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GLOSSARY OF TERMS - AIRCRAFT GROUND REFUELING

1. SCOPE:

This SAE Aerospace Information Report (AIR) presents a glossary of terms commonly utilized in the ground delivery of fuel to an aircraft and some terms relating to the aircraft being refueled.

1.1 Purpose:

The purpose of this document is to provide background material for educational purposes to persons designing, building, and using aircraft ground refueling delivery systems.

1.2 Field of Application:

This document applies to the systems and equipment utilized in the refueling of aircraft at commercial and military airports.

2. REFERENCES:

2.1 Applicable Documents:

The following publications form a part of this document to the extent specified herein. The latest issues of these documents shall apply unless otherwise noted.

2.1.1 API Publications: Available from American Petroleum Institute, 1220 L Street, Northwest, Washington, DC 20005.

API Bulletin 1584API Standard for Four Inch Hydrant Systems Components and Arrangements

2.1.2 IP Publications: Available from Library and Information Department, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR, England, FAX 71 255 1472.

No Number Aviation Hydrant Pit Systems - Recommended Arrangements for - Part I New Facilities, Part II Replacement of Obsolete Valves in Small Pit Boxes - August, 1990

2.1.3 ISO Publications: Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

ISO 45 Aircraft Pressure Refueling Connections

2.1.4 Military Publications: Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MS24484 Adapter, Pressure Fuel Servicing, Nominal 2.5 inch Diameter
MS29514 Flange, Adapter Locking, Pressure Fuel Servicing

2.1.5 British Standards: Available from BSI Standards, Linford Wood, Milton Keynes MK14 6LE, United Kingdom, FAX 908 320856.

BS 4C 14:1991 Aircraft Pressure Refueling Connections

2.1.6 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM D 4176 Test Method for Free Water and Particulate Contamination in Fuels (Clear and Bright Pass/Fail Proceedings)
ASTM D 4860 Test Method for Free Water and Particulate Contamination in Mid-distillate Fuels (Clear and Bright Numerical)

3. GLOSSARY OF TERMS:

The terms, listed below with their common definitions, are commonly utilized in the ground aircraft refueling industry. Terms shown in bold type are defined within the document.

ADAPTER WEAR GAUGE: A device designed to provide inspection of the critical dimensions of an Aircraft Refueling Adapter bayonet flange per ISO 45, MS24484, or MS29514.

AEROSOL: Submicron particles suspended in air, gas, or vapor. A fog, fume, or smoke.

AIR ELIMINATOR: A device installed in a fueling system which allows for automatic removal of trapped air.

AIRCRAFT REFUELING ADAPTER: The mating portion of the quick disconnect between the refueling vehicle (Nozzle) and the aircraft. This connection is dimensionally in accordance with MS24484, MS29514, ISO.45 (1990), and BS.4C.14 (1991). It is an international standard to assure interchangeability.

3. (Continued):

AIRCRAFT REFUELING PRESSURE: The fuel pressure controlled as near as possible to the aircraft adapter during a refueling operation. The only physical port possible at which this pressure can be measured is located within the Nozzle.

ALKYLATION: A gasoline refining process.

ANSI: American National Standards Institute

API ADAPTER: The outlet of a Hydrant Valve or Bottom Loading Adapter which has been designed in accordance with API 1584 or API RP 1004 respectively.

API HYDRANT VALVE: A Hydrant Valve designed in accordance with API 1584. Note: API 1584 defines more than one type of hydrant valve and this term is not sufficient to define a valve.

AQUEOUS CONTAMINATE: Water-borne contaminant.

ATMOSPHERIC PRESSURE: Force per unit area exerted by the weight of the atmosphere. Local barometric pressure.

ASPISCRUBBER: An aircraft underwing refueling system component used with on-board inert gas generating systems or liquid nitrogen inerting systems (in military aircraft) to remove dissolved oxygen from the fuel during pressure refueling.

BAFFLE: A nonliquid-tight, transverse partition in a cargo tank to minimize slosh.

BAYONET FLANGE: The three lug or slot portion of either an Aircraft Refueling Adapter or a Bottom Loading Adapter.

