



Advisory Circular

NCAA-AC-AWS020

10TH APRIL 2023

NIGERIA CIVIL AVIATION AUTHORITY

Storage, Handling and Quality Control of Aviation Fuel at Aerodromes

1.0 PURPOSE

This publication provides guidance on measures that aviation fuel suppliers should adopt in the discharge of the responsibilities placed upon them. It is aimed particularly at those installations managed by aviation fuel suppliers located at aerodrome, though the measure it contains are generally appropriate to all categories of installations.

1.1 Introduction

All fuels to be used in aircraft require very special handling. Negligence in the receipt, storage and handling of fuel or an error in fuelling can endanger an aircraft and the lives of all on board. Therefore it is essential that the **correct grade and quantity of fuel** is supplied and that it is in a condition fit for use in aircraft.

It is the responsibility of the fuel supplier to ensure that on delivery fuel is fit for aviation purposes. The aerodrome fuels installation manager should therefore, on acceptance of bulk deliveries of fuel, insist that the supplier provides satisfactory evidence with supporting documentation to this effect. Such documentation may be in the form of a Certificate of Quality and can be expected to give details of fuel quantity, fuel type with Department of Petroleum Resources (DPR) and

Development (DERD) specification, fuel origin and batch references. Reference may also be made to BS5750 Part 2.

Aviation fuel supplier should appoint a person responsible for discharging the responsibility contained in this AC. Persons having the responsibility for the management of an aerodrome fuel installation must ensure that when fuel is delivered into the installation it is the grade appropriate to the tank designated for that product, and that it has been sampled and found fit for use in aircraft. After fuel has been delivered, the responsibility for its safekeeping, quality control, and proper delivery to aircraft similarly lies with this person.

This publication provides guidance on the duties of the installation manager. They may be summarized as ensuring that:

- (i) Proper quality control and fueling procedures are adhered to.
- (ii) Sampling tests of fuel and inspection of installations are correctly completed and records kept.

Reference is made in this publication to the recording of receipts, their sampling and testing and maintenance and cleaning of installations. The requirement for the completion and preservation of these records is imposed by the NIGERIA Civil Aviation Authority. When delivering into or dispensing fuel from an installation or when carrying out fuel check, maintenance and cleaning operations, records should be drawn up, signed and dated by the person responsible on completion of such work.

It is for managers of installations to decide the form the records should take, but it obviously important that they are kept in such a way as to maintain their legibility. The Appendices to this publication provide some examples of record formats which are recommended for use.

When required by the pilot of an aircraft receiving fuel, the manager of the fuel installation shall provide a written statement of the quantity and grade of fuel supplied. A Certificate of Conformity/Delivery Ticket is often used;

There is no specific reference in this publication to the handling and use of motor gasoline (MOGAS) for aviation purposes.

NOTE

Where within this Publication reference is made to the Authority it refers specifically to:

THE NIGERIA CIVIL AVIATION AUTHORITY

1.2 FUEL CONTAMINATION IN THE SUPPLY CHAIN, TYPES OF CONTAMINATION AND WHERE IT CAN OCCUR

The primary types of contamination are water, particulate and microbiological material. In addition, contamination can occur from other fuel grades and chemicals that may be in multi-product transport systems. The fuel may also be rendered off-specification by either under-dosing/overdosing of approved additives, using an incorrect additive or from product testing issues not limited to, but including, poor sampling, incorrect test procedures and uncalibrated laboratory equipment. These issues can occur in the various elements of the supply chain as follows:

- a) *Refinery*. Incorrect and/or inadvertent use of additives, insufficient settling/tank cleaning to allow removal of dirt and water, incorrect sampling, incorrect test procedures and a lack of laboratory equipment calibration.
- b) *Pipeline*. Inadequate interface monitoring and cutting procedures, interface migration due to poor pipeline controls, failure to flush manifolds, dead legs and booster pumps. Also, inappropriate pipeline sequencing, lack of effective pipeline maintenance, infrequent or ineffective low point drains, lack of document checks/traceability.
- c) *Marine*. Inappropriate vessel selection, incorrect loading or unloading sequence, ineffective cargo segregation, incorrect and/or inadvertent use of additives on-board, non-dedicated marine loading arms or hoses and inadequate draining/flushing/change-of-grade procedures, lack of document checks/traceability.
- d) *Filtration*. Incorrectly specified filters, inadequate maintenance and daily operation checks, unsuitable or damaged filter vessel lining, incorrectly installed filters and incorrectly installed ancillary equipment.
- e) *Storage tanks*. Poor design making water and dirt removal difficult or impossible, incorrect lining materials, failure to conduct adequate draining for water and dirt removal, lack of effective segregation, ineffective change-of-use procedures, infrequent tank inspection and cleaning.
- f) *Road and rail*. Breakdown and/or mishandling of critical equipment, cross-contamination, incorrect change-of-grade procedures, no settling and draining prior to discharge, lack of document checks/traceability.
- g) *Airport vehicles*. Breakdown and/or mishandling of critical equipment, inadequate checks during loading and/or fuelling.

