

# AIRCRAFT REFUELER SAFETY COURSE



(Overview)



PRESENTED BY

**ORANGE COUNTY FIRE AUTHORITY**

and

**JOHN WAYNE AIRPORT**

“ Why Do I Need This Class ? ”



# Aircraft Refuelers

## Safety Course Objectives

- Overview of the Fire Department's role at JWA
- Review the hazards of Aviation Fuels, Static Electricity and Hazardous Materials
- Review the use of Fire Extinguishers
- Relationship of the Driver/Operators to safety on the AOA
- Understand Airport Security Procedures
- Understand relationship of the refueler to Flight-Line Safety
- Understand the Fire Prevention Program at JWA

Introduction To:

# ARFF

Aircraft Rescue  
&  
Fire Fighting



# Fire Protection

## John Wayne Airport

### Station 33 Staffing

- 24/7
- 3 Shifts each with;
  - 1 Captain
  - 3 Fire Apparatus Engineers
  - 3 Firefighters
- Program managed by ARFF Battalion Chief
- Supported by over 800 line firefighters in 62 stations

# Fire Protection

## John Wayne Airport

### Crash 1

- Command unit

### Crash 3

- 1500 gallons of water, 210 gallons of AFFF,  
500 lbs of Halon 1211

### Crash 4

- 3000 gallon of water, 420 gallons of AFFF,

### Crane 33

- 40 ton rough terrain crane 450 lbs of dry chemical

### Crash 5

- 3000 gallon of water, 420 gallons of AFFF,  
500 lbs of dry chemical, elevating *Snozzle* turret

### Crash 2

- 1500 gallons of water, 210 gallons of AFFF,  
500 lbs of Halon 1211

(reserve)

### FT 33

- 1,000 gallons of AFFF

# Fire Protection

## John Wayne Airport

### ■ Response Criteria

- Within 3 minutes first ARFF vehicle to the aircraft
- Within 4 minutes all other vehicles on scene

### ■ Alerts

- Stand-by: aircraft in trouble
- Response: aircraft accident

### ■ Categories

- 1 Single engine
- 2 Multi engine <12,500 lbs
- 3 Multi engine >12,500 lbs or any jet engine aircraft



# Definition of a Hazardous Material

- A substance or material, in a quantity or form, which may pose an unreasonable risk to health, safety, property or the environment.

# Definition of a Hazardous Materials Incident

- The release or potential release of a hazardous material from its container into the environment.

# Physical Properties of Flammable Liquids

## ■ Specific Gravity

- density of a substance divided by the density of water where water's density equals 1 gram per cubic centimeter

## ■ Vapor Density

- ratio of the weight of a given volume of one gas to the weight of an equal volume of another gas, typically air, at the same temperature and pressure.

# Physical Properties of Flammable Liquids

- Ignition Temperature

- **Flash Point**

- Flash Point < 100<sup>o</sup> F
  - » Av Gas
  - » Acetone
- Flash Point > 100<sup>o</sup> F
  - » Jet A, Diesel, Kerosene
  - » Lubricating oil

# Types of Fuel

## John Wayne Airport

### Avgas

- **Flash Point** **-45° F**
- Ignition Temperature 536° F

### Jet A

- **Flash Point** **110° F**
- Ignition Temperature 410° F

# Static Electricity

- Defined

- The electrification of materials through physical contact and separation and the effects of the positive and negative charges so formed.

# Static Electricity Video

# Bonding

## **NFPA 407, 5.4 – Bonding.**

**5.4.1 Prior to making any fueling connection to the aircraft, the fueling equipment shall be bonded to the aircraft by use of a cable, thus providing a conductive path to equalize the potential between the fueling equipment and the aircraft. The bond shall be maintained until fueling connections have been removed, thus allowing separated charges that could be generated during the fueling operation to reunite.**

**5.4.2 In addition to the above, where fueling overwing, the nozzle shall be bonded with a nozzle bond cable having a clip or plug to a metallic component of the aircraft that is metallically connected to the tank filler port. The bond connection shall be made before the filler cap is removed. If there is no plug receptacle or means for attaching a clip, the operator shall touch the filler cap with the nozzle spout before removing the cap in order to equalize the potential between the nozzle and the filler port. The spout shall be kept in contact with the filler neck until the fueling is completed.**

# Grounding No Longer Required

- Grounding during aircraft fueling or refueler loading is no longer required because of the following:
  - It does not prevent sparking at the fuel surface  
NFPA Standard 77
  - It is not required by NFPA 77, Recommended Practice on Static Electricity.
  - The static wire might not be able to conduct the current in the event of an electrical fault in the ground support equipment connected to the aircraft and could constitute an ignition source if the wire fuses. Static electrical grounding points can have high resistance and, therefore, are unsuitable for grounding.

# Ignition Sources

- Exhaust
- Cigarette
- Truck Ignition
- Spark
- Light Bulb (broken lens)
- Friction (Static Electricity)

Really big sparks



# Fueling Operation Fires

- 5 pm September 5, 2001. Denver International Airport. British Airways 777 serviced by United.
- System was bonded.
- Nozzle was attached to the wing.
- The basket was lowered during fueling (a normal procedure for their operation) when the hose hung up. Nozzle and adapter were pulled from the wing hookup.
- As the three wing fuel adapter tabs broke in rapid succession, it caused fuel to spray and atomize.
- Deadman release caused a 3 second delay in the hydrant system shutdown spilling 120 gallons to the ramp.



- Atomized Jet A fuel ignites well below the 410° of the liquid and the ignition source was believed to be aircraft engine components or the hydrant truck's exhaust system.
- Fire was controlled by United employees with wheeled tank extinguishers and extinguished by ARFF crews.
- Procedures were changed to not flow fuel until the basket is lowered (British Airways) or not lower the basket (United).

# Fueling Operation Fires



Miami International Airport  
747 and tanker fuel truck.



Washington DC Regan Airport  
Catering truck fire during fueling  
operations.

# Encountering a Fuel Fire That Is Being Fed by a Flow of Fuel What Should You Do?

- If it is safe to do so, turn off the fuel supply.
  - Going to a fuel shut off and shutting off the fuel supply is the most important thing that can be done - provided it is safe.

# Safety Keys

- Prevent the fire before it starts
- Practice good work habits
  - Stuff does not “Just Happen”, it requires human intervention
- Always pay attention
- Walk around truck before driving off  
(Golden Circle)
- Check Refueler daily and report any deficiencies to the Supervisor

# DOT Emergency Response Guide

**GUIDE**  
**128**

**FLAMMABLE LIQUIDS**  
**(NON-POLOR/WATER-IMMISCIBLE)**

**ERG2000**

**ERG2000**

**FLAMMABLE LIQUIDS**  
**(NON-POLOR/WATER-IMMISCIBLE)**

**GUIDE**  
**128**

## POTENTIAL HAZARDS

### FIRE OR EXPLOSION

**HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks, or flames.**

- Vapors may form explosive mixtures with air.
- Vapors may travel to source of ignition and flash back.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Vapor explosion hazard indoors, outdoors, or in sewers.
- Those substances designated with a "P" may polymerize explosively when heated or involved in a fire.
- Runoff to sewer may create fire or explosive hazard.
- Containers may explode when heated.
- Many liquids are lighter than water.
- Substance may be transported hot.

### HEALTH

- Inhalation or contact with material may irritate or burn skin and eyes.
- Fire may produce irritating, corrosive, and/or toxic gases.
- Vapors may cause dizziness or suffocation.
- Runoff from fire control or dilution water may cause pollution.

### PUBLIC SAFETY

**CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.**

- Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind.
- Keep out of low areas.
- Ventilate closed spaces before entering.

### PROTECTIVE CLOTHING

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighters' protective clothing will only provide limited protection.

### EVACUATION

#### Large Spills

- Consider initial downwind evacuation for at least 300 meters (1000 feet).

#### Fire

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

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## EMERGENCY RESPONSE

### FIRE

**CAUTION: all these products have a very low flash point: use of water spray when fighting fire may be inefficient.**

#### Small Fires

- Dry chemical, CO<sub>2</sub>, water spray, or regular foam.

#### Large Fires

- Water spray, fog or regular foam.
- Use water spray or fog; do not use straight streams.
- Move containers from fire area if you can do it without risk.

#### Fire involving Tanks or Car/Trailer Loads

- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

### SPILL OR LEAK

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- Prevent entry into waterways, sewers, basements, or confined areas.
- A vapor suppressing foam may be used to reduce vapors.
- Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
- Use clean non-sparking tools to collect absorbed material.

