

**DEPARTMENT OF CIVIL AVIATION
MALAYSIA
AIRWORTHINESS NOTICE**

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MICROBIOLOGICAL CONTAMINATION OF FUEL TANKS OF TURBINE ENGINED AIRCRAFT

1. Introduction

- 1.1 Reports have been received that aircraft regularly operating in the climatic conditions prevailing between the latitudes 30°North and 30° South, which includes Malaysia have been contaminated by fungus in the fuel tanks.
- 1.2 In one case, contamination was found during an investigation into the cause of erratic fuel contents indication, when white crusty deposits and brown stains were seen on the probes. Further examination revealed the presence of brown/black slimes adhering to the horizontal upward facing surfaces within the tanks. Subsequent investigation confirmed that this substance was a fungal growth of the type *Cladesporium Resinae*.

2. Effect Of Contamination

- 2.1 The problems associated with microbiological growths have been known for some years and research into their behaviour has been conducted throughout the world. In the case of *Cladesporium Resinae*, the spores of the fungus can exist in a dormant state in kerosene fuels in most parts of the world. These will only develop when in contact with water in the fuel at temperatures such as those reached when the aircraft or storage tanks are exposed to a warm ambient temperature or radiation from the sun for long periods in a tropical or sub-tropical environment or prolonged periods in a heated hangar. If developing fungus forms on water not drained off and which adheres to the tank surfaces, the fungus is able to absorb water later introduced with fuel or condensing following a cold soak.
- 2.2 Where fungus has formed there is a probability that corrosion will occur. Corrosion has been found where fungus has formed on the bottom tank skin, on chordal support members in the wing root and on fuel pipes within the tank. In some cases aircraft have been sufficiently affected to necessitate replacement of component parts, including primary structure.
- 2.3 The fungus itself, if dislodged by fuel during refuelling, can obstruct fuel filters.

3. Inspection

- 3.1 Operators uplifting fuel or operating regularly in an area having high normal ambient temperatures and high humidity, or where fungus development is known to have been encountered, are advised to scrutinise tank areas for signs of fungus whenever access is gained for any purpose. It is further recommended that, for aircraft operating under these conditions, Maintenance Schedules should be amended to include a visual internal tank check at periods prescribed by the aircraft constructor. It is also important, whenever fuel tanks are inspected, to ensure that all passage ways between rib cleats, etc are not obstructed, so that a drainage path for the water is maintained at all times. If the aircraft has been standing in a heated hangar for prolonged periods, the fuel in the tanks should be treated with a biocide.
- 3.2 If contents gauges give suspect indications, immediate consideration should be given to the possibility that tank probes may be contaminated with water and/or fungus and an appropriate inspection should be carried out.
- 3.3 Whenever fuel filters are checked they should be closely examined for the presence of slimes of any colour.
- 3.4 The need to prevent water collection by good maintenance practices and control of fuel supplies is emphasised. A high of protection can be maintained by strict adherence to water drain checks before and after refuelling and, if the aircraft has been standing for a length of time, again before the next flight. Fuel quality control checks should be rigorously applied.

4. Treatment

- 4.1 If fungus is discovered, the fuel system should be cleaned as soon as possible by a method approved by the aircraft constructor and engine manufacturer. It must be appreciated that if the fungus is allowed

to develop, cleansing and rectification could become a major operation involving grounding of the aircraft for a long period.

- 4.2 It is strongly recommended that a fungicidal additive should be used in the fuel as approved by the aircraft constructor and engine manufacturer. The frequency of treatment and dilutions prescribed by the aircraft constructor and engine manufacturer must be adhered to. Introduction of an unapproved fungicide or inhibitor may jeopardise the safe operation of the aircraft.

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