U.S. Department of
Homeland Security

United States
Coast Guard

AVIATION FUEL HANDLING PROCEDURES PROCESS GUIDE

CGTO PG-85-00-170-A

This CGTO PG-85-00-170-A dated 19 January 2012 supersedes CGTO PG-85-00-170 dated 26 April 2010. Destroy all previous editions.

19 January 2012

U.S. Department of Homeland Security
United States Coast Guard

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MEMORANDUM

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Reply to Attn of: CWO McDermott
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To: CGTO PG-85-00-170 Users

Subj: AVIATION FUEL HANDLING PROCEDURES PROCESS GUIDE, CGTO PG-85-00-170-A

1. PURPOSE. This memorandum promulgates the Aviation Fuel Handling Procedures Process Guide, CGTO PG-85-00-170-A, Enclosure (1).

2. ACTION. All Coast Guard personnel and contractors who support the aviation enterprise are required to adhere to the guidelines set forth in the enclosed process guide.

3. DIRECTIVES AFFECTED. This process guide supersedes CGTO PG-85-00-170 dated 26 April 2010.

4. DISCUSSION. This process guide ensures procedural consistency for the handling of aviation fuel for use in Coast Guard aircraft by establishing specific guidelines and procedures that shall be followed.

5. CHANGES. Recommendations for changes and improvements to the Aviation Fuel Handling Procedures Process Guide will be submitted via the chain of command to ALC Engineering Services Division (ESD), using the Technical Manual Application System (TMAPS) Deficiency Report (CG-22).

6. ENVIRONMENTAL ASPECTS AND IMPACT CONSIDERATIONS. Environmental considerations were examined in the development of this instruction and have been determined to be applicable.

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Enclosure: (1) CGTO PG-85-00-170-A

HIGHLIGHTS		
CG-22 No.	Location	Description
501002989	Various chapters	Grammatical changes
501003335	Chapter 3.A.2	Minimum Fuel Farm Size Requirements
501003624	Chapters 2.D.2, 6.B.7, 6.B.8, and 6.C.2	Correct free water limit in Process Guide
501003741	Chapter 3.K	Changes to Fuel Receipt Process, Chapter 3

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CHAPTER 1. INTRODUCTION

A. PURPOSE OF DOCUMENT

1. This document establishes minimum quality and surveillance standards, testing requirements, safety precautions, and handling procedures for the acceptance, storage, dispensing, and testing of aircraft fuels. In addition, this document provides information on the nature of electrical hazards and describes how to minimize electrical problems associated with servicing operations.
2. The objective of this document is the promotion of safe and efficient aircraft fueling operations. Only by fully understanding the safety and procedural issues surrounding fuel handling operations, can the Coast Guard minimize the probability of injury, property damage, and nonconformance of State and Federal solid waste regulations (COMDTINST M16478.1 (series) and CGTO PG-85-00-110) associated with aircraft ground servicing operations and related ground support functions.

NOTE

There are WARNING and CAUTION statements throughout this process guide. Review any WARNINGS or CAUTIONS before starting any task.

NOTE

For the purpose of this process guide, nautical miles will be used as a reference for distance.

B. SCOPE OF DOCUMENT This process guide applies to all Coast Guard aircraft ground servicing operations at land-based fueling facilities. Coast Guard fueling personnel shall exercise caution when refueling any non-Coast Guard aircraft. The standards and procedures in this process guide have been developed with Coast Guard aircraft in mind. Nozzle pressures, refueling procedures, and grounding procedures for non-Coast Guard aircraft might differ substantially from those contained in these pages. Fueling supervisors must remain vigilant at times when refueling any non-Coast Guard aircraft.

C. AUTHORITY TO CHANGE All waivers to this process guide will be made via Coast Guard HQ Aeronautical Engineering, Commandant (CG-41).

D. REFERENCE DOCUMENTS The following documents were used in preparing this process guide.

1. Coast Guard

- USCG Aviation Fuel Handling Procedures Manual, COMDTINST M13001.1 (series)
- Aeronautical Engineering Maintenance Management Process Guide, CGTO PG-85-00-110
- Storage Tank Management Manual, COMDTINST M5090.9 (series)
- Coast Guard Asset Computerized Maintenance System, MPC 153301.0
- Coast Guard Motor Vehicle Manual, COMDTINST M11240.9 (series)
- Coast Guard Hazardous Waste Management Manual, COMDTINST 16478.1 (series)
- Aeronautical Engineering Maintenance Management Manual, COMDTINST M13020.1 (series)
- Coast Guard Air Operations Manual, M3710.1 (series)

2. Department of Defense (DoD)

- Naval Air Systems Command, Aircraft Refueling NATOPS Manual, NAVAIR 00-80T-109 (series)
- Naval Air Systems Command, Aircraft Refueling Handbook, MIL-HDBK-844 (AS) (series)
- Department of the Air Force, Ground Servicing of Aircraft and Static Grounding/Bonding, AFTO 00-25-172 (series)

- Department of the Air Force, Quality Control of Fuels and Lubricants, AFTO 42B-1-1 (series)
- Department of the Air Force, Management of Recoverable and Waste Liquid Petroleum Products, AFTO 42B-1-23 (series)
- Department of the Air Force, Use of Dye in Turbine Fuels to Detect Fuel System Leaks (JP-4, JP-5 and JP-8), AFTO 42B-1-1-10 (series)
- Department of the Air Force, General Operation and Inspection of Installed Fuel Storage and Dispensing System, AFTO 37-1-1 (series)

3. MIL-Standards

- Into-Plane Servicing of Fuels at Commercial Airports, MIL-STD-1548 (series)
- Military Standard Identification Methods for Bulk Petroleum Products Systems Including Hydrocarbon Missile Fuels, MIL-STD-161 (series)
- DoD Standard Practice, Quality Surveillance for Fuels, Lubes, and Related Products, MIL-STD-3004 (series)
- Petroleum Fuel Facilities, MIL-HDBK-1022 (series)
- Aircraft Refueling Handbook for Navy, Marine Corps Aircraft, MIL-HDBK-844A (AS)
- General Specification for Marking Materiels, MIL-43719/4
- Identification Methods for Bulk Petroleum Products Systems, MIL-STD-161
- Turbine Fuel, Aviation Grades, JP-4/JP-5, MIL-DTL-5624 (series)
- Turbine Fuel, Aviation Grade JP-8, MIL-DTL-83133 (series)

4. FAA

- Aircraft Fuel Storage, Handling and Dispensing on Airports, FAA Advisory Circular #150/5230-4, 27 August 1982

5. Industry Documents

- Air Transport Association of America, Standards for Jet Fuel Quality Control at Airports, ATA Specification 103 (series)
- National Fire Protection Association, Standard for Aircraft Fuel Servicing (NFPA 407)
- Sheeting for Retroreflective Traffic Control, ASTM D 4956
- Manual Sampling of Petroleum Products, ASTM D 4057
- American Petroleum Institute (API) documents 650, 653, 1529, 1542, and 1581
- Standard Guide for Use of the Petroleum Measurement Tables, ASTM D 1250

CHAPTER 2. AIRCRAFT FUEL

A. **INTRODUCTION** Fire or explosion hazards are always present in locations where fuels are handled. Safe fuel service depends on keeping fuels in controlled areas, avoiding spills, and keeping all ignition sources 50 ft away from designated servicing areas and tank farms (NFPA 407, 5.8.2).

CAUTION

ADEQUATE SURVEILLANCE OF ALL TYPES OF AIRCRAFT FUEL IS NECESSARY. OTHERWISE, CONTAMINATION IS ALMOST CERTAIN TO RESULT.

B. **DISCUSSION** Most aircraft turbine engines use a variety of grades of aviation turbine fuels. The primary difference between the grades of turbine fuels is the volatility. Paragraph 2.C. describes the six grades of fuel currently authorized for use in Coast Guard aircraft. No other grades of fuel can be routinely used by Coast Guard aircraft without prior approval from Commandant (CG-41).

C. **TYPES OF FUEL** See Table 2-1 for a comparison of the qualities of authorized Coast Guard aviation fuel:

NOTE

Aviation fuels represented in the table below are approximate values before additives are blended. Refer to the distributor's shipping manifest for values after blending and shipment.

Table 2-1. Coast Guard Aviation Fuel Comparison Table

Type of Fuel	Flashpoint	Freezing Point	NATO Code	MIL-Spec No.	Density (API Gravity)
JP-4	Below 0 °F	-72 °F	F-40	MIL-DTL-5624	36-48
JP-5	140 °F	-51 °F	F-44	MIL-DTL-5624	45-57
JP-8	100 °F (min)	-53 °F	F-34	MIL-DTL-83133	37-51
JET A	100 °F	-40 °F	F-34	ASTM D 1655	37-51
JET A-1	100 °F	-53 °F	F-35	ASTM D 1655	37-51
JET B	0 °F	-72 °F	N/A	ASTM D 1655	45-56

1. JP-4 JP-4 is a blend of gasoline and kerosene with a flashpoint of 0 °F and a freezing point of -72 °F. It is procured under Military Specification MIL-DTL-5624. It is an alternative fuel to JP-5 for turbine engine powered aircraft and is used only at shore stations. Shipboard use is prohibited. Because of its higher volatility, JP-4 is more dangerous to handle than JP-5. The fuel vapors in the space above JP-4 fuel in the tank normally occur in the explosive mixture range and can be ignited by static electricity. In addition, JP-4 fires spread rapidly and are much more difficult to extinguish than JP-5 fires. The NATO code for JP-4 is F-40.

WARNING

AVIATION TURBINE FUELS (JP-4/JET A/JET B) CARRY A HEALTH HAZARD FOR DETECTABLE AMOUNTS OF CHEMICALS LIKE BENZINE, WHICH ARE KNOWN TO CAUSE CANCER, BIRTH DEFECTS, AND OTHER REPRODUCTIVE HARM.

CAUTION

IF ADEQUATE SURVEILLANCE OF ANY TYPE FUEL IS NOT PRACTICED, CONTAMINATION IS ALMOST CERTAIN TO RESULT. KEEP FUEL JP-5 AWAY FROM ALL SOURCES OF IGNITION AND OXIDIZERS. AVOID EYE OR SKIN CONTACT. AVOID INHALATION AND INGESTION. WASH THOROUGHLY AFTER HANDLING.

2. JP-5 JP-5 is a kerosene fuel with a high flashpoint of 140 °F and a freezing point of -51 °F. It can also be procured under Military Specification MIL-DTL-5624. The higher flashpoint provides an increased level of safety in shipboard and shore station handling. It is the only aviation fuel authorized for use aboard cutters. It is also used extensively at shore stations. In contrast to JP- 4, contamination removal from JP-5 is more difficult because of its higher viscosity and density. The NATO code for JP-5 is F-44.

3. JP-8 JP-8, procured under Military Specification MIL-T-83I33 (series), is a kerosene fuel similar to commercial jet fuel, ASTM Jet A-1, except that JP-8 contains fuel system icing inhibitor as well as other fuel additives. It is similar to JP-5 with respect to most fuel properties except the flashpoint, which is only 100 °F (min). Since the flashpoint of JP-8 is much lower than that of JP-5, it cannot be used for shipboard operations or at ALC. DoD is currently in the process of converting shore-based operations to JP-8 fuel in order to take advantage of its similarity to commercial aviation turbine fuel and improved safety (lower volatility). If the Coast Guard follows DoD, JP-8 may become the standard Coast Guard shore aviation fuel in the near future. JP-8-100 is not authorized for use in Coast Guard aircraft. The NATO code for JP-8 is F-34.

4. Jet A Jet A is a commercial grade of fuel that meets the specifications of ASTM D 1655. It is very similar to JP-5, except that it has a lower flashpoint of approximately 100 °F compared to the 140 °F flashpoint for JP-5. Jet A can be used as a replacement when JP-5 is not readily available.

5. Jet A-1 Jet A-1 is a commercial grade of fuel that meets the requirements of ASTM D 1655. It is very similar to JP-8 and has the same flashpoint and freezing point. Its NATO code is F-35. Jet A-1 can be used as a replacement when JP-8 is not readily available.

6. Jet B Jet B is a commercial grade of fuel that meets the requirements of ASTM D 1655. It is very similar to JP-4 and has the same flashpoint and freezing point. Jet B can be used as a replacement when JP-4 is not readily available. It does not have a NATO code number.

7. Turbine Fuel Additives Jet A, Jet A-1, and Jet B are essentially the same fuel as their military counterparts except for small, but significant differences, in volatility and fuel additives. All three military fuels contain the following additives not normally contained in commercial fuel:

   a. Fuel System Icing Inhibitor (FSII)

   b. Lubricity Additive (corrosion inhibitor)

   c. Antioxidants (storage stability additives)

   d. Static Dissipater Additive (SDA) (JP-4 and JP-8 only)

   Some SDA additives can break down filter elements. Consequently, they are not added to JP-5. JP-5 fuel handling systems should have a static charge relaxation chamber at appropriate points in order to eliminate static charges.

D. TYPES OF CONTAMINATION Aircraft engine failure or poor performance can be caused by fuel contamination or by using an improper fuel. There are four major classifications of contaminants commonly encountered in aviation fuels: particulates, water, microbes, and surfactants. The most serious situation occurs when there are multiple contaminants.

Paragraphs D.1. through D.5. describe each type of contaminant, its effect, and how it may interact with other materiels to compound problems of contamination control.

1. Particulates

a. Particulates are solid contaminants that will not dissolve in fuel. Most common are iron, rust, scale, sand, and dirt. Other examples are metal particles, lint, particles of filter media, gums, resins, and rubber. The consequences of particulate contamination in aviation fuels may be severe if the materiel is allowed to reach the aircraft. For example, if fuel filters become plugged, the flow of fuel to the engine is interrupted, resulting in engine failure.

b. One method of removing particulates is to provide a minimum of 2 hours for solids to settle before the fuel is withdrawn from the storage tanks. A better method is to recirculate the fuel through filters/separators. The maximum acceptable level of particulate contamination is 2 mg/l. Particulate contamination can be held well below a level of 1 milligram per liter (mg/l) in a properly functioning fuel distribution system. If contamination exceeds 1 mg/l, corrective action should be taken to improve fuel quality. See Paragraph 6.B.7. for contamination limits.

2. Water Water is a common contaminant of aviation fuel and exists in three forms: dissolved, entrained, and free water (either liquid or frozen). Of these three, free water is the only form that can be drawn off or separated from the fuel. Dissolved or entrained water can, however, be reduced to free water and then drawn off or separated. The limit for water in aircraft turbine fuel is 10 ppm.

a. Dissolved Water Dissolved water is essentially humidity in fuel. Like humidity in the atmosphere, it evaporates and condenses as a function of temperature. All aviation fuels have varying amounts of dissolved water depending upon the fuel composition and temperature. For example, at 60 °F petroleum based fuels will dissolve 60 parts per million (ppm) while at 30 °F the same fuel will dissolve only 30 ppm. Lowering fuel temperatures will cause dissolved water to condense into water droplets and fall out of solution as entrained water. Except for changing to the free state upon temperature drop, dissolved water does not pose a problem to aircraft and currently cannot be removed by practical means.

b. Entrained Water Entrained water is water suspended in tiny droplets in the fuel. Individual droplets may or may not be visible to the naked eye, but they can give the fuel a cloudy or hazy appearance depending upon their size and number. Entrained water usually results from violent agitation between a water slug and fuel. It usually will settle out in time depending upon the droplet size, specific gravity, viscosity of the fuel, and currents within the tank. A water haze may often be found in turbine fuels.

WARNING

FREE WATER IN THE FORM OF WATER SLUGS, VISIBLE WATER DROPLETS, OR HAZY ENTRAINED WATER CANNOT BE TOLERATED IN A FUEL HANDLING SYSTEM AND SHOULD NEVER BE DELIVERED INTO AN AIRCRAFT.

NOTE

Free water will settle out in fuel if not disturbed or agitated.

c. Free Water

(1) Free water is water completely free of fuel and may be fresh or saline. It can be accumulated by the settling of condensed moisture from the atmosphere, by the infiltration of water through fill lines, vents, or tank connections, or by the delivery of fuel containing water.

(2) Large slugs of free water can cause an engine flameout. Ice from slugs and entrained water can severely restrict fuel flow by plugging aircraft fuel filters and other mechanisms. An adverse side effect of accumulations of undrainable water in any storage tank is the growth of microbes and a reduction of the level of the Fuel System Icing Inhibitor (FSII).

3. Microbes

a. Microbes are microscopic growths found in soil, air, water, and fuel oil. They derive their nutrients from hydrocarbons in the fuel and add their metabolic waste products to the aqueous layer. There is considerable evidence that microbes can survive even in the absence of water. In a fuel storage tank, microbes may propagate at a very high rate.

b. Microbes usually appear as a brown slime that adheres to the inner surface of a fuel tank. Both the organisms and their products tend to collect at fuel/water interfaces resulting in mats, slimes, and sludge. If the interface happens to be maintained on or within a filter element, rapid plugging may occur. In addition, this may result in microbes getting through the filter and contaminating fuel downstream of the filter. Filter plugging may also result from the breakup of upstream fungal mats. In some cases, the organisms and their byproducts have softened or destroyed the top coatings of integral fuel tanks and subsequently caused severe corrosion.

c. Because microbes thrive in water, a simple and effective method to prevent or retard their growth is to eliminate the water. The presence of slime, sludge, or fungus in fuel being delivered to an aircraft is a reliable indication of the presence of free water and the failure of fuel cleanup equipment.

NOTE

FSII contains microbial growth inhibitors which are closely monitored.

4. Surfactants

a. The term "surfactants" is a contraction of "Surface Active Agents." These soap or detergent-like materiels occur naturally in fuel. They may also be introduced in the refining processes by the inclusion of additives into the fuel, or they may be washed off the internal surfaces of containers previously holding other products. Surfactants are usually more soluble in water than in fuel and reduce the interfacial tension between water and fuel; this stabilizes suspended water droplets and contaminants in the fuel. Surfactants adhere to filters/separators and reduce their effectiveness. They also adhere to metal surfaces until surfactant-rich water droplets are formed. The droplets run down the sides of fuel tanks and form puddles in the bottom or in the sumps. Surfactants in large concentrations usually appear as a tan to dark brown liquid with a sudsy-like water/fuel interface.

b. Surfactants alone are not a great threat to aircraft. However, because of their ability to suspend water and dirt in fuel and damage filter/separators, they are one of the major contaminants in aviation fuels.

5. Miscellaneous Contaminants

a. Miscellaneous contaminants include both soluble and insoluble materiels. Fuel can be contaminated by mixing different MIL-SPEC grades of fuel, improper mixing of additives, or by the introduction of foreign materiels. When contamination occurs, engine performance can be affected. For example, there can be a reduction in flashpoint due to contamination with other fuels that have a lower flashpoint. There can also be a reduction of FSII effectiveness due to contamination with water. These contaminants are not naturally found in fuel and are usually introduced as a result of human error.

E. **PREVENTING CONTAMINATION** Contamination of aircraft fuel can only be prevented by the use of proper equipment and by following proper operating procedures. Mixing different types of fuels or delivering the wrong fuel can be avoided if personnel follow the correct procedures. Coast Guard Air Stations maintain various types of aviation fuel. For example, JP-5, JP-8, and Jet A-1 are utilized depending on location. Completely separate handling facilities and equipment for each grade and type of fuel are required to prevent cross contamination.

CHAPTER 3. BULK FUEL STORAGE FACILITIES

A. COMMAND REQUIREMENTS Commanding Officers shall:

1. Ensure a functional Spill Prevention Control and Countermeasure (SPCC) is in place. See Paragraph 10.C.

2. Plan for reserves to accommodate surge operations, possible evacuation in the event of a natural disaster, or other special circumstances. At a minimum, air station fuel farms shall be designed and built to store fuel to support normal unit operation mission requirements, based on number of aircraft and type, for a 7-day period.

B. FUEL FARMS

1. All Coast Guard Air Station “fuel farms” shall be constructed in accordance with applicable federal, state, and local regulations and in a manner that will prevent damage to the environment due to accidental discharge. All fuel farms shall use "Ready Issue" fuel handling systems to contain and process fuel prior to fueling aircraft. (Air Stations that do not have a fixed fuel farm are exempt.) System requirements include:

   - Storage tanks with sloping bottoms, floating suction, and continuous recirculation through a filter/separator that removes both water and particulates.

   - Additional filter/separators to further clean and dry the fuel as it is loaded onto trucks at fill stands or as it enters and/or exits hydrant systems (MIL-HDBK-1022).

   - Fuel differential pressure gauges (fuel quality monitor gauges) show filter clogging if excessive water or particulates are in the fuel. Fuel differential pressure gauges are normally installed in conjunction with filter/separators at truck fill stands, on trucks and hydrant hose carts, and at direct refueling stations.

2. Proper care and operation of these systems will help ensure that only clean, dry fuel enters an aircraft. Stripping tanks and trucks daily will help eliminate the water buildup.

3. Air Stations without a fuel farm should ensure that the supplier handles fuel in the same manner. Requirements include:

   - Supplier trucks with safety seals on the hatches; otherwise, the fuel will not be accepted.

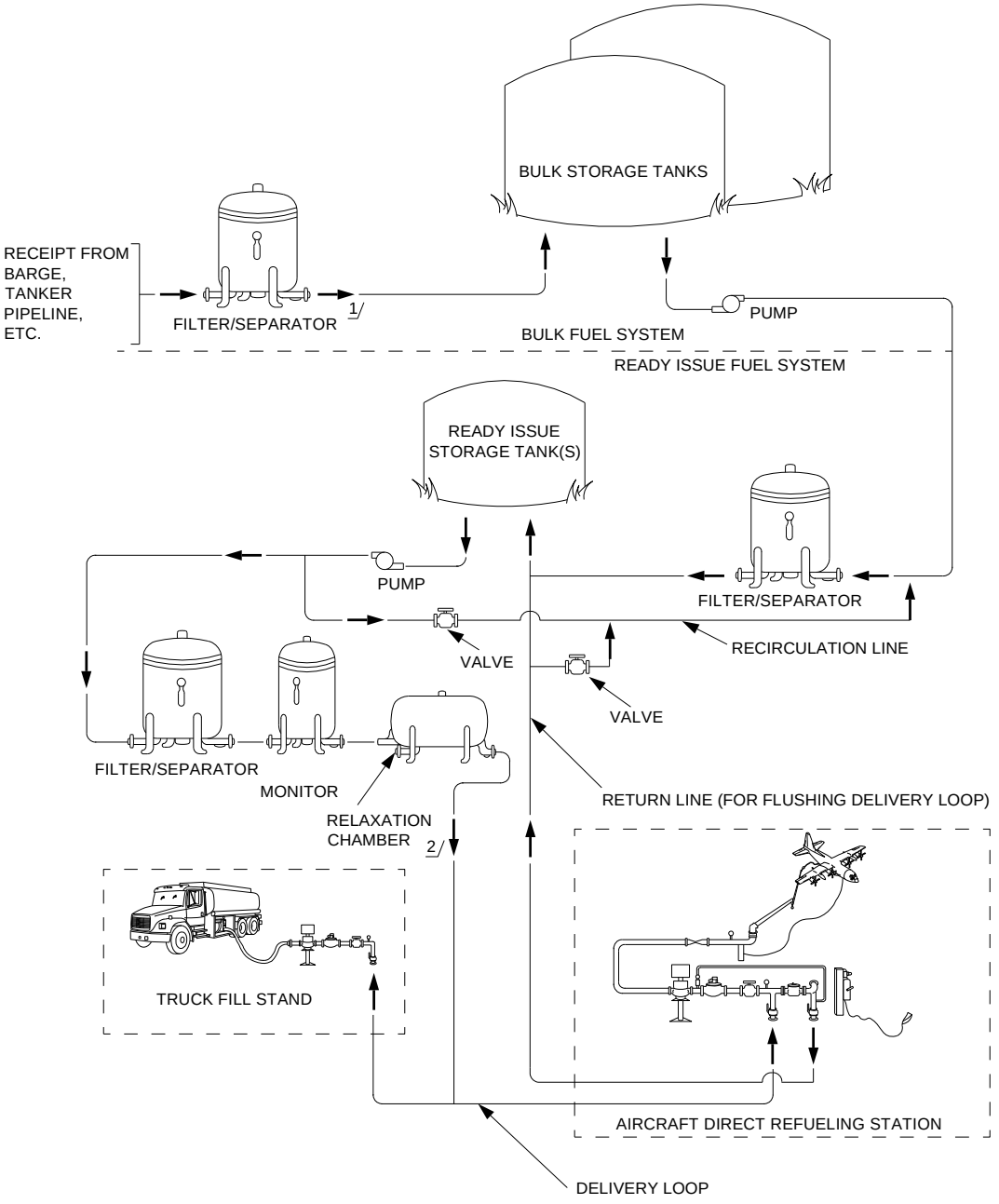
   - Routine observation and recording of pressure drops across filter separators and monitors to detect failures or problems.