BLOCK OUT DEVICE: A device utilized to prevent a Hose End Pressure Control Valve from closing or tending to close (regulate). Used to segregate the Hose End Pressure Control Valve from the system for testing of other components. This may be a mechanical or hydraulic device.

BONDING CABLE: An electrically conductive wire which is used to equalize differences in potential due to accumulated static electricity, both before and during fuel transfer operations such as aircraft fueling and vehicle loading or discharge. This eliminates the hazard which may be caused by an uncontrolled electrical discharge (spark). Bonding cables are intended for handling only static electricity, typified by very high voltage, minimum current. Bonding does not necessarily provide a connection to ground (earth). Typically the cable (sometimes erroneously termed "grounding cable") provided as a part of a refueling nozzle is a bonding cable.

BONDING REEL: A device onto which the bonding cable is wound and stored. (Commonly misnamed as a grounding reel.)

3. (Continued):

BOTTOM LOADING: The method of loading a tank utilizing a closed system through the bottom of the tank.

BOTTOM LOADING ADAPTER: A quick disconnect, dry-break connection that mates either a nozzle or coupler for the purposes of loading a tank vehicle. These units are available in three different forms to assure interchangeability of use:

a. ISO 45, MS24484 or MS29514 2-1/2 in international standard bayonet connection (same as used on the aircraft)
b. 4-in standard in accordance with API 1584.
c. Industrial reverse bayonet connection (4 in size).

The outlet configurations are varied to suit the application.

BULK DENSITY: Mass or weight of the material divided by the volume of the material.

BULKHEAD: A liquid-tight, transverse closure between compartments of a tank.

BURST PRESSURE: The maximum pressure required of the component or system without causing structural failure of the external pressure barrier. The system or valve need not be functional after being subjected to such pressure.

BY-PASS VALVE: A valve utilized on a refueler to control pressure. It is normally mounted such that it allows for by-pass flow from the outlet of a pump back to the inlet or tank.

CARCASS SATURATION: The condition where fuel has permeated the materials of a hose carcass.

CARGO TANK: A container having a liquid capacity in excess of 100 gal (378.5 L), used for the carrying of aviation fuels, and mounted permanently or otherwise secured on a vehicle.

CHECK VALVE: See Nonreturn Valve.

CLAY FILTER: A term used to describe a system of treating fuel to remove surface active agents. Typically, fuel is passed very slowly through elements or cartridges containing particulate material onto which the surfactant is adsorbed, e.g., attapulgus clay, Fullers earth, or diatomaceous earth.

CLEAR, BRIGHT AND DRY TEST: The simplest test to determine if fuel is free from visible water or particulates. Reference ASTM D 4176 or D 4860.

CLOSING TIME: Time for a valve or system to close from full rated flow or any intermediate flow rate.

3. (Continued):

COALESCER ELEMENT: A cylindrical filter cartridge which removes particulate contamination and also causes free water in the fuel to coalesce or gather together into droplets large enough to separate from the Continuous Phase by gravity. Coalescer Elements can be disarmed or rendered inactive by surface active agents (surfactants). Flow direction is normally from the inside to the outside of the element. They are used as the first stage in filter/water separator vessels, in conjunction with separator elements in the second stage.

CO-MINGLED TANK FARM: Fuel tankage system where various fuel suppliers may deposit a specific type of fuel into a common storage tank (tankage) to be used by various users.

COMPARTMENT: A liquid-tight division in a cargo tank.

CONTINUITY TESTER: A device used to check the electrical continuity of a part or set of parts.

CONTINUOUS PHASE: The basic product flowing from a filter separator or monitor system which continues on through the system after being subjected to solids and/or water removal.

D-1 NOZZLE: An Underwing Nozzle defined by MIL-N-5877 designed for military use. It has a characteristic 45° elbow as a part of its inlet body to allow for vertical hose drape when refueling on fuselage mounted refueling adapters. It terminates in a 6-bolt mating flange defined by a military standard drawing. It is used by the U.S. military services. Nozzles approved for procurement by the U.S. military services under this designation are listed on QPL for the MIL-N-5877.

