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TANZANIA CIVIL AVIATION AUTHORITY
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This following circular is hereby promulgated for information, guidance and necessary action.

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Director General

WATER IN FUEL SYSTEMS

This AIC is an extract from various airworthiness advisory circulars of Department of Aviation Australia.

GENERAL
Water enters a fuel system in three ways:-
a) It may be pumped in from contaminated stock.
b) It may condense from humid air.
c) It may leak in through faulty caps or improperly fitted inspection plates. Faulty cap seals not only allow water in the cells but have the potential due to the differential air pressures involved, to cause fuel loss and bladder collapses. It is therefore extremely important that fuel filter caps and adapters be regularly inspected for proper sealing.
The first two possibilities may be eliminated by careful filtering of suspect stock, and by keeping fuel tanks as full as possible

A) WATER CONTAMINATION OF FUEL SYSTEMS ON HIGH-WING CESSNA AIRCRAFT:
Most incidents of water contamination fuel in systems occur on aircraft fitted with bladder type fuel cells, but the problem is not necessarily limited to such aircraft as a number of reports have been received of relating to later model of aircraft with integral tanks. It is important that comprehensive drain checks be carried out at each pre-flight inspection, as is contained in Cessna Owner Advisory SE 82 0 36 A. Due to variety of drain point locations, the flight manual should be consulted for the drain check procedures on each particular Model.

The latest Cessna Models have one or more extra drain valve incorporated into fuel lines and fuel selectors. Quick drain valve has been made mandatory on the Cessna 182 due to a high incidence of Water Contamination problems. Similar modifications may be incorporated in other models. As an example, Cessna service letter SE 81-24 details a retrofit kit to install fuel line

drain valve on 150/152 models. The installation of a quick drain valve removes the necessity to employ a LAME to carry out the check. Experience has shown that if some of the flexible fuel cell snap fasteners are not secured, the cell may gradually develop wrinkles across the bottom surface. These wrinkles form pockets or dams capable of holding back appreciable amounts of water that will inevitably flow with ease when the aircraft is subjected to normal flight manoeuvers. Some forced landings have been attributed to this cause; in one case there was sufficient water to fill the collector tanks before being drawn into the engine fuel system.
From the foregoing, it is apparent that a properly adjusted fuel cap should prevent water from entering fuel tanks during heavy rains, but if water does bypass a fuel cap or is accidentally introduced from refueling drums it is essential to know by regular inspections that the fuel cells are free from wrinkles. Should it be suspected that a fuel cell is wrinkled, it will be necessary to drain it completely and re-secure the fasteners, but if the wrinkles have become permanently set, the only satisfactory course is to renew the cell.

B) WATER DRAINS-TURBINE ENGINE FUEL SYSTEMS

Where multiple tanks are used to supply a turbine engine, fuel systems must be arranged to avoid possible interruption. A common design aspect of such systems is to supply all fuel to a particular engine from the various tanks through a common or collector tank system. In such a system, should any water remain or subsequently condense out in various tanks after carrying out a water drain check, it will progress to the sump of the common or collector tanks system. The volumetric capacity of such a sump is required to bear a given relationship to the volumetric capacity of the tank system from which it is being fed, i.e. large enough to hold any water likely to be accumulated between water drain checks. Clearly then, in order to maintain the water ingress protection afforded by this design requirement, it is essential that just as meticulous attention is paid to water draining from collector or common tank sump as is applied to the drain points of the various tanks themselves.

It should be noted that, due to the characteristic of turbine fuel dissolving and/or holding water in suspension, it is not uncommon to find water in the collector system at the completion of a flight, even though all apparent water had been removed prior to the commencement of the flight. It is, therefore, stressed that the finding of no water in the tanks following fuelling does not mean there would be no water in the collector or common tank sump. Draining from this area must always be carried out.

CONCLUSION:

Petroleum products are hygroscopic and have a dissolved water content which vary with temperature. Due to wide temperature fluctuations in most parts of Tanzania between day and night, free water droplets may be precipitated as the temperature of fuel is reduced. These are difficult conditions in which to maintain fuel free from water contamination and, in addition, the high temperature and humid conditions promote the growth of bacterial fungi in fuel, if water is present. Contamination of this kind can adversely affect aircraft engine performance and, at worst, can be disastrous. Hence fuel system designed to avoid totally the possibility of water build-up and comprehensive operational checking and purging procedures are vital.

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