   - Clear and bright test upon delivery.

   - Prevention of particulate matter (i.e., foreign materiel) into the fuel. All openings and connections, including refueling nozzles, must have dust-tight caps or covers that remain in place at all times when not in use.

NOTE

Galvanized materiels must not be used in aircraft fuel service. No copper alloys, cadmium plating, or plastic materiels are permitted for main fuel piping. The use of copper or copper alloys for other components shall be minimized.



NOTES: 1/ PRE-TREATMENT FILTRATION SYSTEM DEPENDENT ON METHOD OF RECEIPT; E.G., STRAINERS, CYCLONIC FILTERS, ETC.
2/ DOWNSTREAM PIPING IS ACCEPTABLE SUBSTITUTE PROVIDED 30 SECONDS OF RELAXATION TIME ACHIEVED.

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Figure 3-1. Sample Fuel Farm

C. STORAGE TANKS

NOTE

Storage tanks are classified as either Underground Storage Tanks (UST) or Above Ground Storage Tanks (AST). For clarification and management, refer to COMDTINST M5090.9.

1. Each grade of fuel shall be received, stored, and issued in a segregated system. Systems and components used for receiving, storing, and refueling aircraft may be commercial or military systems that are designed specifically for aviation fuel use in accordance with API 650/653.
2. Most Coast Guard Air Stations have either bulk storage/truck or bulk storage/pit refueling. For Coast Guard purposes, service tanks (day tanks) and refueler tanks can be considered to have the same function.
3. All storage tanks shall include the following equipment:
   - Floating suction with means of verifying proper operation
   - Inlet diffuser
   - Gauge hatch with slotted tube
   - Overheat shutoff and alarm
   - Emergency shutoff device
   - Low level devices
   - Temperature and inches gauges
   - Filtering device for fumes
   - Access manhole (two are preferred)
   - Automatic high liquid level shutoff devices to prevent tank overfill
4. Above ground vertical tanks shall also include the following equipment, in addition to the above:
   - Fixed roof (optional)
   - Light color epoxy coated floor and sides up to the top of the first wall panel
   - Internal coatings
   - Cone down bottom to positive center sump with drain
5. Above ground horizontal tanks shall also include the following, in addition to the above requirements, for all storage tanks:
   - Carbon steel tanks with complete internal light colored epoxy coating
   - Sloped bottom to positive sump with drains
   - Nonmetallic tanks not acceptable
   - Access manholes equipped with an internal ladder
6. Underground tanks shall also include the following in addition to the requirements for all tanks:
   - Double walled construction
   - Nonmetallic tanks not acceptable
   - Alarm/detection system in the bottom of the space between the tanks
   - Active cathodic protection system
   - Carbon steel tanks with complete internal light colored epoxy coating

- Access manholes equipped with an internal ladder
- Manholes and other tank appendages extended above ground
- Sloped bottom to positive sump with drains

7. Unless otherwise noted in this process guide, all Coast Guard aviation fuel tanks shall be constructed, maintained, and operated in accordance with Storage Tank Management Manual, COMDTINST M5090.9.

D. **TRUCK TANKS** Every month take a fuel sample on storage tanks in accordance with Chapter 6. Inspect and clean storage tanks whenever tank samples show a continuous solids buildup or when filtration elements on the downstream side of tanks show evidence of premature plugging from excessive solids. If there is no buildup or plugging, storage tanks should be inspected and cleaned as follows.

1. Every 6 years for coated steel tanks and tanks constructed of materiels resistant to corrosion without inlet filter separator or micronic filter
2. Every 8 years for coated steel tanks and tanks constructed of materiels resistant to corrosion with inlet filter separator or micronic filter

E. **PIPING**

1. Requirements for piping casings, ducts, and chases depend on whether the piping is above ground, within a building, or above ground next to a building. All piping shall be marked in accordance with MIL-STD-161 (series).
2. Piping above ground requirements include:
   - Stainless steel or aluminum/steel if downstream from filter separators
   - Suitably cased or installed in a duct or chase unless otherwise approved
   - Construction of piping ducts or chases so that a piping failure does not result in fuel liquid or vapor entering a building
   - Drains on all pipe casings, ducts, and chases
   - Underground piping shall be used in areas of aircraft and vehicle movement unless the piping is protected by a substantial barrier guard and anchored to protect against physical damage
   - Isolation valves on the suction and discharge piping of each pump
   - Check valve at the base of each fuel piping riser to automatically prevent the reverse flow of the fuel into the pump room in the event of pump seal failure, pipe failure, or other malfunction
3. Piping within building requirements:
   - Location within a steel casing of a pressure rating equal to that of the carrier pipe
   - Casing extension beyond the building and terminating at a low point with an automatic leak detection system
   - Casing must drain into a safe location
4. Piping above ground and exterior to buildings requirements:
   - Located within a steel casing
   - Pressure rating of the casing equal to that of the carrier pipe
   - Casing must drain into a safe location
   - Automatic leak detection system at the piping system's low point(s)

F. **THIEF PUMPS** Underground storage tanks will have thief pumps taking suction at the tank low point for water draw off. Above ground tanks will have water draw-off valves at the tank's low point.

G. **FLOATING SUCTION HEADS** Floating suction heads are preferred over bottom suction standpipes for fuel storage tanks. All new fuel tank installations shall have floating suction heads installed.

H. **VENTS** Storage tank vents should be of the pressure/vacuum relief type or equivalent. Filter screens should be kept clean and rust free.

I. **PUMPS/MOTORS**

1. Requirements for pumps depend on whether the pump is located outside or within a building.
2. For pumps installed outside a building:
   - Location at ground level or below ground level
   - No relay pumping permitted
   - Location not less than 5 ft from any building opening
   - Substantially anchored and protected against physical damage from collision
3. For pumps installed within a building:
   - Location in a separate room with no opening into other portions of the building
   - Adequate ventilation of the pump room and containment walls
4. All electrical equipment (including motors) and wiring shall comply with NFPA 70, National Electrical Code (NEC), Article 515, using Class I liquids for all applications. All electrical equipment for dispensing fuel to aircraft shall have a backup or emergency power source in case of a power failure.

J. **BYPASSING FILTERS**

1. Units shall not bypass filters by switching to the standby filter whenever the differential pressure across the filter exceeds 15 pounds per square inch.
2. Incoming fuel may be received into a storage tank without passing through the service filter, provided the fuel received is isolated into a single tank and recirculated through the service filter prior to declaring it ready for issue. Units can only bypass the incoming service filters in urgent or emergency situations. Under no circumstances shall fuel be taken on directly into a service or day tank in this manner. The Aviation Engineer Officer, or designated representative, shall be notified of all instances of receipt of unfiltered fuel.
3. Units shall not dispense fuel into an aircraft, refueler truck, or hydrant without passing through the service filter at the fuel farm and/or on the refueler truck.

K. **RECEIPT OF FUEL**

WARNING

A TRUCK WITH BROKEN INSPECTION SEALS SHALL NOT BE OFFLOADED AND WILL BE REJECTED. FAILURE TO IDENTIFY AND REJECT CONTAMINATED FUEL CAN NEGATIVELY AFFECT SAFETY OF FLIGHT. IF THE QUALITY AND CLEANLINESS OF THE PRODUCT BEING RECEIVED IS QUESTIONABLE, A SPECIAL SAMPLE SHALL BE TAKEN, AND A COMPLETE SET OF FUEL SPECIFICATION TESTS SHALL BE PERFORMED BEFORE THE FUEL IS RELEASED FOR AIRCRAFT USE.

WARNING

THE ACCEPTANCE OF A SUPPLY OF FUEL FROM A TANK TRUCK, PIPELINE, OR BARGE IS A TWO-PERSON OPERATION. IF THE DELIVERY TRUCK DRIVER OR COMMERCIAL SOURCE OPERATOR IS UTILIZED AS THE SECOND PERSON, A SITE SPECIFIC EMERGENCY BRIEF SHALL BE GIVEN TO FAMILIARIZE THE DRIVER/OPERATOR PRIOR TO THE OFFLOAD PROCEDURE.

NOTE

If the product is not procured via Defense Logistics Agency (DLA) or Defense Energy Support Contract (DESC) and delivered via over the road tank vehicles, flashpoint testing shall be conducted to ensure the correct fuel has been delivered for receipt

1. The proper monitoring concerning the quality of an aviation fuel delivery and then the safe receipt of the Military Specification (MIL-DTL) fuel is the first tier of a Coast Guard unit's aviation fuel surveillance program. Directions for sampling and safety cannot be made explicit enough to cover all cases; however, this process guide summarizes the minimum requirements of the fuel receipt acceptance process.

2. Control of static electricity near aviation turbine fuels is of great concern. Ignition sources of concern are cell phones and other portable electronic devices (PED). Cell phones or other PEDs shall not be used in and around areas where flammable vapors are a risk, unless they have been tested, approved and labeled as intrinsically safe. The use of cell phones and other PEDs shall be avoided while working in areas exposed to flammable vapors.

3. Prior to arrival of the delivery tanker and before unloading fuel into storage facilities, the following procedures shall be followed:

    a. Check results of any previous fuel quality tests performed by the company that made/delivered the fuel.

    b. Ensure that the receiving tank will hold the quantity of fuel to be delivered and the tank will contain the same type and grade fuel.

    c. Inspect all storage tank(s) containment walls for damage/tampering.

    d. Strip the receiving storage tank to ensure no free water is present.

    e. Remove excess personnel from the area.

    f. Check weather report to ensure no lightning storms are within 5 nautical miles of the fuel farm.

    g. There shall be no smoking, open flame, spark producing items (to include electric Cushmans and tow tractors), radios, or PDEs within 50 ft of the fuel transfer station.

4. Before unloading fuel into storage facilities, the following procedures shall be followed:

    a. Check the bill of lading for the type, grade, and quantity of fuel. A copy of the Defense Logistics Agency (DLA) or Defense Energy Support Center (DESC) petroleum laboratory test results for the fuel being delivered shall be included with the delivery documentation. The Aviation Department Quality Assurance Office shall retain the delivery documentation for a period of 1 year.

    b. Check that all compartment seals on the tanker are intact with no evidence of tampering. Ensure tag numbers correspond to those on the shipping document.

    c. Ensure all alarm systems are in place and operational.

    d. Bond refueling tanker to the fuel farm receiving station.

    e. To ensure proper testing, allow the fuel carrier tanker truck to sit stationary at the unloading point for 5 minutes to allow water and particulate to settle. Tanker rail cars shall sit stationary for 30 minutes at the unloading point to allow water and particulate to settle.

    f. Take a 1–quart sample from the manifold of each compartment of the transport and inspect in accordance with visual standards for clear and bright, in accordance with Chapter 6.C of this Process Guide.

    g. If any manifold sample fails the clear and bright tests, halt product receipt.

h. Conduct multi-level sampling from the failed compartment in accordance with MIL-STD-3004 (series) or ASTM-D4057, record results on ALC ESD Form 55 (Figure 6-1) and retain with unit fuel delivery records for 1 year. Notify the DESC Quality Assurance Representative (QAR) of the following quantitative test results.

(1) Perform a CFD test with AEL MK III; limit shall not exceed 1.0 mg/liter.

(2) Perform an FWD test with AEL MK I; limit shall not exceed 10 ppm water.

(3) Perform an FSII test using B/2 Anti-Icing Test Kit Refractometer. FSII levels upon receipt of fuel shall be 0.10 – 0.15% by volume.

Obtain a 1-gallon sample of fuel being delivered for subsequent DoD laboratory analysis; ship sample to normal DoD laboratory for testing to verify unit test results. Refer to chapter 6.E for instructions on proper shipment methods and addresses.

i. Suspect fuel should only be received in an emergency and if it can be determined that the filter/separator will reduce the level of contamination to acceptable levels before the fuel is moved from the receiving storage tank.

j. Obtain a 1-gallon sample from the shipment. Sample shall be tagged, logged, and stored in an approved flammable storage cabinet for 60 days or until the fuel is consumed.

k. For multiple receipts of fuel by rail car or tank truck from the same supplier (using the same rail car or tank truck), perform a clear and bright test on each load.

NOTE

After the receipt of fuel into a storage tank, extra testing and surveillance should be conducted downstream to assure that any contamination is reduced to acceptable levels before dispensing to an aircraft.

5. Fuel Received by Pipeline

a. Take a daily line sample and check for clear and bright.

b. Take a daily spot check and test for water and sediment using the AEL MK I and AEL MK III test kits. If the fuel samples pass, the flow will continue. If not, the fuel flow shall be halted pending further testing. The receiving tanks shall be segregated.

c. Take an all levels sample of the receiving tanks once the initial tests have been cleared and test for:

(1) Clear and bright

(2) FSII (0.10-0.15% by volume)

(3) Flashpoint

(4) API gravity

(5) AEL MK I Limit for water is 10 ppm

(6) AEL MK III Limit for solids is 1.0 mg/l

6. Fuel Received by Barge/Tanker

a. Take a sample before fuel discharge, at 2-hour intervals, and just before shutdown and test for:

(1) Clear and bright

(2) FSII (0.10-0.15% by volume)

(3) Flashpoint

(4) API gravity

(5) AEL MK I Limit for water is 10 ppm

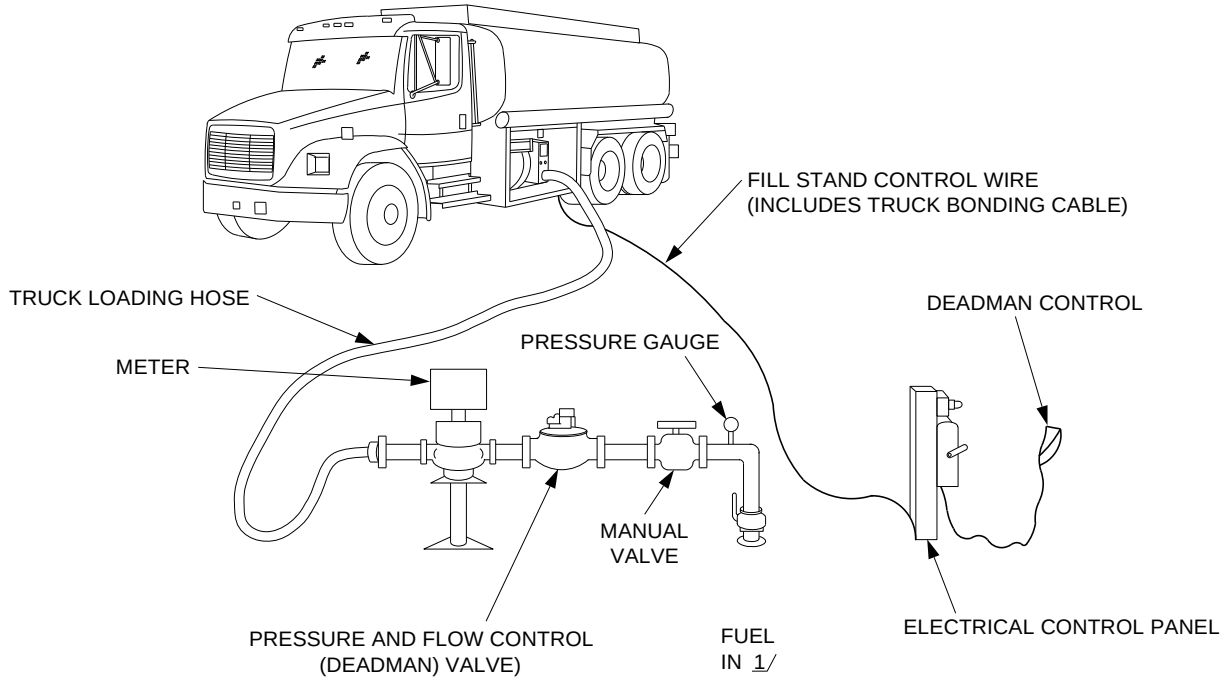
(6) AEL MK III Limit for solids is 1.0 mg/l

L. FILLING THE TRUCK

WARNING

DO NOT START FILLING OPERATIONS WHEN A LIGHTNING ADVISORY HAS BEEN ISSUED, INDICATING AN ELECTRICAL STORM IS WITHIN 5 NAUTICAL MILES OF THE TRUCK FILL POINT.

1. Loading the truck is a two-person operation, even for trucks equipped with high level alarms/shutoff and dead man controls at the fill stand. Top loading a truck with fuel is not authorized unless there is no other means of filling the truck. Personnel shall avoid standing on top of the truck during the fueling operation where practical.



NOTE: 1/ FUEL SUPPLIED FROM DELIVERY LOOP (STAINLESS STEEL OR FIBERGLASS PIPING) AFTER PASSING THROUGH FILTER/SEPARATOR, FUEL MONITOR, AND RELAXATION TANK (OR PIPING).

cg2820002e

Figure 3-2. Sample Truck Fill Point

2. All refueler trucks shall be refueled as follows:

   a. Position the truck, turn off lights, place gear selector in neutral or park, set parking brake, stop engine, and turn off all unnecessary equipment.

   b. Verify the grade of product and amount to be loaded.

   c. Chock the refueler vehicle wheels.

   d. There should be a minimum of one 125/150 lb PKP fire extinguisher available for use.

   e. Connect the bonding wire. A typical bonding connection between a truck and a truck fill stand is shown at Figure 3-2.

   f. Connect the delivery nozzle to the truck's bottom loader.

   g. Set the meter to zero and fill out any required paperwork.

   h. Start fueling the truck slowly.

   i. After the tank is filled, secure the pump if it does not automatically secure.

   j. Disconnect the nozzle.

   k. Disconnect the bonding wire.

   l. Check for leaks.

   m. Remove wheel chocks.

   n. Move the refueler to the truck parking area.

   o. Ground the truck.

   p. Complete the paperwork.

CHAPTER 4. SYSTEM EQUIPMENT

A. INTRODUCTION

1. This section provides a general description and minimum requirements for equipment common to all land-based refueling systems, including mobile equipment. These requirements apply to both new and existing equipment.

CAUTION

THE DESIGN AND CONSTRUCTION OF CERTAIN PIECES OF EQUIPMENT ARE ESPECIALLY CRITICAL TO SAFETY. WHERE NATIONAL STOCK NUMBERS (NSN) ARE SPECIFIED, COAST GUARD AIR STATIONS SHOULD ONLY USE THE IDENTIFIED EQUIPMENT. THE COMPONENTS DISCUSSED IN THIS CHAPTER ARE ESSENTIAL TO ENSURE QUALITY AVIATION FUEL IS DELIVERED TO ALL COAST GUARD AIRCRAFT.

B. REFUELER TANKS (DAY TANKS)

1. Military refueler tanks shall be designed to comply with NFPA 407.
2. In addition, the following minimum requirements shall be adhered to:
   a. The refueler tank shall be made of aluminum, stainless steel, or carbon steel, internally lined with a fuel compatible coating such as epoxy.
   b. Tank construction shall be one compartment only with necessary baffles. Tanks shall completely drain at the low point. The tank shall be designed so that all portions are accessible for cleaning and maintenance.
   c. Tank top openings shall be secured by plastic lock-ties and opened only for inspections and repairs. Manhole covers shall have a fusible plug or plugs, each equipped with fine screens to provide additional emergency vapor release.
   d. Tanks shall be configured for bottom loading. The bottom loading hardware shall include a shutoff valve, a pressure fueling servicing adapter (MIL-A-25896), to accept the standard SPR nozzle, and be of sufficient size to receive product at 385 gallons per minute. A fill stand anti-driveaway device shall be incorporated.
   e. Each tank shall be equipped with an electronic system for controlling the filling operations (Scully Dynaprobe or equivalent model) that is compatible with the system on the station's fill-stand. It should be located near the bottomloading adapter and incorporate an anti-driveaway feature.
   f. The piping system, including all hardware components, shall be capable of dispensing fuel at the rated flow of 385 gallons per minute.

CAUTION

THE USE OF SWING JOINTS WITH ZERK-GREASE FITTINGS IS PROHIBITED SINCE THEY CAN CONTAMINATE THE FUEL WITH GREASE.

C. REFUELER TRUCKS

Trucks shall be equipped with the following:

- Filter/Separator
- Filter/Separator pressure differential gauge
- Relaxation chamber
- Meter
- Approved aircraft refueling hose/hoses
- Hose end control valve (HECV)
- Approved aircraft refueling nozzle/nozzles

- Bonding/ground cables
- A minimum of two fire extinguishers, each with an ANSI rating of at least 20-B:C
- Hand-held deadman control
- Fuel/oil spill kit (locally procured)
- Emergency dry break coupling installed on the hose reel end between hose and the hose reel

NOTE

The Westmor fueling truck, P/N CGS5K, is equipped with only one hose for both fueling and defueling.

1. Tires shall be a non-FOD type with wide lug, wide groove tread. Tread shall not have the narrow groove design in which small stones and gravel can become imbedded and later drop out on a runway or fueling pad. Recaps are not authorized on the steering wheels for any operation.

2. The exhaust of all engines shall be equipped with a suitable spark arrestor. The exhaust shall be shielded to prevent fuel from coming in contact with the exhaust. Only manufacturer's parts shall be used in exhaust system repairs.

D. **REFUELER/DEFUELER TRAILER** These towed units shall be equipped similar to a fuel truck with the exception of a remote deadman control switch. An emergency stop switch is required and must be manned at all times the unit is servicing an aircraft. Filter element replacement cycles will be conducted on an annual basis. Refer to Paragraph 4.G. below for guidance.

E. **FUEL PITS** Coast Guard Air Stations that partially or primarily utilize fuel pits will normally have a sufficient through put of fuel to preclude any contamination issues from dormant fuel in a pipeline. However, units shall circulate the fuel remaining in a fuel transfer pipeline back to the inlet side of a functional filter/separator, fuel monitor, and relaxation chamber or into a functional fuel truck for circulation if any of the following anomalies apply:

- Weekly fuel nozzle sampling and testing at a fuel pit fails Chapter 6 requirements
- Fuel pit is down for maintenance or has not been utilized for more than a 2-week period

If circulating the fuel in the transfer pipeline to the pit is not possible in accordance with Paragraph 7.B.4., due to the lack of facilities/equipment, the unit can contract a qualified commercial vendor to purge the necessary fuel in the pipeline until a successful sampling/test can be accomplished or discharge suspect fuel into a designated "waste fuel" bowser.

F. **WATER DETECTION** Filter/separators must be equipped with automatic water detection systems that will stop fuel flow when actuated by a high water level. Float systems must include provisions for an operational test.

G. **FILTRATION** Aviation fuel dispensed into aircraft shall pass through two filter systems downstream from bulk storage. When operating tanks are installed in conjunction with bulk storage tanks, at least one of the filtration systems shall be located downstream from the operating tanks. The initial filter may be a filter separator, micronic filter, or full flow monitor cartridge type device with differential pressure monitoring. The final filtration of aviation fuel shall be through a filter separator or full flow monitor.

The filter coalescer element shall meet the performance requirements of API publication 1581, Group II, Class B, latest edition, or MIL-PRF-52308 (series). Full flow monitors shall meet the requirements of IP Specifications and Qualification Procedures-Aviation Fuel Filter Monitors with Absorbent Type Elements. Filtration equipment shall be rated equal to or greater than the pumping capacity of the system. Filtration equipment shall be designed so that fuel bypass is not possible.

1. Filter Elements

   a. Filter element replacement in filtration equipment is required when the following occurs:

      - Test results on samples taken downstream of the filtration vessel exceed 5 parts per million free (undissolved) water, 1.0 mg/l of solids, or color assessment is equal to or exceeds a 5 rating for any of the colors in the Aviation Turbine Fuel Contamination Standards (Table 6-1).
      - The pressure differential across the elements at rated flow exceeds 104 kPa (15 PSID) on the aircraft servicing unit.
      - The differential pressures reading decreases 20 kPa (3 PSID) or more from the previous reading when both are recorded at approximately the same flow rate.
      - The micronic filters, used downstream of bulk storage, reach 104 kPa (15 PSID) differential or have been in service for 1 year or 1 million gallons.
      - The filter separator coalescer elements have been in service for one year.
      - A sudden drop in the pressure differential across the elements.
      - No increase in the pressure differential after several months of operation (it should increase slowly with use).
      - Analysis of samples indicates inadequate filtration of water and/or solids.
      - Significant quantities of fibrous materiel are detected downstream of filter/separators.
      - The full flow monitor cartridges reach the differential pressure limit recommended by the manufacturer or l04 kPa (15 PSID), whichever is less.

   b. After the elements are replaced, recirculate a minimum of 1,000 gallons of fuel through the new elements to ensure the fuel is clear and bright prior to placing the system back in service. All filters/coalescer elements used for aircraft fuels shall meet the performance standards of API Specification 1581 (series) and MIL-PRF-52308 (series).

