marked influence on deposition rates, the impact of fuel temperature being stronger than that of wall temperature. They also show that deposition rates increase continuously with increase in wall temperature and do not decline at wall temperatures above around 650 K as the results of previous studies would appear to suggest.

Comparisons of the results obtained with light-distillate fuels of different aromatics content indicates that deposition rates are enhanced by an increase in aromatic content, the effect becoming less pronounced for fuels of higher aromatic content.

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DISCUSSION

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The authors have incorrectly stated the results of the UTRC experiments. Their inference that "an effective method of reducing deposition rates would be by increasing the tube-wall temperature" is totally erroneous. Reference to the UTRC publications will verify that the trend of deposit formation rate versus temperature shown in Fig. 4 (i.e., the leveling off and subsequent decrease in deposit formation at temperatures above 600 K) was attributed to depletion of dissolved oxygen in the fuel and transition from auto-oxidation to pyrolysis. This hypothesis is substantiated by data acquired at the exit of the heated tube (where the temperatures were highest) that show little increase in wall temperature (due to deposition) with increasing test time (see Fig. 5). The decreasing deposit formation rate at higher temperatures was first observed at Exxon and reported by Taylor (1974). What was observed by UTRC was an upper temperature boundary for their experiment and, for that reason, the UTRC data correlations of deposit thickness versus time were limited to temperatures below 600 K.

Fuel preconditioning is of critical importance to fuel deposit formation. Preheating and recirculation can result in depletion of active species (e.g., oxygen, nitrogen, sulfur, and metals) from the fuel, spurious formation of deposit outside the test section in the preheater and hot transfer lines, and inadvertent lowering of the measured deposition rate in the test section. Although none of the test methods now in use completely simulate fuel heating in an aircraft system, in the UTRC apparatus all the thermal decomposition reactions occur within the test section where deposit rates are measured. In this regard, it is similar to the procedure adopted by the ASTM for evaluating the thermal oxidation stability of turbine fuels (JFTOT procedure).

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Authors' Closure

In the UTRC publication referenced as Marteney and Spadaccini (1986) in our paper, it was reported that "the fuel deposition data acquired can be utilized to predict the deposit buildup." Nowhere does it state that the deposition data plotted in Fig. 4 of this paper are valid only for wall temperatures below 600 K.

We agree with Dr. Spadaccini that "fuel conditioning is of critical importance to deposit formation" and that "preheating can result in depletion of active species." This highlights one of the main deficiencies of the UTRC apparatus. This apparatus features a test section that is essentially a heated tube, 2.5 m long. Thus the fuel that produces deposit toward the end of the test section has been subjected to considerable preheating during its passage through the long heated tube with consequent depletion of active species.

In regard to fuel circulation, we agree that it is unsuitable for basic studies on the deposition process and we much prefer a single-pass system for this type of research. However, the recirculation method does serve a useful purpose because it simulates more closely the actual aircraft situation in which the fuel may be heated and recirculated back into the fuel tank several times before it finally flows through the fuel nozzle into the combustion chamber.

We agree with Dr. Spadaccini that none of the test methods now in use (including ours) completely simulates fuel heating in an aircraft system. Nevertheless, we feel that our test technique, which has not remained static but is being continually refined and improved with experience, provides the most realistic simulation of an aircraft system that is available at this time.

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