2.0 REFERENCES.

- ASTM D2276/IP 216 Standard
- AVGAS 100LL
- BS5750 Part 2
- BS3158
- Dangerous Goods Act - Disposal of Toxic Waste and Hazardous Materials
- DERD 2485
- DERD 2494
- ICAO Document 9977
- EI 1583

3.0 GUIDANCE AND PROCEDURES

AVIATION FUEL AT AERODROMES: APPROVED MANUAL FOR STORAGE, HANDLING AND QUALITY CONTROL

3.1 Documentation:

3.1.1 Aviation Fuel should be delivered by a dedicated system. If this is not the case then special precautions not covered in this document are necessary and advice should be sought from the Authority before accepting deliveries of fuel.

3.1.2 Documentation should clearly state the type of fuel being supplied, and that it complies with the relevant specifications. Jet A-1 should comply with DERD 2494. AVGAS with DERD 2485.

3.1.3 On delivery of fuel, the person in charge of the installation will normally be required by the supplier to endorse the Certificate of Conformity/Release Note to confirm that the grade of fuel is as ordered.

3.2 Pre-Delivery Checks:

- 3.2.1 Before the release documentation is accepted and delivery permitted, the person responsible for receiving the fuel should:
- 3.2.2 Check that the grade and quantity as shown on the certificate are as ordered, and corresponds with the grade of fuel in the receiving tank.
- 3.2.3 Examine the seals on the delivery vehicle and ensure they are intact. Also check the vehicle grade plate indicator.
- 3.2.4 Check there is sufficient available capacity in the receiving tank(s) for the quantity of fuel to be received.
- 3.2.5 Take a water check on the fuel in the receiving tank(s) in accordance with the procedures detailed in 3.8. If necessary flush the water drains until a clear and water-free sample is obtained.
- 3.2.6 Allow the delivery vehicle to stand on level ground for ten minutes, then draw a sample from the outlet tap of each vehicle compartment from which fuel is to be delivered and check in accordance with the procedures detailed in 3.8
- 3.2.7 Repeat the procedure in para 3.2.6 if the sample is unsatisfactory. If a third sample is necessary and this also proves to be unsatisfactory, delivery of the fuel should be refused and the fuel supplier informed.
- 3.2.8 Once a satisfactory visual sample and density result (see note below) have been obtained, the vehicle should be bonded to an approved earthing point and discharge of fuel commenced into the selected and correctly grade-plated receiving point.

Note: If on delivery it is considered necessary to determine the density of the fuel then the density should not vary by more than 0.003 kg/litre from the value quoted on the delivery note.

On completion of the fuel delivery, record the results of the pre-delivery inspection and sample tests. Also record the quantity and grade of fuel delivered.

All samples of fuel taken should be retained for a minimum of seven days.

3.3 Storage of Fuels in Bulk

3.3.1 General

- a) All facilities which are used for handling aviation fuel must be fully segregated from other products. Different grades of aviation fuels must also be segregated. Ideally installations should have separate delivery and suction lines and these should be provided on all new installations.
- b) The use of protective treatments containing zinc is prohibited for the internal lining of pipelines, storage tanks, and any other equipment. Zinc alloys, copper or copper alloys, cadmium plating, galvanised steel and plastic materials should not be used for main piping.
- c) Other information on tank construction and the layout of facilities is available in the Dangerous Substances Regulation (1979) Petroleum Bulk Stores (SI 313) available from Government Publications.

3.3.2 Tanks

- a) Tanks should be constructed and installed so as to prevent the ingress of water and dirt. They should have a well-defined low point. To achieve this, horizontal tanks should have a minimum slope of 1:30 with a sump at the lowest point. Vertical tanks should have a cone-down bottom with a minimum 1:30 slope to a centre sump.
- b) When tanks are buried, the manhole chamber/cover should always be kept clean and clear of water.
- c) Jet A-1 storage tanks should have free vent devices. Avgas tanks should have pressure/vacuum relief valves, unless the tank is underground.
- d) All possible precautions should be taken to avoid the entry of water or dirt into storage tanks. Open ended pipes, hoses and sampling points should be fitted with dust caps, plugs or other suitable protection which should be replaced tightly after use.
- e) Provision should be made for withdrawing water from the lowest points of tanks. Therefore above ground tanks should be fitted with a drain cock at the lowest tank

point. Buried tanks should be provided with a thief pump drawing from the tank sump

- f) Contaminated samples should be investigated immediately. If frequent evidence of contamination is found the tank should be internally inspected and cleaned.
- g) Tanks, as a routine measure, should be internally inspected at least every three years. A newly lined tank should be inspected one year after the lining is installed to check for soundness and adherence to the tank shell. Defects should be rectified before the tank is refilled.
- h) It is recommended that all fuel tanks should be coated with an approved lining. A standard of quality for tank linings is available from the fuel suppliers.
- i) The use of a floating suction fitted with a stainless steel check cable is recommended for the delivery of fuel from storage tanks. Check chains should not be used. Whether fixed or floating systems are used, the suction point should be positioned well clear of the tank sump, and in the case of a fixed suction at least 50cm clear of the tank bottom.
- j) Tanks should be fitted with a manhole of at least 650mm diameter.
- k) Tanks should be fitted with a suitable hatch so as to allow samples to be taken from the top of the tank.

