



AEROSPACE INFORMATION REPORT

AIR4783™**REV. B**

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Superseding AIR4783A

Glossary of Terms - Aircraft Ground Refueling and Defueling

RATIONALE

AIR4783B is being revised to update some of the definitions for clarity.

1. SCOPE

This SAE Aerospace Information Report presents a glossary of terms commonly used in the ground delivery of fuel to an aircraft and pertinent 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 used in the refueling of aircraft at commercial airports and military installations.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (U.S. and Canada only) or +1 724-776-4970 (outside U.S. and Canada), www.sae.org.

AIR1616 Self-Sealing Breakaway Valves for Crash-Resistant Aircraft Fuel Systems

AIR5691 Guidance for the Design and Installation of Fuel Quantity Indicating Systems (FQIS)

AIR6325 Fuel Level Point Sensing

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SAE WEB ADDRESS:

Full document details: SAE AIR4783B

For more information on this standard, visit
<https://www.sae.org/standards/content/AIR4783B/>

Documents

Standard, visit Sharing Hub

- AS1284 Standard Test Procedure and Limit Value for Shutoff Surge Pressure of Pressure Fuel Dispensing Systems
- AS5751 Design and Operating Requirements of the Onboard Aircraft Refueling System and Associated Ground Refueling Equipment Interface
- AS5877 Detailed Specification for Aircraft Pressure Refueling Nozzle

2.1.2 API Publications

Available from API, 200 Massachusetts Avenue NW, Suite 1100, Washington, DC 20001-5571, Tel: 202-682-8000, www.api.org.

API 1584 API Standard for Four Inch Hydrant Systems Components and Arrangements (see EI 1584)

API RP 1004 Bottom Loading and Vapor Recovery for MC-306 & DOT-406 Tank Motor Vehicles

2.1.3 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9500, www.astm.org.

ASTM D4176 Test Method for Free Water and Particulate Contamination in Fuels (Clear and Bright Pass/Fail Proceedings)

ASTM D4860 Test Method for Free Water and Particulate Contamination in Mid-distillate Fuels (Clear and Bright Numerical)

2.1.4 BSI Publications

Copies of these documents are available online at www.bsigroup.com.

BS 4C 14:1991 Aircraft Pressure Refueling Connections

2.1.5 EI Publications

Available from Energy Institute, 61 New Cavendish Street, London, United Kingdom, W1G 7AR, Tel: +44 (0) 207 467 7100, www.energyinst.org.

EI 1550 Handbook on equipment used for the maintenance and delivery of clean aviation fuel

EI 1560 Recommended practice for the operation, inspection, maintenance and commissioning of aviation fuel hydrant systems and hydrant system extensions

EI 1584 Four-inch hydrant system components and arrangements

2.1.6 FAA Publications

Available from Federal Aviation Administration, 800 Independence Avenue SW, Washington, DC 20591, Tel: 866-835-5322, www.faa.gov.

AC 20-116 Marking Aircraft Fuel Filler Openings with Color Coded Decals

2.1.7 ISO Publications

Copies of these documents are available online at www.iso.org/store.

ISO 45 Aircraft Pressure Refueling Connections

2.1.8 NATO Publications

Copies of these documents are available online at www.sto.nato.int/publications.

NATO STANAG 3212 Diameters for Gravity Filling Orifices - ED 7 5/23/2017

NATO STANAG 3294 Aircraft Fuel Caps and Fuel Cap Access Covers - ED 4; Amendment 1: 2/17/1998

2.1.9 U.S. Government Publications

Copies of these documents are available online at <https://quicksearch.dla.mil>.

MIL-A-25896 Adapter, Pressure Fuel Servicing, Nominal 2.5-Inch Diameter

MIL-C-8605 Cap, Pressure Fuel Servicing

MIL-N-87963 Nozzle, Fuel Aircraft Overwing ... (superseded MIL-N-26978)

MS24484 Adapter, Pressure Fuel Servicing, Nominal 2.5 inch Diameter

MS29514 Flange, Adapter Locking, Pressure Fuel Servicing (Note – no longer valid for new designs)

MS29525 Cap - Pressure Fuel Servicing, 2 1/2 Inch Flush Type

MS29526 Cap - Pressure Fuel Servicing, 2 1/2 Inch Non-Flush Type

2.1.10 Other Publications

A4A equivalent

IATA equivalent

NFPA 407 equivalent

3. GLOSSARY OF TERMS

The terms, listed below with their common definitions, are commonly used in the ground aircraft refueling industry.

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 that allows for automatic removal of trapped air.

AIRCRAFT PRECHECK SYSTEM: A feature of the aircraft fuel system (specifically, part of the level control subsystem) to allow checking for proper shutoff operation of the Level Control Valves or Fuel Level Sensors and Fuel Shutoff Valves. This feature offers the capability of determining the functionality of fuel flow shutoff 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. The precheck system minimizes the risk of overfilling the fuel tank, is quite prevalent on military aircraft, and is required by 14 CFR Part 25/CS25.979b.(1).

AIRCRAFT REFUELING ADAPTER: The mating component that provides a sealed and locked connection between the refueling vehicle nozzle and the aircraft. This connection is dimensionally in accordance with MS24484, MS29514, ISO 45, and BS 4C 14:1991. It conforms to an international standard to assure compatibility between aircraft and ground equipment.