D-1R NOZZLE: Same as D-1 Nozzle except a nominal 55 psi (3.87 kg/cm^2) Hose End Control Valve is fitted to the unit.

D-2 NOZZLE: Same as the D-1 Nozzle except the inlet body is straight. The straight body allows vertical hose drape when refueling from an underwing position. It terminates in the same 6-bolt flange.

D-2R NOZZLE: Same as D-2 Nozzle except a nominal 55 psi (3.87 kg/cm^2) Hose End Control Valve is fitted to the unit.

DEADHEAD PRESSURE: The pump outlet/system pressure at no flow.

DEADMAN CONTROL: A system which requires positive continuing action of an operator to allow the flow of fuel. Interruption of this action will cause all fuel flow to stop.

DEADMAN HANDLE: The air or hydraulic valve or electric switch, or any other means activated by the operator to open or close the fueling system.

DEADMAN SWITCH: See Deadman Handle.

3. (Continued):

DEADMAN VALVE: An on-off valve used to stop the flow of fuel through the system unless the operator is physically acting upon a control valve or switch in an active manner. Also refers to the control valve that the operator holds while keeping the on-off valve open. See Deadman Handle or Switch.

DECK: A moveable platform used to elevate the refueling operator to be able to easily reach taller aircraft. Same as Elevating Platform.

DECK HOSES: Relatively short output hoses used on a moveable deck of a refueling vehicle for refueling aircraft with Refueling Adapters requiring such access. These hoses normally terminate in Underwing Nozzles.

DEFUELING: Off-loading fuel from an aircraft.

DELTA P (ΔP): See Pressure Drop.

DENSITY: See Bulk Density.

DESIGN PRESSURE: See Proof Pressure.

DIAPHRAGM VALVE: A valve which uses the difference in pressure across a diaphragm assembly or flexible membrane to vary the position of the assembly, thus enabling it to control flow rate, pressure, or other parameters.

DIFFERENTIAL PRESSURE GAUGE: A pressure gauge which indicates the pressure differential between two different locations in a system.

DIPSTICK: A calibrated stick for manually determining the quantity of fuel contained in a fuel tank. The quantity of fuel is indicated by the wetted length of the calibrated stick after fuel submergence.

DISCONTINUOUS PHASE: The contaminated product, containing water or filtered contaminants, which are separated from the continuous phase of a filter system.

DRIPLESS DRIPSTICK: A calibrated device installed and operated from the bottom of a fuel tank for manually determining the quantity of fuel contained in a fuel tank without leakage or loss of fuel from the tank.

DRIPSTICK: A calibrated device installed and operated from the bottom of a fuel tank for manually checking a fuel tank to determine the quantity of fuel contained in the fuel tank. The device is adjusted to locate the interface between the fuel and air in the tank as indicated by drippage from the device.

DROP: The quantity of liquid which makes up a spherical mass; a liquid globule.

3. (Continued):

DRY-BREAK DISCONNECT: A device normally mated to the inlet of a nozzle to allow for the ease of checking a Strainer or interchange an Underwing Nozzle to an Overwing Nozzle, or visa versa, without the draining or spillage of the upstream hose or system.

DYNAMIC: In motion, active, moving.

DYNAMIC DELIVERY HEAD: Pressure, measured in height, within the pump discharge flow of a fuel equal to $\frac{V^2}{2g}$, where V = velocity and g - acceleration due to gravity (32.174 ft/s^2 or 980.665 cm/s^2).

DYNAMIC HEAD: Pressure, measured in height, within the flow of a fuel equal to $\frac{V^2}{2g}$, where V = velocity and g = acceleration due to gravity (32.174 ft/s^2 or 980.665 cm/s^2).

DYNAMIC PRESSURE: Pressure within the flow of a fuel equal to $\frac{\rho V^2}{2g}$, where V = velocity, ρ = density, and g = acceleration due to gravity (32.174 ft/s^2 or 980.665 cm/s^2).

