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DEVELOPMENT OF ALTERNATIVE FUEL SYSTEM ICING INHIBITOR ADDITIVES THAT ARE COMPATIBLE WITH AIRCRAFT TANK TOPCOAT MATERIAL

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In recent years there has been an increasing incidence of reports of the peeling of topcoat material in the ullage space of integral wing tanks in the B52 and other military aircraft. This increase in delamination phenomena coincides with the change from JP-4 to JP-8 as the primary U.S. Air Force fuel and also the change in primary icing inhibitor additive from ethylene glycol monomethyl ether (EGME) to diethylene glycol monomethyl ether (DiEGME). Recent work indicates that with the JP-8/DiEGME combination, the icing inhibitor additive can concentrate in the tank ullage and condense at these high concentrations on the upper tank walls. These high concentrations of DiEGME cause swelling and subsequent peeling of the epoxy-based topcoat.

In this work we report on the identification and evaluation of alternative icing inhibitor additives that do not cause topcoat delamination in fuel tank upper surfaces. Initially, prospective additives need to be evaluated for their ability to inhibit the formation of ice in aircraft fuel systems. Additives which perform well as icing inhibitors then need to be evaluated for their compatibility with fuel tank topcoat material. The initial group of additive candidates evaluated consisted of glycol ether species with decreased volatility. These low volatility species should be less able to concentrate in the ullage and cause topcoat failure. Subsequent testing will involve compatibility with other fuel system materials, evaluation of the effect on fuel properties such as thermal stability, impact on fuel filtration, impact on functionality of other additives, and testing of the biostat capabilities of the additive.