PROJECT

CHAiRLIFT

Compact Helical Arranged combustoRs with lean LIFTed flames

**Funding:** European (Horizon 2020)
**Duration:** Jan 2019 - Apr 2022
**Status:** Ongoing
**Total project cost:** €1,277,934
**EU contribution:** €1,277,934

**Call for proposal:** H2020-CS2-CFP08-2018-01
**CORDIS RCN:** 221606

**Objectives:**

The main objective of the CHAiRLIFT project is to assess an innovative combustor concept capable to achieve an ultra-lean, low NOx, operation of future engines. With this combustion concept the requirements of ACARE Flightpath 2050 will be fully satisfied. The CHAiRLIFT combustor concept comprises two novel features:

The first is to adopt “low swirl” lean lifted spray flames which feature a high degree of premixing and consequently significantly reduced NOx emissions. Inherent characteristics of such flames are the strongly reduced risk of flashback and a reduced susceptibility to thermo-acoustics instabilities compared to conventional swirl stabilized flames. However, such lifted flames bear the risk of lean blow out at some operating conditions.

A second novelty of the CHAiRLIFT concept an alternative approach to standard flame piloting is proposed, enabling a further reduction of NOx emissions. Stable and safe operations of the combustor are ensured by the interaction of adjacent flames in circumferential direction within the annular combustion chamber. This requires tilting of the axis of the flames relative to the axis of the machine. This design is called Short Helical Combustor (SHC). It has the advantage that no extra pilot flame is required which may produce additional NOx emissions. Additional benefits are the reduced length of the combustor. Most importantly, the turning angle of the NGV can be reduced resulting into a smaller number of NGV and hence reduced cooling air requirement.

Experimental and numerical investigations including the development of an advanced spray atomization model will be carried to assess the NOx reduction capabilities of the concept, by exploiting state of the art methodologies. To explore further NOx reduction capabilities of the concept, an advanced LBO active control will also be tested by combining ion sensor probe and plasma assisted combustion.

**Parent Programmes:**
H2020-EU.3.4. - Horizon 2020: Smart, Green and Integrated Transport

**Institute type:** Public institution
**Institute name:** European Commission
**Funding type:** Public (EU)
**Other programmes:** JTI-CS2-2018-CFP08-THT-01 Innovative NOx Reduction Technologies

**Lead Organisation:**

Universita Degli Studi Di Firenze

**Address:**
Piazza San Marco 4
50121 Florence
### Italy

**Organisation Website:**
[http://www.unifi.it](http://www.unifi.it)

**EU Contribution:** €312,710

### Partner Organisations:

**Universite De Rouen Normandie**

**Address:**
RUE THOMAS BECKET 1 MONT SAINT AIGNAN
76821 MONT SAINT AIGNAN CEDEX
France

**Organisation Website:**

**EU Contribution:** €185,125

**Karlsruher Institut Fuer Technologie**

**Address:**
Kaiserstrasse
76131 Karlsruhe
Germany

**Organisation Website:**
[http://www.kit.edu](http://www.kit.edu)

**EU Contribution:** €665,099

**Universita Del Salento**

**Address:**
PIAZZA TANCREDI 7
73100 LECCE
Italy

**Organisation Website:**
[http://www.unisalento.it](http://www.unisalento.it)

**EU Contribution:** €115,000

### Technologies:

- Emissions control systems
- NOx storage catalyst

**Development phase:** Research/Invention

### STRIA Roadmaps:

- Vehicle design and manufacturing

### Transport mode:

- Air transport

### Transport sectors:

- Freight transport

### Transport policies:

- Other specified

### Geo-spatial type:

- Other