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1 INTRODUCTION

a) The petroleum industry is the primary source of information about their products. However, there are also regulations which affect the handling of all petroleum products, including aviation fuel.

b) In addition to the regulations listed at paragraph 8, the Air Navigation Order (ANO) lays down certain requirements for the person in charge of an aviation fuel installation at an aerodrome, and also for personnel carrying out refuelling. Aviation fuel is defined as 'fuel intended for use in aircraft' and 'any area of land or water designed, equipped, set apart or commonly used for affording facilities for the landing and departure of aircraft' is an aerodrome. A pilot who stores his fuel, whether AVGAS, JET A-1 or MOGAS, at a strip (or a back-garden landing pad), or even pours it out of a container, has the same safety responsibilities as the fuel installation manager at an aerodrome licensed by the CAA.

c) Licensed aerodromes are guided by [CAP 748](#) 'Aircraft Fuelling and Fuel Installation Management'. Although CAP 748 should be referred to as the basis of the safety plan at every fuel installation, this leaflet provides more general advice to those who store or dispense fuel away from licensed aerodromes.

d) Additional information and guidance about fuel handling and storage can be found in Energy Institute or Joint Inspection Group (EI/JIG) publications, some of which are listed in paragraph 8.

e) There are three basic hazards associated with aviation fuel:

- i) fire and explosion;
- ii) fuel quality; and
- iii) environmental.

Everyone involved in fuel handling should be constantly aware of these and make every effort to minimise the attendant risks.

2 FIRE PREVENTION

a) Petroleum products are highly flammable. Sources of ignition such as a lit cigarette should be prohibited within any fuelling zone, and at least 16 metres (50 feet) from any open fuel container or fuelling operation, especially downwind. Other possible sources of ignition are sparks originating from exposed battery connections, operating electrical switches, metal studs on concrete, or electronic devices. Refuelling should not take place when there is a risk of lightning or other electrical activity.

b) Static electricity can build up quickly, especially in cold dry weather, and is a potential source of a spark and therefore ignition. To minimise the risk, every piece of refuelling equipment must be bonded (earthed) throughout the process, and the bonding should be checked regularly (resistance along the system should be less than 25 ohms). If fuelling from containers, a device can be made from copper braid, heavy duty crocodile clips and a 'ground stake' to bond the tank, funnel and container. If the aircraft itself is bonded, connecting to an unpainted area of the airframe or engine may be sufficient, but for many aircraft it will be necessary to connect to the filler neck itself. Do not use plastic containers, pipes or funnels unless they are electrically conductive.



c) Have a suitable, preferably foam but NEVER a domestic water type, fire extinguisher available, and ensure you know how to operate it. Know how to contact the fire service if the worst should happen. No-one should be in the aircraft during refuelling.



3 SPECIFICATION & SUPPLY

a) AVGAS (100LL & UL91) and Jet Fuel (Jet A-1) purchasers can expect the fuel supplier to provide the fuel to their storage facility at the approved specification and in the approved manner. However, know whom you should contact if you suspect any problems with the fuel supplied. A small quantity of problem fuel will contaminate the whole container.

b) MOGAS may be used in aircraft when permitted by [CAP 747](#) Section 2, Part 4, Generic Concessions (GCs) 2, 3, 4 and 5. The fuels used must conform to the specifications listed in each individual GC; beware of other fuels which may be widely available (often advertised as having special properties).

c) Only certain light aircraft are permitted to use fuel obtained from garage forecourts, as described in GCs 3, 4 and 5 and subject to the listed conditions. The sampling, analysis and acceptance controls for such fuel are less stringent than those for fuel at aerodromes, so take particular care that it is free from contamination.

4 STORAGE & EQUIPMENT

a) A licence must be issued by the local Petroleum Licensing Authority (PLA - normally part of Trading Standards) to dispense petrol by mechanical or electrical means from a storage tank into an aircraft's fuel tank. Storing more than 20 litres of petroleum fuel outside the aircraft's immediate-use fuel tank, or keeping it in portable containers greater than 10 litres' (metal) or five litres' (approved plastic type) capacity, may also require a licence. Consult the PLA.

b) The oil company supplying the fuel should be asked for assistance in the first instance. However, recent changes in the organisation of fuel distribution and supply have led to a reduction in the involvement and supportive resource which some suppliers can give.

c) Any container or apparatus for dispensing aviation fuel must be of a suitable type, specification and manufacture, and clearly marked with the grade of fuel it is intended for. Hoses have a limited life and should be fitted within two years from manufacture. Nozzles with locking ratchets should not be used for over-wing fuelling.

