JETSCREEN
Jet Fuel Screening and Optimization
(Jun 2017 – Jun 2020)

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A project gathering 14 partners from 5 European countries:

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 723525
The purpose of JETSCREEN is to provide fuel producers, air framers, and aero-engine and fuel system OEMs with knowledge-based screening tools that will:

- **Screen** (prior) and **streamline** the alternative aviation fuel approval process,

- **assess** the compatibility of fuel composition/properties with respect to the fuel system and the combustion system,

- **quantify** the added value of alternative fuels,

- **optimize** fuel formulation in order to attain the full environmental potential of synthetic and conventional fuels.
JETSCREEN Objectives

The two JETSCREEN objectives are to develop:

I. Advanced and reliable **design tools** capturing accurately **fuel-related effects on airframe and aero-engine**, delivered with low cost small scale experimental and model-based testing to predict the impact of fuel on selected engine and fuel system components.

II. A **screening and optimization platform/framework** incorporating the distributed design tools and generic experiments.
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JETSCREEN Methodology

Overall extreme fuels

Fuel Matrix

Tool Development

Experiments → Tool development & validation

Quantitative

Physical and chemical properties
Fit-for-purpose properties
Generic components

Tool Application

Tool Integration

Workflow

Screening
Optimization

Impact Analysis
Fuel ↔ Aircraft

Overall extreme fuels

Process specific extreme fuels

Reference fuel

Process specific extreme fuels

Qualified

Fuel system
Engine operability
Emissions

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Fuels matrix summary

- 20 fuels grouped into 5 categories:
  - (A) Jet A-1 (JS reference fuel) and hydrotreated Jet A-1
  - (B) Alternative Fuels
  - (C) Fuels with aromatic content and volatility variation
  - (D) Fuels with sulphur content variation
  - (E) Blends

- 30 Experiments

  Thermophysical properties
  Chemical kinetic properties

  Pump endurance
  Combustion rig tests

- Amount of fuel / experiment
  - 0.5 L
  - 8000 L

Process specific extreme fuels

- A selection of 2-5 additional fuels is performed in each sub-work package.
- Selection Criteria:
  - Explore the limit behavior/extreme cases/out of specs
  - Strong recommendation from OEMs
JETSCREEN Rationale and approach

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ASTM D4054 Visualization
Model-based Assessment

ASTM D4054
> 70 properties

 Tier 1 & 2:
Density
Kinematic viscosity

 Tier 3:
Atomization

 Tier 4:
Exhaust emissions
Screening and Optimization Platform/Framework
Model-based fuel screening

Network of competent partners

Integration of distributed models

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Survey data from EI - The Quality of Aviation Fuel Available in the Untied Kingdom Annual Survey 2014

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Screening and Optimization Platform/Framework
Database-supported Assessment - Extension to high tiers

<table>
<thead>
<tr>
<th>Fuel specification</th>
<th>Min</th>
<th>Max</th>
<th>Fuel Sample</th>
<th>Whisker Chart</th>
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<tbody>
<tr>
<td>Colour</td>
<td></td>
<td></td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Acidity (mg KOH/g)</td>
<td>0</td>
<td>0.015</td>
<td>0.002</td>
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<tr>
<td>Aromatics IP 156 (%vol)</td>
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<td>25</td>
<td>1.8</td>
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<tr>
<td>Sulphur (%mass)</td>
<td>0</td>
<td>0.3</td>
<td>0.018</td>
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<tr>
<td>Mercaptan (%mass)</td>
<td>0</td>
<td>0.003</td>
<td>0</td>
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<tr>
<td>IBP (degC)</td>
<td></td>
<td></td>
<td>148.8</td>
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<tr>
<td>10% (degC)</td>
<td>205</td>
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<tr>
<td>50% (degC)</td>
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<td>198.7</td>
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<td>90% (degC)</td>
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<td></td>
<td>235.1</td>
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<td>FBP (degC)</td>
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<td>251.9</td>
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<tr>
<td>Flash point (degC)</td>
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<td>41.5</td>
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<tr>
<td>Density @15degC (kg/m3)</td>
<td>775</td>
<td>840</td>
<td>759.6</td>
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<td>Freezing point (degC)</td>
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<tr>
<td>Viscosity @-20degC (cSt)</td>
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<td>8</td>
<td>3.885</td>
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<td>Smoke point (mm)</td>
<td>5</td>
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<td>Naphthalenes (%vol) if SP &gt; 25mm</td>
<td>3</td>
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<tr>
<td>Specific Energy (MJ/kg)</td>
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<td>44.023</td>
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<td>Existent Gum (mg/100 ml)</td>
<td>7</td>
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<tr>
<td>MSEP</td>
<td>85</td>
<td>99</td>
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</tbody>
</table>

Survey data from EI - The Quality of Aviation Fuel Available in the United Kingdom Annual Survey 2014

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Open-source
Intended to be extended
Summary

- JETSCREEN started in June, 2017

- Progress towards objective I - development of design tools capturing accurately fuel-related effects on airframe and aero-engine:
  - Fuels matrix has been developed and most fuels have been delivered
  - Testing has started & Model development is performed in parallel

- Progress towards objective II - development of a screening and optimization platform/framework incorporating distributed design tools
  - First model-based fuel screening workflow successfully executed
  - First version of the fuel data schema has been developed in JETSCREEN to enable the exchange of fuel-related information

- JETSCREEN is ready to initiate pre-approval fuel sample screening and consulting services for fuel producers

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Send us the following information:

1. Company Name / details  Please describe your business (max 150 words)

2.1 What products or fuel type are you making or targeting?  
(e.g. Aviation SPK/A, middle distillates etc.)

2.2 If you are producing a fuel, have you had any analysis carried out?  
(e.g. composition of fuel) - If YES, please provide details

2.3 What is your raw material or feedstock?

2.4 What is the conversion process used to make your product?  
(you are not expected to divulge any commercially sensitive information)

2.5 Is your conversion process feedstock agnostic or does it process a specific feedstock?

Optional:

3.1 What volume, or scale, is your production per annum?

3.2 What volume, or scale, of production do you intend to reach and by when?
Coordinator:
DLR

Contact persons:
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![Partner Logos]

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