



Advisory Circular

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NIGERIAN CIVIL AVIATION AUTHORITY (NCAA)

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AIRCRAFT FUELLING AND DEFUELLING

1.0 GENERAL

Nigerian Civil Aviation Authority Advisory Circulars from Aerodrome Standards Department contain information about standards, practices and procedures that the Authority has found to be an Acceptable Means of Compliance (AMC) with the associated Regulations.

An AMC is not intended to be the only means of compliance with a regulation, and consideration will be given to other methods of compliance that may be presented to the Authority.

2.0 PURPOSE

This Advisory Circular provides methods, acceptable to the Authority, for showing compliance with Aircraft Fuelling and Defueling requirements of Part 12 of Nig. CARs as well as explanatory and interpretative material to assist in showing compliance.

3.0 APPLICATION

The material contained in this Advisory Circular applies to aerodrome operators and fuelling companies involved in the provision of aircraft fuelling and defueling services at aerodromes.

4.0 REFERENCE

The Advisory Circular relates specifically to Part 12.6.17(h) of Nig. CARs.

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1.0 FUELLING

1.1 For the purpose of these recommended fuelling practices, fuelling is regarded as:

- Fuelling of aircraft on the ground;
- Defueling of aircraft tanks;
- The technical guidance material should be supplemented by suitable additional local instructions agreed and promulgated by the Airport, aircraft operator and fuelling company to cover such specialized activities as:
 - Fuelling and defueling in hanger
 - Fuelling of any aircraft on water
 - Draining and filling aircraft tanks during fuel system maintenance operations.

2.0 FUELLING PLACE:

2.1 The fuelling of aircraft at an aerodrome by mobile equipment should only be carried out at a place approved by the aerodrome operator.

2.2 As a general guide, fuelling areas should be sited to avoid bringing fuelling equipment or aircraft fuel tank to within 15 meters (50feet) of any building other than those parts constructed for the purpose of direct loading or unloading of aircraft such as nose loader, aerobridges etc.

3.0 SUPERVISION OF FUELLING

3.1 Aircraft operating companies should appoint a competent person (referred to as the fuelling overseer to ensure the observance of correct fuelling procedures and to liaise with the fuel companies 'service supervisors. The fuelling overseer should also ensure that there is adequate restraint of the aircraft by proper checking to ensure that the brakes are applied and the wheels are checked both before and after.

4.0 CLEAR EXIT PATHS

4.1 The fuelling overseer should ensure that a clear path is maintained from the aircraft to allow quick removal of fuelling equipment in case of an emergency. Fuelling equipment should be positioned such that there is no requirement for vehicles to reverse before departing. All vehicles and equipment should be strategically positioned to ease quick exit of passengers from the aircraft in case of an emergency.

4.2 Aircraft fuelling vehicle should be positioned such that, accessibility to aircraft by rescue and fire fighting vehicles is NOT interrupted.



- 4.3 All vehicles performing aircraft servicing functions other than fuel servicing (e.g. baggage truck etc) should not be driven or be parked under aircraft wings while fuelling is in progress.
- 4.4 The exhaust systems of all operational vehicles required to operate in the fuelling zone must be subjected to the most stringent and regular maintenance to eliminate defects which may result in the emission of sparks or flames capable of igniting fuel or fuel vapour.

5.0 BONDING AND EARTHING

- 5.1 During fuelling, safety depends upon the efficient bonding between the aircraft and the supply source earthing, except through properly designed apron earthing points.

This is difficult and some time not fully effective. In practice, almost 'any ground' will be found satisfactory for static electricity dissipation purposes, although there are exceptions when operations are conducted on sandy or desert terrains. Drag chain or conductive tyres are seldom effective under all climatic condition.

- 5.2 The aircraft fueller, nozzle hose coupling, filters; funnels or any other appliance through which fuel passes should be effectively bonded to the ground and to each other throughout the fuelling operation. Connection should be made to the designated loading points or on clean unpainted surfaces of the aircraft and fuelling vehicles.
- 5.3 Before the transfer of fuel commences, the following procedure should be carried out.
 - 5.3.1 The aircraft should be connected to an approved earthing point.
 - 5.3.2 The aircraft should be effectively bonded to the fuelling equipment.
 - 5.3.3 During over wing fuelling, the nozzle or the hose should be bonded to the aircraft structure before the tank filler cap is removed. In the absence of any suitable bonding point, the nozzle should be brought into contact with the skin of the aircraft before the filler cap is removed and this contact maintained until fuelling ceases.
 - 5.3.4 In the case of pressure fuelling, metal to metal contact between the aircraft fitting and the coupling is not a sufficient protection; therefore separate bonding is still required.
 - 5.3.5 When fuelling from hand operated equipment including pumping from cans or drums, similar precautions should be taken to bond the pumping equipment,



hose nozzle and containers. If funnels are used they should also be bonded both to the nozzle of the hose or can and to the aircraft. If a chamois leather is used, the metal ring around the leather should be bonded to the can funnel, or can. This action will ensure that the funnel, nozzle, can and aircraft are brought to the same electrical potential before removing the aircraft filler cap.