#### Large Spills

- Dike far ahead of liquid spill for later disposal.
- Water spray may reduce vapor; but may not prevent ignition in closed spaces.

### FIRST AID

- Move victim to fresh air. \*\*Call 911 or emergency medical services.
- Apply artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substances, immediately flush skin or eyes with running water for at least 20 minutes.
- Wash skin with soap and water.
- Keep victim warm and quiet.
- Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

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# Material Safety Data Sheet

## Material Safety Data Sheet

Prepared According to the OSHA Hazard Communication Standard (29 CFR 1910.1200).  
(Formerly Called MATERIAL INFORMATION BULLETIN)



CHEVRON Jet Fuel A

**DANGER!** HARMFUL OR FATAL IF SWALLOWED  
PROLONGED OR REPEATED CONTACT WITH SKIN CAN BE HARMFUL  
MAY CAUSE SKIN IRRITATION  
COMBUSTIBLE  
KEEP OUT OF REACH OF CHILDREN

### TYPICAL COMPOSITION

Petroleum mid-distillate (CAS 8008-20-6) 100%

### EXPOSURE STANDARD

No Federal OSHA exposure standard or ACGIH TLV has been established for this material

### PHYSIOLOGICAL & HEALTH EFFECTS

Expected to cause no more than minor eye irritation

May cause skin irritation. Application of a similar material onto the skin of rabbits produced moderate to severe skin irritation. Prolonged or repeated skin contact may be harmful. See Additional Health Data.

Prolonged breathing of the vapor can cause central nervous system effects. See Additional Health Data

Not expected to have acute systemic toxicity by ingestion. Note to Physician: Ingestion of this product or subsequent vomiting can result in aspiration of light hydrocarbon liquid, which can cause pneumonitis.

### EMERGENCY & FIRST AID PROCEDURES

#### Eyes

Flush eyes immediately with fresh water for at least 15 minutes while holding the eyelids open. If irritation persists, see a doctor.

#### Skin

Remove contaminated clothing. Wash skin thoroughly with soap and water. See a doctor if irritation occurs. Launder contaminated clothing.

#### Inhalation

If there are signs or symptoms due to breathing this material as described in this bulletin, move the person to fresh air. If any of these effects continue, see a doctor.

#### Ingestion

If swallowed, give water or milk to drink and telephone for medical advice. DO NOT make person vomit unless directed to do so by medical personnel. If medical advice cannot be obtained, then take the person and product container to the nearest medical emergency treatment center or hospital.

# Health Hazards

- Poisonous to lungs if inhaled.
- Absorption through the skin has accumulative results on internal organs.
- Vapors will cause dizziness or suffocation if inhaled
- Contact will irritate and burn skin and eyes
- Fire will produce poisonous gasses
- Runoff from fire control or dilution water will cause pollution

# First Aid for Hazardous Exposures

- Move the victim to fresh air; Call **911**
- If not breathing, administer rescue breaths
- If breathing is difficult; administer oxygen
- If physical contact occurs:
  - Eyes - Flush with water for 20 minutes
  - Skin - Wash skin with soap and water
- Remove and isolate contaminated clothing and shoes immediately

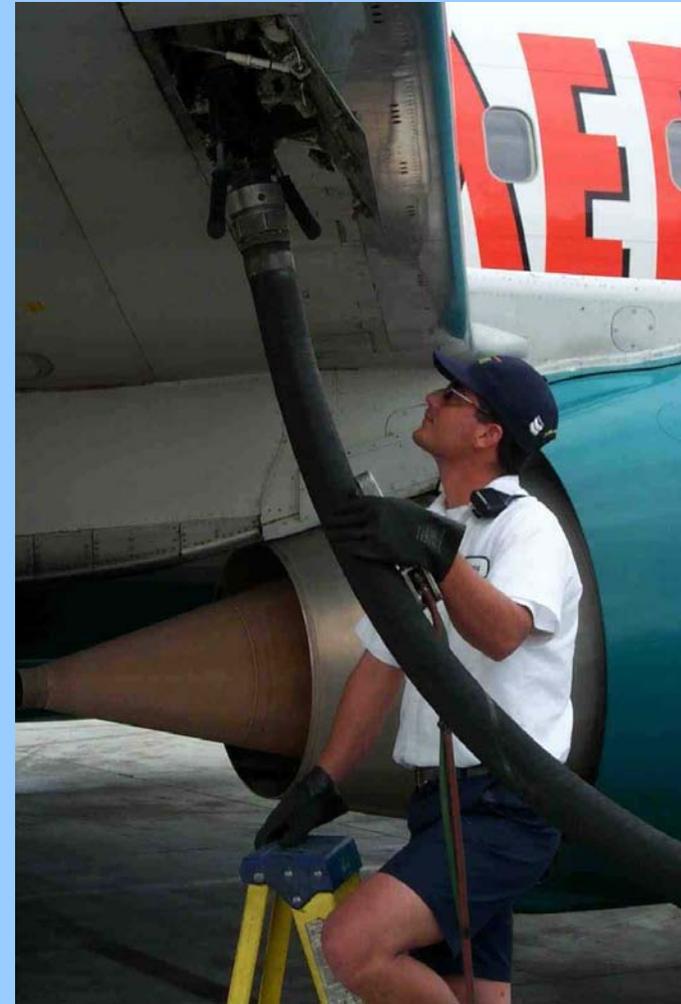
# Personal Safety

- Observe all “No Smoking” signs
- Wear Eye Protection (goggles or glasses)
- Ventilation  
(stay upwind of fumes)



# Personal Safety

- Skin Protection (gloves)
  - Effects are cumulative over your career

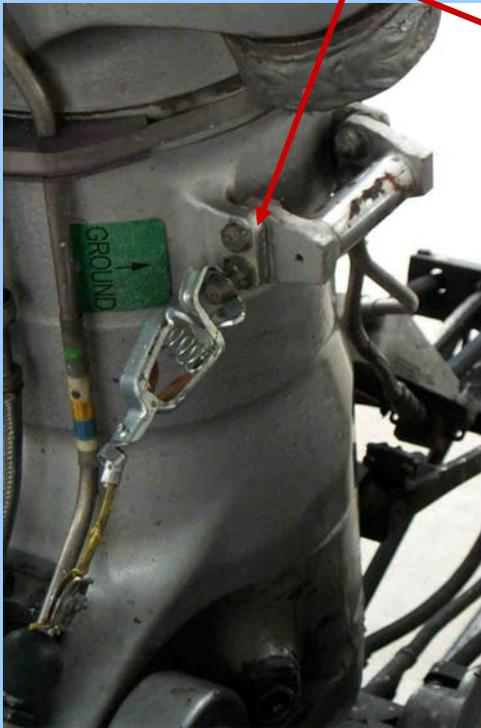


# Operational Requirements

- Aircraft Refueler trucks shall not be parked or located in any position that obstructs egress from any aircraft should a fire occur during fueling operations.
- Every Refueler shall be properly bonded to the aircraft being fueled.
- All bonding connections shall be made prior to any fuel transfer and shall not be disconnected until all fuel transfer operations are completed.

# Operational Requirements

- Proper bonding points



# Operational Requirements

- Use extreme caution when fueling during lightning and electrical storms.
  - If advised by JWA officials that lightning is eminent, your company must suspend operations until an all clear is given.
  - This warning is issued by the ATC.
- Locking of automatic shut-off nozzles or dead-man controls in an open position is strictly prohibited.
- Refueling vehicles shall not be operated unless they are in proper repair and free from accumulations of grease, oil or other combustibles.

# Operational Requirements

- Leaking vehicles shall be removed from service, de-fueled, and parked in a safe area until repaired.
- No open flame or spark producing devices shall be allowed within 50 feet of fuel servicing equipment.
- Maintenance and servicing of refueling vehicles shall be performed outdoors or in a building approved for this purpose.

# Refueler Parking

- There shall be 10 feet of clear space between parked Refuelers.
- Must have avenue of escape during an emergency.
- At a location minimizing exposure to damage of other aircraft, buildings, and vehicles.



Example  
of  
proper  
spacing

# Refueler Parking

- Minimum 50 foot distance must be maintained from:
  - airport terminal buildings
  - aircraft cargo buildings
  - aircraft hangars
  - public structure with windows or doors in exposed wall
  - parked to prevent any leakage from draining to an adjacent building



**This is not a Handicap Fueler Parking Space**  
**Do Not Park on the Fire Hydrant**



# Red Tags

## ■ RED TAG ITEMS

- Any leak
- Cracked / Missing Lens Covers
- No Fire Extinguisher
- Bad Fuel Hoses (old, leaking, etc...)
- Missing Bonding Clips for Overwing Nozzles
- Damaged bonding wiring
- Malfunctioning Interlock Brake
- Malfunctioning Automatic Shut Off (tank fill or top of tank)
- Malfunctioning Emergency Shut Off
- Improper Fusible Link Underneath the Vehicle

# **Red Tags**

Once a Red Tag is affixed, further use is prohibited until repairs are made and the tag is removed by an authorized member of the Fire Department

# Ramp Patrol

- Ramp Patrol is a daily fire prevention activity designed to make the Crash Crews visible to the public and the FBO's and to help maintain a safe working environment.
- Crash Crews remain aware of any changes to the AOA that might affect the tactics used on an aircraft crash or structure fire.

