

PROJECT

ASuMED

Advanced Superconducting Motor Experimental Demonstrator

Funding: European (Horizon 2020)

Duration: May 2017 - Aug 2020

Status: Complete

Total project cost: €4,776,226

EU contribution: €4,007,476



[CORDIS RCN : 209910](#)

Objectives:

Air traffic is projected to grow worldwide by 5% per year resulting in increasing fossil fuel consumption and emissions. Previous studies have shown that hybrid-electric distributed propulsion (DP) in civilian aircraft offers a route to achieve the massive reductions in fuel consumption and emission targeted by Flightpath 2050. These studies identify the necessity of potential superconducting solutions to achieve the required power densities and efficiencies. However, no suitable superconductive motor is available to realise DP in large aircraft and no prototypes have been constructed with this aim.

The purpose of the project is to demonstrate the benefits of a new fully superconducting motor with a power density of 20kW/kg. In particular, the ASuMED project will: design an appropriate motor topology, develop a high-temperature superconducting (HTS) stator with an electric loading of >450kA/m, develop a rotor using HTS stacks operating like permanent magnets providing an average magnetic loading of >2.5 T, integrate a magnetization system into the stator area, implement a light, highly efficient cryostat for the motor combined with an integrated cryogenic cooling system and associated power converter.

The above technologies will be demonstrated in a prototype with approximately 1 MW power at 10.000rpm and a thermal loss <0.1%, showing scalability to higher power values. In addition to the motor development, new active cooling designs will be investigated and novel numerical methods will be developed for 2D modelling of superconducting motors at the level of individual turns in the windings and for 3D modelling of motor components. Moreover, an innovative modular inverter topology with enhanced failure protection will be designed, to realise the highly dynamic and robust control of superconducting machines. After assembly of the overall motor, final tests will evaluate the technology's benefits and allow its integration into designs for future aircraft.

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)

Lead Organisation:

Oswald Elektromotoren GmbH

Address:

BENZSTRASSE 12
63897 MILTENBERG
Germany

EU Contribution: €774,250

Partner Organisations:

The Chancellor Masters And Scholars Of The University Of Cambridge

Address:

TRINITY LANE THE OLD SCHOOLS
CAMBRIDGE
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United Kingdom

Organisation Website:

<http://www.cam.ac.uk>

EU Contribution: €619,225

Close Joint-Stock Company Superox

Address:

NAUCHNYI PROEZD 20/2
MOSCOW
117246
Russia

EU Contribution: €0

K & S Gmbh Projektmanagement

Address:

Purweider Winkel 52
52070 Aachen
Germany

EU Contribution: €109,531

Demaco Holland Bv

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OESTER 2
1723 HW NOORD SCHARWOUDE
Netherlands

EU Contribution: €602,031

Karlsruher Institut Fuer Technologie

Address:

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76131 Karlsruhe
Germany

Organisation Website:

<http://www.kit.edu>

EU Contribution: €364,635

Air Liquide Advanced Technologies Sa

Address:

QUAI d'ORSAY 75
75007 PARIS
France

Organisation Website:

<http://www.airliquideadvancedtechnologies.com>

EU Contribution: €620,000

Institute Of Electrical Engineering, Slovak Academy Of Sciences

Address:

Dubravska 9
841 04 Bratislava
Slovakia

Organisation Website:

<http://www.elu.sav.sk/>

EU Contribution: €286,210

Rolls Royce Plc

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65 Buckingham gate
LONDON
SW1E 6AT
United Kingdom

Organisation Website:

<http://www.rolls-royce.com>

EU Contribution: €151,594

Hochschule Fur Angewandte Wissenschaften Aschaffenburg

Address:

WURZBURGER STRASSE 45
63743 ASCHAFFENBURG
Germany

EU Contribution: €480,000

Technologies:

Aircraft propulsion
Aviation hybrid electric powertrain

Development phase: Research/Invention

STRIA Roadmaps: Vehicle design and manufacturing

Transport mode: Air transport

Transport sectors: Passenger transport, Freight transport

Transport policies: Other specified

Geo-spatial type: Other