- 5.3.6 Any cables, clips and plugs for bonding or earthing should be maintained in good condition and regularly tested for electrical continuity.
- 5.3.7 When fuelling is completed, bonding wire(s) must not be disconnected until the filler cap is replaced.
- 5.3.8 Fuelling hydrant pit must not be used for earthing purposes.

6.0 FIRE PROTECTION

- 6.1 The airline operator's shall provide portable fire extinguishing equipment of 50kg minimum capacity on standby suitable for at least initial intervention in the event of fuel fire. Personnel trained in its use shall be readily available and there shall be means of quickly summoning the rescue and fighting service in the event of fire or major fuel spill. But where provision is not made for the portable fire extinguishing equipment, the service of airport fire service should be engage to provide the fire coverage, most importantly when passengers are on board the aircraft during fuelling
- 6.2 The fuelling operator shall provide suitable portable fire extinguishing agent for the protection of the browser that operate at the airport.

7.0 FUELLING ZONE

Fuelling zone should be established before fuelling commences. These zones should be regarded as extending not less than 6 meters (20 feet) readily from the filling and venting points on the aircraft and the fuelling equipment.

Note: When establishing fuelling zones it should be noted that the engine efflux of modern jet aircraft taxing under the maximum probable engine thrust conditions, has been assessed as having a speed of up to 65 knots; and a temperature of approximately 52°C (125°F at a distance of 30 meters (100 feet) from the jet pipe. This temperature is not dangerous from a fire point of view but the blast, however, could be dangerous to aircraft, personnel and equipment.

- 7.1 Within this zone, smoking, the use of naked lights and the operation of switches on lighting systems other than the approved patterns should be forbidden.



- 7.2 Unless fuelling takes place in a designated no smoking area, “No smoking” signs should be displayed not less than 15 meters (50 feet) from the fuelling equipment and aircraft tank vents. Fuelling vehicles should permanently bear ‘No smoking’ signs or notices.
- 7.3 Personnel engaged in the fuelling process should not carry matches or other means of ignition or put on footwear with exposed iron or studs, nails or tips.
- 7.4 Aircraft borne Auxiliary power units (APU’s), which have an exhaust efflux discharging into the zone should be started before filler caps are removed or fuelling connections made.
- 7.5 If an A.P.U. is stopped for any reason during a fuelling operation it should not be restarted until the flow of fuel has ceased and there is no risk of igniting fuel vapours.
- 7.6 Ground power units (G.P.U’S) may be operated provided they are positioned not less than 6 meters (20 feet) from an aircraft filling and/or venting point and the fuelling unit’s pumping compartments.
- 7.7 It is against fuelling procedure to be driving operational vehicle around the fuelling zone(s).

8.0 FUELLING WITH PASSENGERS ABOARD AND DURING EMBARKATION AND DISEMBARKATION

- 8.1 To enable a reduction in transit time and for security reasons some operators of fixed wing aircraft with a seating capacity exceeding 20 passengers allow passengers to embark, or remain on board during fuelling operations. In these circumstances the following precaution should be taken:
- Passenger should be informed that fuelling will take place and that they must not smoke. Mobile phone, operate switches or other source of ignition should not be operated;
 - The illuminated “No smoking” signs should be on together with sufficient interior lighting to enable emergency exits to be identified. Such lighting should not be allowed to go off until fuelling operations have been completed;
 - Stairways should be positioned at the normal passenger exits except when built in ‘air stair’ is fitted. Doors should be opened or ajar and free from obstructions, except a situation where it is absolutely necessary to close them for climatic or operational reasons. They should never be locked and cabin attendant trained in emergency evacuation procedures should remain at all times in the aircraft to initiate and direct evacuation if need arises;



- d) If fuel is detected in the aircraft interior during fuelling, or any other hazard arises, the fuelling overseer (who must have adequate means of communication) should be informed. Fuelling should be stopped unless the fuelling overseer directs otherwise;
- e) Ground servicing activities and other work within an aircraft should be conducted in such a manner that they do not create hazard or obstruct exits. Access to and from the areas where the aircraft escape chutes may be deployed should be kept clear;
- f) When passengers are embarking or disembarking during fuelling, their route should avoid areas where fuel is likely to be present and this movement should be under the supervision of an airline official;
- g) The 'No smoking' rule should be strictly enforced during such passenger movement and
- h) The provision in section 6.0 should be strictly adhered with.