3.3.3 Pipework

- a) To ensure the integrity of fuels it is essential that each grade of fuel is handled in a completely segregated system with no interconnecting lines between pipelines which handle different grades of fuel. Separate input and outlet lines should be provided.
- b) Drain points should be fitted at all pipeline low points.

3.3.4 Filters

- a) Avgas Installations: Tank input and output lines should be fitted with filters of not less than 80 microns (180 mesh). Also a 5 micron filter should be fitted on the output line. 80 micron filters should be inspected weekly and cleaned if necessary. Damaged filters should be repaired or replaced.

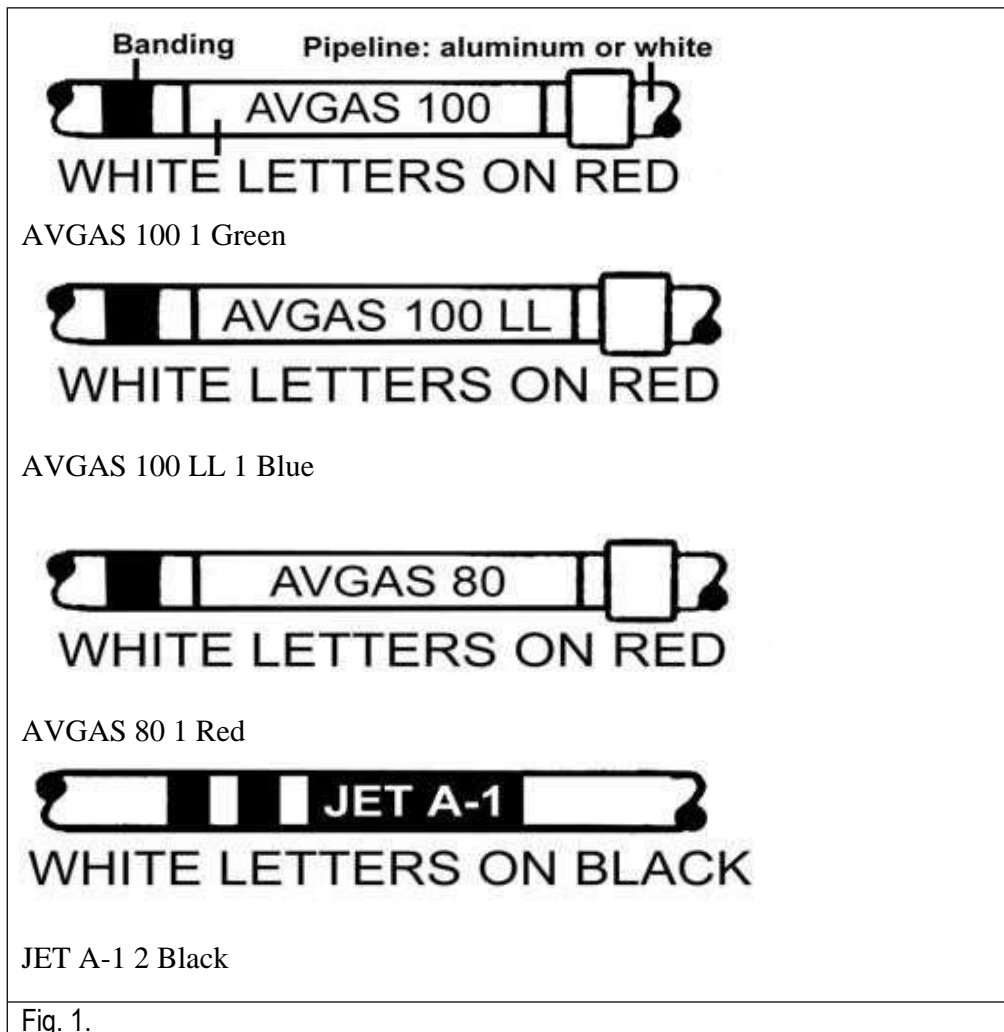
- b) Aviation turbine fuel installations: Tank input lines should be fitted with a 5 micron micro filter, or a filter separator. The output line should also be fitted with a filter separator. Filter separators should have a nominal rating of 5 microns for solid particles and a maximum of 15 parts per million for water.
- c) Filter separators, filter monitors and micro filters should have the differential pressure (dp) checked weekly. The check should be completed at the maximum possible flow rate and the pressure readings recorded. Filter separator elements should be changed when the dp limit at the rated vessel flow as recommended by the manufacturer is reached, usually 1 bar (15psi).
- d) Where a sudden or significant change of dp from the previously recorded trend is detected, the elements of micro filters or filter separators should be checked. They should also be inspected and replaced if necessary when a significant reduction in flow rate is observed or when a sequence of unsatisfactory drain samples is obtained.
- e) As a matter of routine, the elements of filter separators should be replaced after one year use. There is no time limit for changing filter monitor elements but they should be replaced at the dp recommended by the manufacturer, usually 1.5 bar (22psi)
- f) It is recommended that quarterly Millipore colour checks are taken to assess the performance of the filtration equipment. This check is particularly relevant where fuel flow rates exceed 1150 litres/min.
- g) When initially filling a filter separator vessel the fuel flow should be regulated to prevent an excessive build-up of static electricity.
- h) Jet A-1 is a very good insulator. Jet A-1 supplied within Ireland contains a static dissipater additive which reduces static electricity hazard. Fuel suppliers will advise whether fuel contains this additive. Suppliers may also provide advice on operating procedures and engineering safeguards which can be adopted to minimise static electricity hazards.