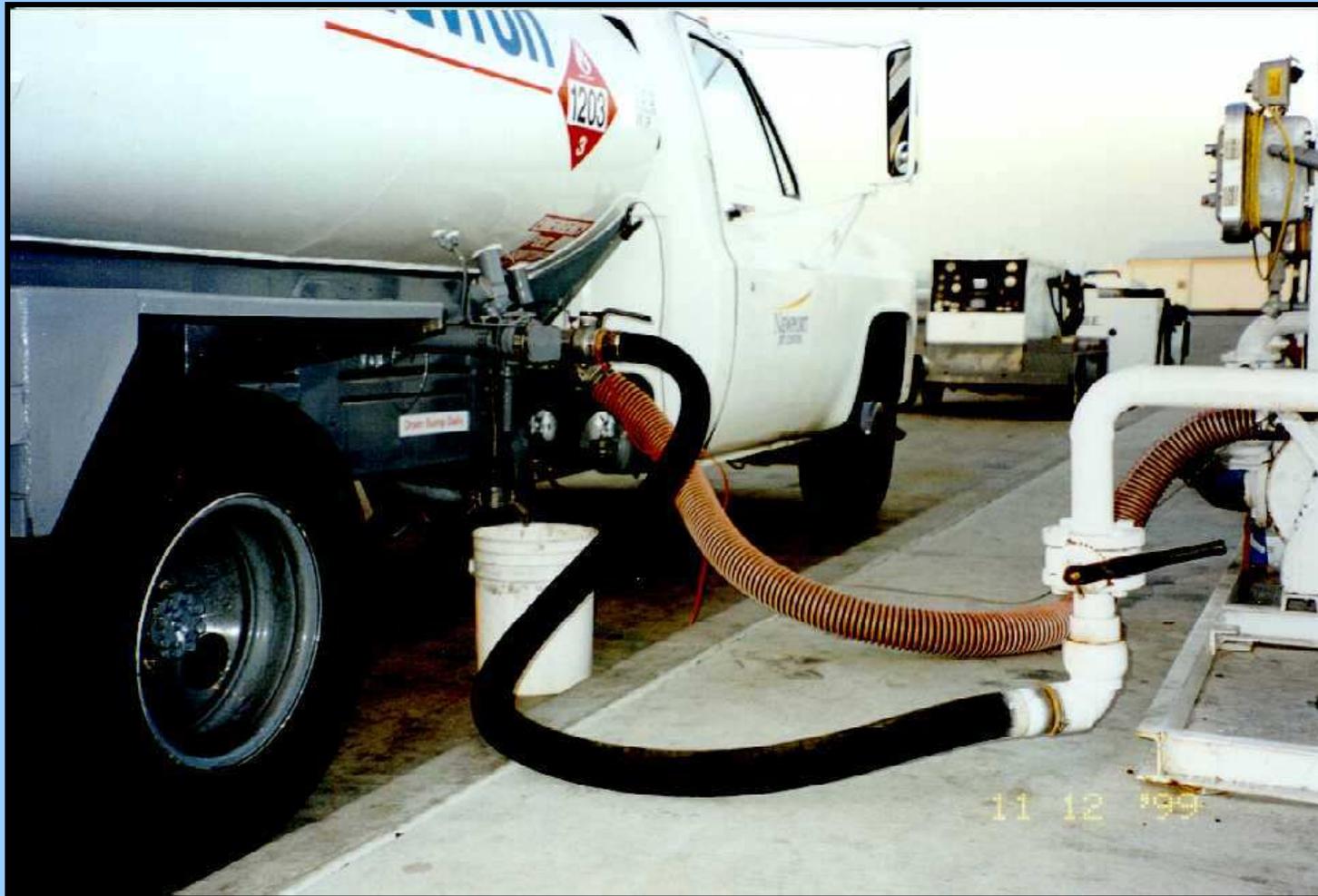
# Ramp Patrol

- Improper fueling procedures
- Tankers in poor condition
- Blocked hydrants
- Tankers illegally parked
- Fueling in hangars
- Improper bonding



# Fuel Truck Loading

Fuel Farms



# Operator at Fuel Truck

Fuel Farms

Drivers are no longer allowed on top of the truck during fueling operations with the use of pre-check valves.

Per the OSHA



# Pre-Check Valve

Fuel Farms



# Fueling Hose

Fuel Farms



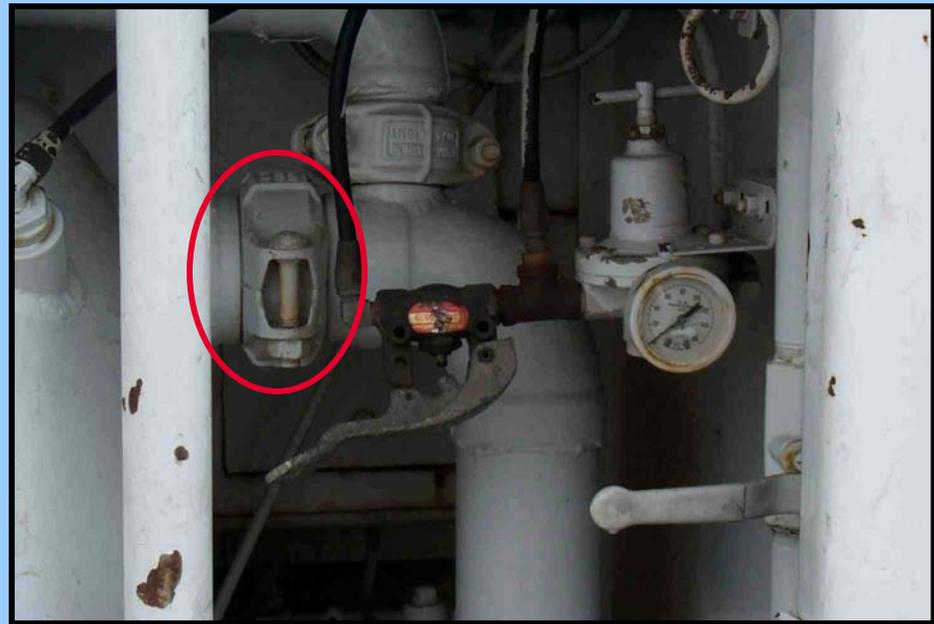
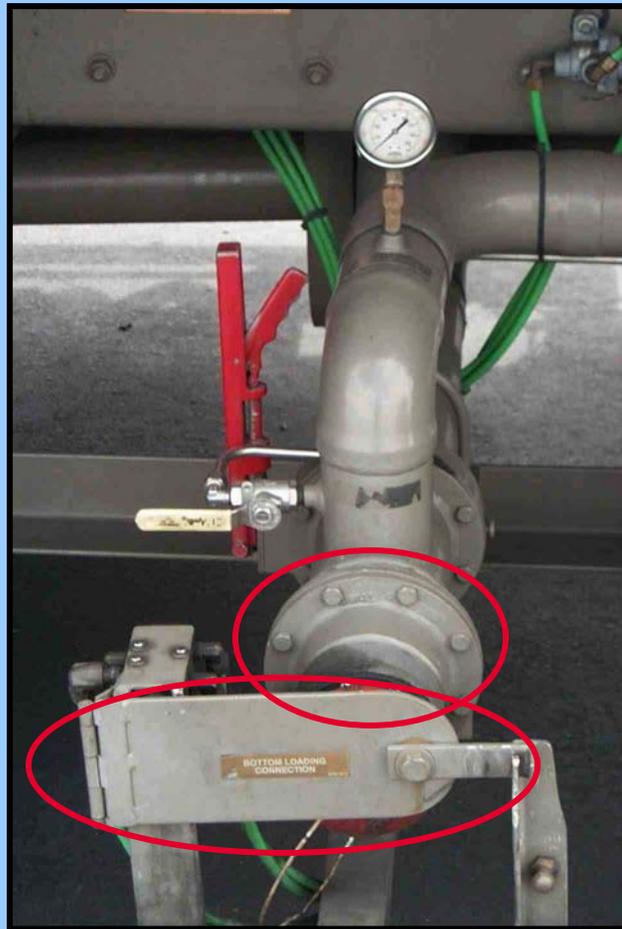
# Coupler