DYNAMIC SUCTION HEAD: Pressure, measured in height, within the flow inlet of a pump on the flow of fuel equal to $\frac{V^2}{2g}$, where V = velocity and g = acceleration due to gravity (32.174 ft/s^2 or 980.665 cm/s^2).

DYNAMIC SUCTION LIFT: Differential height measured between the fuel surface level and flow inlet of the pump during pump operation.

EFFLUENT: Stream of fluid at the outlet of a filter or Filter Separator. Opposite of influent.

ELECTRICAL BONDING: The procedure for which a bonding cable is used.

ELECTRICAL GROUNDING: The connecting of the aircraft or other vehicle to be refueled or defueled or the vehicle accomplishing the refueling operation to a grounding rod suitably inserted into the earth.

ELEVATING PLATFORM: Same as Deck.

EMERGENCY BREAK AWAY/EMERGENCY DRY BREAK: A device mounted strategically in a fuel system that when acted upon by a specific force (pull) will separate and "break" the hose or system connection with a minimum of spillage.

EMERGENCY VALVE: A valve positioned at the outlet of a vehicle fuel tank so that it can be closed to prevent spillage in an emergency.

EMULSION: A dispersion of fine droplets in the continuous phase.

3. (Continued):

ENTRAINED WATER: Discrete water droplets carried by a continuous hydrocarbon phase.

EXCESS FLOW CONTROL: Excess flow control is a function of some Hydrant Valves or Hydrant Couplers which will automatically stop flow through the system if the flow rate exceeds a predetermined value. Some such units have the capability of having two such settings, high and low, to accommodate aircraft of different capability.

EXTERNAL TANK: A fuel tank(s) of pressure vessel construction with aerodynamic fairing which may be hung on either the aircraft fuselage, under the wing, or on the wing tip. They are generally hung on the wing and fuselage by pylons and may be jettisonable.

FEET OF HEAD: Measurement of pressure in feet of the liquid being pumped.

FIBER MIGRATION: Carry-over of fibers from filter or separator media material into the Effluent. Fiber migration is a qualitative part of total media migration.

FIBER OPTIC CABLE: A glass fiber conduit handled in a similar manner as electrical wiring and capable of transmission of light signals.

FIBER OPTIC SENSOR OR PROBE: A device which is utilized to sense the existence of a liquid in a tank and transmit the change by light signal to a control device.

FILTER MONITOR: Same as Filter Separator except the stripped water is retained within a portion of the elements of the unit. Accumulation to a certain level will automatically stop the flow of the fuel through the unit.

FILTER SEPARATOR: A device designed to filter contaminants and water from fuel. Water stripped from the fuel accumulates in a sump at the bottom of the unit and has to be drained periodically. A system to indicate a high water level may be incorporated within the unit (See Water Sump Control or Water Probe).

FILTER VESSEL: The outer container of a Filter Separator or Monitor which contains the filtration devices and other associated apparatus. It provides connection to the fuel system.

FILTRATE: See Continuous Phase.

FLASH POINT: The temperature at which a liquid gives off sufficient vapors to form a flammable mixture of fuel and air near the surface which will flame momentarily when exposed to a source of ignition.

FLOW GAUGE or INDICATOR: A device that indicates the flow rate of liquid in a system. It may be mechanically driven or respond to electronic pulses. An alternative term is Rate of Flow Indicator.

3. (Continued):

FOOT VALVE: See Emergency Valve.

FRICTION HEAD: Pressure loss, measured in height, caused by product moving through pipe and fittings.

FUEL QUANTITY MEASUREMENT SYSTEM: On-board aircraft system (usually electronic) for measuring and indication of fuel quantity (weight) per tank and total fuel on-board. Uses fuel eight and characteristic sensors internally mounted within the fuel tanks, along with preprogrammed (software) conversion of height/volume and fuel density to give fuel weight.

FUEL SENSE PRESSURE: A pressure signal obtained from a point remote from, and downstream of a pressure control valve on refueling vehicle. This enables the valve to control the into-aircraft delivery pressure within prescribed limits. The sense pressure may be taken from a port in the delivery pipe work or from the throat of a Venturi type pressure loss compensator.