3.3.5 Settling Times

- a) On completion of delivery, before aviation fuel is dispensed from the receiving tank, fuel should be allowed to settle for a period of time which depends on the grade and depth of fuel in the tank. The settling time is also dependent on the type of tank, filter arrangement and the method by which fuel is drawn from the tanks.
- b) When discharge of fuel from the delivery vehicle is commenced, no fuel should be dispensed from the receiving tank until the required settling time has elapsed and the satisfactory completion of the water and fuel cleanliness check carried out in accordance with the procedures.
- c) Horizontal tanks fitted with floating suction devices require a minimum settling time of one hour. Vertical tanks similarly equipped require a settling time of two hours.
- d) On tanks where floating suction devices are not provided the following minimum settling times, dependent on fuel grade stored, should be observed:
 - i) Jet A-1 3 hours per metre depth or 24 hours, whichever is less;
 - ii) AVGAS: 90 minutes per metre depth.

3.3.6 Labelling and Colour Coding

- a) All tanks should be labelled and colour coded to identify the grade of fuel they contain. Pipelines should be similarly labelled and colour coded. The form and dimensions of labelling and colour coding are illustrated in Fig. 1. The overall dimensions of the colour segments on both labels and pipelines may be varied provided that the primary indicator colours for the grades (Red for AVGAS and Black for Jet A-1) predominate. The grade wording as illustrated should always be used.
- b) As an additional measure to avoid refueling errors it is recommended that the appropriate grade markings or a band of the appropriate primary grade indicator colour referred to in 6.1 should be painted on delivery hoses or pipes as close as practicable to the delivery nozzle, but not on the nozzle itself. Any colour coding on the delivery nozzle should be provided by a material which will not flake or separate from the nozzle whilst in general use, for example a securely attached plastic sleeve or ring.



3.3.7 Sampling and Checks

- a) Storage tanks should be constructed or adapted so as to allow upper, middle and low samples to be taken. These samples, taken through the depth of the tank, may be required from time to time for analysis.
- b) Sampling, in accordance with the procedures should be carried out at the following times:
 - i) Each day before the first delivery from the tanks.
 - ii) Immediately before receipt of fuel into tanks.
 - iii) After receipt when the fuel has been allowed to settle for the recommended period.

iv) After prolonged heavy rain or snow.

Note: Line flushing should always be sufficient to ensure that a proper tank sample is obtained

- c) If a sample identifies the presence of water or sediment, a further sample should be taken. No fuel should be dispensed from a tank until a clear and bright sample has been obtained.
- d) Should a fuel sample reveal large quantities of water, dirt or slime, or should the fuel be discoloured the tank should be quarantined until the source of contamination is identified and remedial action completed.
- e) Satisfactory samples may be returned to storage to avoid waste of fuel. If contaminated, samples should not be returned to any part of the aviation fuelling system unless the contamination is completely settled out and been removed. It is good practice for installations to have a product recovery (slops) tank for each grade of fuel. Product recovery tanks should be treated in the same way, in terms of water draining, as the main storage tanks.
- f) Buoyancy of floating suction should be checked at least weekly by the operation of the check wire. Check wires should be secured and bonded to the tank shell.

3.3.8 Change of grade procedures

Change of fuel grade in storage tanks can pose a risk of contamination of the new grade by residues of the previous fuel stored and therefore, where possible, such changes should be avoided. If this is not practicable, it is recommended that guidance on the proper procedures should be obtained from the fuel supplier concerned.

3.3.9 Hoses

- a) Hoses shall comply with the requirements of BS3158. New hoses, and hoses previously used in aviation fuel system, should be checked and before use thoroughly flushed with fuel appropriate to the installation. Hoses which have been used previously for non-aviation fuels should not be used on aviation fuel installations.
- b) Fuel in delivery hoses should be recirculated if the delivery system has been unused for a period of two days. If a delivery system has been unused for longer

than this period, then fuel lying in the hose should not be recirculated and dispensed to aircraft unless a satisfactory sampling check.

3.3.10 Laboratory testing of Fuel Stocks

- a) Fuel deteriorates with time and prolonged storage may render it unfit for use in aircraft. Therefore the quality of static bulk stocks of aviation fuels would be verified by laboratory tests when:
- b) Jet A-I has been stored and not added to for a period of twelve months
- c) Avgas has been stored and not added to for a period of six months.
- d) The quality of aviation fuel in either a tank commissioned for use from new, or stored in a tank which has been reintroduced to service after cleaning requires verification by laboratory test.
- e) The companies supplying fuel can provide information on recognised laboratories that can undertake these tests,

3.3.11 Records

Records should be kept of all deliveries into and from an installation. The results of sampling, filter differential pressure readings, purging and floating suction checks should be recorded. A record of tank inspections tank cleaning and maintenance work should also be kept.