Fuel Farms



# Bottom Loading Check Valve

Fuel Farms



# Overflow Alarm

Fuel Farms

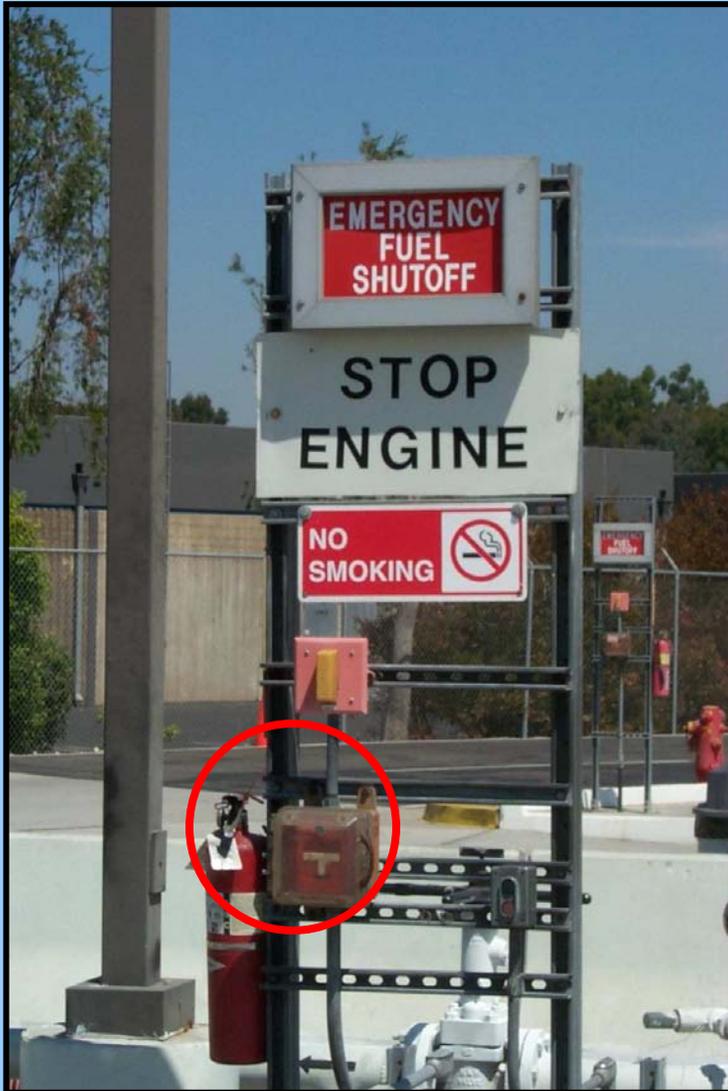


# Manual Shut-Off Switch



# Emergency Shut-Off Switch

Fuel Farms



# Emergency Shut-Off Switch



# No Smoking Sign

Fuel Farms



# Catch Bucket

Fuel Farms



# Electrical Connections



# Bonding Cable

Fuel Farms



# Fuel Spill

## Fuel Farms

- Shut down the fuel flow
- Initiate Call to **911**
- Pull fire extinguisher
- Evacuate all non-essential personnel
- Do not allow other vehicles to pass within 50 feet
- Notify Supervisor

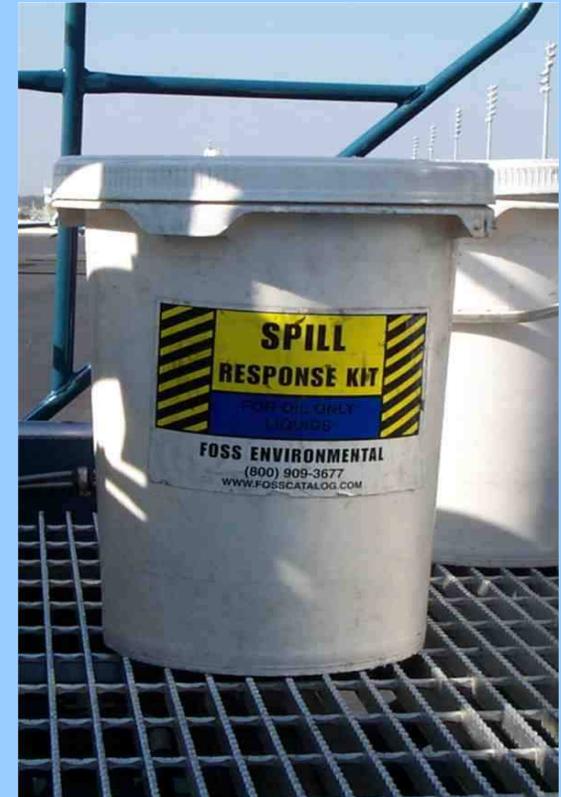


# Fuel Spills

- Every fuel spill shall be:
  - Investigated
  - Treated as a potential fire
- All fuel spills over 10' in any direction or over 50 square feet shall be reported to the Fire Department.

*NFPA 407, 5.2.6*

- Quantities of less than two gallons will exceed these numbers and require notification.



# Fuel Spill Policy

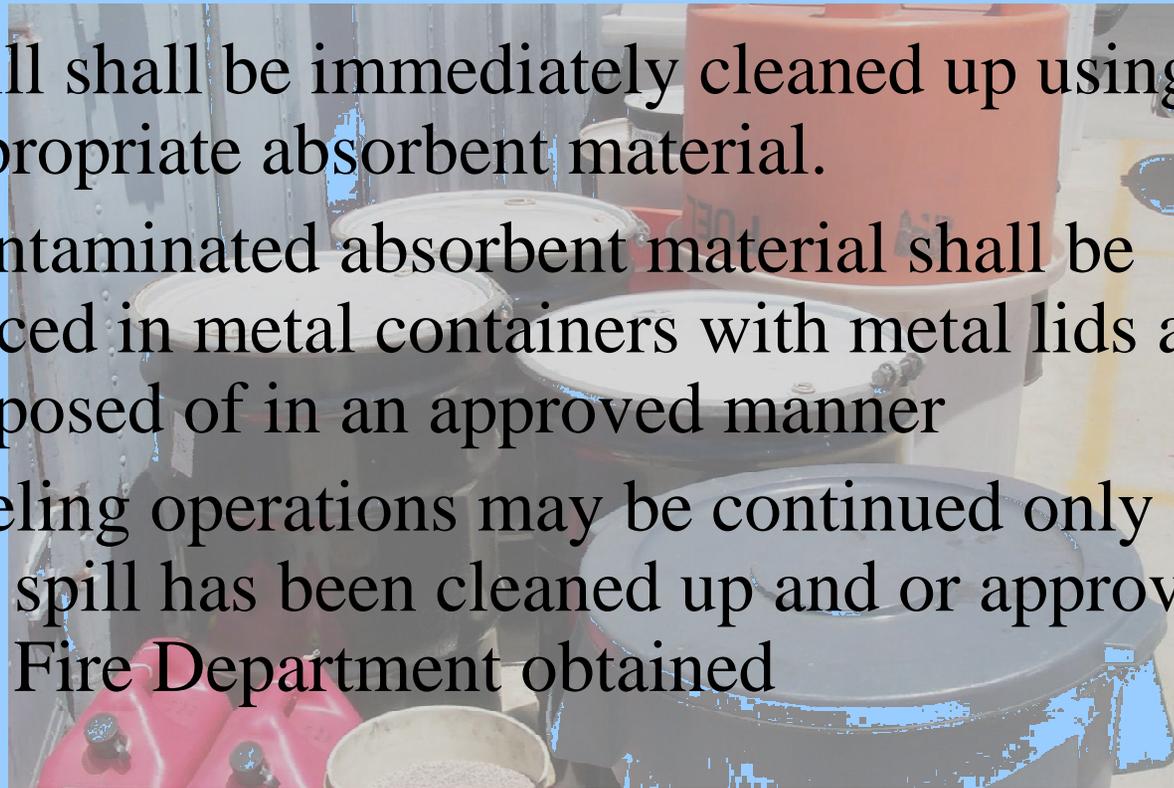
## Orange County Fire Authority

- Discontinue aircraft fueling operations immediately
- Notify: Sheriff's office, Fire Department, JWA Operations
- Evacuate
- Pull an extinguisher
- No electrical, automotive, or spark producing equipment shall be operated or moved in or near the spill.
  - If running, leave it running. Do not shut it down.
  - If ordered by the fire department to shut down a motorized equipment, reduce to idle and turn off to reduce the likelihood of a backfire.