2. Filter Vessels

   a. All filter vessels must be equipped with:

      - Provisions for elimination of air
      - Direct reading differential pressure gauges
      - Manual sump drain-valves with handles spring loaded to the closed position
      - Upstream and downstream sampling (Millipore) connections, including probes and dust caps or plugs
      - Pressure relief valves
      - A stencil indicating month and year of next filter change due date

   b. The use of automatic water drain valves is prohibited.

3. Strainer Strainers provide only minimal protection for coarse solid contamination. They are usually made of wire mesh screen inside a casing. Fuel trucks have catch screens that shall be removed and cleaned monthly. Fuel systems have a 100 mesh strainer on the fueling nozzle that provides a final barrier against introducing particulate contamination of approximately 150 microns into the aircraft fuel system.

4. Filter Water Separator

   a. Filter/Separator has two functions: filtering particles and separating water from fuel. It is usually a two-stage unit, within one enclosure. The first stage acts as a filter and coalescer, while the second stage separates the resulting larger droplets from the fuel.

b. Filter requirements include:

- Sized to hold 5-micron particles
- Stenciled date of the next filter change on the filter exterior

H. DIFFERENTIAL PRESSURE GAUGES

1. Filtration equipment shall be equipped with differential pressure gauges.
2. Piston type differential pressure gauges require no calibration if the piston returns to zero under no flow conditions.

I. FUEL QUALITY MONITOR It has been determined by the filter assembly Original Equipment Manufacture (OEM), monitors are not to be utilized on fuel trucks that dispense aviation fuels containing anti-icing additives. Fuel system icing inhibitors, i.e., DiEGME or PRIST, can disarm water absorbing elements allowing water to pass downstream.

J. RELAXATION CHAMBER A relaxation chamber follows the filter/separator. This chamber allows static electricity charges, which develop as the fuel passes through the filtration equipment, to "relax" before the fuel enters an aircraft. The chamber is engineered to slow the flow of fuel for 30 seconds to dissipate any static electricity that may have built up before the transfer to the aircraft.

K. PRESSURE GAUGES

1. Pressure gauges are required for monitoring aircraft refueling operations and shall be mounted where they are visible to the fueling equipment operator.
2. Pressure gauge requirements include:
   - Minimum face diameter of 4 inches and accuracy of +/- 2% of full scale

L. METERS All fueling meters shall be the positive displacement type and meet the calibration requirements of the national Bureau of Standards Handbook 44, Liquid Measuring Devices.

M. HOSES AND COUPLINGS

1. Fuel hoses and couplings shall comply with the requirements of API 1529, or MIL-DTL-26521 (series). Only hose specifically constructed for aircraft fuel servicing will be used in dispensing systems.
2. Hose requirements include:
   - Grade 2/Type C only.
   - Restriction to one continuous section whenever possible. If sections must be added, keep to an absolute minimum.
   - Off-the-ground storage in a manner that prevents kinks.
   - Protection from sunlight when not in use to reduce ultraviolet deterioration. Use dust covers on both ends.
   - Draining of fuel from hose and capping both ends if the hose is being stored for an extended period.
   - Flush with fuel any hose being returned to service after extended storage.
   - Fuel sampling and check for clear and bright and particulate contamination.
3. Coupling requirements include:
   - Specifically designed standard male and female screw couplings for aircraft refueling hose
   - An emergency dry breakaway coupling should be installed on the refueling hose at or near the place where the hose attaches to refueling equipment piping or hose reel. This device is required for each direct refueling system pantograph and recommended for all other installations.

N. NOZZLES

1. Over the wing and single point nozzles shall be available as required.
2. Nozzle requirements include:
   - Installation of 100 mesh or finer screens that can be readily removed for inspection or cleaning
   - Single point pressure nozzles mating to the standard aircraft-fueling receptacle that meet the requirements of SAE-AS5877 (series)
   - Swivels with the collar secured by lock rings or safety-wired collar retention screws
   - Fuel sampling and pressure testing connections

O. STATIC BONDING CABLES

1. In accordance with AFTO 00-25-172 (series), electrostatic bonding systems shall have a total resistance of less than 10,000 ohms.
2. Bonding is the process of connecting two or more metallic objects using a conductor, equalizing the electrostatic potential between two or more conductive objects. The following hardware items are used to make a static bonding cable:
   - Clamp (part no. M83413/7-1 only)
   - Plug (part no. M83413/4-1 only)
   - Cable (3/32 inch, NSN 4010-00-286-2681 or NSN 4010-00-575-6234 only)

P. DUST COVERS Dust covers or other protective devices shall be used to prevent debris from accumulating on mating surfaces of hydrant couplers and aircraft fueling nozzles.

Q. SAFETY INTERLOCKS

WARNING

REFUELER/DEFUELER TRAILERS DO NOT HAVE A SAFETY INTERLOCK. ENSURE THAT THE TOW VEHICLE IS NOT DRIVEN AWAY WITH THE FUEL HOSE EXTENDED OR CONNECTED TO THE AIRCRAFT.

1. All mobile fueling equipment, with the exception of refueler/defueler trailers, have various safety interlocks for preventing the equipment from being moved. Safety interlock requirements for preventing the vehicle from being moved include:
   - Override control secured in the normal position with breakaway safety wire for interlock systems equipped with an override device
   - Placards identifying normal and override control positions with a light indicating override activation prominently located in the vehicle cab

R. PRESSURE CONTROLS

1. All aircraft fueling equipment shall have separate primary and secondary pressure control devices.

CAUTION

FUELING PRESSURE CONTROL SYSTEMS SHALL NEVER ALLOW THE ACTUAL FUEL PRESSURE, MEASURED AT THE NOZZLE, TO EXCEED THE PRESSURE INDICATED BY THE OPERATOR'S GAUGE. THE PRESSURES LISTED BELOW ARE FOR COAST GUARD AIRCRAFT. USE CAUTION WHEN REFUELING NON-COAST GUARD AIRCRAFT; THE ALLOWABLE PRESSURES COULD DIFFER SUBSTANTIALLY FROM THOSE LISTED BELOW.

2. Primary pressure control will protect the aircraft under constant flow conditions and from pressure surges caused during aircraft valve closure. Fueling pressure at the fuel nozzle shall not exceed the maximum allowable pressure listed in the applicable aircraft flight manual. Listed for reference:
   - MH-65 55 PSIG
   - MH-60 55 PSIG
   - HU-25 50 PSIG
   - HC-130 60 PSIG
   - HC-144 50 PSIG
3. Secondary pressure control device (HECV) will protect the aircraft in the event of primary control failure.
4. Fuel pressure control system requirements include:
   - Pressure controlling hydrant pit valves
   - Pressure controlling hydrant pit couplers
   - In-line pressure valves
   - Hose end control valves (HECV)
   - High fuel pressure rapid shutdown switches

S. DEADMAN CONTROL SYSTEM

WARNING

AN INOPERATIVE SYSTEM OR THE IMMOBILIZING OF A DEADMAN CONTROL CIRCUIT CAN CAUSE INJURY OR DAMAGE TO AN AIRCRAFT AND/OR A RELEASE OF FUEL INTO THE ENVIRONMENT.

1. All aircraft fueling equipment shall be equipped with a deadman control system with the exception of refueler/defueler trailers mentioned in Paragraph 4.D.
2. Control system requirements include:
   - Overshoot not to exceed 5% of actual flow rate from the time the deadman control is released until the time flow stops completely.
   - Control valve located and designed to operate during an accident, power failure, or spill.
   - Control valve must close completely in case of a power failure.
   - System must be part of the valve controlling the flow of fuel to an aircraft.
   - Fueling operator must be able to view the fueling control panel during fueling operations.
3. The fuel flow control valve shall be either:
   - The hydrant pit valve
   - At the tank outlet on a tank vehicle
   - A separate valve on the tank vehicle
   - On the nozzle for overwing servicing
4. Deadman controls shall be designed to prevent tampering and manually securing in the open position.

T. EMERGENCY FUEL SHUTOFF SYSTEM

1. Trucks, hydrant carts, and fueling cabinets, shall be equipped with an emergency fuel shutoff system in addition to a deadman control.

2. Shutoff requirements include:

   - Shutoff control accessible from the ground.
   - Fuel flow should be stopped by automatically closing the hydrant pit valve upon activation. The system is designed to shut off the main valve at the bottom of the tank.
   - Fuel flow should be stopped within a maximum 5% overrun.

U. IDENTIFICATION OF FUEL HANDLING EQUIPMENT All systems shall have appropriate identifying markings and symbols denoting type and grade of fuel, in accordance with the latest issue of MIL-STD-161 (series). Fixed and mobile equipment shall be marked in accordance with API Bulletin l542, MIL-STD-161(series), or with a NATO Product Identification Code.

1. Mixing different grades and types of petroleum products is a constant problem in field operations and can be disastrous to the operation of aircraft and support equipment. Improper identification, carelessness, and eradication or markings are often causes of such inadvertent mixing of different grades and/or dissimilar products.
2. Markings may be applied by painting, stenciling, or if desired by means of decals. Decal markings shall conform to MIL-43719/4 (series) and ASTM-D 4956.

CHAPTER 5. INSPECTION CHECKS

A. INTRODUCTION

1. Coast Guard Air Stations shall test the fuel they issue to aircraft for particulate and free water contamination and fuel system icing inhibitor (FSII) content and keep accurate records of all tests and inspections. In special cases, it may also be necessary to test other fuel qualities such as flashpoint, API gravity, and static dissipater level. The American Society for Testing and Materiels (ASTM) Standard Practice for Manual Sampling of Petroleum and Petroleum Products, ASTM D4057, describes testing procedures and techniques in detail. All Coast Guard Air Stations should have a copy of this document and adhere to its recommended procedures. Copies are available from the American Society for Testing and Materiels, 1916 Race Street, Philadelphia, PA 19103-1187, telephone number (215) 299-5400, fax number (215) 977-9769.
2. The qualified Fuel King at each Coast Guard Air Station should periodically check all aircraft fueling equipment, including fueling cabinets. Daily checks should be made prior to the first scheduled flight of the day for each aircraft. Any fueling equipment not in daily use should have all daily, monthly, quarterly, annual, and triennial checks up-to-date before the equipment is returned to service. Each Coast Guard Air Station should establish a Preventive Maintenance System (PMS) based on this process guide. An Air Station may develop its own PMS to suit its particular systems and equipment.
3. Maintenance requirements described in this chapter are generally limited to those activities required to maintain fuel quality and safety. They do not replace or supplement PMS actions for ensuring the mechanical reliability of all equipment servicing aircraft.
4. For additional information on aviation fuel facility preventive maintenance checks, refer to NAVFACENGCOM Maintenance Manual Petroleum Fuel Facilities, NAVFAC MO-230.

B. INSPECTIONS PRIOR TO USE

1. New construction, out-of-service facilities, and repaired equipment shall be inspected prior to acceptance or reactivation. Special attention should be given to rated capacities of hardware, pipeline sizing, drainage, accessibility, emergency controls, safety, and fire prevention features.
2. Before starting a major flight operation, there should be inspections covering equipment performance, pipeline integrity, valve positioning, tank arrangement, and personnel assignments.

C. WINTERIZATION INSPECTIONS

1. In climates where the ground air temperature can fall below 32 °F, all equipment which can be adversely affected by freezing temperatures shall be inspected for proper winterization measures in early autumn.
2. Special inspections for damage should also be conducted following any storm, flood, fire, earthquake, lightning strike, suspected act of sabotage, or vandalism. When operators identify abnormal variations of performance, flow rates, pressures, or capacities: A special inspection to determine the cause of the malfunction is required. Special inspections performed by personnel from other departments may also be conducted by request on electrical equipment, communications equipment, buildings, security fences, roadways, and fire prevention equipment.

D. REFUELER/DEFUELER TRAILER Every Coast Guard Unit that utilizes tow behind refueler/defuelers (i.e., 1600, 2500 gallon, etc.) should utilize locally promulgated daily, weekly, monthly, annual, triennial preventative maintenance to ensure proper working order. Each trailerable refueler/defueler shall be marked in accordance with Paragraph 4.U. as well as adhere to fuel sampling and testing requirements in accordance with Chapter 6 if the equipment introduces fuel into a Coast Guard aircraft.

1. The filter/separator coalescer elements shall be changed in accordance with Paragraph 4.G.
2. Record filter/separator pressure differential on locally promulgated form Table 5-1 in accordance with Paragraph 5.E.1.c.

E. FUEL TRUCK INSPECTIONS All Coast Guard fuel trucks (self-propelled vehicle with a PTO) shall be maintained in accordance with MSR MPC 153301.0 for acceptance, weekly, monthly, semiannual, annual, and triennial inspection criteria.

1. Daily Checklist

a. Daily checks shall be completed on all aircraft fuel delivery equipment in continuous use once every 24 hours. The checks shall not interfere with or preclude operations.

CAUTION

WHEN NOZZLES ARE ALLOWED TO HANG INVERTED, EXPOSED TO THE ENVIRONMENT, WATER AND DIRT MAY BUILD UP IN THE BEARING COLLAR AND NOSE SEAL AREAS.

b. Before a clear and bright test can be conducted, 2 quarts of fuel will be drained from all low point drains (filter separator and relaxation chamber).

CAUTION

DIFFERENTIAL PRESSURE READINGS SHOULD ONLY BE MADE WHEN THE SYSTEM IS OPERATING AT NORMAL REFUELING CONDITIONS. OTHERWISE THE ACCURACY OF THE DIFFERENTIAL PRESSURE READINGS IS NOT RELIABLE AND COULD PREVENT THE IDENTIFICATION OF FILTER OR ELEMENT FAILURES.

NOTE

Any rapid change (more than 1 psi/week) in differential pressure indicates filter problems (depending on the age of the filter).

c. Over time the differential pressure, commonly known as Delta-P or DP, across the filter/separator and monitor pressure elements will increase as more dirt and water is trapped. Each Coast Guard Air Station shall document this differential pressure for each filter/separator in operation as per MSR MPC 153301.0. The readings shall be documented and recorded during the daily and weekly checks. Paper copies of the daily pressure differential records should be retained at the unit for trend analysis for a period of 12 months. Replace filter elements as required in Paragraph 4.G.

2. Weekly Checklists

a. The Fuel King, or any other personnel properly qualified to perform the Fuel King's duties, shall perform weekly checks. In addition to weekly performance, any equipment being returned to service after 72 hours or more of downtime for maintenance shall also be given a complete weekly check.

b. With the arrival of the new fuel trucks, all Coast Guard and contractor personnel shall recognize the differences in maintenance practices for fuel trucks. The current fuel trucks have distinct differences in maintenance procedures.

CAUTION

FAILURE TO COMPLY WITH ESTABLISHED MAINTENANCE PROCEDURES CAN RESULT IN LOSS OR DAMAGE TO THE FUEL TRUCK, PROPERTY, AND THE AIRCRAFT AS WELL AS PERSONAL INJURY.

3. Monthly Checklists

a. The monthly checklist requires special equipment and moving of mobile equipment to a location outside of the operating area.

CAUTION

IF PRESSURES EXCEED 50 PSI OR FLOW RATES EXCEED 385 GPM FOR THE ISOMETRIC AND 200 GPM FOR THE WESTMOR, THE EQUIPMENT SHOULD BE REMOVED FROM SERVICE UNTIL THE PROBLEMS ARE CORRECTED.

CAUTION

MANHOLE COVERS ARE NOT TO BE OPENED DURING PERIODIC CHECKS. THE ONLY TIME THAT MANHOLES ARE TO BE OPENED IS DURING THE INTERIOR AND MANHOLE COVER INSPECTION. AT ALL OTHER TIMES, THEY SHOULD BE SEALED. THIS PREVENTS FOREIGN MATERIEL FROM ENTERING THE TANK AND PREVENTS FLAMMABLE/EXPLOSIVE FUMES ESCAPING THE REFUELING VEHICLE AND FINDING AN IGNITION SOURCE.

CAUTION

ENSURE THAT THE PRIMARY PRESSURE CONTROL IS SET TO 50 PSI AT THE NOZZLE BEFORE THE SYSTEM IS PLACED BACK IN OPERATION.

CAUTION

COMPLY WITH SAFETY AND ENVIRONMENTAL HEALTH MANUAL (ASHORE CONFINED SPACE ENTRY), COMDTINST M5100.47 (SERIES) BEFORE ENTERING ANY FUEL TANK.

4. Hose End Control Valves Hose end control valves for individual refueling systems shall be tested for performance and materiel condition monthly. HECV valves will be tested and determined to be functional prior to aircraft servicing.

Table 5-1. Filter/Separator or Monitor Pressure Drop Log

FILTER/SEPARATOR OR MONITOR PRESSURE DROP LOG					
Vessel Number:				Vessel Type *Filter/Separator *Monitor	
Vessel Location:				Vessel's Rated Flow (GPM):	
Date	Pressure (psi)			Measured Flow Rate (GPM)	Calculated Differential (psi) Pressure
	Inlet	Outlet	Differential		

CHAPTER 6. SAMPLING AND TESTING PROCEDURES

A. INTRODUCTION

1. The major objective of any aviation fuel handling program is to deliver clean, dry, and correct fuel to aircraft. The fuel systems of today's aircraft are complex and sensitive; they will not function properly if contaminated with dirt, water, or biological matter. This chapter describes minimum sampling and testing requirements for aviation fuels.
2. Regardless of an air stations source of aviation fuel (contracted FBO, DoD, etc.), documentation of a quality surveillance program is a mandatory requirement and shall be maintained in record form by the Air Station. Laboratory results from a qualified aviation fuel vendor may be utilized for an aviation engineering department's test results when a testing laboratory is not available at the unit level. An aviation fuel surveillance program should maintain paper documentation for a minimum of daily, weekly, and monthly testing for a period of 12 months.
3. All Coast Guard Air Stations shall establish a formal fuel quality surveillance program that meets the requirements of this process guide and describes fuel handling procedures at each particular Air Station and forward operating locations (AIRFAC). All forward deployed units are encouraged to establish MOU with host commands fuel supply or commercial vendor.

CAUTION

PERSONNEL RESPONSIBLE FOR HANDLING FUELS AND LUBRICANTS SHALL BE THOROUGHLY TRAINED AND FULLY QUALIFIED TO PERFORM THEIR ASSIGNED RESPONSIBILITIES. THEY SHOULD BE AWARE OF THE HAZARDS IN HANDLING FUELS AND LUBRICANTS, AS WELL AS THE APPLICABLE SAFETY AND OPERATING PROCEDURES.

NOTE

These are minimum requirements and do not preclude more frequent and rigorous testing by Coast Guard Air Stations if contamination is suspected. Contaminated fuel can cause poor performance, aircraft engine failure, aircraft damage, and even loss of life.

B. SAMPLING PROCEDURES

1. Fuel Sampling Documentation Daily "clear and bright" for the air stations fuel trucks shall be entered on MPC 153301.0 (fuel truck weekly). Each assigned BRAVO aircraft "clear and bright" results shall be documented in the Electronic Asset Logbook (EAL) under "fuel samples." Weekly samples for all fuel systems and equipment other than fuel trucks and aircraft shall be documents on locally promulgated form (Figure 6-1).

The basic guidelines for sampling are:

- Proper PPE shall be worn.
- Samples should be as representative of the product being sampled as possible.
- Samples of fuel being delivered to the aircraft should be taken from the fueling nozzle.
- Samples from filter/separators should be taken at the inlet and outlet positions.
- Samples shall be capped promptly, protected from light, and handled expeditiously.
- Sample bottles shall be filled to within ½ inch of the cap line.
- Sampling connections for fixed piping systems should be installed in vertical pipe runs where practicable. If they are installed in horizontal runs, they should be placed in the side, halfway between the top and the bottom of the pipe.
- There shall be no smoking, open flames, spark, or flame producing items, or radio transmission items within 50 ft of a sampling operation.

- Samples shall be taken at the same flow rate and pressure as used during regular aircraft refueling. Ensure that the pressures and flow rates are stabilized prior to sampling.

2. Sample Container Sample containers shall be clear glass quart bottles for visual samples. Colored glass or stainless bottles may be used to gather samples for AEL MK I, AEL MK III, and FSII tests; however, clear glass is the recommended container. Plastic, polyethylene, steel, or aluminum containers shall not be used as sample containers. Samples for lab tests shall be collected in the type of container required by the testing lab.

3. Sample Container Preparation Sample containers shall be cleaned and inspected immediately prior to use by rinsing and flushing several times with the same fuel being sampled. The containers should be cleaned at least weekly with a laboratory glassware detergent such as Alconox (NSN 7930-01-107-9169), Alcojet (NSN 7930-01-326-8099), or Fisherbrand Sparkleen. They should be flushed with clean fresh water, dried in a warming oven, sealed, and thoroughly inspected prior to use.

4. Sampling Points The sampling point will depend on the type of storage vessel:

   a. Tank trucks and barges with multiple tanks shall have each separate tank or bay sampled on arrival at the receiving facility. The sample shall be taken from the manifold or fuel nozzle.

   b. Storage tanks shall be sampled at the lowest point available.

   c. Underground storage tanks may be sampled using an all levels sample method.

   d. Fuel taken from a pipeline should be taken from a spot where the line is straight and horizontal whenever possible.

   e. Aircraft daily samples shall be taken from all tanks using the fuel sample ports provided in the aircraft.

   f. Refueler samples shall be taken from the nozzle.

   g. Samples at the storage facility of outgoing fuel shall be taken downstream of the filter/separator.

NOTE

If representative sampling does not meet the MIL-DTL-5624 (series) for (JP-5) or MIL-DTL-83133 (series) (JP-8), alternate sampling procedures may be followed. Top and mid-level sampling is to be conducted in accordance with MIL-STD-3004 (series) and ASTM D 4057.

5. Types of Samples There are three types of fuel samples taken at a Coast Guard Air Station. Sample frequency varies by type of sample.

   a. Clear and bright samples are taken daily from all RIF sources, and “BRAVO” aircraft. Samples are taken in clear glass bottles only (NAVAIR 00-80T-109 page 15-5, para. 15.3.1) and inspected visually. No chemicals are added to the fuel for testing purposes. These samples are normally returned to the fuel system for reuse if they are not contaminated.

NOTE

Weekly sampling of fuel trucks or any other approved fuel dispensing equipment is not required in accordance with MIL-STD-3004 (series) unless contamination is suspected.

BULK AVIATION FUEL QUANTITY SURVEILLANCE LOG

SAMPLE		Date Tested	Sample Serial No.	Source of Sample	TEST PERFORMED					Test Results	Tester's Initials
Date	Time				VIS	CFD	FWD	API	FSII		

ALC ESD 55 02/03/10

Figure 6-1. ALC ESD Form 55

b. FWD, CFD, and FSII test samples are to be taken upon receipt of fuel from all bulk storage tanks weekly or when placing a fueling system component back into operation. Samples can be taken in a clear glass bottle, a colored glass bottle, or a stainless steel container. They are tested at the Air Station and, in some cases, test chemicals are added to the fuel sample. Fuel samples shall not be placed back into service. Instead they shall be placed into a separate tank for use in the base heating system, emergency diesel generator, or disposed of appropriately.

NOTE

When a fuel contains additives, it must meet the formula for usage regardless of whether it is required for a specific aircraft type.

c. Lab samples Once a month, every Coast Guard Air Station with storage capability shall take routine correlation samples at a time when no fuel problems or aircraft problems related to fuel are known to exist, when contamination is suspected, or when there has been an aircraft mishap.

6. Fuel Issued to Aircraft

a. Recirculate fuel in refueler trucks, direct fueling systems, or other shore-based dispensing equipment through the equipment/system's hose and aircraft refueling nozzle and back to the tank. Do this each day before the first refueling of the day in accordance with Paragraph 8.C.2.

b. Sample fuel at the nozzle and test for clear and bright.

c. Sample each tank, on each aircraft, and daily before flight operations begin.

7. Particulate Contamination Levels The particulate contamination level for fuel being dispensed to aircraft is 1.0 mg/l at the fuel dispensing nozzle as determined by the AEL MK III tester. If the contamination tests higher than 2.0 mg/l, the fuel dispensing tank in question shall be removed from service until corrective action has brought the contamination levels back into safe limits. Aircraft issued fuel from the particulate contaminated fuel dispensing tank shall be grounded until corrective action has successfully brought the contamination back into safe levels.

WARNING

FUEL WITH GREATER THAN 10 PPM OF FREE WATER SHALL NOT BE ISSUED TO AN AIRCRAFT.

8. Water Contamination The limit of water contamination in turbine fuels is 10 ppm. Fuel with greater than 10 ppm of water, as determined by the AEL MK I tester, shall not be issued to an aircraft. If a fuel dispensing tank sample tests greater than 10 ppm, the fuel dispensing tank in question shall be removed from service until corrective action has brought the water contamination back into safe levels. Aircraft issued fuel from the water contaminated fuel dispensing tank shall be grounded until corrective action has brought the water contamination back into safe levels.