FUEL SERVICING CABINET: A fixed, above-ground structure containing equipment connected to an airport fueling system to enable fuel to be dispensed into aircraft.

FUEL SHUTOFF VALVE: Aircraft control valve used to enable fuel to enter a tank during refueling, and shut off upon command or automatically if part of the level control system. May be manually or electronically controlled (can be, in some cases, shut off at preselected fill level).

FUEL STORAGE FACILITIES: Tanks and associated facilities for the storage of aviation fuel at an airport. Same as Tank Farm.

FUEL TANK/TANKAGE: See Cargo Tank.

FUEL-DEFUEL VALVE: A multi-position valve, within a ground refueling system, which is manually positioned to change a mobile refueling system from a fueling mode to a defueling mode.

FUELER: See Refueler.

FUELING: Loading fuel into an aircraft.

GLOBE VALVE: A type of valve in which the flow direction through the controlling portion is generally at 90° to the inlet and outlet ports. The controlling portion may be positioned manually or automatically by pressure applied to a diaphragm or similar device.

GRAVITY FILL POINT OR PORT: An opening in the fuel tank of an aircraft which allows for filling by use of an overwing nozzle. See Overwing Nozzle Adapter.

GRAVITY REFUELING: See Overwing Refueling.

3. (Continued):

GRAVITY SEPARATION: Separation of immiscible phases resulting from a difference in specific gravity (settling).

GROUNDING CABLE: As commonly used in the aircraft fuel industry, it is a misnomer for a Bonding Cable. A true Grounding Cable is a cable capable of grounding high power currents within an electrical system.

HEAD: A liquid-tight, transverse closure at the end of a cargo tank.

HEAD PRESSURE: Pressure or resistance to flow or pressure available to produce fuel flow.

HOSE: A flexible conduit utilized to connect two points in a fueling system for the transmission of a fluid product.

HOSE END BALL VALVE: A ball valve mounted to the inlet of a nozzle to allow for checking the strainer without disconnection of the unit and with minimum or no spillage of fuel when fitted with a strainer in the ball bore.

HOSE END CONTROL VALVE: See Hose End Pressure Control Valve.

HOSE END PRESSURE CONTROL VALVE: A direct-acting pressure regulator that is mounted on the inlet of the nozzle to limit pressure at its outlet and control surge pressure limits in the downstream aircraft manifold system.

HOSE END REGULATOR: See Hose End Pressure Control Valve.

HOSE END SURGE CONTROL VALVE: Same as Hose End Pressure Control Valve.

HOSE REEL: A device used to store hose and to allow for the easy utilization of same in either a full or partial length condition. May be operated by hand or by hydraulic, pneumatic, or electric motor.

HOT HYDRANT VALVE: A Hydrant Valve whose inlet shutoff portion has been left open or whose inlet shutoff valve seals are leaking sufficiently to prevent reduction of the pressure, in the cavity between the inlet shutoff valve and the outlet adapter, by the compressing of the pressure equalization valve in the outlet adapter poppet.

HYDRANT BOX: See Hydrant Pit.

HYDRANT CART: Same as Hydrant Servicer but usually limited to a towable unit which is not self-propelled.

HYDRANT COUPLER: The mechanical quick connection between the Hydrant Servicer and the Hydrant Valve. The Hydrant Coupler may include various control features or may be a simple quick coupling.

HYDRANT DISPENSER: Same as Hydrant Servicer.

3. (Continued):

HYDRANT PIT: A covered opening in the concrete apron of an airport strategically located to provide access to the aircraft underwing Refueling Adapter. The Hydrant System piping terminates within the Hydrant Pit containing a Hydrant Valve and other associated equipment.

HYDRANT PIT COVER: See Hydrant Pit Lid.

HYDRANT PIT LID: The cover or lid to a Hydrant Pit.

HYDRANT SERVICER: Also called Hydrant Cart or Hydrant Dispenser. A vehicle, self-propelled or towable, which contains the necessary equipment to allow for connection to the Hydrant Valve and the aircraft refueling adapter. The Hydrant Servicer may include, but is not limited to, intake hose, outlet hoses, booster pumps, meters, filter separators or monitors, pressure control systems, and other controls necessary for effecting a safe and rapid refueling of the aircraft.