# Fuel Spill Policy

## Orange County Fire Authority

- Spill shall be immediately cleaned up using appropriate absorbent material.
- Contaminated absorbent material shall be placed in metal containers with metal lids and disposed of in an approved manner
- Fueling operations may be continued only after the spill has been cleaned up and or approval of the Fire Department obtained



# Fuel Spill

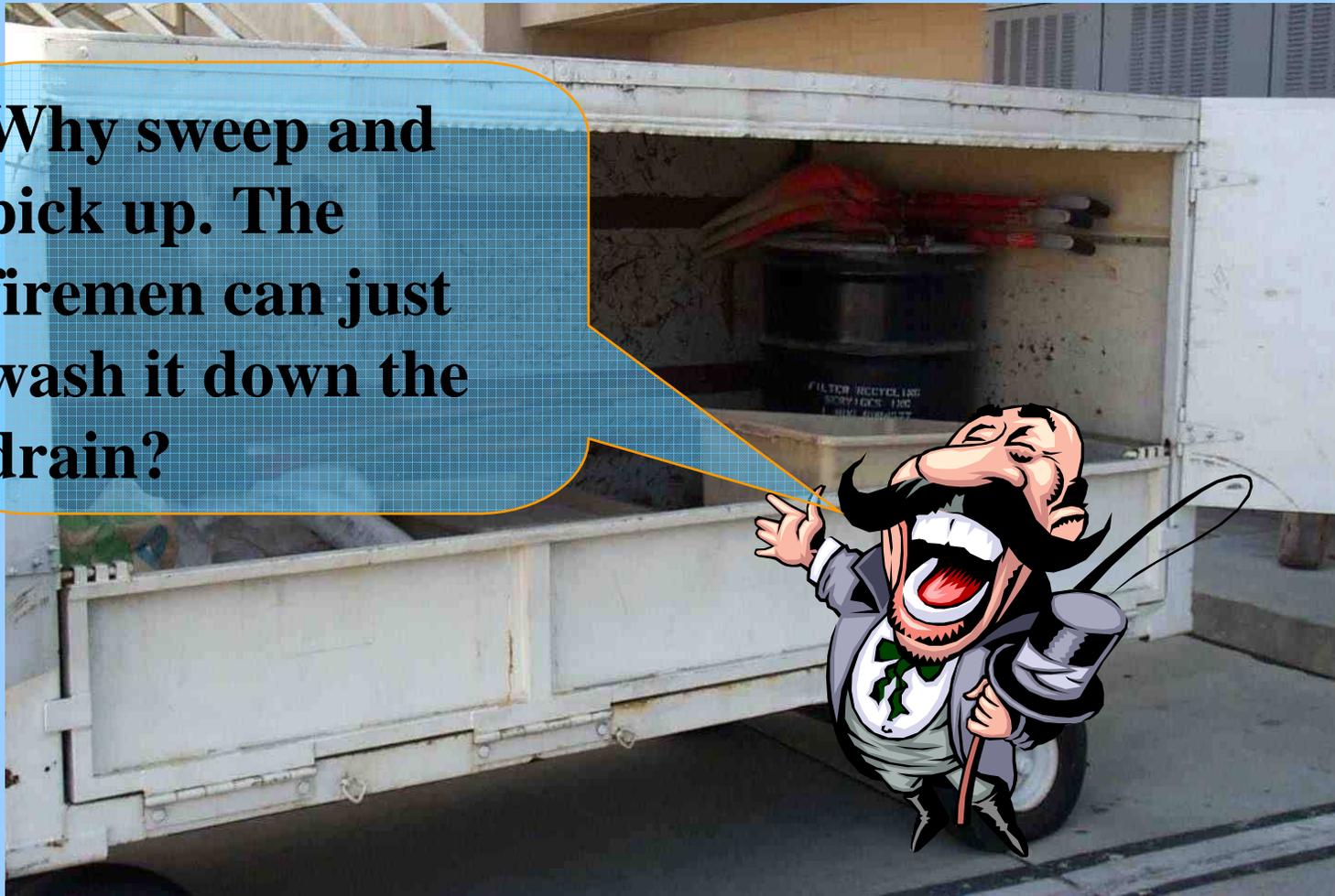
JWA - July 2001



# Fuel Spill Cart

Fuel Farms and Commercial Ramp

Why sweep and pick up. The firemen can just wash it down the drain?



# Requirements

- The FBO must train their personnel in all aspects of refueling.
- Refueler operator permit must be obtained from OCSD office in the main terminal.
- Refueler must successfully complete this Refueler safety class - pass a written and manipulative test.
- Must pass the JWA written driving test and background check.

# Codes, Ordinances, + Rules

- California Vehicle Codes
  - Speeding, unsafe turns, equipment violations, etc.
- Orange County Codified Ordinances
  - Speeding, reckless, failure to yield to aircraft, driving on runways or taxiways, parking, etc.
- JWA Rules and Regulations
  - Speeding, reckless driving, failure to yield to aircraft, driving on runways or taxiways, parking, etc.
  - Rules of conduct
- FAA Part 139 Rules and Regulations
  - Incursion violations and fines

# Licenses Required

- Class A or B license is required to drive fuel trucks
- Medical certificates are required and renewed every two years.
- Special certificates are required for carrying hazardous materials (fuel).
  - The first three, for now, pertain to fuel truck drivers off the airport property
- Valid California class “C” driver’s license
  - Must be in possession
- Valid John Wayne Airport ID badge with fuel truck symbol
  - Must be in possession and visible at all times
- Must pass a JWA FAA security background and fingerprint check
- Operator’s permits for JWA are valid for two years.

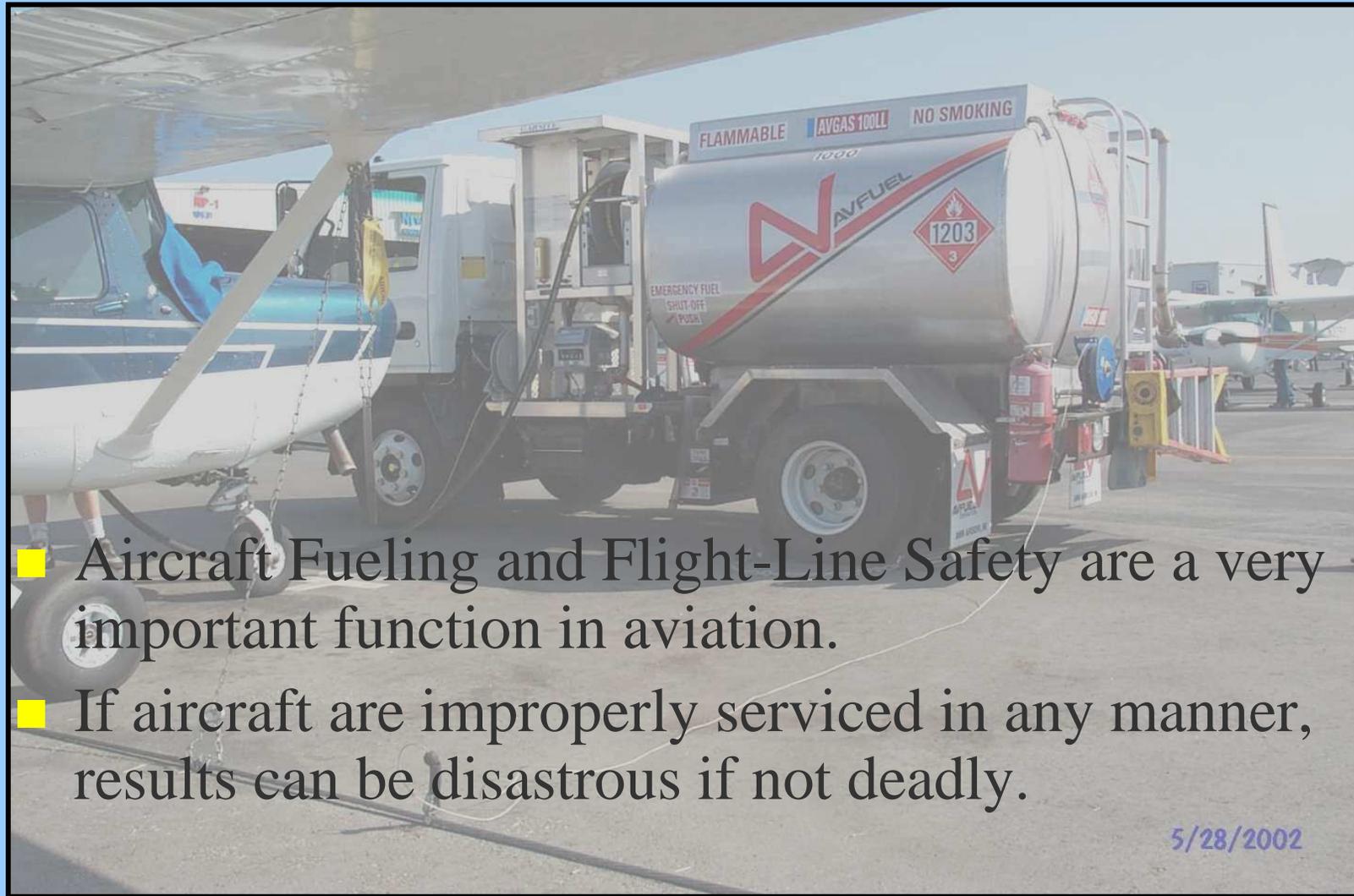
The fines and punishments for driving or equipment violations are always greater than those placed on regular vehicles – due to the extreme danger and hazards they create.