9. Correlation and Special Lab Sampling

a. Each of the Air Station's bulk storage tanks require a 1-gallon (NSN 8110-01-371-8315) and 1-quart (NSN 8115-00-719-4111) sample drawn from it. The gallon sample shall be sent to an external lab for testing. The quart sample will be retained at the Air Station until such time as the external lab results are received. The quart sample is a backup in the event the gallon is lost in shipping or contaminated. The samples shall be sent to the nearest DoD laboratory for testing and the results of the CFD, FWD, and FSII shall be compared with the Air Station's findings. This will give the Air Station an additional tool to check the accuracy of its test equipment and the performance of the fuel handling program.

C. TYPES OF FUEL TESTS There are three basic aviation fuel tests. The most basic is the visual clear and bright test that can be performed on the spot by qualified personnel with a minimum of

equipment. More detailed tests can be conducted for dirt, water, flashpoint, API Gravity, and icing inhibitor at the Air Station with testing kits. The most detailed tests are conducted at DoD testing laboratories on the monthly correlation samples and any special samples taken for cause.

WARNING

CLEAR AND BRIGHT TEST IS A "VISUAL TEST" AND SHALL BE CONDUCTED UTILIZING GLASS JARS ONLY (NAVAIR 00-80T-109 PAGE 15-1, PARA. 15.3.1) THE PROPER PPE SHOULD BE WORN TO PRECLUDE PERSONAL INJURY IN THE EVENT THE GLASS JAR IS DROPPED OR BROKEN IN HAND.

1. Clear and Bright Tests

a. Fuel delivered to the aircraft shall be clean, bright, and contain no free water. "Clean" or "clear" means the absence of any cloud, emulsion, readily visible particulate matter, or entrained water. "Bright" refers to the shiny appearance of clean, dry fuels. The terms "clear" and "bright" are independent of natural color of the fuel. Jet fuels are not dyed and may be any color from clear to amber. Ordinarily, a cloud or haze in fuel indicates the presence of water. Occasionally, a cloud denotes excessive amounts of fine particulate matter or finely dispensed stabilized emulsion. Fuel containing a cloud caused by water contamination is not acceptable if a light cloud forms when "clear and bright" fuel cools. It indicates that dissolved water has precipitated. This "precipitation cloud" represents a very slight amount of fresh water. Even this slight amount is not acceptable in fuel to be delivered to the aircraft.

b. A "precipitation cloud" can be removed by a properly operating filter/separator; the fuel should be drained back upstream of the filter/separator and recirculated to remove the cloud. Any cloud that remains despite recirculation must be presumed to indicate a failure or malfunction of the filter/separators, a source of contamination downstream of the filter/separator, or an improperly cleaned sample container.

c. The clear and bright test shall be conducted:

- 30 minutes after aircraft refueling and/or movement
- Daily from aircraft tanks and fuel dispensing equipment
- After each recirculation of fuel, with a sample taken from the appropriate tank
- After replacement of or maintenance on any system component with a sample from downstream of the component
- A minimum of 2 quarts drained prior to sampling
- Upon receiving fuel from storage
- During weekly and monthly tests
- Any time when fuel condition is suspect

d. During the clear and bright test procedure, the sample is checked for proper color and visible contamination. Then the sample is swirled to form a vortex. All free water and sediment that have settled will accumulate beneath the vortex. When a sample is being examined, move the bottle around to vary the background light. If a sample shows dirt and/or water, clean the bottle and filling equipment, flush the hose (if one is used), and conduct the test again.

WARNING

SAMPLES THAT ARE CLOUDY, HAZY, OR CONTAIN SEDIMENT SHALL NOT BE USED IN AIRCRAFT.

e. If the second clear and bright test shows evidence of contamination, conduct CFD/FWD test.

f. Table 6-1 lists parameters for visual "clear and bright" inspection of JP-5 and JP-8 fuel.

2. Detector Kit Tests

a. AEL MK I

(1) The viewer kit, free water detector AEL MK I (NSN 6640-00-999-2786) is a small unit for use in the field or the laboratory to determine the free water content of aircraft fuels. It was designed for use in conjunction with the contaminated fuels detector, AEL MK III, and will accurately measure trace quantities of free water in gasoline or jet fuels.

(2) Testing procedures are as follows:

(a) Pass the sample of fuel to be tested through a chemically treated 43 micron filter pad placed in the filter holder of the MK III detector. The chemical on the pad is sensitive to any free water in the fuel, producing a fluorescent pattern readily visible under ultraviolet light.

(b) Examine the pad under the ultraviolet light contained in the viewer kit after filtration. The amount of free water in the fuel sample is determined by the intensity of fluorescence on the test pad. Visual comparison is made with a series of standards called the Millipore Scale that represent known quantities of water.

(c) Complete the free water detector test using the AEL MK I as soon as possible following sampling.

(d) Both the MK I and MK III detectors can be ordered through the Navy Supply System.

WARNING

IF FREE WATER LEVELS EXCEED 10 PPM, FUELING OPERATIONS SHALL BE STOPPED. CORRECTIVE MEASURES MUST BE TAKEN BEFORE FLIGHT OPERATIONS CAN RESUME. ENGINE FAILURE, LOSS OF LIFE, AND DAMAGE TO THE AIRCRAFT CAN RESULT.

b. AEL MK III

(1) The Contaminated Fuel Detector Model AEL MK III (NSN 6640-01-013-5279) is a portable field unit to determine solid contamination in aircraft fuels. The AEL MK III has a wide range covering 0-10 milligrams/liter of solid's and is designed for both gasoline and jet fuels. It uses the Millipore scale with a scale range from A2 to A7, with A7 being the worst.

(a) Obtain a sample of fuel to be tested in the sample bottle provided or in a clean glass or stainless steel container.

(b) Filter the fuel through two-membrane 43-micron filters used in series. Solid contaminants will be collected on the top of the filter.

(c) Show a light through each filter and use a meter to measure the decrease in transparency of the filters due to the trapped solids. The use of two filters eliminates errors due to variations in color of different fuels. A calibration chart is provided to convert the meter readings to contamination level in mg/liter.

WARNING

IF SOLID CONTAMINANTS EXCEED 1.0 MG/L, DELIVERY OF FUEL TO AIRCRAFT SHALL BE STOPPED. CORRECTIVE MEASURES SHALL BE TAKEN BEFORE FLIGHT OPERATIONS CAN RESUME. ENGINE FAILURE, LOSS OF LIFE AND DAMAGE TO THE AIRCRAFT CAN RESULT. REFER TO INDIVIDUAL AIRCRAFT MAINTENANCE PROCEDURES FOR PURGING CONTAMINATED FUEL. ALL DELIVERY SYSTEMS SHALL BE SECURED UNTIL DELIVERY OF CLEAN FUEL IS ASSURED.

(2) The AEL MK III CFD unit will enable Coast Guard Air Stations to determine the solid's content of aircraft fuels. Although simple to use, it is a precision instrument and should be treated accordingly. The unit should be used for, but not necessarily limited to, the following inspections:

- Fuels received into storage tanks
- Daily monitoring of filtration equipment
- Daily spot checks on the fuel at aircraft dispensing nozzles
- Checks of any suspect fuel
- Troubleshooting equipment

(3) Refer to the technical manual, Contaminated Fuel Detector, AEL MK III, and MIL-HDBK-844A (AS), for additional operating details.

c. Fuel System Icing Inhibitor (FSII)

(1) The B/2 Anti-Icing Test Kit Refractometer (NSN 6630–01–165–7133) contains two FSII scales, one for each of the FSII compounds currently in use. It should be noted that all JP-5 fuel tested can contain the high flashpoint type of FSII Materiel, Diethylene Glycol, Monomethyl Ether, or DiEGME, which is read off of the scale on the B/2 refractometer marked "JP-5" or "M."

(2) If the FSII level drops below 0.07% by volume, the Air Station Commanding Officer must be notified. Each pilot of aircraft using the fuel should consult the aircraft flight manual and follow the special operating instructions to avoid safety-of-flight problems induced by ice. Transient aircrews, USA, USN, USAF, USMC, and foreign military aircraft shall be notified if the FSII level falls below 0.10% by volume. This will allow them to consult their appropriate technical directives for special operating instructions to avoid ice induced problems.

CAUTION

FAILURE TO PROPERLY NOTIFY AIRCREWS OF A LOW FSII CONDITION CAN LEAD TO SAFETY-OF-FLIGHT PROBLEMS. 0.03% IS THE MINIMUM FSII LEVEL ALLOWED FOR SAFE OPERATION OF COAST GUARD AIRCRAFT.

(3) Unless specifically exempted, all USCG aircraft shall use FSII as a fuel additive in normal day-to-day operations. FSII prevents the formation of water and ice in fuel systems and acts collaterally as a biostat preventing micro-organism growth. Micro-organism growth in fuel cells can cause considerable damage to the aircraft fuel systems and bulk fuel storage systems.

WARNING

FSII CONTAINS MUTAGENIC MATERIELS THAT ARE TOXIC TO HUMANS IN THEIR PURE, NON-DILUTED STATE. ONCE MIXED WITH FUEL, THEY ARE SAFE IF THE FUEL IS HANDLED IN AN APPROPRIATE MANNER.

3. Flashpoint Test

NOTE

Air Stations or units utilizing JP-8 shall conduct weekly flashpoint tests.

a. The flashpoint is the temperature at which the vapor above the fuel sample temporarily ignites. The Pensky-Martens ASTM Method D93 is the only procedure for determining flashpoint that is authorized at Coast Guard Air Stations. The test stand (NSN 6630–00–530–0987) must be sitting on a steady, level surface. The room or compartment must be draft free. The test stand must be surrounded on three sides by a fire containment shield that is 18-24 inches high. Thoroughly dry and clean all parts before starting the test. During the testing, ensure that all fuel samples in the vicinity are tightly capped and that the test is conducted under an exhaust hood.

(1) Determine the flashpoint by pouring a small amount of fuel into the sample container provided with the Pensky-Martens kit.

(2) Heat the sample slowly at a constant rate, stirring all the time.

(3) Direct a small flame into the cup at regular intervals.

b. The temperature of the sample at the start of the test should be 60-75 °F. This means that in some instances the sample may need to be refrigerated. MIL-T-5624 (series) lists the flashpoint of JP-5 as 140 °F and MIL-T-83133 (series) lists the flashpoint of JP-8 at 100 °F. Correcting the flashpoint for barometric pressure is optional except when comparing correlation test results or in the case of a disputed flashpoint reading. In that case, the flashpoint should be corrected using the following formula:

Corrected flashpoint = F+0.06 (760–P)

(Where F is the observed flashpoint temperature in degrees Fahrenheit and P is the ambient atmospheric pressure in mm.)

4. API Gravity Determination

a. The API gravity check is used to determine volume correction and aircraft fuel weight. The measurement is most accurate when the temperature is near the standard of 60 °F. The hydrometer and cylinder (NSN 6630–00–245–8376) used for the test should be approximately the same temperature as the fuel sample.

(1) Pour the sample into the clean graduated cylinder.

(2) Place the cylinder containing the sample in a vertical position in a location free from drafts.

(3) Lower the hydrometer into the sample. When it has settled, push it down about two scale divisions into the fuel and then release it. Gently spin the hydrometer when releasing it. Allow the hydrometer to become stationary and all air bubbles to come to the surface.

(4) Read the hydrometer to the nearest scale division. The correct reading will be at the meniscus of the fluid. Record the temperature to the nearest degree F. (See Figure 6-1.)

(5) Correct the observed API gravity reading using ASTM D1250, Volume II, Table 5B for JP-5 and JP-8 fuels. Volume Table 6A is used for JP-4 fuel. Record the observed API gravity/temperature and API gravity corrected to 60 °F.

(6) To correct measured volume to 60 °F net volume, use ASTM 1250, Volume II, and Table 6B for JP-5 and JP-8. Use Volume I, Table 6A for JP-4 fuel.

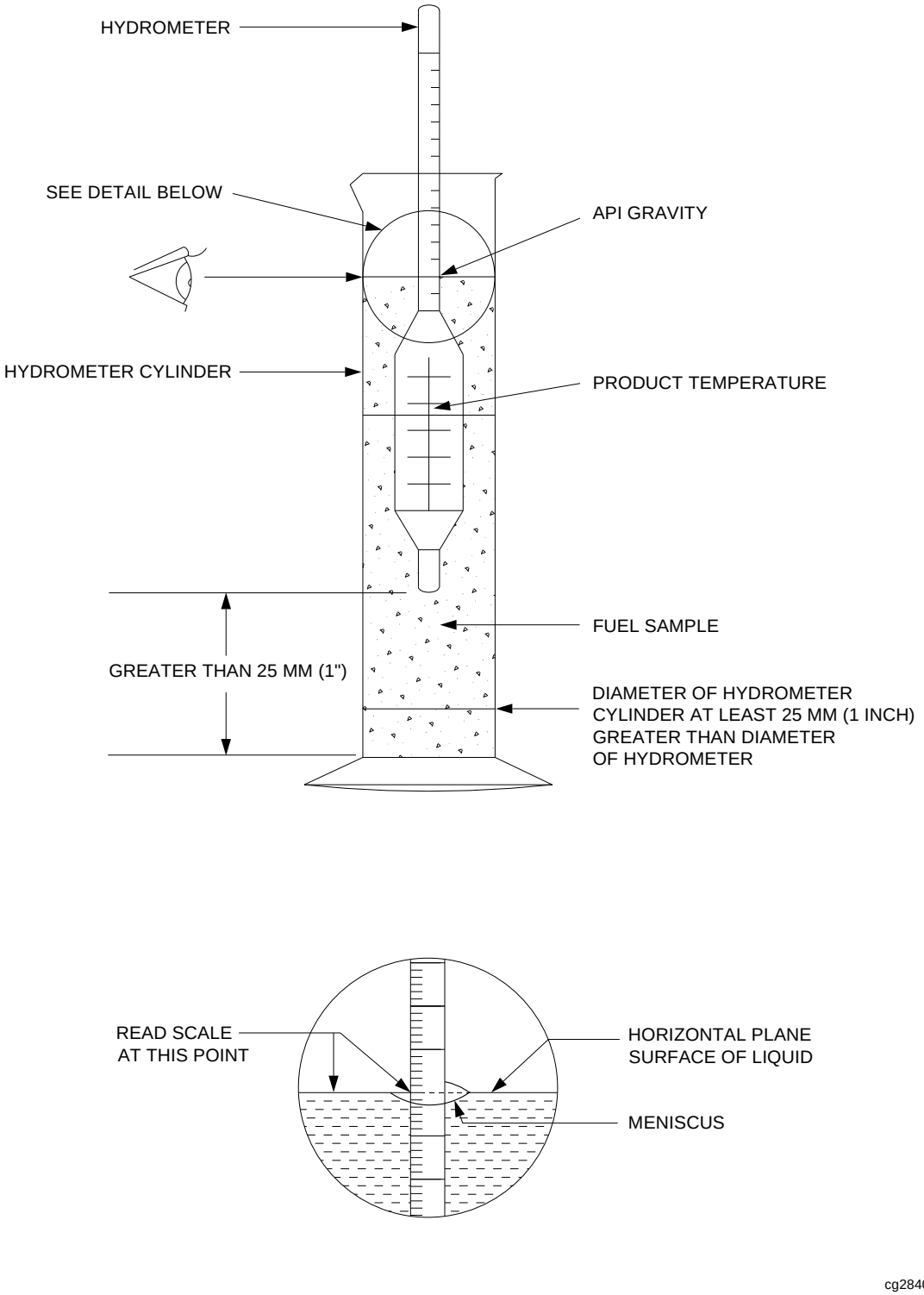


Figure 6-2. API Gravity Hydrometer

5. Static Dissipator Additive Sampling and Testing The EMCEE fuel conductivity meter (NSN 6630-01-115-2398) is a simple method of measuring the electrical conductivity of aviation fuel that may have supplementary Static Dissipater Additive (SDA). Coast Guard aircraft are not required to use fuel with SDA and therefore have no reason to routinely test for conductivity. In the event that the Fuel King believes there is a conductivity problem, a special SDA test can be requested. Ensure that the request briefly explains why the test is required.

WARNING

WHEN CONDUCTING FUEL SAMPLING, NO MORE THAN 1 GALLON OF FUEL MAY BE IN THE LAB AT ANY TIME.

CAUTION

THE STORAGE OF ANY VOLUME OF FUEL IN THE LAB AFTER THE COMPLETION OF TESTING IS PROHIBITED.

D. COAST GUARD AIR STATION LABORATORY TESTING Each Coast Guard Air Station that maintains bulk storage (i.e., fuel farms, day tanks) shall have a designated laboratory where the in-house inspections can be performed in a clean, safe environment. The lab must meet all the requirements of the National Fire Protection Association (NFPA). As a minimum, the lab shall have the following:

- An approved, by the proper authority, cross ventilation system for removal of fumes that directs air away from the personnel breathing zone.
- Impermeable tabletops and floor
- An audible fire alarm
- Outward opening doors equipped with panic bars
- Eyewash/Shower
- A fire blanket
- Telephone
- An approved fire extinguisher
- Grounding straps
- Climate Control (HVAC)
- Sink with running hot and cold water
- Storage cabinets for testing equipment support items

1. Testing Equipment Each Coast Guard Air Station that maintains a bulk storage facility shall maintain a laboratory with the test equipment listed in the above paragraph. Refer to MIL-HDBK-844 (AS) for overall instructions in using test kits. Refer to the operating manuals for individual test kits for more detailed instructions. Replacement manuals may be obtained from the U.S. Navy through NAVAIR (AIR-4.4.5).

   a. Sediment Test Equipment

      (1) Contaminated Fuel Detector (CFD) or AEL MK III kit.

      (2) Currently, the only CFD being procured is the CCFD, NSN 6640-01-013-5279. It includes a built-in FWD viewer kit. The regular CFD, NSN 6630-00-706-2302, is still available and may be used.

      (3) Additional materiels needed to conduct the tests include:

         - Filter element, fluid, 0.65 micron, NSN 6640-00-967-0500 filter, and wratten, NSN 6630-00-849-5288.

b. Water Content Test Equipment

(1) Viewer Kit, Free Water Detector (FWD) or AEL MK I (NSN 6640-00-999-2786)

(2) Additional materiels needed to conduct the test include:

- Detector pad, free water, NSN 6640-00-999-2785
- Standard, free water, NSN 6640-00-999-2784

NOTE

Free water standards deteriorate with exposure to ultraviolet light and need to be replaced every 6 months.

c. Fuel System Icing Inhibitor Test Equipment

(1) B/2 Anti-Icing Test Kit or FSII Refractometer

(2) Reference: NSN 6630-01-165-7133

d. API Gravity Test Equipment API Hydrometers and a 1,000 ml clear glass graduated cylinder

Reference:

- Hydrometer, graduated 29- to 41-degree range, JP-5/8, NSN 6630-00-242-9258
- Hydrometer, graduated 39- to 51-degree range, JP-5/8, NSN 6630-00-245-8376

e. Flashpoint Test Equipment

(1) Pensky-Martens, ASTM Method D93

- Pensky-Martens closed cup flashpoint tester, NSN 6630-00-530-0987(requires use of a propane cylinder)
- Electronic flashpoint tester, NSN 6625-01-472-6783 (requires N-Dodecane for calibration)
- N-Dodecane Calibration Standard, NSN 6810-01-419-2677 (for use with electronic flashpoint tester)

NOTE

Air Stations or units utilizing JP-8 shall conduct weekly flashpoint tests.

E. DOD LABORATORY TESTING Take routine fuel samples monthly. These samples serve two purposes. They assist the Air Station in monitoring the performance of their local fuel testing laboratory. They also provide DoD with information on the general quality of the fuel delivered to aircraft and the performance of AEL MK III and FSII detector kits.

The following aircraft fuel sampling containers and shipping containers conforming to MIL-K-2374 are available in the military and civilian supply system. These sampling kits meet all requirements for shipment of aircraft fuels by military and commercial transportation media.

- Fuel Sampling Kit, complete, NSN 8115-00-719-4111
- Top and bottom cushioning (inner-pack), NSN 8115-00-719-4825
- Replacement Kit containing four sample tags and four glass sample bottles, 32 oz. Size - NSN 8115-00-717-8572
- Drum, Shipping and storage, 5-gallon, 24 gauge steel, epoxy-lined fuel sample container suitable for shipment or retention of fuel samples, NSN 8110-00-282-2520
- Bottles, glass, clear, 12 1-quart glass bottles, (without tags) suitable for taking visual samples and for shipping to laboratories, NSN 8125-00-378-9994

- Container, safety can. Containers for the safe storage and transport of used fuel are available in two sizes:

  1 gallon, NSN 7240-00-177-4999

  5 gallon, NSN 7240-00-178-8286

1. Sample Container Identification

   a. Accurate record keeping is necessary so that the test results may be correlated with the samples submitted. The following is a suggested guide for sample identification and labeling:

      - Coast Guard Air Station name and address
      - Coast Guard Air Station sample serial number
      - Type Fuel (e.g., JP-5, JP-8)
      - Date and time sample taken
      - Location of sampling point (e.g., nozzle sample, refueler no. 3)
      - Name of person drawing sample
      - Classification of sample and testing required

   b. For a special test, attach comments describing the type of test requested and a brief explanation why the test is required. This will assist laboratory personnel in determining which additional tests should be performed.

2. Shipping Instructions Air Station samples should be forwarded to the nearest DoD testing laboratory by the most expeditious means. Samples from All Coast Guard Cutter aviation fuel systems will be shipped to the Mid-Atlantic Fuels Testing Laboratory in Norfolk, VA. See Table 6-2 for a current list of DoD fuel testing labs and their addresses. A current list is also maintained in MIL-HDBK-844 (AS). When possible, deliver samples to the laboratory by overnight courier. Samples shipped by military aircraft shall be packed according to Packaging and Handling of Dangerous Materiels for Transportation by Military Aircraft (38-250/NAVWEPS) and the U.S. Coast Guard Hazardous Waste Manual, COMDTINST 16478.1 (series).

Table 6-1. Visual (Clear and Bright) Inspection of JP-5 and JP-8 Fuel

Appearance	Contaminant	Characteristics	Effect On Aircraft
Not visible	Dissolved water	Fresh water only, precipitates out as a cloud when the fuel is cooled.	None, unless precipitating out by cooling, then the same as entrained water
Light haze or cloud May not be visible	Entrained water	Tiny droplets of water suspended in the fuel; usually caused when a slug of water in the fuel is agitated, as when passing through a pump; may be settled out over time	Icing of fuel system Erratic fuel quantity indications
Droplets adhering to the sides of the bottle; large, visible amounts settled in the bottom	Free water	May be salt or fresh water, presence of a cloud indicates entrained water	Same as entrained water can also cause engine flameout, salt water can cause corrosion of fuel system parts
Red or black powder, rouges, or grains May appear as a dye-like materiel in the field	Rust	Red rust considered non-magnetic, black rust magnetic; rust is generally the leading source of particulate contamination	Can cause fuel controls, flow dividers, filters, pumps, and nozzles to clog, stick, and fail
Crystalline, granular, or glass-like	Sand or dust	Frequently present; a common source of particulate contamination	Same as rust
Red, brown, gray, or black, stringy, fibrous materiel	Micro-biological growth	Usually found with other contaminants, very lightweight: floats or “swims” in the fuel longer than water droplets or other particulates, develops only when free water is present	Fouls fuel quantity indicator probes, flow dividers, and fuel controls; clogs filters and may cause engine flameout
Brown, gray, or black sticky materiel, variously described as gelatinous, gummy, or like catsup or mayonnaise	Stabilized emulsion	Entrained water with rust or microbiological growth that stabilizes or “firms” the emulsion, will adhere to most materiels it contacts, usually present as “globules” or stringy, fibrous materiel in either clear or cloudy fuel, may stand indefinitely without settling	Same as free water, rust, and microbiological growth, except more drastic
White or gray powder or paste	Aluminum or magnesium compounds	Sometimes very sticky or gelatinous when present with water	Same as rust
	Surfactants	Soap or detergent-like materiels that occur naturally in fuel or that are introduced in the refining process; they help suspend contaminants in the fuel and can coat filter elements, rendering them ineffective	Same as free water, rust, and microbiological growth
Cloud in fuel	Air bubbles	Cloud dispenses upwards in a few seconds	None

Table 6-2. DoD Fuel Testing Laboratories

Location	Lab Shipping Address	Lab Mailing Address
Norfolk, VA	Mid-Atlantic Fuels Testing Laboratory 9673 Virginia Avenue Building W-388, Code 134.14 Norfolk, VA 23511-3323 COMM: (757) 444-2761 DSN: 564-4364	Same as shipping address
Jacksonville, FL	Director Fuel Department (Code 700) FISC 8808 Somers Rd., Bldg. 56 Jacksonville, FL 32218-2600 COMM: (904) 696-5411 DSN: 942-4907	Same as shipping address
Dayton, Ohio	Director Aerospace Fuels Laboratory Det. 13, SA-ALC/SFTLA Area B, Bldg 70, Suite 1 Wright-Patterson AFB, OH 45433-7632 COMM: (573) 255-5687 DSN: 785-5687	Same as shipping address
San Diego, CA	Fleet and Industrial Supply Center Point Loma Sub Base 199 Rosecrans Bldg 50 San Diego, CA 92106 COMM: (619) 553-1326 DSN: 553-1326	Director, Fuel Department FISC San Diego Code 700 937 North Harbor Dr., Suite. 480 San Diego, CA 92132-0480
Seattle, WA	Naval Supply Center 7501 Beach Drive Port Orchard, WA 98366 COMM: (360) 476-2135 DSN: 439-2135	Director, Fuel Department FISC Puget Sound P.O. Box 8 Manchester, WA 98353-008
Pearl Harbor, HI	NSC Pearl Harbor POL Lab Director, Fuel Department Naval Supply Center Code 700, Box 300 Pearl Harbor, HI 96860-5300 COMM: (808) 471-9344 DSN: 471-9344	Same as shipping address

CHAPTER 7. FUEL PREVENTIVE MAINTENANCE PROCEDURES

A. **INTRODUCTION** No single step or process can ensure product cleanliness. Fuel maintenance must be a continuous and progressive operation from refinery to aircraft. All cleanup steps shall be performed concurrent with fueling operations.

