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RECENT PROGRESS IN SYNTHETIC FUELS DEVELOPMENT FOR AVIATION

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The twin drivers of high oil prices and environmental concerns have accelerated recent developments in synthetic jet fuel since Bauldreay *et al* [IASH 2003] set out some of the key properties of paraffinic fuels derived via Fisher-Tropsch synthesis. Although the emphasis of research has been on fit-for-purpose properties and ensuring that these synthetic fuels can be operated safely in current and future air transport system, this paper sets out some recent findings that identify specific performance benefits and risks. Based on in-house research at Shell and collaborative work with TU Delft, it will cover a description of the key linkages between fuel composition and physical properties, and explores the effect these have on aircraft performance and gas turbine emissions.

The paper identifies the key compositional constraints of Fisher-Tropsch fuels and how they influence the jet fuel properties critical for the safe and efficient operation of the aircraft/engine system. The results of several fit-for-purpose experiments will be presented.

The effect of fuel properties, including gravimetric and energy density, have been modelled on the critical payload-range performance of existing aircraft configurations; a range of techniques have been used, including a basic aircraft performance model and a high-fidelity gas turbine cycle performance package. Results are presented for three aircraft/engine combinations ranging from a business jet to a long haul commercial airliner.

The composition of synthetic fuels free of sulphur and aromatic compounds will affect its combustion properties. These will be quantified for a range of fuel blends from low percentages up to 95% synthetic fuels based on recent experiments.