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**HYDROCARBON LIQUID FUELS THERMAL STABILITY, ANTIOXYDANT
INFLUENCE AND BEHAVIOUR**

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Jet fuel undergoes an oxidative chemistry upon being heated in fuel system of advanced civil aircraft. The degradation process may lead to the formation of bulk and surface solids. For engines featuring a low-NO_x combustion chamber based on multipoint injection, these deposits could plug the injection system. Deposits formation has different origins; one of them is dissolved oxygen. The aim of this study is to strongly decrease or inhibit the autoxidation reactions present during the fuel degradation. This is why the use of antioxidant additives is considered. So, autoxidation reactions are exacerbated by the use of a static device developed at ONERA. Liquid fuel is stressed to a bulk temperature of 185°C with an air flow of 100 ml/min during 72 hours.

Kerosene Jet A-1 is composed of hundreds of hydrocarbons, so we used different molecules representative of the main families present in the jet fuel. We tested a linear alkane (n-dodecane, C₁₂H₂₆), a ramified alkane (2,2,4,4,6,8,8-heptamethylnonane, C₁₆H₃₄), and two cyclic compounds (1,3-diisopropylbenzene, C₁₂H₁₈ and cyclohexylbenzene, C₁₂H₁₆).

The characterization of the various products formed during degradation (gas, liquid, and solid) allows knowing the role played by the selected molecules in the degradation of kerosene. GC, GC/MS, and IR are the characterization techniques used for the analytic part of this study. The live consumption of each initial compound is observed during the entire test. In parallel of this consumption, different gases like CO, H₂, and light saturated and unsaturated hydrocarbons are formed. The liquid analysis shows the formation of oxidized products like ketones, carboxylic acids, and alcohols. Moreover, only cyclohexylbenzene formed solids. The degradation of a mixture of hydrocarbons involves the formation of alcohols, ketones, and carboxylic acids.

Three antioxidants have been tested on each hydrocarbons: the phenol, 2,6-bis (1,1-dimethylethyl)-4-methyl- (BHT), the phenol, 2- (1,1-dimethylethyl)-4-methyl- (TBMP) and the phenol, 2,4-bis (1,1-dimethylethyl) (2,4-DTBP). The quantity added to each hydrocarbon is about 1 wt %. TBMP and 2,4-DTBP are not very efficient for the selected hydrocarbons.

BHT is the most effective for alkanes but not very efficient for cyclic compounds. Indeed there is no alkanes consumption during the entire test and BHT just delays the degradation of cyclohexylbenzene and 1,3-diisopropylbenzene. There is no formation of deposit for all hydrocarbons tested in presence of BHT.