3.4 Aircraft Fuelling Vehicles

3.4.1 General

- a) All fuelling vehicle equipment should be constructed of aluminium alloy, stainless steel or mild steel protected internally with an epoxy lining. Zinc and copper alloys, cadmium plating, galvanised steel or plastic materials are not permitted.
- b) Grade identification labels of the type illustrated in Section 3.3.6 should be carried in prominent positions on fuelling vehicles. Fuel inlets and outlets including hoses and nozzles should be marked accordingly.
- c) Tank compartments, whether lined or unlined, should be kept clean and precautions taken to prevent the entry of contaminants. All open-ended hoses,

pipes and sampling points should be fitted with dust caps, plugs or other suitable protection which should be properly replaced after use.

- d) Tank compartments should be drained and inspected internally within a twelve monthly inspection cycle. Cleaning and repair work, when necessary, should be completed during these periodic inspections.
- e) Where fuelling vehicles draw fuel from aerodrome installations which handle both Jet A-I and AVGAS, all line couplings should be grade selective. A fuelling vehicle should carry only one grade of fuel.
- f) Change of fuel grade in vehicle tanks can pose a risk of contamination of the new grade by residues of the previous fuel carried, therefore, where possible, such changes should be avoided. If this is not practicable, it is recommended that guidance on the proper procedures should be obtained from the fuel supplier concerned.

3.4.2 Sampling and Purging

- a) All fuelling equipment (drain cocks, tank compartments, filter separators, filter monitors, micro filters, gauze filters and air separators) should be purged of water and sediment.
 - i) before the first aircraft refuelling each day
 - ii) after each filling of the vehicle and after refuelling,
 - iii) after vehicle washing, prolonged heavy rainfall or snow.
- b) After a refuelled has been filled, samples should not be taken until 10 minutes settling time has been allowed. No deliveries from or into the vehicle should be made until satisfactory samples are obtained. If unsatisfactory samples continue to be obtained action must be taken to identify and eliminate the cause. Satisfactory samples may be returned to storage. (Recommended sampling and checking procedures are explained in detail in Section 3.8)

3.4.3 Hoses

- a) Hoses shall comply with the requirements of BS3158. New hoses, and hoses previously used in aviation fuel systems, should be checked and before use

thoroughly flushed with fuel appropriate to the installation. Hoses which have been used previously for non-aviation fuels must not be used on aviation fuel installations.

- b) Fuel in delivery hoses should be recirculated if the delivery system has been unused for a period of two days. If a delivery system has been unused for longer than this period, then the fuel lying in a hose should not be recirculated or dispensed to aircraft unless a satisfactory sampling check in accordance with the procedures in Section 3.8 is obtained.

3.4.4 Filters

- a) All fuelling vehicles containing AVGAS should be fitted with a 5 micron filter. Vehicles containing Jet A-I should be fitted with a filter separator or monitor with a 5 micron rating.
- b) 150 micron (100 mesh) rating hose end filters should be fitted which should be inspected at least once monthly and if necessary, cleaned, repaired or replaced, Excessive contamination of a hose and filter may indicate deterioration of the hose, in which case the hose should be replaced.
- c) Differential pressure checks taken at the maximum flow rate should be made on micro filters, filter separators and filter monitors at weekly intervals.
- d) Micro filters and filter separator elements should be changed when the dp reaches the limit recommended by the manufacturer (normally 1 bar, 15 psi).
- e) Filter monitor type elements should be replaced after a maximum of Twelve (12) months use or when the dp reaches 1.5 bar (22 psi).
- f) Should a sudden or significant change from the previous trend of differential pressures occur, the elements should also be inspected to ensure they are functioning correctly. Filter elements should also be inspected and changed if necessary if a significant reduction in flow is detected or continuing unsatisfactory drain samples are obtained.

3.4.5 Records

Records should be kept of all fuel deliveries both into and from vehicles together with the results of sampling differential pressure, purging and filter checks. Results of tank inspections should also be recorded along with a record of all rectification and maintenance work. Details of hose inspections should also be kept.

3.5 Inspections

3.5.1 General

- a) Aircraft fuelling facilities must be inspected annually by an Approved Inspector and a Certificate of Compliance obtained.
- b) From time to time the Authority may authorise third parties to carry out inspections and issue certificates.
- c) Fuel may not be dispensed into aircraft facilities without a current certificate.

3.5.2 Fuel Supplies

- a) A fuel supplier must not supply aviation fuel to a facility without a certificate.

