PROJECT

NATHENA

New Additive manufacTuring Heat ExchaNger for Aeronautic

Funding: European (Horizon 2020)

Duration: Mar 2018 - Feb 2022

Status: Ongoing

Total project cost: €1,499,178

EU contribution: €1,499,178

Call for proposal: H2020-CS2-CFP06-2017-01

CORDIS RCN : 213938

Background & policy context:

Existing heat exchanger manufacturing technologies and processes (mechanical assemblies of repetitive and regular unitary components, such as folded sheet metal and/or tubing, which are mostly welded) can hamper progress towards higher performance.

Traditional manufacturing entails limits for the customisation of the inner structure, which have a direct impact on the thermal behavior of the exchanger core. Design and manufacture a complex core structure accordingly and well adapted to the inner thermal phenomenon seems to be a promising way to increase performances. Accordingly, NATHENA project aims at developing new complex inner structures for heat exchangers.

Objectives:

The NATHENA project will focus on the design development of a complex compact heat exchanger that best addresses thermal performance, made by additive manufacturing. These new compact air-air heat exchangers developed in NATHENA project will provide an efficient thermal management system dedicated to hybrid propulsion system.

Two types of material will be studied regarding heat exchanger use:

- Aluminium for low temperature range and
- Inconel for high temperature range.

The set objectives (see targets below) will be reached using calculation and multi-physical simulation (thermo-mechanical-fluidic) applied to evolutionary latticed and thin-walled structures combined optionally with fins to form a matrix of complex structures.

Predictive models and/or laws will be developed for pressure and temperature drop. Topological and parametric optimization will be carried out in an iterative way towards the most efficient model.

Through sample tests and final element method, calculation correlations will be carried out to ensure the relevance and validity of the basic structural choices as well as their combinations.

Targets:

- Delta temperature: 200°C to 400°C
- Flow: 0.01kg/s to 2kg/s
- Power: 0.5 to 500kW
- Reynolds number: 400 to 10000
- Pressure drop: 100mBar max
- Size: up to 500x300x300mm

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-CS2-2017-CFP06-LPA-01-35 Innovative compact heat exchangers modelisation & characterisation

Lead Organisation:

Sogeclair Aerospace Sas

Address:
AVENUE ALBERT DURAND 7
31700 BLAGNAC
France

EU Contribution: €416,913

Partner Organisations:

AddUp

Address:
5 RUE BLEUE ZONE INDUSTRIELLE DE LADOUX
63118 CEBAZAT
France

EU Contribution: €388,440

Temisth Sas

Address:
45 rue Frédéric Joliot-Curie
13382 MARSEILLE
France

EU Contribution: €326,225

Institut Von Karman De Dynamique Des Fluides

Address:
Chaussee De Waterloo 72
1640 Rhode Saint Genese
Belgium

EU Contribution: €367,600

Technologies:

Aircraft propulsion
New concepts for heat exchangers

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