AIRCRAFT REFUELING PRESSURE: The fuel pressure measured at the aircraft adapter during a refueling operation. Unless measured in the aircraft refueling manifold, this pressure is typically measured using a port on the nozzle. For commercial aviation, the maximum allowed pressure at the aircraft/ground equipment interface is placarded adjacent to the refuel coupling in accordance with part 25 certification requirements. For military aviation, the design standard is for a maximum steady-state interface pressure of 60 psig (4.1 Barg). See Operating Pressure.

ALKYLATION: A gasoline refining process.

ANSI: American National Standards Institute

API ADAPTER: The outlet of a Hydrant Valve or Bottom Loading Adapter that has been designed in accordance with EI 1584 (historically, API 1584) or API RP 1004, respectively.

API HYDRANT VALVE: A Hydrant Valve designed in accordance with EI 1584 (historically, API 1584).

NOTE: EI 1584 defines more than one type of hydrant valve, and this term is not sufficient to define a valve.

AQUEOUS CONTAMINANT: Water-borne contaminant.

ATMOSPHERIC PRESSURE: Force per unit area exerted by the weight of the atmosphere, i.e., local barometric pressure.

ASPI-SCRUBBER: An aircraft underwing refueling system component used with onboard 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 fuel 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 used to prevent a Hose End Pressure Control Valve from closing or tending to close (regulate). Used to deactivate the Hose End Pressure Control Valve for the purpose of testing other components. This may be a mechanical or hydraulic device.

BONDING CABLE: An electrically conductive wire that is used to equalize differences in potential energy due to accumulated static electricity before and during fuel transfer operations such as aircraft fueling and vehicle loading. This minimizes the hazard that may be caused by an uncontrolled electrical discharge (spark). Bonding cables are intended for handling only static electricity. 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.)

BOTTOM LOADING: The method of fueling a tank using 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 fueling 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-inch international standard bayonet connection (same as used on the aircraft).
- b. 4-inch standard in accordance with EI 1584.
- c. Industrial reverse bayonet connection (4-inch size).

The outlet configurations are varied to suit the application.

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

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

BURST (ULTIMATE) PRESSURE: The pressure that the fuel system can sustain without external leakage or rupture. The aircraft refueling system shall have an ultimate pressure that is at least two times the proof pressure. The system or component need not be functional after being subjected to such pressure.

BYPASS VALVE: A valve used in a refueling system to control pressure. It is normally mounted such that it allows for bypass 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.

CARGO TANK: A container 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 absorbed, 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 and/or particulates. Refer to ASTM D4176 or ASTM D4860.

CLOSING TIME: Time for a valve or system to fully close from a fully open position.

COALESCER ELEMENT: A cylindrical filter cartridge that causes free water in the fuel to coalesce or gather together into droplets large enough to separate from the Continuous Phase by gravity. It also removes particulate contamination. 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 distribution system where various fuel suppliers may deposit a specific type of fuel into a common storage tank.

COMPARTMENT: A liquid-tight division in a cargo tank. This definition of compartments is applicable only to Aircraft Ground Refueling and Defueling.

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

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

D-1 NOZZLE: An Underwing Nozzle defined by AS5877 designed for military use. It has a characteristic 45-degree 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 (refer to MS24484). Nozzles approved for procurement by the U.S. military services under this designation are listed on QPL for AS5877.

D-1R NOZZLE: Same as D-1 Nozzle except a nominal 55 psig (3.8 Barg) Hose End Pressure Control Valve is fitted to the unit. Additional HEPC valves are available in 35 psig (2.4 Barg) and 45 psig (3.1 Barg) ratings.

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 psig (3.8 Barg) Hose End Pressure Control Valve is fitted to the unit. Additional HEPC valves are available in 35 psig (2.4 Barg) and 45 psig (3.1 Barg) ratings.

DEADHEAD PRESSURE: The pump operating outlet/system pressure at zero flow.

DEADMAN CONTROL: A system that requires positive continuing action of an operator (i.e., the holding closed of a trigger or handle) 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 required to be continuously held or activated by the operator to open or close the ground fueling system.

DEADMAN SWITCH: See Deadman Handle.

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 movable 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 movable deck of a refueling vehicle for refueling aircraft with Refueling Adapters requiring such access. These hoses normally terminate in Underwing Nozzles.

DEFUEL BOWSER: A tank used for storing fuel removed from aircraft and other vehicles. Typically, a defuel bowser is used for storing fuel removed from aircraft fuel tank low point drains and is portable. A defuel bowser may be a self-propelled or towed vehicle, with an onboard fuel supply, containing all necessary equipment that is used to defuel an aircraft.

DEFUELING: Off-loading fuel from an aircraft.

DEFUEL DRAIN VALVE: A dedicated valve either electrical or mechanical that can be opened to drain the fluid quickly from the reservoir below the tank pumpability level (includes undrainable and unusable fuel).

DEFUEL PUMP: A prime mover usually mounted inside the fuel reservoir; when selected, it can remove fuel from the aircraft fuel reservoirs in a reasonable amount of time. Note that to save weight and BOM (aircraft bill of materials), this pump may have more than one function.

DELTA P (ΔP): See Pressure Drop.

DENSITY: Measure of the mass per unit volume.

DESIGN PRESSURE: See Proof Pressure.

DIAPHRAGM VALVE: A valve that 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 and pressure.

DIFFERENTIAL PRESSURE GAUGE: A pressure gauge that 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, that is separated from the continuous phase in a coalescer/separator 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: A spherical mass of liquid; a liquid globule.

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 vice versa, without the draining or spillage of the upstream hose or system.