9.0 HELICOPTERS

- 9.1. Due to the design features of helicopters, such as the close proximity of fuel intakes and tanks to the passenger compartments, passenger should not be allowed to remain in aircraft or within the fuelling zone during a fuelling operation. Normally the engines should not be operated whilst fuelling is in progress; under exceptional circumstances, it may be necessary to keep the engine(s) running. In this event, extreme caution should be exercised and the provisions of section 8 of this document where applicable should be applied.
- 9.2. In the severe weather and wind conditions experience on off shore oil rig platforms, it is frequently necessary to keep helicopter engine(s) running after landing on the helipad to achieve a 'quick turn-around'. Adverse weather conditions may also make it necessary to refuel the helicopter. In such circumstances, the captain of the helicopter should be responsible for the overall direction of the operation and the owner of the oilrig should be aware of the possible hazards, and they, in turn, should cooperate to ensure that their Staff fully observes necessary safety precautions when the aircraft passengers are embarking or disembarking whilst the engine(s) are running.
 - 9.2.1 In the case of fuelling with jet A1 (AVTUR), it should only be permitted with engine(s) running if the exhaust system is higher than the filling point or on the opposite side of the aircraft.



- 9.2.2 Fuelling should be carried out using approved installation such as the portable fuel tanks, which are encased in a frame having a separate compartment for the pump and filters.
- 9.2.3 No other relaxation of this TGM should be permitted during off – shore fuelling operations.

10.0 FUEL SPILLAGE

In the event of fuel spillage the following action may be appropriate although each spillage will need to be treated as an individual case because of such variables as the size and location of spillage, type of fuel involved, prevailing wind and weather conditions, equipment arrangement, aircraft occupancy, emergency equipment and personnel available etc.

- 10.1. In the case of a spillage covering an area more than 2 meters (6 feet) in any dimension, the fuelling overseer should:-
- a) Initiate action to stop the flow of fuel. Evacuate all persons from the affected area to a place at least 15 meters (50 feet) from the spillage;
 - b) Notify the Aerodrome Fire Service (where applicable);
 - c) Prevent the movement of personnel or vehicles into the area and ensure that all activities in the vicinity are restricted to reduce the risk of ignition;
 - d) Vehicles in the spillage area whose engines are not running should not be started. The engine of stationary vehicles within 6 meters (20 feet) of a spillage should not be restarted until the area is declared safe;
 - e) If large scale spillage occurs, fuel should not be washed into drains or culverts. In the event of this occurring accidentally, large scale water flushing should be carried out once and the local authorities are notified. Absorbent clearing agents, emulsion compounds or rags may be used to absorb the spilled fuel. Contaminated absorbents should be placed in suitable containers and removed to a safe location for disposal. The selection of tools and equipment to be used in removing spillage and the disposal of contaminated materials should have regard to minimizing the risk of ignition.

11.0 SAFEGUARDS AGAINST SPECIAL HAZARDS

- 11.1 **OPERATION OF RADAR.** A minimum of 30 meters safety gap must be allowed between an aircraft and radar equipment under test or in used in air craft or ground installation during fuelling process.



11.2 OVER HEATED UNDERCARRIAGE ASSEMBLIES

When any part of an aircraft undercarriage like the wheels, tyres or brakes, is abnormally heated, the Airport fire service should be called and fuelling should not take place until the heat is completely dissipated. Fuelling equipment should not be positioned on aircraft until the fuelling overseer certifies the environment hazard free.

Note: - *In checking for high temperatures, care should be taken in approaching the wheels. The best approach is only fore and aft, never from the sides.*

11.3 HAZARDS FROM ADJACENT AIRCRAFT OPERATIONS

Before or during fuelling, the fuelling overseer should ensure that no personnel or equipment is under hazard from the efflux of other aircraft or APUs. If the fuelling overseer observes hazards, he should stop refuelling immediately until condition permits resumption.

11.4 ELECTRIC STORMS

Extreme caution should be exercised when fuelling during electrical storms. Fuelling should be suspended during severe lightning disturbances in the immediate vicinity aerodrome and precaution should be taken to prevent rain water entering fuel tanks etc.

11.5 PHOTOGRAPHIC FLASH EQUIPMENT

The use of photographic flash, electronic flash equipment within 6 meters (20 feet) of the filling or venting points or aircraft or fuelling equipment should not be permitted.