# Type of Extinguisher on Refueler Truck

- Each aircraft fuel servicing tank vehicle shall have two listed extinguishers each having a rating of at least 20BC, mounted one on each side of the vehicle
- Each hydrant vehicle shall have one listed extinguisher having a rating of at least 20BC installed on it

2001 Uniform Fire Code

# Flight-Line Safety



- Aircraft Fueling and Flight-Line Safety are a very important function in aviation.
- If aircraft are improperly serviced in any manner, results can be disastrous if not deadly.

5/28/2002

# Two Basic Types of Refueler Trucks

- **Tanker Trucks** a truck with a tank used for Avgas and or Jet A. An Avgas truck primarily refuels over-wing. Jet A trucks are generally equipped to refuel both overwing and underwing.



- **Hydrant or Lift Trucks** are the other type of truck that is used primarily for large commercial aircraft with underwing or single point refueling.



# Vehicle Inspections

- Morning/first use of day or shift
  - Thorough inspection – lights, tires, tanks, hoses, leaks, brakes and foreign objects.
- Pre-Inspection
  - Short version of “A”
- Post Inspection
  - Short version of “A”
  
- Speed and Braking Distance
  - Perception Distance (average alert driver,  $\frac{3}{4}$  second) at 25 mph = 27.5’
  - Reaction Distance (average alert driver,  $\frac{3}{4}$  second) at 25 mph = 27.5’
  - Braking Distance (good brakes, good tires, and a dry day) at 25 mph = 55’
  - Total Stopping Distance at 25 mph = 110’

**Vehicle Inspections**  
**Save Lives**

# Vehicle Inspections

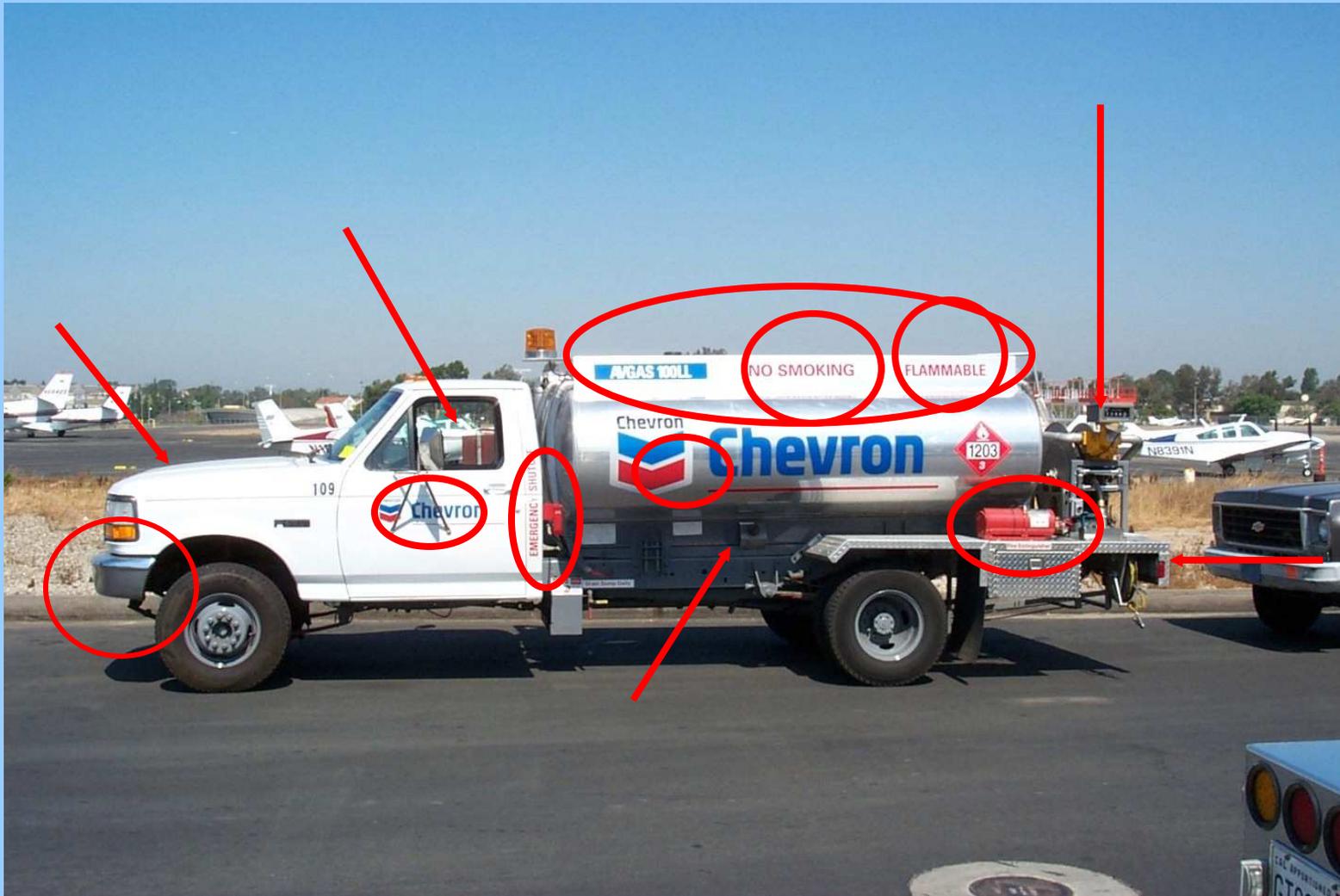
- ARFF Personnel Conduct Refueler Truck Safety Inspections at least every 90 days.

# Vehicle Safety is Extremely

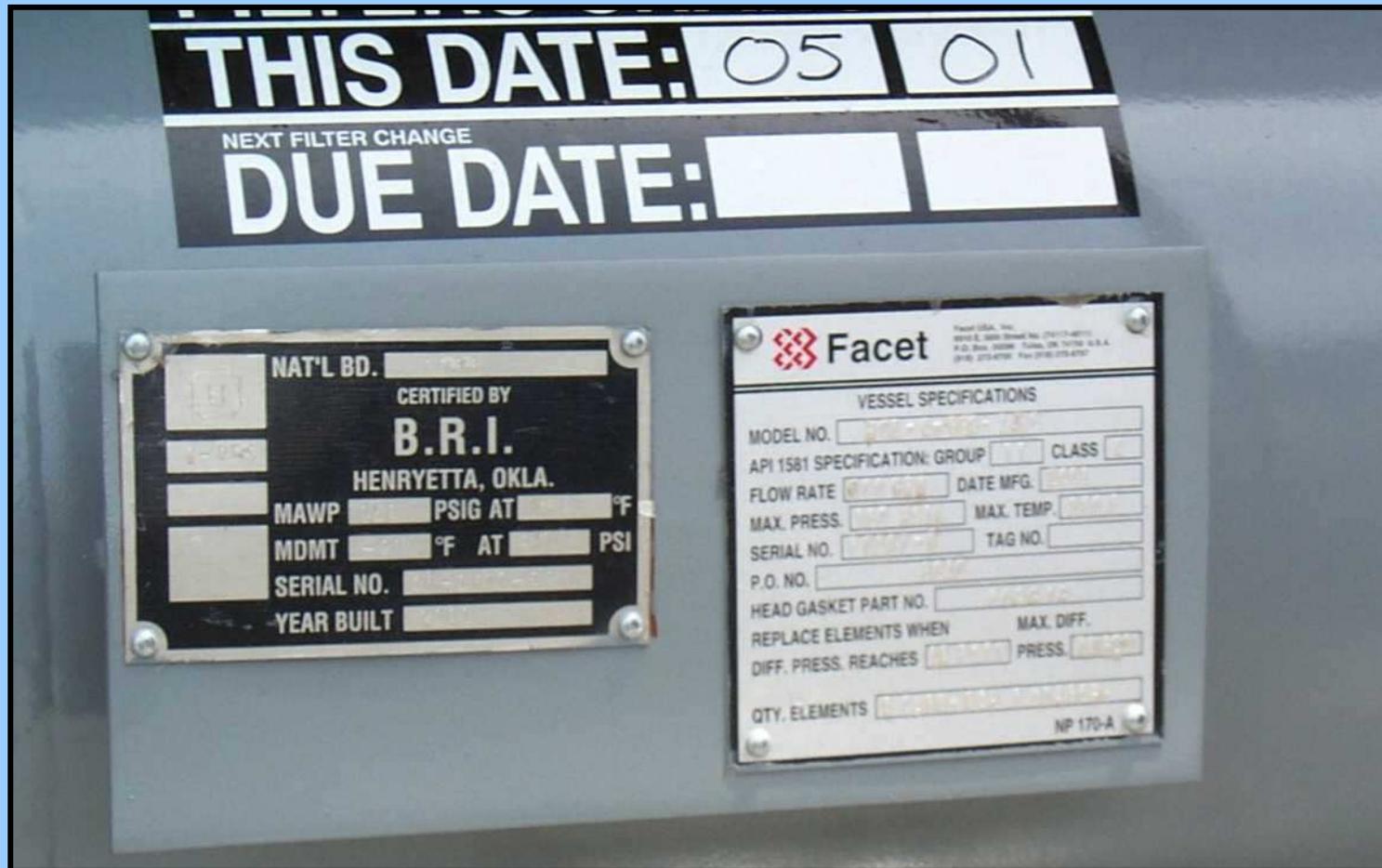
- Always walk your “Golden Circle” to be sure you are clear of all obstacles and the truck is ready to move.
- Did you forget anything?