HYDRANT SYSTEM: A hydrant system consists of three basic elements:

a. Tank farm or storage facility
b. Piping and controls, such as pumps and filters, required to connect the Tank Farm with the apron-mounted hydrant valves
c. Hydrant pits and valves

The hydrant system provides a consistent source of fuel from a remotely located storage facility or tank farm to the refueling apron or parking positions of the various aircraft to be refueled.

HYDRANT VALVE: The terminus of the hydrant system piping system which will provide as a minimum quick coupling capability with a Hydrant Coupler and may provide controls (pressure, on-off, excess flow, etc.).

HYDROMETER: A device used to measure the specific gravity, or alternatively, the density of a liquid. It is used in the general process of fuel quality assurance checks.

HYDROPHILIC: Water accepting or water wettable. Opposite of Hydrophobic.

HYDROPHOBIC: Not water wettable. Opposite of Hydrophilic.

IMMISCIBLE: Liquids which are mutually insoluble; opposite of miscible.

IN-LINE VALVE: A valve which is mounted in the fueling vehicle pipe work to automatically control flow, pressure, or other parameters - distinct from a Hydrant Coupler which performs a similar function.

INDUSTRIAL ADAPTER: A dry break disconnect with a three slotted (inverted bayonet) to allow connection to the mating Industrial Coupling.

3. (Continued):

INDUSTRIAL COUPLING: The mating coupling for an Industrial Adapter. Opening and closing may be accomplished automatically by the coupling action or may require a lever (handle) type actuation.

INFLUENT: Stream of fluid at the inlet of a filter or Filter Separator. Opposite of effluent.

INSPECTION HATCH: A covered opening in a tank which allows for access. It may contain various components to control venting or vacuum control of the tank.

INTAKE HOSE: Also the hydrant dispenser Inlet Hose. The hose connection between the hydrant coupler and the plumbing of the hydrant dispenser.

INTERLOCK SWITCH: A switch used in the Stowage Bucket or at the Bottom Loading Adapter to actuate the Interlock System (to prevent the vehicle movement) when the Nozzle or Coupler is not stowed or when the Bottom Loading System is being utilized. It may also be used to interlock the pump engagement or the elevated platform.

INTERLOCK SYSTEM: A system incorporated into the stowage of some or all of the movable equipment which shall be put into a stowage position prior to allowing the movement of a vehicle. Interlock Valves, Switches, or optical sensors may be used in effecting the desired interlock.

INTERLOCK VALVE: A valve used in the Stowage Bucket or at the Bottom Loading Adapter to actuate the Interlock System when the Nozzle or Coupler is stowed or when the Bottom Loading System is being utilized. It may also be used to interlock the pump engagement, the elevated platform, or any other piece of moveable equipment that is normally stowed before the movement of a vehicle can be accomplished.

INTERNAL VALVE: See Emergency Valve.

IP HYDRANT VALVE: A Hydrant Valve as defined by the Institute of Petroleum in a document titled "Aviation Hydrant Pit Systems".

JET LEVEL SENSOR: A fluidic control device used in a Bottom Loading System which discriminates between liquid and gas to signal a bottom loading valve (may be an Emergency Valve) to open and close when the liquid level reaches a preset level.

LEVEL CONTROL VALVE: A device mounted within an aircraft fuel system which controls the flow of fuel into a tank based upon the level of the fuel within the tank. (Can also be the Fuel Shutoff Valve.)

LOW POINT: The lowest point in a pipe line or tank where drains may be installed.

MANHOLE: Same as Inspection Hatch when referenced to a tank application.

3. (Continued):

MANLID: Same as Inspection Hatch.

MEDIA MIGRATION: Carry-over of fibers and particles from filter or separator media material into the effluent. Includes fiber migration measured in milligrams per liter.

METER (BULK): A device that measures the quantity of liquid passing through it. Meters can display the total volume and/or the rate of flow.