3.6 Defuelling Procedures

3.6.1 Defuelling

- a) When an aircraft is to be defuelled, whether in total or in part, instructions on the disposal of the fuel should be obtained from the aircraft operator. Fuel must not be returned to aircraft unless satisfactory quality checks are obtained.
- b) The acceptance of fuel from aircraft into fuelling vehicles or aerodrome storage tanks can introduce the following two hazards to quality:
 - i) water, other liquid or sediment from the aircraft tanks may be introduced into vehicle or storage tanks;
 - ii) fuel taken from aircraft tanks, and any resultant blend with existing contents of the vehicle or storage tanks, may not meet the appropriate product specification.
- c) The above mentioned hazards will be avoided by defuelling into an empty fuelling vehicle or an empty storage tank segregated from other parts of the installation.

Before defuelling is commenced, samples should be taken from the drain cocks of each aircraft tank involved in the defuelling operation. Unsatisfactory samples do not preclude defuelling but will call for particular attention and thoroughness in the cleaning of vehicles and tank installation after disposal of the fuel.

3.6.2 Records

Records of all defuelling operations are required. They should include the registration of the aircraft involved, the results of sampling checks and the quantity and grade of fuel drawn. Records should also be made of the fuel disposal.

3.7 Barrelled and Reusable Portable 1000l Vessels Supplies

3.7.1 Delivery, Handling and Storage

- a) Barrels storing aviation fuel should be distinctly coloured according to grade.
 - i) Jet A-1: Body black with white ends.
 - ii) Closure seals should show the grade name in white on a black background
 - iii) AVGAS 100LL: Body olive drab with red ends.
- b) Containers should be distinctly marked to show the appropriate fuel grade labelling and colour coding referred to in Section 3.3.6.
- c) Before acceptance, barrels and containers should be examined for damage and seal integrity. Grade marking and inspector's identification should cross check with details on the delivery note and release certificate.
- d) Barrels should be stored under cover, clear of the ground and on their sides with both bungs below the liquid level.
- e) A storage system should be adopted that will use the oldest fuel first, according to batch number and filling date.
- f) Different grades of fuel should be separated from each other to minimise the risk of fuelling error.
- g) Batches of AVGAS require laboratory testing six months after the filling date with periodic six monthly checks thereafter. For Jet A-1 the testing period is every twelve months. After sampling the barrels and containers must be resealed.

iv)

3.7.2 Sampling

- a) Before sampling, check that the seals are intact then stand the barrel on end and wipe clean the area adjacent to the bung. Allow the contents to settle before drawing off the required quantity of fuel. Sampling procedures should be in accordance with Section 3.8. Containers are sampled from the sample point provided.
- b) Discolouration of the fuel, or the presence of water or dirt in the sample indicates that the fuel is unfit for aviation use and therefore the barrel must be rejected.

3.7.3 Decanting and Dispensing

- a) Fuel should preferably be decanted from barrels and containers into fuelling vehicles or storage by means of a suitable pump and lines fitted with a micro filter or filter separator. AVGAS may alternatively be decanted through a funnel fitted with an 80 micron filter.
- b) When it is necessary to dispense fuel direct from barrel to aircraft, the barrels should be stood on end and the contents allowed to settle for ten minutes before taking samples. Once a satisfactory sample has been obtained fuel may then be dispensed to the aircraft tanks through a suction standpipe designed so that fuel cannot be drawn below a depth of 75 mm from the barrel bottom.
- c) Delivery of AVGAS or JET A-1 to an aircraft should be via a filter monitor type element or equivalent filter. Additionally, Jet A-1 delivery should be through a micro filter or filter separator. Specifications are given in Section 3.3.4. Fuelling hoses should comply with BS3158.
- d) After decanting or dispensing fuel, replace barrel caps tightly and reseal.
- e) After use, drums should not be re-filled with fuel intended for aviation purposes. It is recommended that when emptied barrels should be carefully disposed of.

3.7.4 Records

- a) Records should be kept of all barrel deliveries, deliveries, decanting and dispensing of fuel, and sampling checks.

NOTE: Disposal of drums should be in accordance with the Dangerous Goods Act - Disposal of Toxic Waste and Hazardous Materials.

3.8 Sampling Procedures

3.8.1 General

During the handling and storage of aviation fuels sampling checks will be required to ensure that fuel intended for use is in a fit state for that purpose.

3.8.2 Visual Examination

- a) Fuel should be considered unfit for use in aircraft if visual examination shows:
 - i) More than a trace of sediment
 - ii) globules of water;
 - iii) cloudiness;
 - iv) a positive reaction to water finding paste, paper or a chemical detector.
- b) The following should serve as a guide to the visual assessment of fuels:
 - i) Colour, Aviation gasoline are dyed blue. Aviation turbine Jet A-I is undyed and can vary in appearance from water white to straw yellow.
 - ii) Undissolved water (free water) will appear as droplets on the sides or as bulk water in the bottom of the sample vessel. When suspended water is present the fuel will appear hazed or cloudy.
 - iii) Solid matter (particulate matter) generally consists of small amounts of rust, sand, dust, scale etc. suspended in the fuel or settled out on the bottom of the sample vessel.
 - iv) The terms 'clear' and 'bright' are independent of the natural colour of the fuel.
 - # **'Clear'** refers to the absence of sediment or emulsion.
 - # **'Bright'** refers to the sparkling appearance of fuel free from cloud or haze.