B. **MAINTAINING FUEL** Once the fuel is on board and in the system, it must continue to be maintained. The following procedures should be considered minimum guidance and may be supplemented by individual Coast Guard Air Stations to meet the needs of local conditions and circumstances.

1. Settling After receipt of fuel, allow at least 3 hours of settling time per foot of fuel depth above the settling line before stripping the tanks of any free water.

2. Stripping Procedures are as follows:

   a. Strip all service tanks daily before recirculating.

   b. Strip all storage tanks weekly before recirculating. Increased frequency of stripping may be required if fuel tests indicate an elevated free water contamination level.

   c. Strip storage tanks before transferring fuel to the service tanks.

   d. Ensure flow rate is sufficient to pull water and other contaminants (56-GPM minimum) out with the fuel.

3. Filtration

   a. Filter/separators remove contamination from fuel. Even fuel that tests clean should be circulated through the filter/separator periodically.

   b. Procedures are as follows:

      (1) Ensure all water is drained from the filter/separator after every recirculation.

      (2) Change filter elements annually, every 1 million gallons, or when the pressure differential (delta P) across the filter/separator exceeds 15 PSID. A sudden drop in delta P across the filters indicates that one or more filter elements have failed and the filter elements should be replaced.

4. Recirculation

   a. The filter/separator should be a part of the recirculation loop for fuel in service tanks, storage tanks and piping.

   b. Procedures are as follows:

      (1) Run fuel being dispensed to aircraft, fueling vehicles, or a pipeline through the filter separator.

      (2) Circulate contaminated tanks until the fuel meets the minimum requirements of the test.

      (3) Fuel being received by pipeline or truck does not need to be received through the filter/separator. However, the tank(s) that received the fuel should be recirculated within 24 hours.

      (4) Recirculate storage tanks through the filter separator once a week.

      (5) Recirculate the service tank daily.

5. Storage Time Limits There is no practical limit on the time JP-5 and JP-8 can be stored, provided it is properly maintained. Military fuels contain additives to prevent the breakdown of certain characteristics. However, fuel stored containing water will eventually lose part or all of its FSII content and become unusable. Commercial grade fuels should not be stored for longer than 3 months. The minimum level of FSII in fuel used by Coast Guard aircraft to prevent water/ice formation is 0.03%.

6. Records and Logs Procedures are as follows:

   a. Maintain accurate records of fuel quantity, condition, and age.

b. Maintain complete and accurate records for 12 months to fit the particular needs of each Coast Guard Air Station. Entries should include the daily, weekly, monthly, and annual checks along with information on facility maintenance, fuel receipts, inventory, and delivery.

C. FUEL ADDITIVES Aviation fuels for use in Coast Guard aircraft may contain one or more additives that are normally added at the refinery or the DoD facility from which the fuel is purchased. Coast Guard Air Stations are not authorized to blend additives into fuel except in emergency, or as noted in Paragraph 7.F.

1. Icing Inhibitor (FSII)

   a. JP-5 and JP-8 fuel received from military sources will normally contain Fuel System Icing Inhibitor (FSII). FSII is mandatory for routine use in all Coast Guard aircraft. The normal level of FSII in the fuel is 0.10 to 0.15% by volume. The only materiel currently authorized for use is Di-Ethylene Glycol Monomethyl Ether (DiEGME).

   b. FSII lowers the freezing point of free water in the fuel of the aircraft. This prevents the formation of ice in the aircraft fuel system that can clog the fuel system and cause aircraft engine failure from fuel starvation.

   c. FSII also restricts bacterial growth; however, it can be broken down by the presence of free water.

WARNING
FSII IS A MUTAGEN IN THE UNDILUTED STATE.

2. Corrosion Lubricity Improver (CI) A combination lubricity improver and corrosion inhibitor additive is present in all military turbine engine fuels and is available as an optional additive in most commercial grade fuels. CI is added at the refinery to improve the lubricating characteristics of the fuel. Long-term use of fuel oil without CI will cause engine damage. There is no required testing for CI.

3. Static Dissipator Additive (SDA) JP-4 and JP-8 fuels are injected with a special additive that increases the fuel's conductivity and helps reduce static electrical charges produced during fuel handling operations. SDA is not added to JP-5 because when the two are combined, they tend to have an adverse effect on filter/separator performance. There is no required testing for SDA.

4. Thermal Stability Additive (TSA)

   a. Thermal Stability Additives (TSA) can raise the flashpoint of turbine engine fuels and increase their storage life. Also known as antioxidant additives, TSAs are added at the refinery. They are normally only found in fuels for military applications because military fuels are held in storage longer than commercial fuels. During longer periods of storage, some properties of the fuel, including its thermal stability, can break down. The flashpoint may also be lowered and the fuel becomes more volatile. TSA can remedy other unacceptable property changes encountered during long storage periods such as total acid number, copper strip corrosion, and existent gums.

   b. Since the Coast Guard does not normally store fuels for long periods, the use of TSA is not mandatory. However, with prior authorization from ALC, TSA may be added to JP-8 fuel to provide thermal stability above 100 °F.

5. Plus 100 Additive This additive for high performance jet aircraft is usually added at the refinery or at the DoD storage and handling facility. Currently, Coast Guard aircraft do not require the use of Plus 100 additive.

NOTE
For use of Leak Detection Additives, follow procedures outlined in MIL-STD-81298.

6. Leak Detection Additives Chemical Leak Detection Compounds (LDC) are occasionally added to aviation fuel by aviation mechanics to pin down the source of fuel leaks. LDCs can

be harmful to the fuel and the aircraft if not used properly. Refer to MIL-STD-81298 and AFTO 42B-1-1-10 (series) for proper procedures for mixing and adding LDCs.

D. **CLEANING TANKS** The cleaning of tanks is a highly specialized procedure. Civil engineering personnel or certified contractors shall be the only authorized authority to enter and clean tanks. Tanks should be cleaned in accordance with AFTO 37-1-1. All personnel should confer with the local Safety Officer and a USCG Certified Gas Free engineer prior to entry into any tank in accordance with COMDTINST M5100.47, Chapter 6.

E. **CHANGE OF PRODUCT GRADE**

1. Procedures To convert from JP-5 to JP-8 service or JP-8 to JP-5, consult with AFTO 42B-1-1. Specific procedures must be followed to ensure fuels meet the required MIL-SPEC.

F. **ADDITIVE BLENDING** Fuel additives will normally be blended at the refinery, the DoD fuel farm, or commercial facility from which the fuel is purchased. Additives should only be blended by qualified fuel servicing personnel when the purchased fuel does not contain the desired additives while away from the aircraft's permanent station.

1. Procedures

   a. The two basic methods for putting additives into fuel are manual (hand doping) or proportional injection. The preferred method is proportional injection using a fuel-driven design that injects additives proportionately at various flow rates. Always draw samples for receipt testing before blending additives.

   b. There are several techniques for hand doping additives; however, hand doping is not recommended.

      (1) Add FSII using the 590 ml (20 ounce) aerosol can during over-wing refueling. Determine the fuel load and calculate the amount of additive required. It should be added gradually during filling to permit proper blending in the fuel. One 590 ml can of aerosol additive will inhibit 180 gallons of fuel to 0.087% by volume.

WARNING

MANY FUEL ADDITIVES, INCLUDING PRIST, ARE MUTAGENS, AND MUST BE HANDLED WITH GREAT CARE.

WARNING

ALWAYS WEAR A RESPIRATOR, RUBBER GLOVES, RUBBER APRON, AND SAFETY GOGGLES WHEN HANDLING ADDITIVES. IF ADDITIVES ARE SPLASHED ON EXPOSED SKIN OR EYES, FLUSH WITH COPIOUS AMOUNTS OF FRESH WATER AND SEEK MEDICAL ATTENTION. IF ADDITIVES ARE ACCIDENTALLY INGESTED, INDUCE VOMITING AND SEEK MEDICAL ATTENTION.

NOTE

Any time FSII is introduced into an aircraft by means of aerosol can, an entry must be made into the Electronic Asset Logbook (EAL).

G. **WATER BOTTOMS** The use of aviation fuel tanks with water bottoms is prohibited at Coast Guard Air Stations. All fuel storage tanks shall have sumps for collecting and stripping accumulated water. Units shall check and drain sumps at least weekly. Tanks with open floating roof designs shall be stripped daily.

CHAPTER 8. AIRCRAFT FUELING OPERATIONS

A. INTRODUCTION

1. Aircraft fuel servicing is potentially one of the most hazardous of aircraft ground operations. The fueling process generates electrostatic charges that can produce sufficient electrical energy to ignite any explosive fuel/air mixtures present. Fueling personnel must make a conscious effort to remove the potential for ignition by eliminating or equalizing these electrostatic charges through appropriate grounding and bonding procedures on aircraft, fuel trucks, and personal clothing. A minimum of two people is required for every fuel transfer operation.

2. The following paragraphs describe specific minimum actions to be taken when performing the various fueling evolutions. Each paragraph is designed to be a stand-alone paragraph for ease of finding instructions specific to the evolution at hand. Therefore, some repetition has occurred.

CAUTION

USE CAUTION WHEN REFUELING NON-COAST GUARD OR ANY UNFAMILIAR AIRCRAFT. ALWAYS CONFIRM PROCEDURES AND SERVICING STANDARDS WITH THE AIRCRAFT CREW BEFORE COMMENCING FUELING OPERATIONS. FUELING PRESSURES AND PROCEDURES COULD DIFFER SUBSTANTIALLY.

B. COMMAND REQUIREMENTS Commanding Officers Shall:

1. Review all refueling plans annually.

2. Ensure that the local fire department is fully informed on Air Station hot refueling procedures/events, positioning of aircraft, available Air Station fire fighting resources, and response plans.

3. Ensure personnel are fully qualified prior to performing the following:

   - Any aircraft fueling duties
   - Operate fuel servicing equipment
   - Act as the unit fuel king

4. Review all environmental liabilities addressed in Chapter 10.

C. COLD REFUELING (NORMAL OPERATIONS)

WARNING

DO NOT START COLD REFUELING OPERATIONS WHEN A LIGHTNING ADVISORY HAS BEEN ISSUED, INDICATING AN ELECTRICAL STORM IS WITHIN 5 NAUTICAL MILES OF THE AIR STATION.

WARNING

AIRCRAFT RADAR AND HF RADIOS SHALL NOT BE OPERATED IN THE TRANSMIT MODE WITHIN 300 FT OF COLD REFUELING OPERATIONS.

WARNING

DO NOT SERVICE OXYGEN SYSTEMS DURING REFUELING OPERATIONS.

1. Personnel Requirements

   a. Cold refueling an aircraft from a hydrant, refueler (cart), or truck requires a minimum of two people. One person is the truck driver/fuel system operator. The driver/operator can also perform the duties of fire extinguisher operator. Another person is required at the aircraft control panel to operate the control panel and the nozzle connection. Common sense should dictate the amount of personnel needed to safely complete the task.

   b. Emergency procedures are as follows:

      (1) The driver/operator shall immediately release the deadman control and secure the PTO to cut off the flow of fuel.

      (2) The driver/operator shall then remove the wheel chocks and man the fire extinguisher.

      (3) The fuel control panel operator shall disconnect the nozzle and bonding cable from the aircraft.

      (4) The fuel control panel operator shall then take over the fire extinguisher.

      (5) The driver/operator shall reel in the hose, bonding wire and move the truck or cart out of the area.

2. Truck Preparation If a truck is used to refuel the aircraft, these additional procedures are needed for truck preparation:

   a. Ensure that the daily recirculation of fuel and sampling requirements have been completed in accordance with MSR MPC 153301.0.

   b. Drive the truck into position following the path described in Paragraph 8.I. of this process guide. The truck shall be positioned so that it can be driven away quickly.

   c. Place the gearshift in neutral.

   d. Turn off the headlights, leave parking lights on and secure any unnecessary electrical equipment on the truck.

   e. Set the brakes and ensure wheel chocks are used.

   f. Open the driver's side door and leave open during refueling.

3. Procedures All Coast Guard Air Stations shall have written instructions on cold refueling. As a minimum, instructions shall include the following procedures:

   a. Check aircraft for hot brake condition in accordance with applicable aircraft flight manual.

   b. Tow or taxi aircraft into the refueling area. Aircraft shall not be cold refueled in the same refueling pit at the same time hot fueling is in progress. If an aircraft is towed into the fueling pit and the tractor remains attached, the tractor engine must be secured during fueling. If aircraft are being fueled from a truck, the truck engine may remain running if it is the only source of power for the pump. Otherwise, only the pump engine should be running.

   c. Chock the truck wheels.

   d. Attach bonding cable between the aircraft and the refueling station or refueler.

NOTE

Grounding of the aircraft and the fuel truck (cable from aircraft and fuel truck to earth) during fuel servicing is not required if servicing on a concrete surface.

   e. During the fueling operations, secure all aircraft electronics and electrical switches not required for refueling operations.

f. There shall be no smoking, open flames, spark or flame producing items, or radio transmissions items within 50 ft of a cold refueling operation. The electrical power cables should be of sufficient length to permit parking of the power unit at least 50 ft away from fuel servicing vehicles and equipment, and outside of the fuel servicing safety zone.

g. Verify that the required firefighting equipment is in the refueling area or pit. There should be a minimum of one 125/150 lb PKP fire extinguisher available for use.

h. Shut down all operating equipment within 50 ft that is not required for refueling and do not start up the equipment again until after fuel vapors have dissipated.

i. Equip all internal combustion engines operating within 50 ft of cold refueling operations with a spark-arresting muffler. No aircraft or auxiliary power unit (APU) engines shall be started or stopped within 50 ft during cold refueling operations.

j. Fully extend the hose and place in proper position for refueling.

k. Remove the fueling cap from aircraft and the dust cover from the single point nozzle. Inspect the face of the nozzle to ensure it is clean and verify that the flow control handle is in the fully closed position. Nozzle will not connect if handle is not fully closed.

l. Visually inspect the aircraft's adapter or receptacle for damage or wear. If there is any doubt about the integrity of the adapter, do not refuel.

m. Lift the nozzle by the lifting handles, align the lugs with the slots on the aircraft adapter, and hook up to the aircraft by pressing it firmly into the adapter and rotating clockwise to a positive stop. The nozzle must be seated firmly on the receptacle and not be cocked, before opening the single-point, nozzle handle. Zero the refueling station or truck meter.

n. Rotate the nozzle flow control handle to the FULL OPEN position prior to charging the fuel hose.

CAUTION

THE AIRCRAFT PRE-CHECK SYSTEM SIMULATES THE COMPLETION OF A FUELING EVOLUTION. ALL FUEL FLOW INTO THE AIRCRAFT SHALL STOP WITHIN 1 MINUTE OF THE SYSTEM BEING ACTIVATED. THE REFUELING STATION METER WILL STOP REGISTERING FUEL FLOW IF THE AIRCRAFT PRE-CHECK SYSTEM IS WORKING PROPERLY. AIRCRAFT SHOULD NOT BE REFUELED IF THE AIRCRAFT PRE-CHECK SYSTEM TEST FAILS, UNLESS AN EMERGENCY EXISTS.

o. Upon receiving signals from the nozzle/operator that hook up has been completed, open valves on truck and actuate the hand-held deadman control.

p. Exercise the aircraft pre-check system once fuel flow has been established.

q. Fuel aircraft as directed by the aircraft control panel operator. The aircraft control panel operator shall monitor aircraft vents, tank pressure gauges, warning lights, and/or fuel panels.

r. The truck driver/operator will release the deadman control when directed by the aircraft refueling panel operator.

s. Rotate the nozzle flow control handle into the OFF and fully locked position.

t. Disconnect the nozzle from the aircraft and reinstall the dust cover.

u. Close all valves on refueler, stow the hose, and remove wheel chocks.

v. Remove bonding wire between aircraft and fuel truck.

w. Read meter and record. Complete paperwork.

NOTE

Annotate which aircraft tail number was fueled by which truck on the unit's locally promulgated form.

D. **OVERWING REFUELING** All Coast Guard Air Stations shall have a written instruction for overwing refueling.

WARNING

DO NOT START COLD REFUELING OPERATIONS WHEN A LIGHTNING ADVISORY HAS BEEN ISSUED, INDICATING AN ELECTRICAL STORM IS WITHIN 5 NAUTICAL MILES OF THE AIR STATION.

WARNING

AIRCRAFT RADAR AND HF RADIOS SHALL NOT BE OPERATED IN THE TRANSMIT MODE WITHIN 300 FT OF COLD REFUELING OPERATIONS.

WARNING

DO NOT SERVICE OXYGEN SYSTEMS DURING OVERWING REFUELING OPERATIONS.

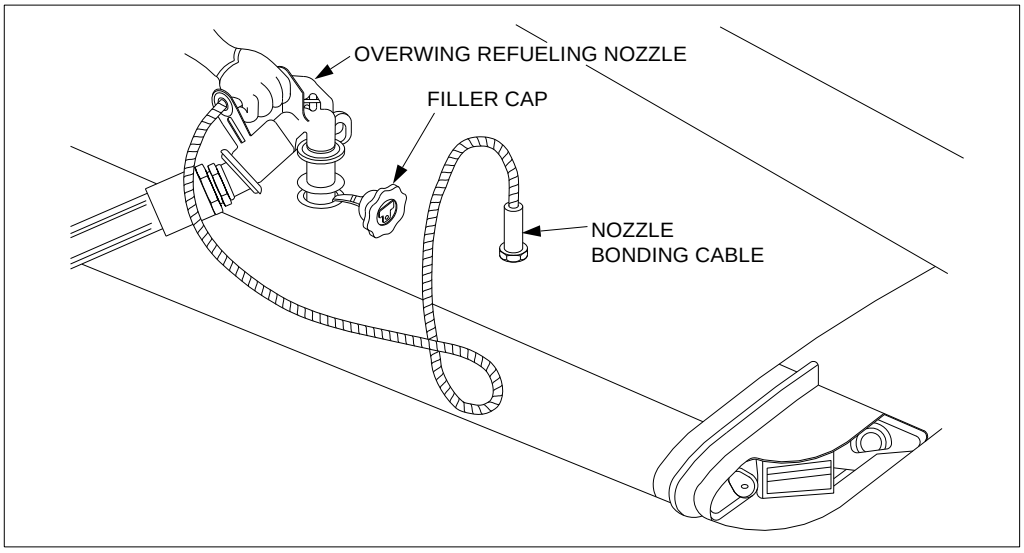


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Figure 8-1. Overwing Refueling

1. Personnel Requirements Overwing refueling procedures by hydrant, refueler (cart), or truck require a minimum of two people: an aircraft fuel nozzle operator and a fuel system operator/truck driver. Common sense should dictate the number of personnel to safely complete the task.

2. Truck Preparations Truck preparations for overwing are the same as for cold refueling, except that the overwing nozzle is used. See Paragraph 8.C.2.

3. Procedures As a minimum, instructions shall include the following procedures:

   a. Check aircraft for hot brake condition in accordance with applicable aircraft flight manual.

   b. Tow or taxi aircraft into the refueling area. Aircraft shall not be cold refueled in the same refueling pit at the same time hot fueling is in progress. If an aircraft is towed into the fueling pit and the tractor remains attached, the tractor engine must be secured during fueling. If aircraft are being fueled from a truck, the truck engine may remain running if it is the only source of power for the pump. Otherwise, only the pump engine should be running.

   c. Chock the truck wheels.

   d. Attach bonding cable between the aircraft and the refueling station or refueler. Figure 8-1 shows a typical bonding connection for overwing refueling.

NOTE

Grounding of the aircraft and the fuel truck (cable from aircraft and fuel truck to earth) during fuel servicing is not required if servicing on a concrete surface.

   e. During the fueling operations, secure all aircraft electronics and electrical switches not required for refueling operations.

   f. There shall be no smoking, open flames, spark or flame producing items, or radio transmissions items within 50 ft of a cold refueling operation. The electrical power cables should be of sufficient length to permit parking of the power unit at least 50 ft away from fuel servicing vehicles and equipment and outside of the fuel servicing safety zone.

   g. Verify that the required firefighting equipment is in the refueling area or pit. There should be a minimum of one 125/150 lb PKP fire extinguisher available for use.

   h. Shut down all operating equipment within 50 ft that is not required for refueling and do not start up the equipment again until after fuel vapors have dissipated.

   i. Equip all internal combustion engines operating within 50 ft of cold refueling operations with a spark-arresting muffler. No aircraft or auxiliary power unit (APU) engines shall be started or stopped within 50 ft during overwing refueling operations.

   j. Fully extend the hose and place in proper position for refueling.

   k. Bond the overwing nozzle to the aircraft.

   l. Insert the overwing nozzle into the aircraft refueling port and maintain a metal-to-metal contact throughout the fueling evolution.

   m. The fuel system operator/truck driver may actuate the hand-held deadman control upon receiving signals from the nozzle/operator that the fueling operation is ready to begin.

   n. Once direct communication utilizing hand signals with the operator/truck driver have been established, the nozzle operator shall initiate fuel flow by squeezing the handle on the overwing fueling nozzle.

   o. The truck driver/operator will release the deadman control when directed by the nozzle operator.

p. The operator/truck driver should monitor the aircraft's ground profile for abnormalities during the operation.

q. Disconnect the nozzle bonding wire and refueler/truck bonding wire from the aircraft.

r. Replace fuel cap on aircraft.

s. Stow the hose.

t. Read meter and record. Complete paperwork.

NOTE

Annotate which aircraft tail number was fueled by which truck on the unit's locally promulgated form.

E. HOT REFUELING Hot refueling shall only be conducted to meet urgent operational mission requirements or for periodic proficiency training of unit personnel and should not be conducted as daily routine.

WARNING

HOT REFUELING AIRCRAFT IS A HAZARDOUS OPERATION AND SHOULD NEVER BE REGARDED LIGHTLY. AN ANALYSIS OF HISTORICAL USAF, USN, AND USCG HOT REFUELING INCIDENTS HAS REVEALED TRENDS THAT ALL ENGINEERING OFFICERS, SAFETY OFFICERS, COMMAND STAFF, AND AVIATION PERSONNEL SHOULD BE COGNIZANT OF. NEARLY ALL CLASS A, B, AND C HOT REFUELING MISHAPS INVOLVE FAILURE OF ONE OR MORE OF THE FOLLOWING:

- **THE SPR NOZZLE LOCKING DEVICE**
- **FAILURE OF THE SPR NOZZLE OPERATOR TO PROPERLY ENGAGE THE LOCKING MECHANISM**
- **FAILURE OF THE HOSE.**
- **FAILURE OF HOSE COUPLINGS**
- **FAILURE OF AIRCRAFT INTERNAL FUEL TRANSFER PLUMBING OR VALVES.**

HOT REFUELING AT NIGHT IS PARTICULARLY HAZARDOUS AND SHOULD BE EXECUTED WITH UTMOST CAUTION. NIGHT HOT REFUELING SHALL BE PERFORMED IN WELL-LIGHTED AREAS ONLY. THE USE OF NIGHT VISION DEVICES WHILE HOT REFUELING IS PROHIBITED.

WARNING

THE REFUELING HOSE MUST BE FULLY EXTENDED FOR THE EMERGENCY DRY BREAKAWAY DEVICE TO WORK PROPERLY. THE HOSE SHALL NOT PASS UNDER THE AIRCRAFT TO REACH THE SPR CONNECTION. DISCONTINUE REFUELING IMMEDIATELY IF LEAKS ARE DISCOVERED. THE DEADMAN CONTROL OPERATOR SHALL HAVE A DIRECT LINE-OF-SIGHT TO THE REFUELING PANEL OPERATOR AT THE AIRCRAFT RECEPTACLE. IF EITHER THE PRIMARY OR SECONDARY PRE-CHECK TEST FAILS, THE HOT REFUELING OPERATION SHALL BE HALTED IMMEDIATELY. AIRCRAFT DOORS/WINDOWS LOCATED ON THE SAME SIDE AS THE SPR SHALL REMAIN CLOSED DURING THE HOT REFUELING OPERATION.