METER (CONDUCTIVITY): A device for measuring the electrical conductivity of a liquid. For jet fuel, the device is used to monitor the potential for relaxation of static electrical charge. For power boost fluids, conductivity is related to certain types of contamination and is thus used as a control check.

MICRO FILTER ELEMENT: A construction, usually cylindrical and made from a variety of material, through which fuel is passed to remove particulate contamination. Several filter elements would be housed in a single filter vessel.

MIL-SPEC/MILITARY SPECIFICATION: A performance specification detailing the requirements for specific equipment, normally associated with U.S. military use.

MISCIBLE: Liquids which are mutually soluble. Opposite of immiscible.

N.P.S.H.: Net Positive Suction Head.

N.P.S.H. AVAILABLE: Differential pressure in excess of the fuel true vapor pressure available at the pump interface (flow inlet).

N.P.S.H.R: Net Positive Suction Head Required.

NONRETURN VALVE: A valve that prevents flow of fluid in one direction and the free flow of fluid in the opposite direction. Same as a Check Valve.

NOZZLE: The quick connection utilized to attach the refueling vehicle outlet to the Aircraft Refueling Adapter. There may be one or more (normally no more than four) Nozzles per each Hydrant Servicer. The Nozzle may or may not include a Hose End Pressure Control Valve. Common short term for Underwing Nozzle. See also Overwing Nozzle.

NOZZLE PRESSURE: Same as Aircraft Refueling Pressure.

NOZZLE PRESSURE DROP: The pressure drop across the nozzle and an aircraft refueling adapter. It is not possible to separate the two elements of this disconnect, hence the pressure drop of the nozzle is considered a part of the total aircraft fuel system pressure drop. The inlet and outlet size of the system should be identical to eliminate the affects of velocity upon the results.

3. (Continued):

OPENING TIME: Time for a valve or system to achieve 90% of full rated flow starting from zero.

OPERATING PRESSURE: The range of steady-state static pressure that can be experienced in the system.

OVERSHOOT: The quantity of fuel passing through the system after the system controlling valve has been initiated to closed (deadman closure or other actuating devices).

OVERWING NOZZLE ADAPTER: A metallic, structural component that is located at the aircraft's gravity fill ports. An appropriate Fuel Tank Filler Cap is installed and locked into this adapter. Overwing refueling is accomplished through this adapter when the cap is removed. Military overwing nozzle adapters are designed in accordance with MS27379 and military caps are in accordance with MIL-C-38373.

OVERWING NOZZLE: A manually-operated, hand-held, on-off device for use in dispensing liquid into the top of an open tank (hence overwing).

OVERWING REFUELING: The refueling of an aircraft by use of an overwing nozzle through an adapter opening near the top of the wing tank. Sometimes referred to as gravity refueling as contrasted to pressure refueling where an underwing nozzle is utilized. Military nozzles are typically designed in accordance with MIL-N-26978 or MIL-N-87963.

PIPE or VESSEL LINING or COATING: An inert material that is bonded to the inside of a pipe or vessel to serve as corrosion protection and to provide a smooth internal lining. Coatings can also be a similar material applied to the outside of a pipe.

PISTON VALVE: A valve which utilizes a piston as its main control element.

PRECHECK SYSTEM: A feature of the aircraft fuel system (part of the level control system) providing a simulated closure operation of the Level Control Valves or Fuel Shutoff Valves. This feature offers the capability of determining the functionality of the level control system without completely filling the tank(s). It can also be used to check for system fuel leaks. The system, in most cases, can be operated at the ground refueling station or from the cockpit. A precheck system is quite prevalent on military aircraft and may not be a part of a commercial aircraft system.

PRE-FILTER ELEMENT: The same as a Micro Filter Element, but used in an application where it is followed in the flow direction by a Filter Monitor or Filter Separator. The purpose is to prolong the service life of the downstream equipment.

3. (Continued):

PRESSURE AT THE SKIN OF THE WING: A misnomer. Same as Aircraft Refueling Pressure. There is no port available "at the skin of the wing" at which one can measure the pressure. Pressure is normally measured within the ports provided in the Underwing Nozzle.