3.8.3 Technical Description

The following check/tests have been previously mentioned in this publication and for reference are described below:

i) Density Check:

This check is frequently made to confirm the correct grade and unchanged quality of fuel stocks by comparison of test results with the value recorded on delivery documentation. Should this comparison, after correction to standard temperature, differ by more than 0.003 kg/litre, fuel contamination may be present and therefore further investigation should be made before the product is accepted for aviation use.

ii) Millipore Test

For this test five litres of fuel should be passed through single and double membranes in order to determine colorimetric or gravimetric levels of particulate contaminant. This test is carried out in accordance with the joint ASTM D2276/IP 216 Standard.

3.8.4 Sample Containers

Clean, clear glass jars with necks and screw caps should be used for sample examination. Where, in addition, buckets are utilised they should be manufactured from stainless steel. When fuel is drawn into buckets they should be bonded to the fuel line by cable and clip. All sampling equipment should be kept in a scrupulously clean condition.

3.8.5 Sampling Procedures

- a) Water finding paste applied to the end of a dipstick or dip tape should be used for direct checking of fuel in bulk storage, barrels and fuelling vehicles. Fresh paste must be used for each check and the dipstick allowed to rest on the bottom of the container for a short period of time but not for longer than 10 seconds.
- b) Fuel samples from above ground storage tanks and aircraft fuelling vehicles should be drawn from sampling or drain cocks. From buried tanks and barrelled supplies fuel samples should be obtained by using a thief pump.

- c) Sample size should be sufficient to complete a full and conclusive check of the state of the fuel. As a general guide, when sampling from fuel company delivery vehicles, bulk storage or aircraft fuelling vehicles, approximately 4.5 litres should be drawn from each compartment. A one litre sample will suffice when checking barrelled fuel supplies.
- d) Samples should then be checked for colour, sediment, water globules, cloudiness, and general cleanliness. Check for free or suspended water by using a water detecting paste or paper. Aviation turbine fuels will require checking by using a chemical water detector. The presence of free or suspended water is indicated by a distinct change in the colour of the paste, paper or detector element.
- e) If a fuel sample proves to be unsatisfactory then the sampling procedure should be repeated. If a third sample is necessary and proves to be unsatisfactory then action should be taken to identify the cause of contamination and no fuel dispensed to aircraft from the installation concerned. It would, in this case, be advisable to inform and seek advice from the fuel supplier concerned.

3.8.6 Retained Samples

- a) Samples, minimum of 2.5 litres, should be taken and retained for the following activities:
 - i) For all deliveries, whether by road tanker, pipeline or in package;
 - ii) from the bulk tank, vehicle or packed stock, each day aircraft refuelling is made;
 - iii) whenever samples are taken for laboratory testing;
- b) Samples should be retained from a minimum of seven days, or longer if required by the Authority.
- c) All samples should be kept cool and stored out of daylight and be labelled with the following information:
 - i) grade of fuel;
 - ii) reason for sample;
 - iii) date and time of sample;
 - iv) place taken;

- v) name of sampling person.
- d) These samples are the means whereby the installation manager may demonstrate satisfactory quality of the fuel used for refuelling aircraft. They will be of particular value in demonstrating compliance with the requirement of the Air Navigation Order following an accident involving an aircraft that had refuelled from the installation.

4.0 Health, Safety, Environment, Training and Emergency Procedures

4.1 Safety and Training

Supply and Distribution depots must have a Health, Safety and Environment Policy. It is the responsibility of the participants of each joint operating facility to ensure that a suitable policy, conforming to local and mandatory Health, Safety and Environment legislation, is available and is enforced.

4.1.1 General

This section deals with those aspects of safety which are the direct concern of operating personnel. It is the responsibility of the Manager to ensure that the personnel under his control are adequately trained.

The majority of accidents can be attributed to lack of attention to, or failure to carry out, or deviations from prescribed procedures. The training and indoctrination of all personnel at all levels in all of the operational tasks they are normally required to undertake, and the tasks they would be expected to perform in an emergency, is of prime importance in seeking to achieve “accident-free” operations.

4.1.2 Training

a) New personnel must be thoroughly trained in all operations and procedures which they will be called upon to perform in the course of their duties and in all actions to be taken in the event of an emergency. Existing personnel called upon to undertake new tasks must be similarly trained before undertaking the new task without supervision. An employee training record must be maintained for every employee which indicates (i) for which tasks training has been given and the date of such training, (ii) the signature of the trainer, (iii) a “yes/no” assessment of whether the trainee demonstrated satisfactory understanding of the training, (iv) the signature of the trainee. Where necessary, training records for existing personnel must be established. Follow-up job observation (with refresher training if it is found to be necessary) is to be undertaken by supervisory or training

staff at a frequency determined by the depot Manager based on his assessment of on-going operator performance. The dates and results of these follow-up observations are to be recorded on the operator's training record. Training is to cover routine standard tasks such as sampling, tank and filter draining etc, and tasks which are specific to a location such as pipeline fuel receipts and tank management. The latter tasks must be the subject of specific written procedures which also form the basis of the training given. Where appropriate some of these written procedures should be displayed at the work location.

b) Fire drills attended by all personnel shall take place approximately once every year on the type of fires which may be encountered on the job, using fire extinguishers and equipment located at the facility. All personnel must be given the opportunity of operating and discharging fire extinguishers. Emergency situations which could occur during operations (e.g. fuel spillage, fire, injuries to personnel) should be simulated to provide practice in the most effective measures necessary to deal with them, and to ensure that all personnel clearly know their duties. Appropriate standing orders shall also be displayed.