d) To prevent contamination, the container (tank, jerrycan etc.), and all parts such as hoses, seals and liners, must be of good quality materials which will not be affected by the fuel to be contained. Water should not be able to enter the container or any part of the fuelling system.

e) The apparatus, container and its parts must be kept scrupulously clean with no chance of having been contaminated by other liquids. For example, do not transport AVGAS in

a jerrycan which previously contained Jet Fuel. The fuel, containers and dispensing systems must all be checked systematically to detect any contamination or deterioration. Filters should be cleaned and/or replaced following the manufacturer's instructions, but ensure they are refitted the correct way round!

f) Fuel in contact with air will deteriorate with time, and condensation of water vapour will contaminate the fuel below. Fuel should not be allowed to remain unused in hoses for long periods; recycle the fuel through them every week if possible, ensuring the full volume of the hose is changed.

g) Containers must always be kept closed, and not filled above 90% to allow for expansion. However, even in ideal conditions stored fuel may lose its properties after a while. If petrol has been in undisturbed storage for more than three months, consider having a sample laboratory tested before using it (six months for Jet A1). Whilst much depends on the condition of the container and the atmospheric conditions during storage, the likelihood of significant fuel performance degradation is real. To minimise MOGAS deterioration, use freshly obtained fuel from a major supplier with a high turnover.

h) Economic issues may encourage owners to keep stocks at a minimum during periods of inactivity. However, if levels in tanks are allowed to drop and remain low, the fuel at the bottom may depart from specification, affecting the quality of the whole tank when it is re-filled. A full tank is less likely to suffer either deterioration or water

contamination. When fuel use is forecast to be low, such as in winter, keep containers as close to 90% full as possible.

i) Aviation fuel can damage the environment, so any leakage must be contained. A tank may have a double skin, the gap of which needs regular checking. Otherwise, a concrete 'bund', or bath which can hold the tank contents, should surround it. Consider how to minimise environmental damage from other leaks, such as a jammed hose nozzle, and know whom to contact in the event of a major spillage.

5 SAMPLING & TESTING

a) As described in [CAP 748](#), a fuel sample should be taken from the delivery vehicle before it is accepted at the installation, checked, and kept for seven days. Samples should also be taken from the installation, checked and retained once the fuel has settled. You should also take samples after heavy rain or snow, or washing down the bowser or tank.

b) Samples must be taken from the lowest point of the tank, where water is likely to settle. Make sure the low point is the lowest point! If a drain or sampling cock is not available, a 'thief pump' may be used.

c) Before issuing fuel to the first aircraft of the day, take a sample from the hose nozzle, check it and retain it.

d) Samples should be clear and bright. Inspect them for water and contaminating particles. Consider water detection paste or papers. Check jet fuel for water using detection capsules which should be in date and stored away from damp.

e) At least a small amount of water can be expected, since condensation will occur naturally. However, if water remains after one or two samples have been discarded, suspect a failed seal or vent. Particles may indicate that the hose or tank lining is deteriorating, which may block filters.

f) Samples should be kept in scrupulously clean non-corroding metal (ideally) or screw-top glass jars.



These should be marked with the date of sampling and kept cool and out of daylight, which can cause rapid deterioration of the fuel. After seven days, if they still appear in good condition, samples may be returned to the tank for later use, as may recycled hose contents.

g) Alcohol is increasingly being added to motor gasolines by oil companies. However, alcohol may cause damage to aircraft fuel systems, and is also likely to cause a reduction in power. Only certain aircraft may use fuel containing alcohol, and to ensure it is absent MOGAS requires an additional test, as detailed in [SafetySense Leaflet 4 'Use of MOGAS'](#).

h) Fuel in aircraft tanks is subject to the same possible deterioration as that in storage containers, and condensation is probably more likely. Samples should be taken from all sampling points before flight and examined in accordance with the Flight Manual or Operating Handbook.



The picture illustrates the boundary between a considerable amount of water and the AVGAS below. Consider what to do with the sample; small amounts of petrol poured onto concrete will evaporate, but tarmac will be damaged. Do not consider returning samples to aircraft tanks unless they are completely free from contamination.

