257g Effects of Ethanol as a Fuel Additive on General Aviation Aircraft Fuel System Electrochemical Corrosion

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Replacement of leaded aviation fuels with viable non-leaded alternatives continues to be a concern of environmentalists, industry representatives, and federal regulatory agencies. The elimination of tetra ethyl lead (TEL), which is now used in 100 LL aviation gasoline (avgas) as a fuel additive, is a certainty when acceptable alternative fuel additives are approved in the future. This will be a significant event for the general aviation community. Besides being an octane enhancer, TEL has an advantage in preventing wear of some engine components.

Among the octane enhancing additives that are being considered as replacements of TEL are ethyl-tertiary-butyl ester (ETBE) and anhydrous ethanol. ETBE has its own environmental concerns because of the ground water contamination problems that have been encountered with the chemically similar automotive fuel additive methyl-tertiary-butyl ether (MTBE). Ethanol has also been suggested as an octane-enhancing additive for general aviation (GA) fuel. Ethanol is becoming increasingly popular within many public and legislative circles because it is completely biodegradable and it is a renewable resource.

The potential for electrochemical corrosion in the piston powered general aviation fleet was examined for the various gasoline-ethanol blends that have been proposed in the presence of moisture (water). Corrosion was found in the aluminum and steel samples tested, however, the results show that the corrosion effects can be offset with the use of corrosion inhibitors. The ethanol compositions of interest vary from the standardized automotive 10% ethanol gasohol blend up to the 85% ethanol aviation gasoline blend that has been proposed by others.