PRESSURE COMPENSATION: A method by which a control valve or coupler is able to control pressure within set limits at a remote and otherwise inaccessible point downstream of the actual Sense Point. A Venturi is one device utilized to accomplish this.

PRESSURE CONTROL: To limit or modulate pressure at known value or range. Aircraft ground refueling delivery systems are designed to provide a safe pressure at the connection to the aircraft (underwing or overwing). This pressure is automatically achieved by Pressure Control in a number of acceptable schemes. It may be accomplished by the Hydrant Pit Valve, Hydrant Coupler, Line-Mounted Pressure Control Valve, or by a Hose End Pressure Control Valve (mounted as a part of the Nozzle).

PRESSURE CONTROL VALVE: A line-mounted type valve that provides pressure control at a downstream location, either directly within the valve body or remotely from the valve by means of a fuel sense line. The control systems can be hydraulic, pneumatic or electric or a combination of any of these. The valve can also include open-close controls in conjunction with the deadman system.

PRESSURE DROP: The difference in pressures measured at two different locations in a system or across a component(s) at a given flow rate. If the cross-sectional areas at which the measurements are taken are equal, the pressure drop measured is not affected by the velocity of the fluid. If these areas are not equal, the change in velocity will affect the results and a velocity correction should be made to achieve accurate results if these are required for a particular purpose.

PRESSURE FUELING NOZZLE: Same as Nozzle.

PRESSURE LOSS: Same as Pressure Drop.

PRESSURE LOSS COMPENSATOR: The term normally applied to a Venturi-shaped device when used for remote sense-pressure-control purposes. Some types are able to monitor small differences in pressure between two points (related to flow rate) and modulate an air pressure signal to a control valve. The term, in some cases, is also applied to a Venturi.

PRESSURE REFUELING: See Underwing Refueling.

3. (Continued):

PRESSURE/VACUUM VALVE: A valve mounted in a tank which provides both positive and negative pressure relief within specific limits. Pressure relief would be required during loading/discharge, and also to allow for thermal expansion/contraction of the fuel in the tank to prevent the tank from becoming damaged due to differences between internal and external pressure for which it was not designed.

PRIMARY PRESSURE CONTROL: Pressure resulting from a control valve or other such device located as close as possible to the aircraft refueling adapter, associated with the refueling pressure.

PRODUCT SELECTION: A design feature of a hydrant valve and coupler that keys the two units to mate only if both halves (hydrant valve and coupler) are the same. The API Bulletin 1584 specifies the types and controls dimensions to assure compatibility of all couplers for the 4-in units. There are two different product selection methods available on the 2 1/2-in units, one used in the United States (and influenced areas) and one used in Europe (and influenced areas). They are not compatible with each other. Product Selection is usually utilized to prevent access to a particular brand or type of fuel. It can also be for user selection where there are several hydrant systems used by different suppliers.

PROOF PRESSURE: The maximum total pressure (including momentary surges) required of a component or system without external leakage after which the component or system will meet all other specification requirements.

PULSE TRANSMITTER: A device mounted on a Meter to count the number of revolutions of a Meter either electronically or optically. The number of revolutions or pulses is translated to an electrical signal for use in remote digital displays or for use in other control systems. Same as Pulser.

PULSER: Same as Pulse Transmitter.

QPL: Qualified Product List - A listing of items that are approved for procurement in accordance with a particular military specification.

QUICK DISCONNECT or QD: A device mated to the inlet of a Nozzle to allow for ease of removing the Nozzle from the hose with a minimum of, or no, tools.

RATE OF FLOW INDICATOR: Same as Flow Gauge or Indicator.

REEL HOSES: Relatively long output hoses contained on reels for compact storage. These hoses can terminate in either Underwing Nozzles or Overwing Nozzles.

REFUEL CONTROL PANEL: Aircraft mounted control panel. Used for controlling fueling and fuel distribution to aircraft fuel tanks. Provides remote display of fuel quantity to refueling personnel. In some cases, enables precheck testing of Fuel Shutoff Valves or Level Control Valves.