6 **DISPENSING FUEL**

a) Bond (earth) the aircraft and all equipment before opening filler caps. Park the aircraft with brakes off so it can be moved away from any fire (chock the wheels if necessary). Where is the fire extinguisher?

b) Fuel, especially jet fuel, can cause skin irritation, and fumes can affect breathing. The vapour displaced by the fuel entering the tank will descend, but also blow with the wind. Consider wearing anti-static protective equipment and clothing. Do not open fuel containers indoors.

c) If pumping from a fixed installation, follow the manufacturer's instructions. Devices designed to prevent over-filling and spillage are not always reliable. Nozzles can be damaged by scraping along the ground, and kinks can damage hoses. Ensure the area around filler necks is clean, and protect them and hose nozzles from water ingress.

d) If dispensing by hand from a container, make sure the aircraft tank itself is bonded to the container and funnel. Place a filter just before the fuel enters the aircraft tank. A chamois leather in the funnel should absorb water. From a full container, start pouring with the opening at the top to minimise splashing and loss of fuel. Re-check the bonding before opening a second container.

e) A small amount of spillage may be expected. Splashes may not only irritate the skin, but chill it when it evaporates. Fuel-soaked clothing is a fire hazard, and even when dry may cause corrosive burning of the skin, so should be removed. Know where you can wash and change clothes.

7 RECORDING

a) There is a requirement to keep records relating to fuel for use in an aircraft.

b) Record where and when you obtained the fuel, and the type and quantity obtained or delivered, and confirm that the sample tested satisfactory. Record each occasion when a sample was taken from the tank and tested; whether it was satisfactory; and if not, what was wrong, for example how much water was found, or what particles.

July 12

AERODROME AIR FUEL QUALITY CONTROL RECORD

DATE	AIRCRAFT	FUEL TYPE	QUANTITY	TEST RESULTS	REMARKS
12/07	BA123	AVIATION	100L	✓	OK
13/07	BA123	AVIATION	100L	✓	OK
14/07	BA123	AVIATION	100L	✓	OK
15/07	BA123	AVIATION	100L	✓	OK
16/07	BA123	AVIATION	100L	✓	OK
17/07	BA123	AVIATION	100L	✓	OK
18/07	BA123	AVIATION	100L	✓	OK
19/07	BA123	AVIATION	100L	✓	OK
20/07	BA123	AVIATION	100L	✓	OK
21/07	BA123	AVIATION	100L	✓	OK
22/07	BA123	AVIATION	100L	✓	OK
23/07	BA123	AVIATION	100L	✓	OK
24/07	BA123	AVIATION	100L	✓	OK
25/07	BA123	AVIATION	100L	✓	OK
26/07	BA123	AVIATION	100L	✓	OK
27/07	BA123	AVIATION	100L	✓	OK
28/07	BA123	AVIATION	100L	✓	OK
29/07	BA123	AVIATION	100L	✓	OK
30/07	BA123	AVIATION	100L	✓	OK

KEY
✓ SATISFACTORY
✗ UNSATISFACTORY
V-WATER TEST
H-HYDRO KIT TEST
C-CLEAR AND BRIGHT
B-BUBBLE
P-PALE STRAW

c) You must also keep a record of the quantity and grade of fuel dispensed to each aircraft, and it is advisable to keep a running total of tank contents if appropriate.

d) All maintenance and tests carried out on the equipment, such as bonding checks, should be recorded, as should the times when the equipment is cleaned.

8 FURTHER READING

a) Article 217 of the ANO 2009 contains the regulations concerning aviation fuel at aerodromes.

b) The Health and Safety Executive website www.hse.gov.uk includes useful [background](#) to applicable safety regulations for the storage and transport of fuel. The Petroleum (Consolidation) Act 1928 applies to AVGAS and MOGAS.

c) The Dangerous Substances and Explosive Atmospheres (DSEAR) Regulations 2002 apply to those working with Jet Fuels.

d) The Petroleum Spirit (Motor Vehicles etc.) Regulations 1929 and the Petroleum Spirit (Plastic Containers) Regulations 1982 concern fuel handling outside the workplace.

e) For static installations, the Joint Industry Group (JIG) of petroleum manufacturers produce the leaflet JIG 4 'Guidelines for Aviation Fuel Quality Control & Operating Procedures for Smaller Airports' for purchase and, with The Energy Institute, they are shortly to publish EI/JIG 1530 'Quality Assurance Requirements for the Manufacture, Storage and Distribution of Aviation Fuels to Airports'.

9 SUMMARY

- a) Only use equipment suitable for dispensing fuel to aircraft.
- b) Ensure equipment is clean and marked with the intended fuel grade.
- c) Ensure you have any relevant licences.
- d) Ensure any leaks will cause minimum damage to the environment.
- e) Keep containers closed and full to 90% if possible.
- f) Keep sources of ignition well away from refuelling operations.
- g) Avoid static build-up by bonding all equipment before opening filler caps.
- h) Do not use plastic equipment unless it is electrically conductive.
- i) Have a fire extinguisher to hand and know how to contact the fire service.
- j) Only obtain MOGAS from garages with a high turnover.
- k) Test MOGAS for alcohol before use.
- l) Take, check and retain samples when required.
- m) Record supplies, issues, samples, tests and cleaning.