12.0 HYDRANT FUELLING SYSTEMS

12.1 The service pressure to which the system and its components may be subjected should not exceed the design pressure rating. Surge pressure should be controlled by the use of press equipment, slow closing valves, surge suppressors or other devices placed in the system. Systems components should be designed and installed in accordance with industrial safe practices and should permit safe operation without placing an abnormal demand on the abilities of operating personnel.

12.2 Emergency shut off mechanisms should be installed as an integral part of the system. They should be so located as to be readily accessible in the event of an accident or spillage and should not be obstructed by vehicles or equipment. All major fuel dispensing equipment systems capable of delivering Jet B or 100L should have operating controls, which will be automatically cut off on release of the control by the operator or failure of the operating energy. The operator of the control should have a clear view of refuelling operations.



13.0 THE SERVICING MAINTENANCE, TESTING OR REPAIR OF AIRCRAFT DURING FUELLING

- 13.1 Whilst fuelling is in progress, servicing, maintenance, test and repair activities within the fuelling zone should be subject to the following recommendations:-
- i. All ground equipment such as rostrums steps should be clear of aircraft during fuelling. This is to prevent damage to the aircraft setting on to the ground equipment as a result of extra weight of fuel being lifted up;
 - ii. The main aircraft engine(s) should not be operated (except for helicopter engines under exceptional circumstance, see section 9.0) APUs may be operated as specified in section 7.5 and 7.6;
 - iii. Only aircraft switches essential to either the fuelling operation or aircraft servicing should be operated when fuelling is taking place;
 - iv. The engines of vehicles including those on electrically powered vehicles, normally employed for servicing aircraft should not be run within the fuelling zone unless they have been designed for the purpose. All vehicles, their engines and equipment should be subjected to regular inspection and maintenance to preserve their safety characteristics;
 - v. All connections between ground equipment and the aircraft should be made before filler caps are removed and should not be broken until fuelling ceases;
 - vi. Battery trolleys may be used within the fuelling zone provided that connection is made to the aircraft and any switch operated before the filler caps are removed. The circuit is to remain unbroken until fuelling has ceased;
 - vii. Vehicle operating in the fuelling zone should not pass under, or park beneath, the main plane or taint plane unless specifically required to do so for fuelling or maintenance purposes;
 - viii. Aircraft combustion heaters should not be used;
 - ix. Only checking and limited maintenance work such as the exchange or units should be allowed on radio, radar and electrical equipment. Any testing of such equipment should be deferred until fuelling is completed (see paragraph 11.1);
 - x. Radio equipment of approved types, installed on fuelling and servicing equipment, may be operated;
 - xi. Maintenance work, which may create a source of ignition, should not be carried out in the vicinity of the tanks or fuelling equipment;



- xii. A hand torches and inspection lamps on their cable connection used within the fuelling zone should be of approved 'flameproof or 'Intrinsically safe' design;
- xiii. Only authorized persons and vehicles should be permitted within the fuelling zone and the numbers of these should be kept to the minimum and
- xiv. The use of GSM and other cell phone should not be allowed within the fuelling zone.

14.0 VEHICLE EXHAUST SYSTEMS

- 14.1 It is essential that the exhaust systems of all vehicles required to operate in the fuelling zone should be subjected to the most stringent and regular maintenance to eliminate defects which may result in the emission of sparks or flames capable of igniting fuel vapours.

15.0 VEHICLES ELECTRICAL SYSTEMS

- 15.1 A vehicle required to operate in or near the fuelling zone should have their ignition and electrical system properly maintained to reserve their safety characteristics.

16.0 ACTION TO BE TAKEN IN THE EVENT OF FIRE OCCURRENCE WHEN REFUELLING OR DEFUELLING OF AIRCRAFT IS IN PROGRESS

- 1. The fuel supply valves are to be shut off.
- 2. The aircraft fueller, hose or nozzle coupling, filters, funnels or any other appliance through which fuel passes and all other connections are to be disconnected and removed from the area.
- 3. Replace aircraft filler cap.
- 4. Notify the Aerodrome fire service immediately.
- 5. Evacuate the aircraft if passengers are on board and switch off all electrical switches in the aircraft.
- 6. Fight the fire with any available fire media before the arrival of the Aerodrome fire service personnel.

17.0 TRAINING

The Aerodrome Operator, fuel companies and Aircraft operators should ensure that:

- i. Personnel engaged on fuel servicing operations are aware of, and practice effective safety procedure during fuel servicing operations. Before delivery commences, such personnel should also establish that the correct grade of fuel is dispensed.



- ii. Personnel are fully conversant with the operation of mobile fire protection equipment provided to cover such operations and be conversant with the initiation of emergency procedures.

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