WARNING

CREW CHANGES SHALL NOT BE MADE IN THE FUELING PIT OR DESIGNATED HOT REFUELING AREA DURING HOT REFUELING OPERATIONS

NOTE

Hot refueling should only be performed when emergency operational requirements dictate. This operation is significantly more dangerous and costly, both in terms of fuel and manpower expenditures. Only single point hot refueling shall be performed. All Coast Guard Air Stations shall maintain written instructions on hot refueling. The Logistics Compliance Inspection teams will review the hot refueling instructions. As a minimum, the instructions shall include the following procedures and requirements.

1. Personnel Requirements Hot refueling procedures require a minimum of four people: one on fire guard, one fuel system operator on the dead man control, one person operating the aircraft fuel control panel, and a hot refueling supervisor.

NOTE

If using an aircraft refueler, the fuel truck driver/operator serves as the dead man control operator.

Personnel conducting hot refueling operations shall have completed a locally developed training syllabus prior to performing duties of any hot refueling position. The syllabus shall include a minimum of two satisfactorily completed hot refueling evolutions, for each position, under direct supervision of a qualified hot refueling operator.

2. Procedures Prior to Entering the Refueling Area Units shall perform the following before the aircraft enters the hot refueling area:

   a. Notify the local fire department at least 15 minutes before hot refueling.

   b. Ensure the daily recirculation of fuel and fuel sampling has been completed on the fuel truck.

   c. Check the area for FOD.

   d. The hot refueling supervisor shall ensure that the refueling team is properly outfitted with hearing protection, flight crew helmets, long-sleeved shirts, and long pants. Footwear shall not have nails or metal plates capable of causing a spark.

   e. Qualified aircrew members shall ensure that all ordnance and pyrotechnics are safe.

   f. There shall be no smoking, open flames, spark or flame producing items, or radio transmissions items within 50 ft of a hot refueling operation.

3. Equipment Requirements

   a. The following equipment is required to conduct a hot refueling:

      (1) The fuel system shall have a fully functioning deadman control.

      (2) A refueling hose, fuel truck, or refueler cart.

      (3) One bonding cable.

      (4) Aircraft wheel chocks.

CAUTION

IF THE FIRE/RESCUE VEHICLE IS CALLED AWAY DURING HOT REFUELING, FUELING MUST STOP AND MAY NOT PROCEED UNTIL THE FIRE/RESCUE VEHICLE RETURNS. IF 125/150 LB PKP UNITS ARE USED, AT LEAST ONE MUST BE MANNED AND READY JUST OUTSIDE THE 50 FT FUEL SERVICING SAFETY ZONE. THE OTHER UNIT SHALL BE IMMEDIATELY AVAILABLE WITHIN 100 FT OF THE FSSZ.

(5) Any one of the following:

(a) Two 125/150 lb PKP Extinguishers

(b) An aircraft crash rescue/fire-fighting vehicle

(6) One emergency dry-breakaway coupling installed between the fuel hose and the reel.

4. Procedures in the Hot Refueling Area Once the aircraft is ready for entry into the hot refueling area, the following procedures shall be performed:

a. Check for hot brakes on aircraft

b. Taxi the aircraft into the designated hot refueling area in accordance with the local Coast Guard Air Station's operating procedures and at the direction of the fueling supervisor. The area shall be defined with a red circle drawn on the pavement. Once properly positioned, the aircraft shall be chocked.

During hot refueling operations, the aircraft may not be taxied or positioned within:

- 200 ft of an inhabited or uninhabited building
- 100 ft from a parked aircraft
- 50 ft from a taxiing aircraft

c. The aircrew shall secure all unnecessary electronic and electrical equipment not needed for refueling.

CAUTION

AIRCRAFT RADARS, HF RADIOS, AND EO/IR SYSTEMS SHALL NOT BE OPERATED IN THE TRANSMIT MODE WITHIN 300 FT OF HOT REFUELING OPERATIONS.

NOTE

Any Air Station that cannot meet the required guidelines set above must contact COMDT CG-41 for waivers.

d. The fueling supervisor will verify that firefighting equipment is attended and properly positioned in the hot refueling area.

e. The fueling supervisor will direct the fuel truck to the refueling area.

f. All internal combustion engines operating within 50 ft of a hot refueling procedure must be equipped with a spark-arresting muffler. No internal combustion engine shall be started or stopped within 50 ft of the hot refueling area.

g. Chock refueler vehicle wheels.

h. Bond the aircraft to the refueling equipment.

i. Pull out the hose fully and place in the proper position for refueling.

j. Remove the fueling cap from aircraft and the dust cover from the SPR nozzle. Inspect the face of the nozzle to ensure it is clean and verify that the flow control handle is in the fully closed position.

k. Visually inspect the aircraft's adapter or receptacle for damage or wear. If any doubt exists about the integrity of the adapter, do not proceed with fueling operations.

l. Lift the nozzle handles, align the lugs with the slots on the aircraft adapter, and hook up the nozzle to the aircraft by pressing it firmly into the adapter and rotating clockwise to a positive stop. The nozzle must seat firmly on the receptacle and not be cocked.

m. Zero the refueling meter.

n. Rotate the nozzle flow control 180 degrees to the FULL OPEN position prior to charging the fuel hose. Do not attempt to use the nozzle flow control to regulate fuel flow.

o. The fuel truck driver shall open the appropriate valves on the truck and engage the deadman control after receiving a signal from the fueling supervisor.

CAUTION

THE PRE-CHECK SYSTEM SIMULATES THE COMPLETION OF A FUELING EVOLUTION. ALL FUEL FLOW INTO THE AIRCRAFT SHALL STOP WITHIN 1 MINUTE OF THE SYSTEM BEING ACTIVATED. THE REFUELING STATION METER WILL STOP REGISTERING FUEL FLOW IF THE PRE-CHECK SYSTEM IS WORKING PROPERLY. AIRCRAFT SHOULD NOT BE REFUELED IF THE PRE-CHECK SYSTEM TEST FAILS UNLESS OPERATIONAL NECESSITY DICTATES.

p. Once fuel is flowing, exercise the aircraft pre-check system.

q. Fuel the aircraft as directed by the fueling supervisor. The fueling supervisor shall monitor the area around the aircraft and fuel truck.

r. Release the deadman control when directed by the fueling supervisor.

s. Rotate the nozzle flow control handle into the OFF and fully locked position.

t. Disconnect the nozzle and bonding wire from the aircraft.

u. Stow the hose and nozzle. Remove wheel chocks from aircraft and refueler vehicle.

v. The refueling supervisor will direct the fuel truck to exit the refueling area.

w. Ensure the area is clear of equipment and personnel.

x. Taxi the aircraft away from the area.

y. Notify the local fire department that hot refueling is completed.

z. Complete the paperwork.

F. AIRCRAFT TO AIRCRAFT FUELING Due to the extremely hazardous nature of transferring fuel from a C-130 to a helicopter or helicopter to helicopter, it is imperative that both aircraft commanders and aircrews are cognizant of the special procedures as outlined in their respective aircraft Flight Manual and ACMS MSR MPC 120001.0 or MH-60 MPC 28203.0. This procedure is intended to facilitate CG missions in a forward operating area where appropriate fuel is not available. Each aircraft crewmember involved in the transfer of fuel from one aircraft to another should have:

- A thorough knowledge of the aircraft fuel systems and fueling equipment used in the operation.
- A thorough knowledge of and observe all safety procedures.
- A thorough knowledge of and follow the sequential steps for the operation.

NOTE

The annual inspection requirements for the C-130 refueling kit can be found in the MSR MPC 120001.0.

G. DEFUELING OPERATIONS

CAUTION

DO NOT OPEN TANK TOP WHILE FUEL IS UNDER PRESSURE AND MOVING FROM AIRCRAFT TO FUEL TRUCK.

CAUTION

THERE SHALL BE NO DEFUELING WITHIN 300 FT OF OPERATING GROUND OR AIRCRAFT RADAR.

Defueling operations are technically more demanding and potentially more dangerous than regular fueling operations. Most aircraft defueling pumps and equipment can defuel an aircraft faster than the aircraft can release it. This can damage the aircraft fuel system. The defueling pump must normally be regulated to prevent cavitation that could damage the pump. Once the proper balance is achieved, it must be maintained by manipulating the valve on the downstream side of the pump.

Defuelings normally have a lower priority than a refueling; however, a defueling request due to a fuel leak or maintenance shall be given the highest priority consistent with current operations.

All Coast Guard Air Stations shall have written instructions on defueling. As a minimum, instructions shall include the following procedures:

- Review Paragraph 10.L. for disposition of fuel.
- Maintenance not connected to the defueling operation is prohibited.
- Aircraft shall not be positioned any closer than 50 ft from another aircraft or building.
- Any vehicles operated within 50 ft of the fueling area shall be equipped with spark arrestors.
- Evictor/evacuation systems shall not be used to defuel aircraft.
- Suspect aviation turbine fuel shall be removed by a defueler and deposited in a designated storage tank.
- The aircraft and the defueler unit must be bonded to each other during the entire operation.
- There shall be no smoking, open flames, spark or flame producing items, or radio transmissions items within 50 ft of a defueling operation.
- All operating equipment in the fueling area must be shut down before starting defueling and not started up again until the process is complete.
- A minimum of one, 125/150 lb PKP fire extinguisher, shall be readily available in the defueling area.
- Routine defueling for weight and balance, fuel load change, or maintenance does not require special handling or sampling.
- Fuel containing leak detection dye can only be reissued to unit aircraft. It should not be issued to transient aircraft.
- The Aviation Engineer Officer or qualified personnel shall decide on the disposition of all defueled turbine fuel.
- The aircraft refueler used for defueling shall maintain a flooded suction above the anti-vortex splash plate in its tank to minimize turbulence and possible ingestion of air. Normally this involves keeping a minimum of 1,000 gallons in the defueling unit. Equipment may differ and minimum standards may need to be set for each defueler at an Air Station.
- Defueling will be discontinued if the pump starts to cavitate or lose prime. Operations shall not be restarted until the cause has been found and fixed.
- Defueler tank tops shall not be opened during defueling.
- All defueling operations shall be noted in a separate logbook. The log must record as a minimum:

1. Date
2. Aircraft defueled
3. Fuel truck number
4. Amount removed
5. Reason for defuel
6. Fuel status (ready for issue, etc.)

1. Personnel Requirements

a. Defueling an aircraft to a hydrant, refueler (cart), or truck requires a minimum of two people:

(1) One fuel system operator/truck driver operating the truck and performing the duties of fire extinguisher operator

(2) One person operating the aircraft control panel

b. Emergency procedures are as follows:

(1) The driver/operator shall immediately release the deadman control and secure the PTO to cut off the flow of fuel.

(2) The driver/operator shall remove the wheel chocks and man the fire extinguisher.

(3) The fuel control panel operator shall disconnect the nozzle and bonding wire from the aircraft and secure the controls.

(4) The fuel control panel operator shall take over the fire extinguisher.

(5) The driver/operator shall reel in the hose and move the truck or cart out of the area when it is safe to do so.

CAUTION

ENSURE THAT THE RECEIVING STORAGE UNIT OR DEFUEL TRUCK HAS A SUFFICIENT VOID CAPACITY TO ACCEPT THE VOLUME OF FUEL BEING REMOVED FROM THE AIRCRAFT DURING THE DEFUELING PROCESS. FAILURE TO EFFECTIVELY CALCULATE THE TRANSFERRED FUEL CAPACITY CAN OVERFILL THE STORAGE UNIT OR DEFUEL TRUCK AND CAUSE AN UNWANTED ENVIRONMENTAL SPILL.

2. Defueling Procedures Aircraft defueling procedures are as follows:

WARNING

DO NOT START DEFUELING OPERATIONS WHEN A LIGHTNING ADVISORY HAS BEEN ISSUED, INDICATING AN ELECTRICAL STORM IS WITHIN 5 NAUTICAL MILES OF THE AIR STATION.

a. If suspect, determine the status of the fuel in accordance with Paragraph 10.L.

b. Check the capacity of the defueling equipment to be used versus the amount of fuel to be removed to ensure a fuel spill does not occur.

c. Select defueling equipment to be used: defueler for suspect fuel or refueler/defueler for non-suspect fuel.

d. Position the defueler, if mobile. Chock the defueler vehicle wheel.

e. Verify that the aircraft is spotted properly.

f. Check for possible sources of ignition within 50 ft.

g. Connect the bonding wire from defueler to aircraft. Grounding of either the refueler or the aircraft is not required.

h. Position and connect the defueling hose to the aircraft.

i. Commence defueling when signaled by the fueling supervisor.

j. Secure all equipment when defueling operations are complete.

k. Record date, aircraft defueled, fuel truck number, amount removed, reason for defuel, and fuel status for further determination in accordance with Paragraph 10.L.

3. Disposition of Removed Fuels Suspect aviation fuel shall be removed from the aircraft using a defueler only and deposited in a designated holding tank. Ultimate disposition will depend on the results of lab tests. A special log of each defueling operation shall be maintained. Fuel not suspect of being contaminated can be defueled and used to fuel any aircraft. Fuel shall be tested for Clear and Bright and flashpoint before being returned to a storage tank.

H. CONCURRENT FUELING The Commanding Officer may authorize concurrent fueling evolutions when operations require it. All Coast Guard Air Stations shall have a written instruction covering local procedures for concurrent fueling operations. Loading of ordnance, pyrotechnics or oxygen servicing is not authorized during fueling operations.

NOTE

Concurrent fueling operations are defined as fueling while conducting maintenance, loading/unloading cargo, equipment, or with passengers on board the aircraft.

1. Personnel Requirements Concurrent refueling of aircraft from a hydrant, refueler (cart), or truck requires a minimum of two people. One fuel system operator or truck driver who can also perform the duties of fire extinguisher operator and one person operating the aircraft control panel to monitor the fuel control panel and the nozzle connection. These two individuals will always be exclusive of all other personnel performing concurrent tasks.

WARNING

IN THE CASE OF AN EMERGENCY, THE DRIVER/FUEL SYSTEM OPERATOR SHALL IMMEDIATELY RELEASE THE DEADMAN CONTROL AND SECURE THE PTO TO CUT OFF THE FLOW OF FUEL. HE SHALL THEN REMOVE THE WHEEL CHOCKS AND MAN THE FIRE EXTINGUISHER WHILE THE FUEL CONTROL PANEL OPERATOR DISCONNECTS THE NOZZLE AND BONDING WIRE FROM THE AIRCRAFT. THE FUEL CONTROL PANEL OPERATOR SHALL THEN TAKE OVER THE FIRE EXTINGUISHER WHILE THE DRIVER/OPERATOR REELS IN THE HOSE AND MOVES THE TRUCK OR CART OUT OF THE AREA.

2. Procedures As a minimum, the following procedures and precautions shall be included in the Air Station instruction on concurrent fueling.

WARNING

DO NOT START CONCURRENT REFUELING OPERATIONS WHEN A LIGHTNING ADVISORY HAS BEEN ISSUED, INDICATING AN ELECTRICAL STORM IS WITHIN 5 NAUTICAL MILES OF THE AIR STATION.

CAUTION

NO ENGINES SHALL BE STARTED OR STOPPED WITHIN 50 FT OF A CONCURRENT REFUELING OPERATION. A 125/150 LB PKP EXTINGUISHER SHALL BE LOCATED IN THE FUELING AREA. DO NOT OPERATE EO/IR, AIRCRAFT RADAR, OR H/F RADIOS IN THE TRANSMIT MODE WITHIN 300 FT OF CONCURRENT REFUELING OPERATIONS.

a. Equip all engines operated within 50 ft of concurrent refueling operations with spark arresting type mufflers.

b. Any vehicle connected to the aircraft shall also be bonded to the aircraft. This includes fuel pipelines, refueler vehicles (carts), and trucks.

c. There shall be no smoking, open flames, spark or flame producing items, or radio transmissions items within 50 ft of an overwing refueling operation.

d. Position a crash/rescue vehicle just outside the fueling area if passengers or Medevac patients will remain on board the aircraft during the fueling operation.

e. Provide unobstructed ramps for quick egress when passengers or patients are on board during refueling.

CAUTION

PASSENGERS AND MEDEVAC PATIENTS SHALL NOT BOARD OR LEAVE THE AIRCRAFT WHILE FUELING IS IN PROGRESS UNLESS AN EMERGENCY EXISTS.

f. Maintain a communications system to link the person in charge of the fueling operation with the crash/rescue truck.

g. Maintain a clear path around the aircraft at all times.

I. POSITIONING EQUIPMENT

WARNING

FAILURE OF THE DRIVER/OPERATOR TO OBSERVE THE NOZZLE OPERATOR CAN LEAD TO A SERIOUS FUEL SPILL AND FIRE. THE HOSE SHALL NOT PASS UNDERNEATH THE AIRCRAFT. NEVER CONDUCT SIMULTANEOUS OVERWING AND PRESSURE FUELING OPERATIONS..

CAUTION

REFUELERS SHALL NEVER BE PARKED POINTING TOWARDS ANY PART OF THE AIRCRAFT, BE DRIVEN CLOSER THAN 10 FT FROM ANY POINT ON THE AIRCRAFT (INCLUDING ROTOR BLADE PATH), BE LEFT LESS THAN 25 FT FROM A FUELING PORT OR VENT, OR BE BACKED NEAR AN AIRCRAFT.

1. These procedures shall be duplicated each time there is refueling so all personnel involved will know what to do. Whenever possible, refuelers shall proceed down a line parallel to the aircraft fuselage access. The refueler shall stay at a distance equal to the length of the hose. At no time shall a refueler proceed closer than 10 ft to an aircraft. Driving between parked aircraft in a line shall be avoided.

2. The following rules shall apply for positioning equipment:

   a. The refueler shall be parked in a position on the same side of the aircraft's fuel servicing adapter so that the driver/operator has a direct line of sight to the refueling nozzle operator while actuating the deadman control.

   b. Tailpipe temperature and the location of aircraft tank vents are important considerations when positioning refueler equipment. Refuelers should be positioned inside a fueling pit or have spill kits available.

   c. Refuelers shall not be parked closer than 50 ft from any structure during fueling operations.

3. Figure 8-2 and Figure 8-3 show the correct ways for refueler trucks to approach a fixed wing aircraft and the MH-60, respectively.

4. Figures 8-4 through Figure 8-7 show the SPR locations on current USCG aircraft. These are for reference only. For specific information, refer to applicable maintenance manuals.

