**Objective**

FIRST will deliver key enabling technologies for combustion emission reduction by developing improved design tools and techniques for modelling and controlling fuel sprays and soot.

Aviation’s environmental impact must be reduced to allow sustainable growth to benefit European industry and society. This is captured in ACARE’s 2020 goals of reducing CO2 by 50%, NOx by 80% and in SRA1/2 proposed reductions in soot and development of alternative fuels.

CFD tools are essential to design combustors for emissions, soot, thermo-acoustic noise, flame stability, cooling and the outlet temperature profile. The two most significant gaps in today's CFD capability are fuel injector spray and soot modelling. The fuel injector is critical to the design of low emission combustors. By understanding and controlling the complex physics of fuel atomisation and mixing, the emissions performance can be directly improved. CFD simulations have for many
years relied upon over-simplistic definition of the fuel spray. The availability of methods developed in the automotive industry and faster computers make their application to aero-engines timely. The FIRST project will deliver a step change in the detail and accuracy of the fuel spray boundary conditions; through novel physics based modelling techniques, advanced diagnostic measurements and the derivation of sophisticated correlations. CFD computations of the combustion system also provide the information needed to allow soot emissions to be controlled and minimised. These calculations require the improved fuel spray boundary condition described but also need higher fidelity physical and chemical models describing the soot production and consumption processes. FIRST will deliver improved CFD soot models, enabling the reduction of soot in aero-engine combustors.

The design of future alternative fuels will be enhanced by FIRST by performing predictions and measurements of both fuel sprays and soot across a number of alternative fuels.

Field of science

/social sciences/economics and business/economics/sustainable economy
/social sciences/social and economic geography/transport/sustainable transport
/engineering and technology/environmental engineering/energy and fuels

Programme(s)

Topic(s)

Call for proposal

FP7-AAT-2010-RTD-1

Funding Scheme

CP-FP - Small or medium-scale focused research project

Coordinator

ROLLS-ROYCE PLC

Address

Activity type

EU contribution

€ 322 595
Participants (21)

**MTU AERO ENGINES GMBH**  
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**A2 PHOTONIC SENSORS**  
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**AVIO SPA**  
Italy

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Activity type: Private for-profit entities (excluding Higher or Secondary Education Establishments)

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**ENGINSOFT SPA**

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€ 90 000

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**IMPERIAL COLLEGE OF SCIENCE TECHNOLOGY AND MEDICINE**

United Kingdom  
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**UNIVERSITE PIERRE ET MARIE CURIE - PARIS 6**

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€ 67 500

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MTU AERO ENGINES AG
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<th>Activity type</th>
<th>Administrative Contact</th>
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<td>OFFICE NATIONAL D’ETUDES ET DE RECHERCHES AEROSPATIALES</td>
<td>France</td>
<td>€ 934 410</td>
<td>Chemin De La Huniere, 91120 Palaiseau</td>
<td>Research Organisations</td>
<td>Brigitte Giacomi (Ms.)</td>
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<td>ROLLS-ROYCE DEUTSCHLAND LTD &amp; CO KG</td>
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<td>Ruud Eggels (Dr.)</td>
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<td>SAFRAN AIRCRAFT ENGINES</td>
<td>France</td>
<td>€ 100 001</td>
<td>Bvd Du General Martial Valin 2, 75015 Paris</td>
<td>Private for-profit entities (excluding Higher or Secondary Education Establishments)</td>
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EU contribution

€ 90 000

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EU contribution
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GE AVIO SRL

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