# Fueler Truck Inspections



# Fuel Truck Inspection Data Plate



# Fuel Truck Inspection

## Exhaust



# Fuel Truck Inspection Under the Hood



# Fuel Truck Inspection Spark Arresting Air Intake



# Fuel Truck Inspection

## Cab Area



# Fuel Truck Inspection

## Signage

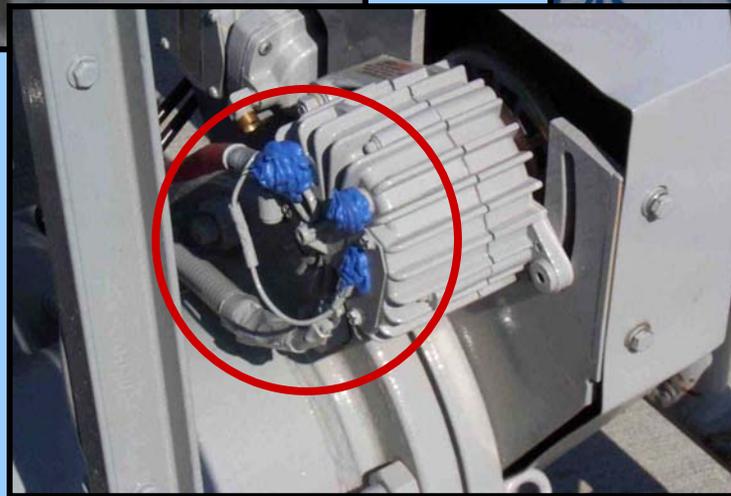


# Fuel Truck Inspection Tank



# Fuel Truck Inspection

## Electrical

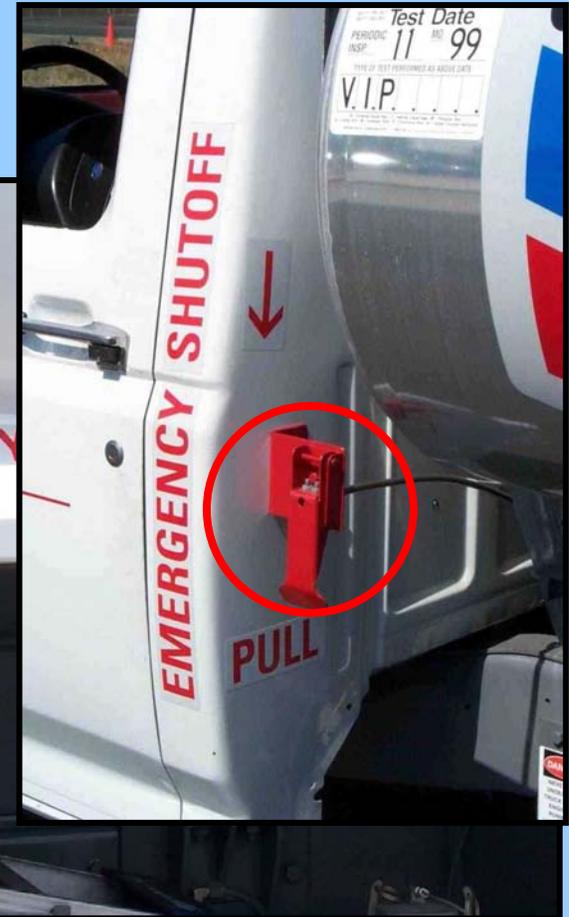


# Fuel Truck Inspection Lens

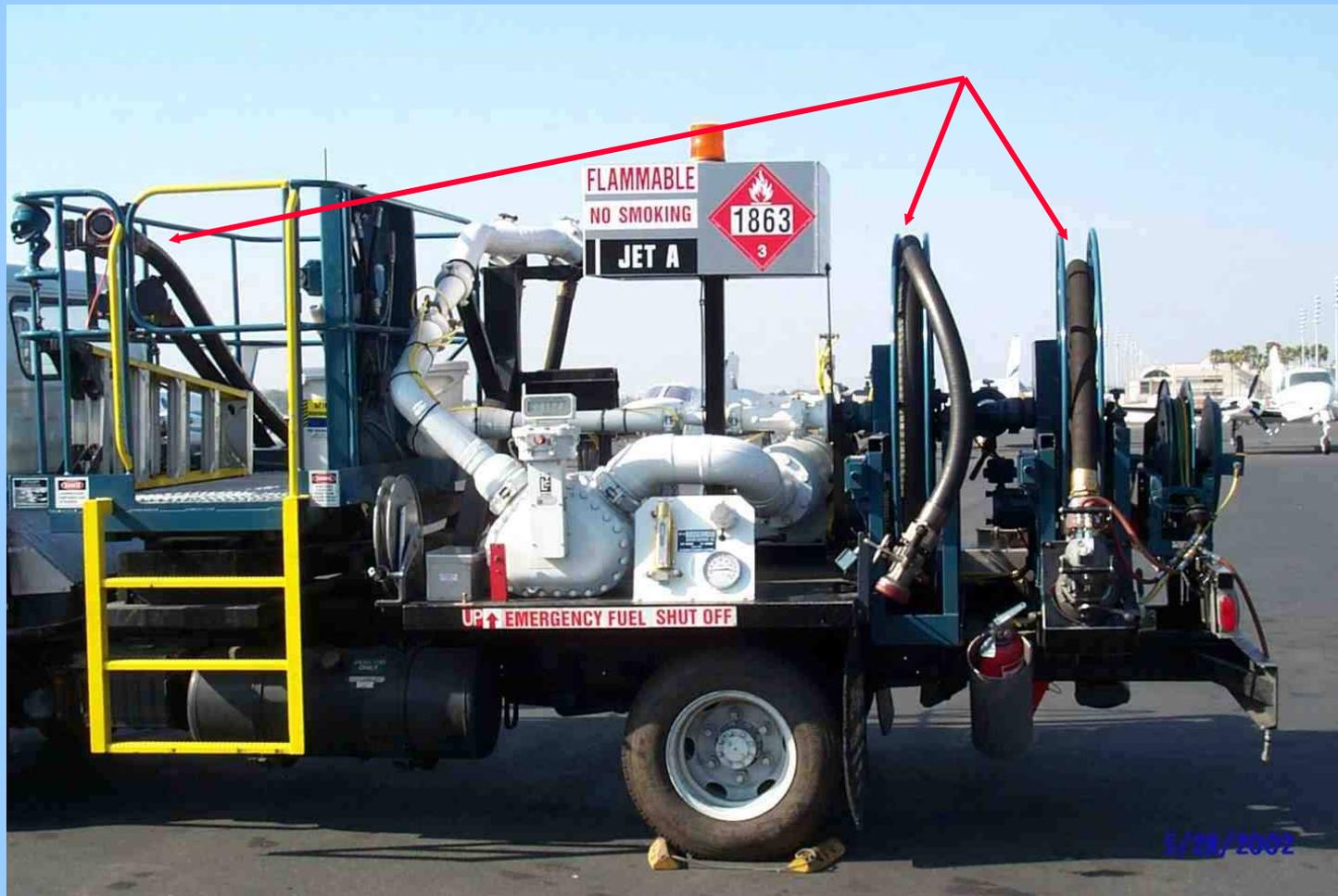


# Fuel Truck Inspection

## Emergency Shut Off

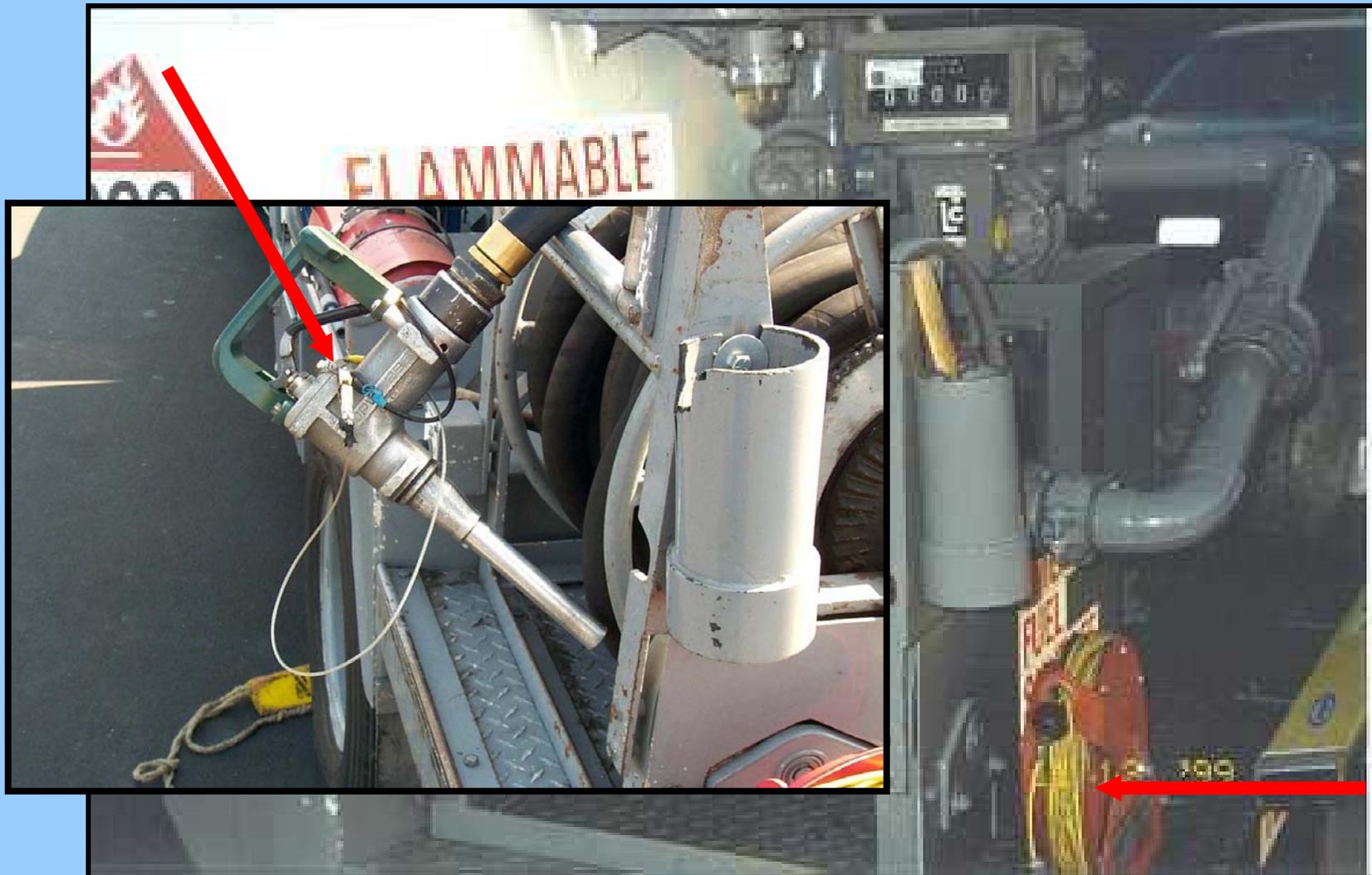