Where possible, training should be carried out in co-operation with the airport or local fire service. Fire drills and names of personnel taking part shall be recorded.

c) All personnel must be familiar with the location of fire alarm systems and the procedure for calling the fire service and other emergency services. They must also be familiar with the location and operation of emergency stop switches and controls.

4.1.3 Medical Service – Washing Facilities

a) Facilities for first aid treatment must be available and arrangements must be made to ensure that appropriate medical aid and ambulance service can be obtained at short notice.

b) Adequate washing facilities must be provided and instruction given on the care to be exercised when handling products to avoid contact with the skin. Clothing soaked with fuel must be removed without delay and a shower/bath taken.

4.1.4 Safety Precautions

a) Entry into deep pits should be avoided unless necessary for maintenance purposes and shall be controlled by an entry permit system. Warning notices shall be prominently and permanently posted inside pits forbidding entry unless safety precautions are strictly applied. Where entry is necessary, it is important to ensure adequate ventilation to remove all toxic vapours and to ensure that adequate oxygen is present to maintain life. Continuous venting shall be maintained whilst

operators are within the pit. Two men should always be involved in these operations, one on a life line with harness and one at readiness outside.

b) Where required, adequate personal protection equipment must be provided.

4.2 Reporting Accidents/Incidents

4.2.1 Accidents

All participants shall be notified immediately of any accident involving personnel, facilities or equipment.

The Manager shall initiate whatever investigation is necessary.

4.2.2 Incidents Affecting Fuel Quality/Availability

All participants/users shall be notified immediately of any incident likely to affect fuel quality/fuel availability. The Manager shall consult the participants/users and carry out the agreed action.

4.3 Health Hazards

4.3.1 Drug and Alcohol Policy

Supply and Distribution depots must have a Drug and Alcohol Policy. It is the responsibility of the participants of each joint operating facility to ensure that a suitable policy is available and is enforced.

3.2 List of Precautions

To reduce health hazards in handling aviation products and other materials which may be held at the depot, a list of precautions shall be drawn up and posted prominently, and personnel instructed in elementary precautions.

4.4 Emergency Procedures

4.4.1 General

Personnel must be able to analyse emergency situations, act in a disciplined manner and apply the correct procedures with confidence. This can only be achieved if procedures have been prepared to cover all possible emergencies and training carried out to ensure that all personnel are familiar with the procedures and proficient in their assigned duties.

4.4.2 Manager's Responsibility

It is the Manager's responsibility to identify all possible emergencies, and to prepare written pre-planned procedures to meet such emergencies for approval by the Management Committee. The procedures should include, but not be restricted to, the following:-

a) Be specific to the type and location of the emergency;

- b) Detail actions to be taken;
- c) Mandatory responsibilities of specific staff;
- d) List all essential contacts with routine and emergency telephone numbers
- e) Availability and source of emergency equipment;
- f) Procedure for keeping up-to-date;
- g) Be kept in locations where they will be clearly visible and where all staff will have immediate and direct access to them.

4.4.3 Training

All staff must be thoroughly familiar with these procedures and instructed in their use, particularly in the location and emergency usage of essential controls. Regular drills must be conducted so every employee can become proficient in his/her assigned duties. Wherever possible, relevant airport and local authorities should be involved in these drills.

4.4.4 Emergency to be considered

The following are examples of emergencies which should be considered:-

- a) Equipment breakdown affecting ability to operate;
- b) Power failure;
- c) Product spillage;
- d) Serious injury to staff, contractors or third parties as a result of actions of joint operation;
- e) Terrorist actions, bomb warning, civil disturbances etc;
- f) Fuel quality problems;
- g) Fire.

4.5 Security

It is the Manager's responsibility through the Management Committee to ensure that the security arrangements are adequate to protect the personnel, assets and operation of the facility.

4.6 Spillage of Fuel

Spillage and leakage must be avoided at all times. Every spill is a fire hazard as well as an environmental pollutant and must be dealt with immediately. Each fuel spill presents a different situation involving many variables, such as size of spill, weather conditions and location of spill etc. Action required will depend on particular situations, so no one set of instructions will apply in every case. Prompt action, good judgment and initiative by well trained personnel is of major importance to prevent hazards arising from fuel spills.

The Manager is responsible for ensuring that the local and mandatory regulations relating to environmental pollution are fully met. This includes keeping the Spillage Emergency Plan up-to-date and ensuring that all staff are aware of the plan and what must be done should a spill occur.