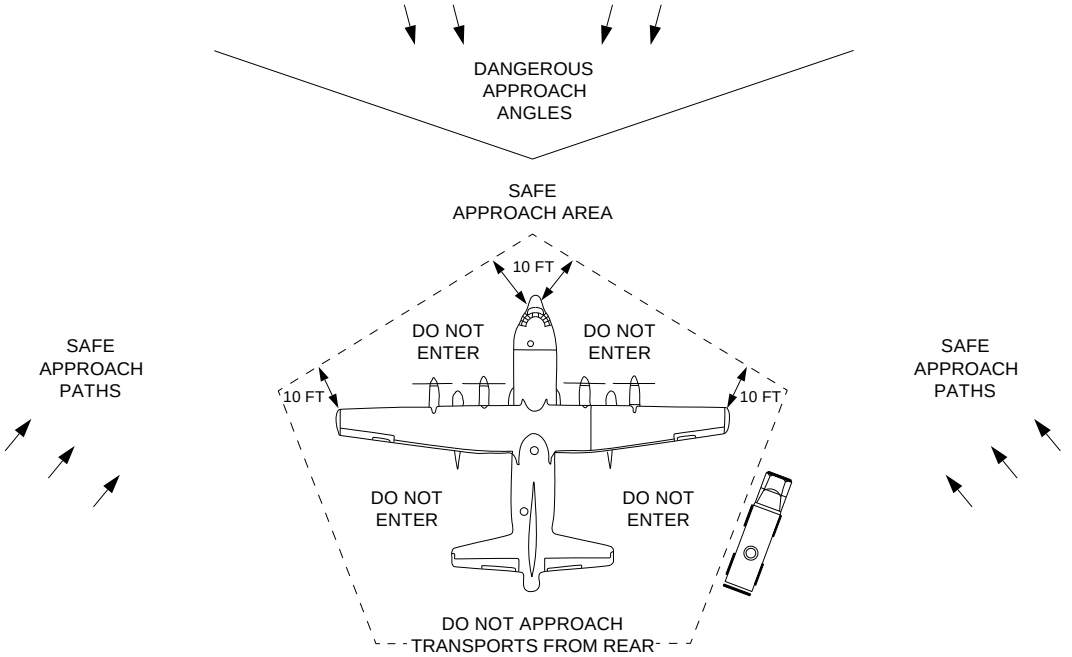

Figure 8-2. Fixed Wing Approach Path

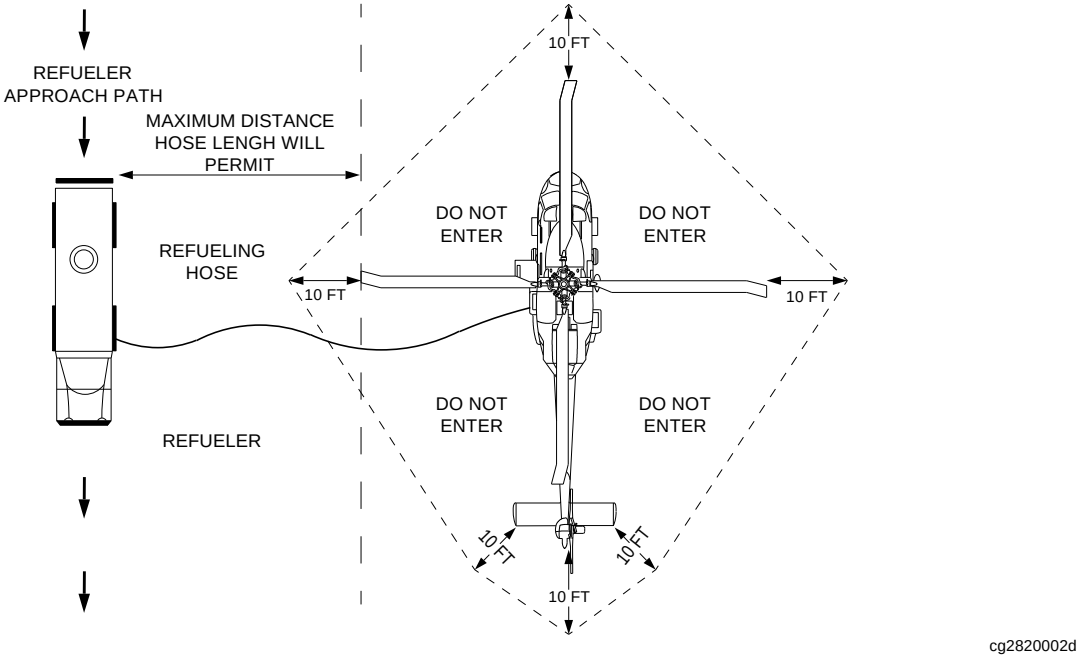

Figure 8-3. Rotary Wing Approach Path

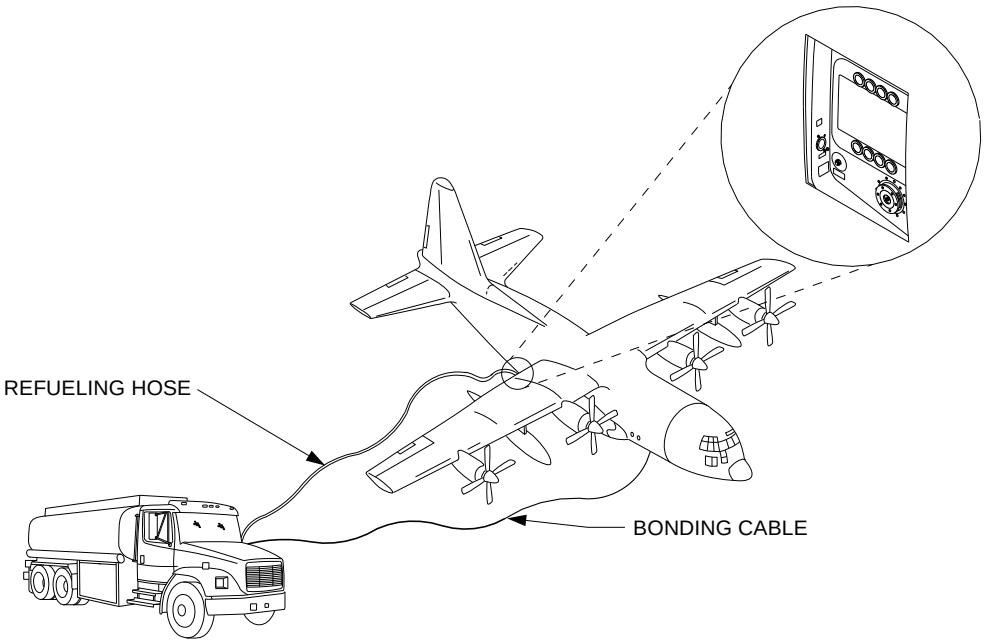

Figure 8-4. HC-130 SPR Panel Location

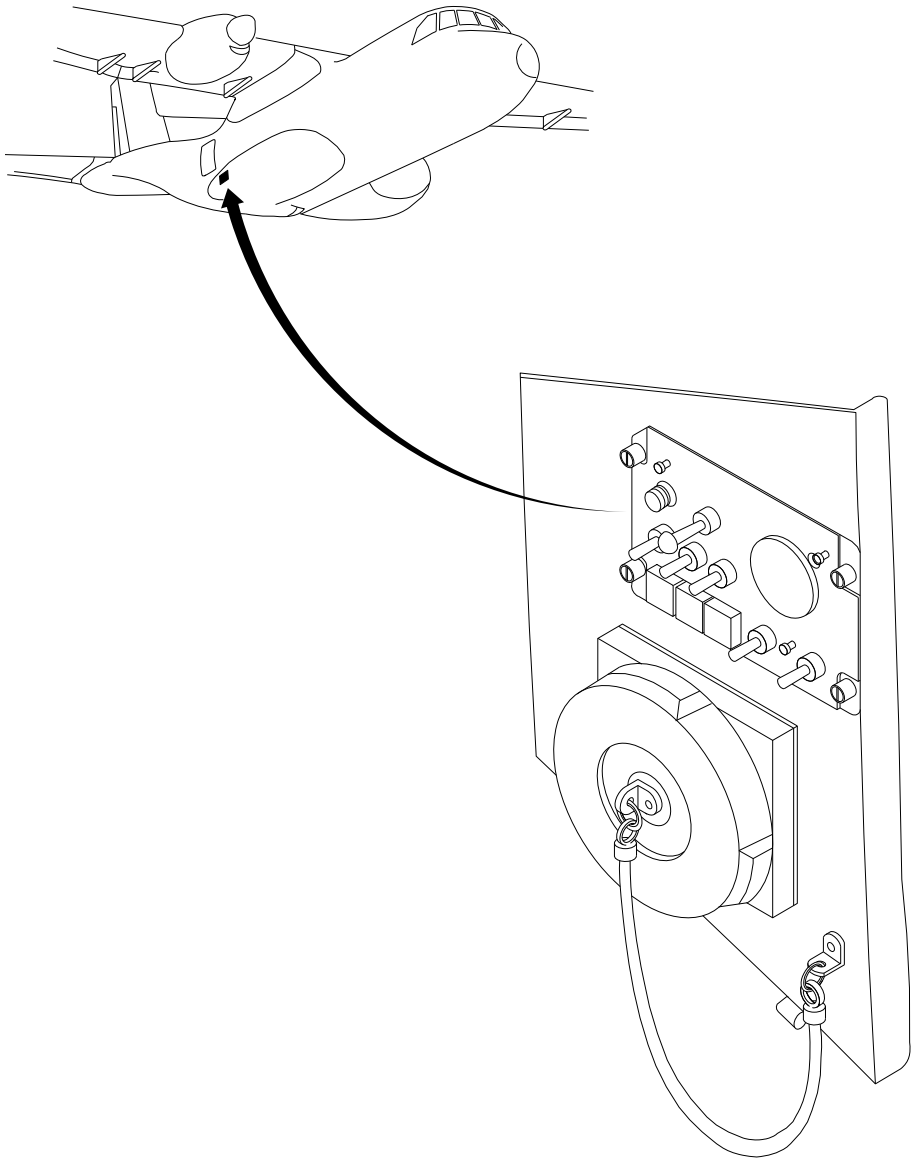

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Figure 8-5. HC-144 SPR Panel Location

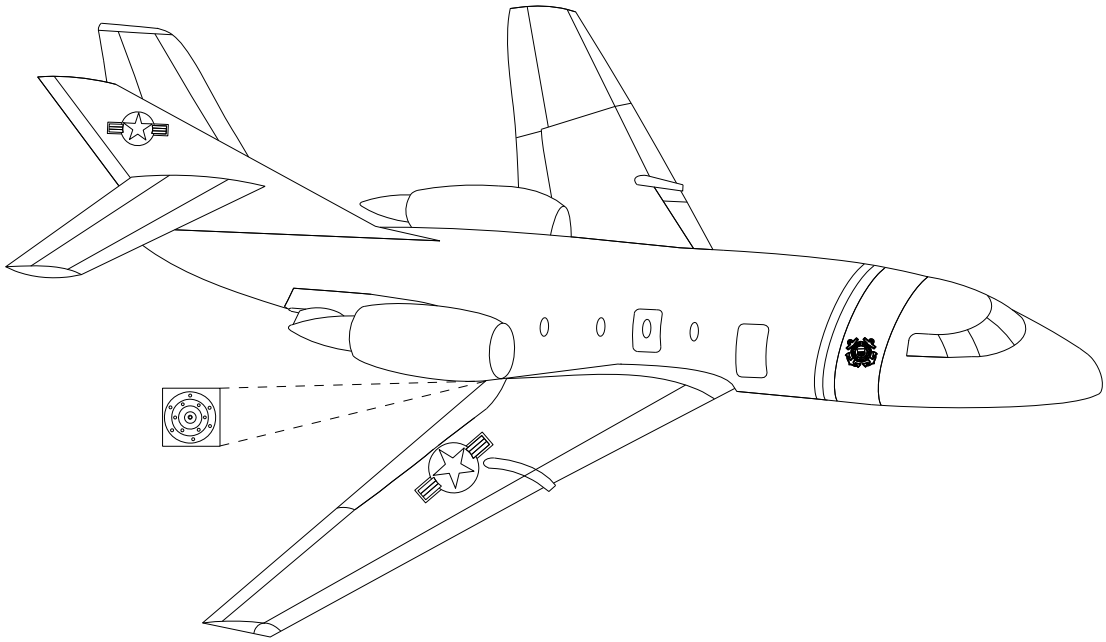

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Figure 8-6. HU-25 SPR Location

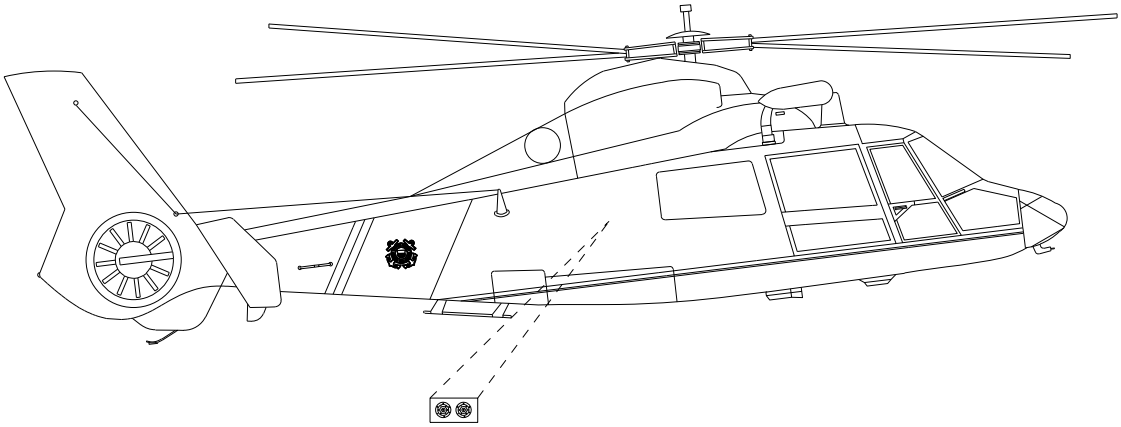

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Figure 8-7. MH-65 SPR Location

J. BONDING AND GROUNDING

1. Bonding and grounding are NOT the same. Earth grounding is the process of connecting one or more metallic objects and ground connectors to ground electrodes (earth). Bonding is the process of connecting two metallic objects together, by means of a bonding cable, to equalize electrostatic potential between two conductive objects (i.e., fuel truck and aircraft).

NOTE

Earth grounding of the aircraft and refueling vehicle is required whenever refueling/defueling operations are conducted on any surface other than concrete (i.e., asphalt).

2. Prior to making any fueling connection to an aircraft, the fueling equipment shall be bonded to the aircraft with a metal cable, providing a conductive path to equalize potential between the fueling equipment and the aircraft. The bond shall be maintained until fueling connections have been removed. This allows separated charges that could have been generated during the fueling operation to be reunited.

3. The following rules shall apply for bonding:

   a. Bonding Clamp When the aircraft being serviced is not equipped with grounding receptacles, a clamp shall be used on the bonding cables of refueling equipment. The clamp shall conform to MIL-C-83413/7 (series).

b. Overwing Nozzle Bonding In addition to the above, when fueling overwing, the nozzle bond cable shall be connected to a metallic component of the aircraft that is connected metallically to the tank filler port. The bond connection shall be made before the filler cap is removed and shall remain connected until the servicing is complete and the filler cap replaced.

c. Bonding Plug When the aircraft being serviced is equipped with grounding receptacles, a plug shall be used on the bonding cables of refueling equipment. The plug shall conform to MIL-DTL-83413/4 (series).

WARNING

GROUND WIRES ON AIRCRAFT AND SUPPORT EQUIPMENT, TO INCLUDE FUEL TRUCKS, CAN BE AN IGNITION SOURCE. THE GROUND WIRE IS NOT SUFFICIENT IN SIZE TO PROVIDE FAULT PROTECTION IN THE EVENT OF AN ELECTRICAL MALFUNCTION OR LIGHTNING STRIKE.

CAUTION

ANY PETROLEUM FUEL MOVING THROUGH A HANDLING SYSTEM TO STORAGE TANKS, TANK CARS, REFUELING UNITS, OR AIRCRAFT TANKS WILL DEVELOP A STATIC ELECTRICAL CHARGE AND WILL CARRY THIS CHARGE INTO THE CONTAINER. THIS CHARGE WILL BE PRESENT, ALTHOUGH THE SYSTEM AND EQUIPMENT BEING USED ARE PROPERLY GROUNDED AND BONDED.

4. When two different materiels come into contact, electrical charges flow across the surfaces of contact. This occurs when petroleum fuels flow through pipes, valves, pumps, and filter/separators. The continuous contact and separation process when fuel flows through a bulk handling system results in the gradual buildup of a charge in the fuel and of an opposite charge in the pipeline. The charge in a properly grounded pipeline will leak away rather rapidly, but the charge in the fuel will tend to be carried downstream. The charge buildup in the fuel does not continue indefinitely. If the piping system is long enough, the rates of accumulation and dissipation of charge in the fuel will reach equilibrium, and the charge per gallon of fuel moving downstream will remain constant. However, the equilibrium charge for a given pipe and fuel will increase with an increase in the velocity of the fuel.

5. The hazard of static charges is particularly acute in pumping JP-4 into a tank because the atmosphere (vapor-air mixture) in which the spark occurs is likely to be within the flammable or explosive range. Since avoiding or eliminating the vapor space or the flammable vapor-air mixtures in tanks is virtually impossible, the only effective way of reducing the hazard is to minimize the buildup of the static charge.

6. Grounding is the electrical connection of an aircraft or a fuel truck to the earth. Grounding is to be accomplished when the aircraft or fuel truck is parked (not during servicing procedure).

a. Connection Sequence The proper connection sequence to ground using a clamp-plug unit in the hangar is:

1. Attach a grounding clamp to the earth grounding point
2. Insert the plug of the other end of the clamp-plug unit into an aircraft receptacle jack assembly or attach the clamp of the other end of the clamp-plug unit to an unpainted metal portion of the aircraft or support equipment.

K. FUEL EQUIPMENT/VEHICLE SAFETY The following safety precautions for refueling vehicles and equipment shall be observed to ensure the safe and proper fuel servicing of aircraft:

- Fuel truck operators shall have a valid state driver's license applicable to their employment status. See Paragraph 11.C.1.e. for requirements.
- Fuel truck operators shall ensure there are no fuel leaks and the general condition of the refueler is satisfactory.

- Fuel servicing vehicles shall not be used if any safety equipment is not in proper working order.
- Safety devices shall not be bypassed in the interest of "getting the job done."
- Fuel servicing vehicles shall approach the aircraft so the operator's side of the vehicle is adjacent to the aircraft fuel servicing panel.
- Fuel servicing vehicles shall be operated in a safe and professional manner at all times. The maximum ramp speed shall be 5 miles per hour.
- All fuel service vehicles shall carry a spill kit.
- Fuel servicing equipment shall not proceed closer than 20 ft to the aircraft without guidance from ground personnel to ensure proper clearances.
- A distance of 25 ft shall be maintained between the refueling vehicle and the aircraft filler points and vents.
- Whenever possible, fuel servicing vehicles shall be parked upwind from the aircraft fuel tank vents during refueling operations.
- A minimum of 10 ft shall be maintained between the refueling vehicle and any portion of the aircraft (including rotor blade path).
- All operating equipment not required in the fuel servicing operation shall be shut down before the start of the operation. The equipment shall not be restarted until fuel vapors have dissipated.
- A portable 125/150 lb PKP fire extinguisher shall be the minimum for refueling operations. It will be placed in the immediate vicinity of the refuel/defuel operation and be positioned for immediate use.
- Under no circumstances shall the fuel truck operator drive or operate any fuel servicing equipment in the servicing area if fuel is leaking from the aircraft or a major fuel spill is detected near the aircraft.
- If a fuel spill should occur during fueling operations, immediately stop all fuel servicing and comply with the procedures outlined in Paragraph 10.D.
- All internal combustion engines operated within 50 ft of fueling operations must be equipped with a spark arrestor.
- Refueling operations are not to be carried out at the same time as oxygen system servicing.

1. Procedures Coast Guard Air Stations using trucks to refuel aircraft shall follow the following procedures.
   a. Refueler Parking Coast Guard Air Stations shall require that all refueler trucks be attended when the engine is running. Operator is considered in attendance when performing functions related with refueling aircraft. When parking the truck for the night or otherwise leaving it unattended, the driver/operator shall follow these procedures:
      (1) Drive the truck clear of the aircraft.
      (2) Direct the front wheels to an open unobstructed area.
      (3) Set the parking brake.
      (4) Stop the engine.
      (5) Chock the wheels.
      (6) Ground the truck.
2. Refueler Parking Area Requirements
   a. Park in a parking area designated by the airport or Coast Guard Station.
   b. Coast Guard Air Stations with refueler trucks shall have an adequate dedicated refueler truck parking area. Both the parking area and the roads the refueler truck travels on shall be paved. If avoidable, refueler trucks are NEVER to be driven over grass, dirt, or other soft surfaces. Parking areas shall be free of potholes, ruts, and FOD.

c. Parking area requirements are as follows:

(1) A minimum of 25 ft between centerline of adjacent trucks when in the parked position or 10 ft minimum of clear space between parked trucks, whichever is greater.

(2) No trucks shall be parked closer than 100 ft from any inhabited building.

(3) No truck shall be parked closer than 50 ft from a uninhabited building.

(4) Separate entry and exit gates to facilitate one-way traffic entering and leaving the parking area.

(5) Free and direct egress of any truck from the parking area at any time. No backing, jack-knifing, or additional maneuvering shall be required.

(6) A security fence to prohibit unauthorized entry.

(7) Security lighting capable of illuminating the entire refueler parking area.

(8) Spill containment system that drains with berms to an oil water separator which prevents spillage to the environment.

(9) The parking area should be concrete where possible. Concrete provides a better grounding platform for aircraft and fuel truck tires. Asphalt tends to allow fuel spills to penetrate the roadway.

CHAPTER 9. SAFETY COMPLIANCE

A. INTRODUCTION

CAUTION

ALL PERSONNEL INVOLVED IN AIRCRAFT FUELING EVOLUTIONS SHALL WEAR PROTECTIVE CLOTHING/EQUIPMENT (GLOVES, APRONS, AND EYE PROTECTION) APPROVED FOR THE MATERIELS AND EQUIPMENT BEING USED AND APPROPRIATE FOR THE PROCEDURE BEING CONDUCTED. CONTACT YOUR SUPERVISOR OR SAFETY OFFICER FOR GUIDANCE AND READ Paragraph 9.E.

1. This chapter describes safety procedures and requirements that are either general in nature and have not been covered in other chapters of this process guide, or which are extremely important and are repeated here for emphasis. These safety procedures and requirements are no substitute for a thorough knowledge of aviation fuels and their inherent characteristics and dangers. All Coast Guard personnel shall handle aviation fuels with the maximum caution because of the obvious dangers associated with possible fires, explosions, and hazard to humans.
2. Although kerosene type fuel such as JP-5 is much less volatile than JP-8, under certain conditions, such as severe agitation, mists can form flammable and explosive atmospheres. The breathing of vapors in enclosed or confined spaces have the potential for making breathing hazardous. Personnel should position themselves where the breathing of vapors is minimal. Handle all aviation fuels with care.

B. COMMAND REQUIREMENTS Commanding Officers shall create a locally promulgated instruction to ensure adherence to flightline vehicle safety. This instruction should include the following as a minimum:

- Drivers shall comply with all station, local, state, and federal laws as appropriate in accordance with COMDINST M11240.9 (series).
- Posses a valid state driver's license.
- Seatbelts must be worn by ALL occupants.
- Adhere to all speed limits.
- Never leave a running vehicle unattended.
- When operating fuel trucks, adhere to requirements set forth in Paragraph 11.C.1.e.
- Aircraft have the RIGHT OF WAY.
- Establish a safety zone around aircraft.
- Establish maximum towing speed for GSE (ramp speeds).

C. MINIMIZING HEALTH HAZARDS In order to minimize health dangers fuel handling personnel shall:

- Whenever possible, avoid entering enclosed areas where fuel vapors may be present.
- Always minimize the exposure to fuel vapors. Appropriate ventilation of workspace is essential.
- Stay on the upwind side of a fuel spill if it is necessary to remain in an area where a large spill has occurred.
- Stay on the upwind side of a fuel spill occurring during fuel handling operations, where the formation of vapors is unavoidable, such as at a truck fill stand.
- Stop the fuel handling operation and move to a fresh air location immediately if dizziness or nausea occurs.

- Avoid skin contact with fuels. If fuel does contact the skin, immediately wash with soap and water.
- Never wash hands in gasoline or jet engine fuels.
- Do not allow fuel to dry on skin or clothing. Remove fuel-soaked clothing and wash skin areas with soap and water. Do not wear fuel-soaked clothing in shop spaces.
- Wear eye protection and clothing that leaves a minimum amount of skin exposed during refueling operations. In case of a fire, appropriate protection will minimize burns.

D. **SMOKING/OPEN FLAMES** Prohibit smoking, open flames, and sources of ignition within 50 ft of fueling operations. The fuel farm containment area, the refueler parking area, and the cab of the refueler truck shall also be designated “No Smoking" areas at all times. Internal combustion engines shall not be operated within 50 ft of refueling operations unless equipped with an approved spark arrestor. Internal combustion engines shall not be started or stopped within 50 ft of a fueling operation.

E. **PROTECTIVE EQUIPMENT** To protect themselves:

1. Fueling operations personnel shall wear eye protection and clothing that expose as little skin as possible. They shall not carry or wear:
   - Loose metal objects
   - Knives
   - Cell Phones
   - Keys
   - Objects that might fall into a tank
2. Fueling personnel shall not remove or put on clothing during fueling operations.
3. Personnel taking and testing fuel samples shall wear non-absorbent gloves.
4. Personnel performing fuel tests shall wear clear face shields and rubber or leather aprons.
5. Fueling crews shall only wear footgear that completely cover the feet to protect against fuel spills and fires. They shall not wear:
   - Shoes made of fabric or other absorbent materiels
   - Shoes with nails or other metal devices on the soles that could cause a spark

F. **UNNECESSARY PERSONNEL** Personnel not directly involved in the fueling operation or a concurrent fueling evolution shall remain clear of the fueling area. Personnel that are performing Professional Qualification Standards (PQS) or On-The-Job Training (OJT) before becoming fully qualified for the fueling detail may work in the area when properly supervised.

G. **EXPLOSIVE SAFETY** Reducing or controlling the release of fuel vapors can enhance explosive safety. All Coast Guard Air Stations shall take the following precautions:

- Treat empty containers as though they still contain fuel; they may contain dangerous fuel vapors.
- Do not conduct fueling operations inside the hangar or any confined space that was not designed as a refueling area. This does not prohibit taking fuel samples from tank bottoms or aircraft sumps.
- Keep all fuel containers, tanks, and filter/separator vessels closed except when necessary to open for operations.
- Avoid spilling fuel.
- Take immediate action to clean up any fuel spills.
- Properly dispose of oily waste or rags immediately after use in accordance with COMDINST 16478.1 (series).
- Never drive or move a refueler that is leaking aviation turbine fuel.

- Immediately report all leaks in the fuel handling facilities to the Fuel King, “Maintenance Control,” the OOD, and fire department.
- Do not handle aviation fuel in open containers. Fuel vapors are heavier than air and will collect in low places such as pits, drains, and open sewers.
- Cell phones, laptops, portable radios, pagers, and PDA are strictly prohibited.
- Never dispose of waste fuel in storm drains or sanitary sewage systems.
- Never top load trucks or tanks.
- Keep all equipment and work areas clean, neat, and in good working order. Ensure that all equipment is properly stowed after every evolution with caps and dust covers in place.
- Never use aviation turbine fuel as a cleaning agent.

CAUTION

STORAGE TANK VENTS AND FILTER/SEPARATOR TANK VENTS USUALLY FALL INTO THE PRESSURE/VACUUM RELIEF CATEGORY. IF PROPERLY MAINTAINED, THEY WILL VENT FUEL OR VAPORS WHENEVER THE PRESSURE IN THE TANK EXCEEDS THE SETTING FOR THE VENT VALVE. THIS MEANS A TANK COULD VENT VAPORS AT ANY TIME, THOUGH IT IS MOST LIKELY TO HAPPEN DURING A FUELING EVOLUTION. PERSONNEL SHOULD AVOID BEING DOWNWIND OF A FUEL TANK VENT WHENEVER POSSIBLE AND ESPECIALLY DURING A FUELING EVOLUTION. UNITS SHALL NEVER ALLOW OPEN FLAMES OR SMOKING WITHIN 50 FT OF A TANK VENT.

H. BENZENE EXPOSURE Most fuel oils contain benzene in some form. Repeated or prolonged exposure to benzene, even at relatively low concentrations, has been associated with various blood disorders ranging from anemia to leukemia. Fueling personnel should avoid breathing fuel vapors. If dizziness occurs, immediately move the victim into the fresh air, and obtain medical attention. The Occupational Safety and Health Administration (OSHA) has developed comprehensive benzene exposure standards (29 CFR, Part 1910.1028). Review of MSDS by personnel to determine if specific PPE is required for the different types of fuel.

I. RF RADIATION HAZARDS

- The aircraft’s radios and radars shall not be operated in transmit mode during fueling operations.
- Ground surveillance radar shall not be operated within 300 ft of a fueling operation.
- Air surveillance radar shall not be operated within 100 ft of a fueling operation.
- Radars and radios on an aircraft being fueled shall not be switched on or off during a fueling operation

J. STATIC AND ELECTRICAL DISCHARGE PREVENTION One of the primary sources of ignition in aviation fuel fires is static electricity. To minimize the risk posed by static electricity discharge, all Coast Guard Air Stations shall take the following precautions:

- Prohibit the top loading of fuel trucks or tanks.
- Refill filter/separator or monitor vessels slowly after they have been drained.
- Keep tanks free of foreign objects. Thermometers or samplers may be suspended in a tank provided they are removed before receiving fuel.
- Always electrically bond the aircraft to the refueling hydrant, mobile refueler (cart), or truck.
- Before removing aircraft fuel tank caps, bond overwing refueling nozzles to the aircraft using a separate bonding pigtail.

- Attach bonding cables to aircraft using plug and jack method.
- Inspect bonding and grounding cables, clamps, and plugs daily.
- Check the electrical resistance of cables monthly.
- Prohibit fueling operations within 5 nautical miles of an electrical storm in accordance with AFTO 00-25-172.
- Remove refuelers from aircraft parking areas during electrical storms.
- Require fueling personnel to wear non-static producing clothing such as cotton.

K. **REFUELING MEDEVAC FLIGHTS** If refueling with non-ambulatory patients onboard, units shall position a crash/rescue truck just outside the fueling area. Only under the most urgent and compelling conditions should a unit or aircraft commander choose to forego the presence of a crash rescue vehicle while refueling with non-ambulatory patients onboard the aircraft.