# Fuel Truck Inspection Hoses



# Fuel Truck Inspection

## Dispensing Equipment & Controls



# Fuel Truck Inspection Platform Controls



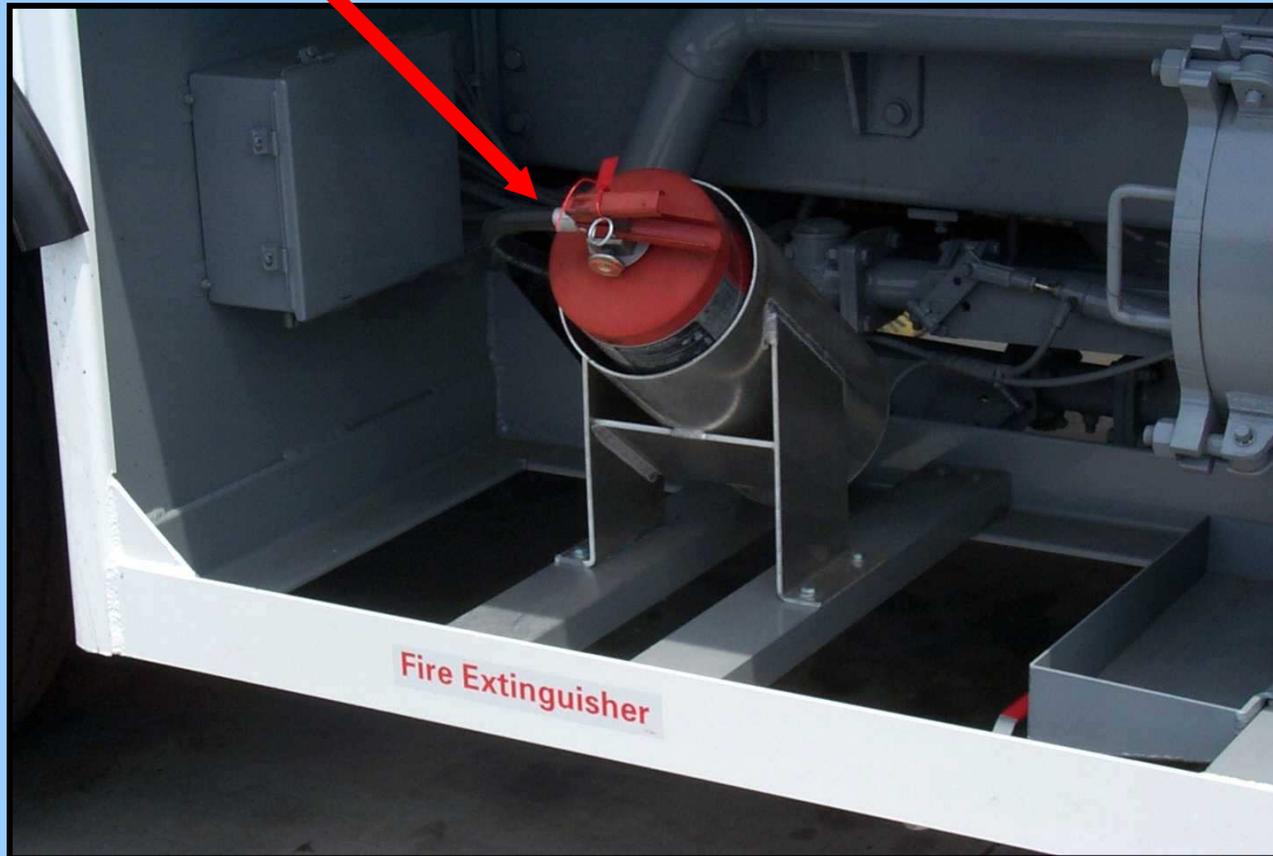
# Fuel Truck Inspection

## Dispensing Equipment & Controls



# Fuel Truck Inspection

## Extinguishers



# Fuel Truck Inspection

## Chock Blocks



# Why do we chock?



JetPhotos.Net - Image Copyright © Michael Carter

# Fuel Truck Inspection



**Hey Boss... I had this little problem  
de-fueling the plane.**

**Do you still love me?...because nobody else does!**



The End