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Mechanism of Ignition of Jet A by Silver Oxide Deposits

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Standard aircraft industry practice in preventing explosions of flammable vapors in the fuel tank ullage has been to eliminate all possible ignition sources. One potential ignition source that has received little attention is due to silver oxide deposits bridging electrical conductors that are mounted in the vapor space of a fuel tank. Research is underway to determine the mechanism and ability of such conductive deposits to initiate combustion. The results have shown that silver oxide deposits can be formed electrochemically when water bridges two silver conductors with different voltage potential. Further, the silver oxide can be reduced to silver by Jet-A fuel if the temperatures resulting from localized current density are sufficiently high. Deposits containing a large portion of silver are capable of high power dissipation that can produce surface temperatures exceeding the hot surface ignition temperature of Jet A. A thermal model of the power dissipation process indicates that electrical power alone is sufficient to cause hot surface ignition. Logistic regression on a series of ignition tests shows that ignition probability is strongly correlated with electrical power dissipation.