

## FIJI AERONAUTICAL INFORMATION CIRCULAR



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### FUELLING OF AIRCRAFT

#### **1. Introduction**

- 1.1 In spite of well known and well publicised procedures to avoid loading of incorrect fuel and errors in uplift of quantities, weight computation and refuelling procedures, cases continue to occur from time to time.
- 1.2 In this regard, the most critical case is the piston-engined aircraft refuelled with turbine fuel, since piston engines will invariably stop as soon as pure turbo fuel reaches the engine; alternatively a mixture of the two fuels reaching the engine can lead to detonation and the consequent risk of destruction of the engine. Either circumstance can easily coincide with a critical stage of flight and in recent years there have been a number of serious accidents resulting from this error.
- 1.3 Nearly all piston-engined aircraft in current operation use 'gravity' type (eg. over-wing) fuel filler points and thus the main emphasis on highlighting the problem and associated precautions is in relation to aircraft with this type of filler point and the associated refuelling equipment. Within this group of aircraft there are two additional factors which can cause confusion and thus contribute significantly to the risk or error. Firstly aircraft types which have variants fitted with either piston or turbine engines, secondly, the tendency of some manufacturers to paint the word 'TURBO' in prominent lettering on piston-engined aircraft which are fitted with turbo-charged engines. In the latter case operators should remove any such markings that might cause confusion.

#### **2. Refuelling Procedures**

- 2.1 It is the aircraft commander's responsibility to ensure that the aircraft is refuelled with the correct type and quantity of fuel and that correct refuelling procedures are followed. The fuel suppliers should not commence to refuel an aircraft until they have established the precise requirements from the pilot in command or his authorised representative.
- 2.2 In order to minimise refuelling incidents various systems of marking or colour coding and detailed storage, dispensing and refuelling procedures have been developed and promulgated. However, darkness, type of lighting and colour

blindness can confuse the situation with respect to markings and colour codings, and inattention to notified procedures is the prime cause of refuelling incidents. Ultimately, therefore, it is strict adherence to correct procedures by all persons involved in the refuelling operation which must provide the primary safeguard.

### **3. Marking of Refuelling Equipment and Aircraft Filling Points**

- 3.1 It is current practice for all ground refuelling equipment and associated pipelines to be marked with labels and colour coding to identify the type of fuel involved. Such markings should include RED or BLACK colour coding, as appropriate, painted as close as practicable to the delivery nozzle or on the nozzle itself or alternatively, the coding should be provided by means of a fitted plastic sleeve or ring.
- 3.2 Existing Airworthiness requirements dictate that all filling points on an aircraft be clearly marked with the identification of the fluid that may be filled at that point. On some aircraft, this requirement may have been met by the word 'FUEL' or the appropriate fuel grade specification (e.g. 100LL or 100/130). In such cases operators should ensure that these are further identified by means of a coloured circle or square, either around or immediately adjacent to the filler point using the following colours.

RED - Gasoline

BLACK - Turbine fuel

- 3.3 Safety may be enhanced by incorporating the words 'AVGAS' for gasoline points and 'AVTUR' or 'JET A-1' for turbine fuel. Where the actual filler cap is beneath a hinged cover panel, these markings may be applied to the undersurface of the cover panel, provided always that they become and remain prominently visible with the panel in its normal open position for refuelling.
- 3.4 Red and black are respectively the primary colours used for gasoline and turbine fuel in the internationally accepted colour coding scheme for aviation fuel.
- 3.5 If it is necessary to achieve adequate contrast between the identification colour and the aircraft colour scheme, the markings should be outlined in white. Whilst the size of the markings may be varied as required, it is important that they provide prominent identification of the filler point and all such markings should be maintained in a legible condition.
- 3.6 This combination of colour coding of ground refuelling equipment and aircraft filler points should provide a final check for refuelling staff, especially with regard to aircraft with 'overwing' filling points.

#### **4. Other Occurrences Associated with Fuelling of Aircraft**

- 4.1 From time to time, other occurrences are reported in connection with refueling activity. Established fuel suppliers usually have adequate procedures for quality control and testing of the fuel supplied. This safeguard may not be available where an operator holds stocks in drums and such operator should ensure that procedures are established to replace stored fuel with new stocks at appropriate intervals and that the quality of fuel from each drum is tested as necessary prior to use in an aircraft. Operators may obtain guidance material on the subject from the Authority.
- 4.2 Fuel spillage occurrences in Fiji average two per month. The principal causes are, in large aircraft the failure of the auto-shut off valve and generally overfilling (inadvertent or incorrect requirements specified by the pilot in command or operator). Fuel spillage creates an unnecessary hazard and additionally where this occurs on bitumen surfaces invariably leads to a break-up of the surface, requiring costly repairs. Fuel suppliers and operators should exercise care in order to avoid such occurrences and their attention is drawn to the "Surface Movement and Safety Procedures" document, published by the Authority, which contains details of aircraft fuelling practices.
- 4.3 Pilots in command should ensure that fuel caps are adequately secured following fuelling operations. Investigation of occurrences of overwing fuel leakages show that these have sometimes resulted from insecure caps, either due to the retention chain being trapped between the cap and the sealing ring or improper fitting of the cap seal.
- 4.4 Pilots in command should also exercise caution in notifying fuel quantity requirements to the fuel supplier and in computation of weights. Several occurrences reported overseas relate to misinterpretation of the instructions and uplift of Incorrect quantities of fuel. These occurrences are in part related to the use of different units of measurements for measuring fuel uplifted and for calculation of aircraft weight. The situation may be further aggravated by the use of standards other than the International System of Units (metric) and in conversions between such units.

#### **5. Recommended Precautions**

- 5.1 The following minimum precautions should always be observed in order to reduce and eliminate incidents relating to refuelling –
  - (a) The fuel supplier and operator should ensure that the fuel to be used is of adequate quality.
  - (b) The pilot in command or his authorised representative should ensure that the refuelling crew is in no doubt as to the type and quantity of fuel required.

- (c) The pilot in command should satisfy himself that steps have been taken to check that the correct type of fuel is being supplied and correct delivery should be verified from the supplier's delivery note.
- (d) The fuel supplier, aircraft operator, maintenance staff and the pilot in command should ensure that the correct safety procedures are adhered to during refuelling operations.
- (e) The pilot in command should on completion of refuelling, as appropriate, ensure that the fuel cap or valves are properly secured, that the quantity of fuel uplifted is adequate and that the correct weight computations are made.