L. **WEATHER** Aircraft fueling operations are prohibited within 5 nautical miles of lightning storms. Fueling operations should not be conducted in sustained winds of over 50 knots.

NOTE

Fueling aircraft in high winds (sustained gusts over 50 knots) should only be accomplished when operational necessity dictates.

M. **PERSONNEL GROUNDING/BONDING**

1. Personnel will use grounding or bonding techniques to dissipate or equalize static charges that have accumulated during ground servicing operations.
2. During an aircraft fuel servicing operation, a static spark in the wrong place could ignite a fuel vapor concentration. Fuel service personnel will ground or bond themselves to a suitable grounding/bonding point before commencing the fueling operation. This can be done with a grounding stick or directly by hand.
   a. If a spark occurs during the initial grounding or bonding procedure, atmospheric conditions are ideal for additional static charge accumulations. Under this condition, personnel will ground or bond themselves periodically.
   b. If no spark occurs during the initial grounding or bonding procedure, additional grounding or bonding is not necessary.
   c. All personnel shall avoid grounding or bonding themselves within 3 ft of the aircraft fuel vent outlets.

CHAPTER 10. ENVIRONMENTAL ISSUES

A. INTRODUCTION

1. Aircraft turbine fuel is toxic. It can damage the environment and endanger the health of humans and wildlife if handled improperly. Consistently following the safety procedures of this process guide will help to keep aviation fuel spills to a minimum and ensure contaminated fuels are disposed of safely. If or when fuel spills do occur, the fueling crew must take immediate steps to:

    a. Limit the size of the spill

    b. Contain the spill

    c. Notify appropriate authorities, i.e., OOD, Fire Department, HAZMAT Response Team, Maintenance Control

    d. Clean it up as quickly and safely as possible

2. Coast Guard Air Stations shall develop a written instruction on fuel spill reaction that complies with current Commandant Instructions on HAZMAT handling and complies with local pollution laws. All Coast Guard Air Stations shall have a trained, designated "Spill Response Team" to handle "large" fuel spills.

B. LIABILITY

1. Air stations that, because of location, could reasonably be expected to cause substantial harm to the environment by discharging oil (primary concern is aviation fuel) into or on the navigable waters or adjoining shoreline are required to develop construction, inspection, and response plans. This includes:

    a. Construction of fuel/oil carriers with double walled tanks

    b. Periodic inspection of bulk storage tanks

    c. Inspection of spill response equipment

C. COUNTER MEASURES

1. The SPCC Plan-40 CFR 112 establishes requirements for the preparation and implementation of Spill Prevention, Control, and Countermeasure (SPCC) Plans. SPCC Plans are designed to complement existing laws, regulations, rules, standards, policies, and procedures pertaining to safety standards, fire prevention, and pollution prevention rules. The purpose of an SPCC Plan is:

    a. Form a comprehensive unit program that satisfies Federal/State spill prevention programs that minimizes the potential for discharges in accordance with COMDTINST M16478.1 (series).

    b. Address all relevant spill prevention, control, and countermeasures necessary at the specific facility.

NOTE

Compliance with 40 CFR 112 does not in any way relieve the owner or operator of an onshore or an offshore facility from compliance with other Federal, State, or local laws.

2. The requirements for an SPCC Plan apply to any owner or operator of a non-transportation-related onshore or offshore facility engaged in storing, transferring, distributing, using, or consuming oil and oil products, which due to its location, could reasonably be expected to discharge oil in quantities that may be harmful into or upon the navigable waters of the United States or adjoining shorelines, into or upon the waters of the contiguous zone, in connection with activities under the Outer Continental Shelf Lands Act or the Deepwater Port Act of 1974, or that may affect natural resources belonging to, appertaining to, or under the exclusive management authority of the United States (including resources under the Magnuson Fishery Conservation and Management Act) that has oil in:

   a. Any aboveground container (AST)

   b. Any completely buried tank (UST)

   c. Any container that is used for standby storage, for seasonal storage, or for temporary storage, or not otherwise "permanently closed"

   d. Any "bunkered tank," or "partially buried tank," or any container in a vault, each of which is considered an aboveground storage container for purposes of 40 CFR 112.1

D. FUEL SPILLS

1. Small Spills Small spills covering an area up to 18 inches in any dimension (small priming spills) are normally of minor consequence. Ramp personnel shall stand by until the aircraft is dispatched. Once the aircraft has left, the spill may be cleaned up with absorbent pads.

2. Medium Spills

   a. Medium spills can cover up to 10 ft in dimension, but not over 50 square feet. They shall have a fireguard posted upwind equipped with at least one 125/150 lb PKP fire extinguisher. Absorbent cleaning agents (such as diatomaceous earth) or emulsion compound may be used to absorb the spilled fuel. Contaminated absorbent shall be placed in metal containers with closed lids until they can be disposed of in accordance with local hazardous waste disposal procedures.

   b. An exception to this method may be authorized if the spill occurs in an area where no operations are in progress. In such an event, the area shall be roped off. Fuels such as JP-5 and JP-8 that will not evaporate shall be removed by absorption or emulsification.

3. Large Spills Large spills over 50 square ft in area require handling by the "Spill Response Team." This is normally the airport or local fire department. The team shall be summoned immediately and all other personnel evacuated to a safe distance. No one shall be permitted to walk through the liquid area of a fuel spill.

NOTE

The above spill size designations are general. Local regulations may be more stringent. A spill of fuel into the dirt (classified as a discharge) is a much more serious environmental issue and shall be reported to the unit environmental director as soon as possible. Probable remediation of the site is determined by local regulations.

E. LEAKING TANKS In the event a fuel tank is found to be leaking, the following actions shall be taken as quickly as possible:

1. Empty the tank by pumping it into another tank(s). If none are available, summon empty refueler trucks and temporarily pump the tank contents into the refueler trucks.

2. Check the tank containment system and ensure that it is intact and no fuel is escaping the containment system. Place buckets or barrels under the leaking section if possible.

3. Call for the "Spill Response Team" if the spill meets the criteria of a large spill. If not, clean up the spill in accordance with the procedures for a small spill.

4. Attempt temporary repairs to the leaking pipes or tanks. Do not try to repair with "Hot Work" if the area has not been certified safe for hot work by an industrial chemist or gas-free engineer.

5. Ensure that the Aeronautical Engineer Officer and the Commanding Officer are notified immediately.

F. TANKS CLEANING RESIDUE (SLUDGE) Sludge (solid waste) removed during a tank cleaning shall be sealed in metal containers with closed lids and then disposed of in accordance with the Coast Guard Hazardous Waste Management Manual, COMDTINST 16478.1 (series).

G. TANK STRIPPING AND SEPARATOR DISCHARGE

1. Coast Guard Air Stations shall have a waste oil tank for contaminated fuel and other used or contaminated oils. The tank shall be sized appropriately for the number and type of aircraft and type of fueling activity.

2. The minimum tank size shall be at least 1,000 gallons. Waste oil stripped from the bottom of tanks and discharged from the filter/separator and the oily water separator shall be declared unfit for reissue if the quality of the fuel cannot be verified or determined by the Fuel King. This waste shall be transferred to the waste oil tank and held there until it can be properly disposed of in accordance with Coast Guard Hazardous Waste Management Manual, COMDTINST 16478.1 (series).

H. DISPOSAL OF USED FILTERS AND TEST EQUIPMENT

1. Used filters and test equipment shall be stored in properly marked metal containers, sealed with a lid, and disposed of in accordance with Coast Guard Hazardous Waste Management Manual, COMDTINST 16478.1 (series).

2. Discarded glass or metal test equipment may be washed with soap and water. Once pieces are free from any oil contamination, they may be disposed of with the regular trash or recyclable wastes.

I. DISPOSAL OF USED TEST SAMPLES

WARNING

UNDER NO CIRCUMSTANCES SHALL A CLEAR AND BRIGHT SAMPLE BE ADDED DIRECTLY BACK INTO A FUEL TRUCK OR AN AIRCRAFT.

1. Used test samples contaminated with test chemicals shall be disposed of into the waste oil tank. Fuel left over from a flashpoint test shall also be disposed of in this manner. Samples taken for clear and bright tests may be returned to a fuel storage tank, provided they are recirculated twice through the filter/separator before being issued to an aircraft. If a storage tank is unavailable, treat samples as a waste product.

2. If the Fuel King declares a clear and bright sample unfit for further use, it shall be disposed of in the waste oil tank.

J. COLLECTION AND SEGREGATION

1. A direct connection from the fuel storage tanks and service tanks to the used or waste oil tank shall be prohibited. The only authorized connections should be from the filter separator discharge, oily water separator discharge, and tank stripping connection. Any direct connection shall have a stop/check valve in the line to prevent waste fuel from backing up into the system.

2. All connections shall have a ball or gate valve at the connection that should be normally closed and only opened when there is oily waste fuel to be delivered to the tank. The oily waste tank shall have a high level alarm to ring at the fuel farm office and at the desk of the Air Station Duty Officer.

3. The tank should have a full 110% containment system if the tank is above ground.

K. COLLECTION CONTAINERS

1. Collection containers for a shop, such as 55-gallon drums, shall be installed only after informing the ground safety office and fire department of location and anticipated usage. If 55-gallon drums are not available, then appropriate sized 16 or 18 gauge steel drums can be used.
2. Containers should:
   a. Be marked in accordance with Paragraph 4.U.
   b. Comply with National Fire Protection Association Codes and the Base Spill Prevention Control and Countermeasures Plan.
   c. Be clean, reusable, easily handled, and easily stored.
   d. Be bonded between containers with at least one container or with the drum rack connected to ground (for containers positioned at collection points designated for flammable products with a flashpoint below 100 °F (38 °C)).
   e. Have appropriate closure devices to prevent vaporization and/or entry of water. These containers may be mounted on carts, dollies, or trailers to facilitate mobility, safety, and ease of handling.
3. Mobile carts or bowsers containing flammable products shall be bonded to the product transfer point before and during all product transfer operations.
4. Trucks, carts, and trailerable carts used to recover fuel drained from aircraft sumps must be clean. They must have a low point drain, be able to prevent the entry of materiel other than the product being collected, and be marked for and restricted to a single grade of product. Fuel not suspected of being contaminated can be defueled into a designated refueling vehicle and used to fuel any aircraft.
5. All containers used for the collection or storage of Reclaimable and Waste (R and W) petroleum products shall be isolated from those containing specification products. To prevent accidental aircraft servicing, vehicles used to collect waste products shall be marked conspicuously. These vehicles will not be equipped with single point or other nozzles used to service aircraft. Salvaged or excess fuel servicing vehicles may be retained and used for R and W petroleum products.
   a. Do not use assigned mission support aviation refuelers to defuel.
   b. Do not use drums, bowsers, product collection tanks, or pits.
   c. Do not recover reclaimable, recyclable, or waste petroleum products, except in an emergency.
6. Storage tanks can be purchased locally. Bowsers and tank vehicles may be modified for specific local use.

L. DISPOSITION OF FUELS It is imperative that the disposition of aviation fuel be correctly determined in order to provide safe and reliable aircraft as well as meet Coast Guard environmental stewardship challenges. The following are profiles and actions necessary to maintain this delicate balance:

1. Ready Issue Fuel An applicable grade and MIL-DTL fuel that has been received by the unit and stored in a tank managed in accordance with Chapter 6 or that has been removed from an aircraft or fuel truck managed under the same surveillance program. The defueled product, from an aircraft or fuel truck, that is not suspected of being contaminated can be returned to a "ready for issue" storage tank or placed directly back into another aircraft. Any truck or towable tank that is used for this capacity shall be marked as a refueler/defueler and restricted to a single grade of product.
2. Reclaimable Fuel Fuel that has been removed from an aircraft with recent engine or airframe fuel system problems, possibly related to fuel quality, shall be segregated and collected in either a designated defueler or clean tank. This fuel is to be sampled and tested to determine whether it is to be reintroduced into bulk storage for additional filtering, settling, or segregated for recycling.

3. Used Fuel This is a product that has been contaminated by physical or chemical impurities. This fuel is to be recycled and shall be handled under 40, CFR Part 279 guidelines. Contracted vendors that remove the used fuel/oils/lubricants from the unit should meet 40 CFR 279 Subpart E and local oil recycling statutes.

4. Waste Fuel This is a product that is no longer suitable for recycling initiatives or any use on an installation because of contamination other than POL (i.e., solvent) or quality degradation. This contaminated POL is to be managed under 40 CFR Part 260, local statutes, and COMDTINST M16478.1 series. Units are encouraged to minimize this waste stream by utilizing best management practices.

CHAPTER 11. TRAINING

A. INTRODUCTION

1. It is essential to the safety of fuel handling operations that fueling personnel be properly trained in the correct operation of the aircraft refueler controls and in the use of the available fire fighting equipment and extinguishers. Units should not use TAD personnel in fueling operations unless certified by the local Fuel King.

B. COMMAND REQUIREMENTS Commanding Officers shall require that contractors certify all their employees involved with fueling operations. The certification process shall include a performance-based examination as well as on-the-job observation. Training and certification records shall be kept on file by the Contracting Officer's Technical Representative (COTR).

C. ON-THE-JOB TRAINING

1. As a minimum, units shall provide all personnel involved in fueling operations with the following:

   a. An informal course that covers the fuel handling procedures described in this document and MIL-HDBK-844A (AS). All aircraft fueling personnel who are new to the station or to the fueling detail shall attend the course. The course should emphasize MIL-HDBK-844A (AS) safety and procedural requirements and procedures applying to local facilities, equipment, and operations. Attendees shall pass a performance-based examination before beginning the duties of a fueling detail member.

   b. All fuel position training OJT will be based on this process guide and:

      - Airman's syllabus
      - Basic Aircrew syllabus
      - Aircraft qualification syllabus
      - Station instructions

      NOTE

      A check list shall be developed that covers all the required duties of each position for the following fuel operations: Cold Refueling, Defueling, Hot Refueling, Concurrent Fueling, Overwing Refueling, and Safety.

   c. Units shall maintain unit training records and personnel shall not perform a fueling function unsupervised unless they have a completed locally promulgated syllabus for that position signed off by a qualified instructor.

   d. Air Stations with a fuel farm shall develop a locally promulgated syllabus for the position of Fuel King describing fuel farm operations. Personnel shall not be designated a Fuel King until they have completed the syllabus (PQS). This syllabus should reflect the contents of this process guide, as well as adequate OJT defining Fuel King responsibilities.

   e. If refueler trucks are assigned to a unit, the Commanding Officer should institute a program for active duty members, equivalent to a level that a state licensing evaluator requires, to qualify and authorize personnel to drive/operate fuel trucks on the base. Once specialized training has been successfully completed, an OF-346 shall be issued and the training documented in a local PQS training jacket. Active duty members are offered an exception in some states from CDL requirements on base. However, active duty members must comply with State/Federal regulations when operating on public highways. If driven on the base, federal employees and contractor personnel shall possess a valid state driver's license for the size and class of vehicle being operated (CDL) accompanied with a HAZMAT endorsement in accordance with COMDINST M11240.9 (series).

NOTE

TSA HAZMAT Driver Security Threat Assessment (Section 1012 of the USA PATRIOT Act) requires all commercial drivers seeking to apply, renew, or transfer hazardous materiel endorsement (HME) on their state issued CDL must undergo a "security threat assessment" to determine whether or not the individual poses a security risk. This background check routinely takes approximately 30 days.

D. **RESIDENT COURSES** The assigned Fuel King must attend a resident course on aviation turbine fuel testing. Fort Lee in Virginia offers training that meets the requirements of this document. The Fuel King and/or the leader of the Spill Response Team should also attend a resident course on handling HAZMAT. No other resident courses are required.

E. **CORRESPONDENCE COURSES** Currently, there are no correspondence courses offered by the Coast Guard Institute on aviation fuel handling.

F. **PROFESSIONAL QUALIFICATION STANDARD (PQS)** Currently, the Coast Guard has no formalized PQS for fueling personnel. Coast Guard Air Stations shall develop a local syllabus for each position on the fuel team based on paragraph 8.C of this process guide. The syllabus should include all the requirements of this process guide, particularly those functions of the fueling crew covered in Chapter 8 of this process guide. The local syllabus shall account for the equipment, aircraft type, and facilities found at the Air Station.

G. **HAZMAT TRANSPORT** Units are highly encouraged to check with their local State statutes concerning the transportation of Hazardous Materiels; however, 49 CFR 171.1 classifies job functions involving the transport of hazardous materiels that are not subject to the HAZMAT regulations:

- Motor vehicle movements of a hazardous materiel solely within a contiguous facility where public access is denied
- Transportation of a hazardous materiel in a transport vehicle or conveyance operated by a federal, state, or local government employee solely for government purposes
- Transportation of a hazardous materiel by an individual for non-commerical purposes in a private motor vehicle

CHAPTER 12. FORWARD DEPLOYED UNITS REFUELING

A. INTRODUCTION Occasionally it becomes necessary for Coast Guard Aviation units to establish a temporary fueling site and landing strip in remote areas. To date, this has been confined to Alaska, Mexico, and the Bahamas. However, marine disasters and major pollution incidents can also lead to forward deployments for refueling.

B. REFUELING FROM A TRUCK

1. Forward-deployed aircraft will normally be fueled from a truck. The fuel shall be tested visually in accordance with the requirements of Paragraph 6.C. Daily samples will be taken from the bottom of the truck's tank and given a clear and bright test. The fuel should be recirculated at least once a day through the bottom load valve (1,000 gallons min).

C. COMMERCIAL SOURCE FUEL Ensure all fueling of Coast Guard aircraft is in accordance with Chapter 2 concerning fuel grades and additives.

GLOSSARY

Aircraft Fuel Servicing Movement of fuel to or from an external source, to or from an aircraft, including the time during which fueling connections and disconnections are made

AIRFAC Forward Operating Air Facility

API American Petroleum Institute

APU Auxiliary Power Unit

AST Aboveground Storage Tank

ASTM American Society for Testing and Materiels

Bonding Electrical connection of two or more components in a system to equalize voltage potential

Bowser Four-wheeled trailer mounted tank with a capacity ranging between 200 and 600 gallons, used for the collection of used and waste fuels

"BRAVO" Aircraft Aircraft that are ready to fly/on alert

Bright Fuel Fluorescent appearance of fuel that has no clouds or haze

Bulk Storage Above or below ground storage tanks equipped for receiving and transferring the product to truck fill stands and/or hydrant system operating tanks

CAUTION Operating procedures or practices that could result in damage to or destruction of equipment if not strictly observed

CDL Commercial Drivers License

CFD Contaminated Fuel Detector

CG Coast Guard

CI Corrosion Lubricity Improver

Clear and Bright Absence of sediment or water in the fuel

Coalescer Elements that unite minute water droplets into large droplets so the water separator is more efficient. Droplets collect in the bottom of the filter vessel for removal.

Coarse Particles Solids that are larger than 10 microns (coarse). Coarse particles can be seen with the naked eye.

Cold Refueling Normal fueling operations of an aircraft from either a pit, hydrant, or a truck with engines secured

Concurrent Fueling Fueling while conducting maintenance, logistics, or passenger operations

COTR Contracting Officer's Technical Representative

Day Tanks Storage tanks that contain ready-to-issue fuel

Defueling Removal of fuel from aircraft or other storage vehicles or tanks

Dissolved Water Essentially humidity in fuel that condenses and evaporates with fuel temperature resulting in a cloudy appearance

DoD Department of Defense

Dry Fuel Fuel containing no water

EAL Electronic Asset Logbook

Entrained Water Water suspended in tiny droplets in the fuel

Fine Particles Smaller than 10 microns (fine). Fine particles in sufficient amounts appear as haze or cloudiness in fuel.

Filter Assembly A canister containing several filter elements for removing both water and particulate contamination from the fuel. As the elements become contaminated, they restrict the flow of fuel from the fuel farm.

Filter Separator Vessel Cylindrical vessel housing coalescer and separator elements that remove solid contaminants and free water from fuel

Flashpoint The temperature at which the vapors above the fuel sample temporarily ignites without supporting continuous burning

FOD Foreign Object Damage

Free Water Fresh or saline water completely free of fuel

FSII (Fuel System Icing Inhibitor) Chemical compound mixed into aviation fuel to prevent water in the fuel from freezing and forming ice pellets that can clog a fuel line; also contains microbiological growth inhibitors

Fuel Flow Monitor Cartridges Filter elements that remove free water and particulates from fuel. Fuel flow is restricted or shut off by the elements when saturated with water.

Fuel King The individual whose primary responsibility is the receipt, storage, testing, recirculation, and dispensing of aviation fuel at a Coast Guard Air Station

Fuel Servicing Safety Zone Area within 50 ft of a pressurized fuel-carrying servicing component and/or within 25 ft of aircraft fuel vent outlets

FWD Free Water Detector

GPM Gallons Per Minute

Grounding (electrostatic) A method of removing electrostatic charge building on a conductive object by connecting the conductive object to an earth ground point

HAZMAT Hazardous Materiel

HECV Hose End Control Valves

Hot Refueling Refueling an aircraft with one or more of the main engines running not including the APU

Hydrant System The pumping of fuel from storage tanks through a filter separator and a manifold to lateral lines containing one or more servicing outlets. Aircraft are serviced through a hydrant hose truck or hose cart connected to the hydrant outlet located in the ramp or aircraft parking area.

kPa Kilo Pascal

LDC Leak Detection Compounds

May An acceptable, optional, or suggested means of accomplishment

Microbes Microscopic growths found in soil, air, water, and fuel oil

MOU Memorandum of Understanding

MSDS Materiel Safety Data Sheet

Mutagen Anything that can increase the rate of abnormal change in human cells, which can lead to cancer

Nautical Mile Any various unit of distance used for sea and air navigation. The conversion is 1 nautical mile = 1.15 standard mile.

NEC National Electrical Code

NFPA National Fire Protection Association

Note An essential operating or maintenance procedure, condition, or statement usually related to safety of flight, which must be highlighted

NSN National Stock Number

OEM Original Equipment Manufacturer

OJT On-the-Job Training

OOD Officer of the Day

OSHA Occupational Safety and Health Administration

Overwing Refueling Delivering fuel directly into an aircraft fuel tank using an overwing refueling nozzle (commonly referred to as gravity refueling)

PMS Preventive Maintenance System

POL Petroleum, Oil, and Lubricants

PPE Personal Protective Equipment

PQS Professional Qualification Standards

Pressure Gauge Fuel pressure measured by a pressure measurement device containing a scale calibrated in pressure units, such as psi or kPa

Pressure Refueling Delivery of fuel directly into an aircraft via an enclosed system of hoses and pumps. Fuel is typically delivered under high pressure via a single point refueling (SPR) nozzle that attaches to an aircraft via a locking hose coupling.

psi Pounds Per Square Inch

PSID Pounds Per Square Inch Differential

PSIG Pounds Per Square Inch Gauge

PTO Power Takeoff

Reclaimable Product Product of known or determinable quality that can be used for the original grade without reprocessing; for example, JP-5 received from defuelers and returned directly to bulk or operating storage

Recyclable Product (Fuel) Product that does not meet its original specification but which, through processing, can be recovered for the original grade or a lower grade without reprocessing (except for settling time, filtration, and/or blending)

Refueler Tanks Fuel tanks used to dispense fuel into aircraft (via filter/coalescers). Refueler tanks may be fuel trucks or day tanks used to feed hydrants.

Refueling Rate Amount of fuel in gallons per minute (GPM) or liters per minute (L/min.) at which aircraft are serviced

Refueling Vehicle Trucks equipped with a tank, pump, filtration, and other accessories for refueling aircraft

Refueler/defueler (trailer) A trailer equipped with a tank, pump, filtration, and other accessories for refueling/defueling aircraft

Ready Issue Fuel Product that meets applicable grade MIL-DTL-SPEC as well as surveillance requirements of Chapter 6 of this guide

RIF Ready Issue Fuel

SDA Static Dissipater Additive

Settling Line Sediment Line

Shall Mandatory requirements

Should Preferred method of accomplishment

Slug A quantity of free water in a fuel system

SPCC Spill Prevention Control Countermeasures

SPR Single Point Refueling

Stripping Process of removing water and other contaminants that settle out of fuel

Surfactants Soap or detergent-like materiels occurring in fuel

TAD Temporary Assigned Duty

TSA Thermal Stability Additive

Used Product Fuel contaminated by physical or chemical impurities. The intent for the fuel is to be recycled and shall be handled under 40 CFR part 279 guidelines.

UST Underground Storage Tank

WARNING Operating procedures or practices that could result in personnel injury or loss of life if not followed

Waste Product Product that is no longer suitable for any use on an installation because of excessive contamination or quality degradation (hazardous waste or used POL)

Will Mandatory requirement; also used to express a declaration of purpose

VIS Visual Inspection (Clear and Bright)