Appendix A, Form HCM-3, Aircraft Fuel Facility Inspection Log, for required record-keeping. The individual responsible for fueling and/or the fuel source will keep a record containing the following information:

- Condition (clean, clear, bright, etc.) of:

  - Tank sump sample

  - Filter sump sample

  - Nozzle sample

  - Flow rate in gallons per minute to the nearest 1/10 gallon

  - Filter change, reason and date

XI. Fuel Spills.

The information in this section is consistent with National Fire Protection Association (NFPA) Publication 407-90, “Standard For Aircraft Fuel Servicing,” and should be utilized for both Vendor and government fueling operations.

Fuel spills are often the result of improper or careless operation of fueling equipment and lack of preventive maintenance of the fueling equipment. Close attention on the part of every person responsible for fueling is required to prevent fuel spillage. Personnel shall follow the guidelines listed below. See Chapter 12 for crash-rescue and firefighting procedures regarding fuel spills.

CAUTION: All fuel spills, regardless of size, should be considered a fire hazard.

Procedures for handling fuel spills are subject to the regulations and procedures established by the authority having jurisdiction.

WARNING: Report all spills immediately; do not attempt to hide the fact that a spill occurred. There are severe civil and criminal penalties if a spill is not reported promptly.

Each incident is somewhat unique, but certain general principles apply in all cases. Every fuel spill involves several variables:

- Size of the spill
- Terrain on which the spill occurred
- Equipment
- Weather conditions
- Type of fuel and its flammability
- Proximity to aircraft or personnel
- Aircraft accident involved
- Emergency equipment and personnel available.

A. Prevention.
Following good spill prevention practices will significantly reduce the chances of one occurring:

- Devote full attention to the fueling operation.
- Never leave any fuel nozzle unattended.
- Never tie or wedge the nozzle trigger in an open position.
- Frequently check the amount of fuel in the tank to prevent overfilling.
- Pumps, hand- or power-operated, shall be used when aircraft are fueled from drums Pouring or gravity flow shall not be permitted.
- Kinks and short loops in fueling hose should be avoided.

- At remote fueling locations using portable fueling equipment, sandbags should be used to elevate the fittings to facilitate pre-operational checks and detection of fuel leaks.

- At remote fueling locations using portable fueling equipment, construct a berm around the fuel bladder to contain fuel in case of rupture for both temporary and semi-permanent systems.

B. Mitigation Procedures in the Event of a Spill.

If a fuel leak develops or a fuel spill occurs during aircraft servicing, initiate the following emergency procedures without delay:

WARNING: During any spill or leak, extreme caution must be exercised to avoid actions that could provide ignition sources for the fuel vapors. See Chapter 12, Fire Protection And Crash-Rescue, for procedures to follow to avoid ignition of a fuel spill resulting from a crashed aircraft.

- Maintain, keep current, and post a spill contingency plan (the procedures outlined below, with the addition of local, specific material, will suffice).

- Have absorbent material at the helibase or fueling location.

- If the leak continues, or the spill is a large one, all non-essential personnel should leave the area immediately until the hazard is neutralized, repairs are made, and the area is safe.

- Alert the airport fire crews or follow established emergency procedures applicable to a remote fueling operation, as outlined below.

- Stop the flow of fuel and the fueling operation immediately upon discovering leakage or spillage:

    - If fuel is leaking or spilling from a fuel servicing hose or equipment, the emergency fuel shutoff valve must be actuated immediately.

    - If the fuel is leaking or spilling from the helicopter at the filler opening, vent line, or tank seam, fuel delivery must be stopped immediately.

- If the spill occurs during open port (“hot) refueling operations, the Pilot will make the decision on moving or keeping the helicopter in place. If the latter, then all electrical power must be shut down and the helicopter evacuated.

- Before the helicopter is put back into service, it must be thoroughly checked for damage and for flammable vapors that may have entered fuselage areas.

- Small spills involving an area less than 18” in any plane dimension normally involve minor danger. However, personnel manning fire extinguishers during start-up

procedures should stand by until the helicopter departs the area of the spill because engine exhaust could ignite the spill. These spills contain such a small amount of fuel that they may be absorbed, picked up, and placed in an approved container.

NOTE: New products to absorb fuel spills are available that will reduce or eliminate the need for hazardous material containers. These new products should be considered for most fuel spills.

- A fire guard should be posted for other small or medium static spills - not over 10 feet in any dimension nor over 50 square feet in area. The fire guard should have one or more fire extinguishers with at least a 20 B rating. Local regulations and procedures must be followed, but in most cases absorbent materials or emulsion compounds should be used to absorb the spilled fuel, especially if aviation gasoline (AvGas) or low flash point fuels are involved. The contaminated absorbent should be picked up and placed in an approved container to await disposal.

- Large spills - over 10 feet in any dimension or over 50 square feet in area - or smaller spills continuing to enlarge (non-static) should be handled by the fire department, or if in a remote location, by a ground engine. Anyone in the area of a large spill should move upwind of the spill at once.

NOTE: Aircraft fuels will damage some types of ramp surfaces. Spilled fuel should be picked up as quickly as possible if operating from a hard-surfaced ramp.

- All fuel spills occurring as a result of a aircraft crash or ground collision should be blanketed with foam, if available, to prevent ignition, and to prevent further damage to the equipment. See Chapter 12 for further information.

CAUTION: Wildland fire foams are not adequate suppressants for fuel spills. Foams must be approved for hydrocarbon fuels.

C. Fuel Spillage on Personnel.

If the fuel handler's clothing becomes soaked with fuel, the individual should:

- Avoid ignition sources;

- Leave the fueling area immediately.

- The act of removing clothing creates static electricity. Wet the clothes with water before removing. If water is not available, the person should be grounded to prevent sparks when they remove their clothes.

- Wash fuel off skin with soap and water as soon as possible.

- Seek medical attention.

WARNING: Entering a warm room wearing fuel-soaked clothing can be dangerous. Chances of a fire starting because of static electricity are increased.