Foreseeing the next generation of Aircraft

PRESS RELEASE

To be released immediately.

Researchers at KIT to take part in €4.8M Horizon Europe project to design the next-generation aircraft.

The Lattice Boltzmann Research Group (LBRG) at KIT has announced it is taking part in a newly launched €4.8 million euros Horizon Europe project that aims to enhance the design capabilities of the European industrial aircraft sector, focusing on fluid-structure interaction phenomena to improve the aeroelastic performances of aircraft.

Direct aviation emissions accounted for 3.8% of total CO^2 emissions and 13.9% of the emissions from transport in the EU in 2017, making it the second biggest source of greenhouse gas emissions after road transport. In addition, although the noise emissions of each aircraft have decreased approximately by 75 % over the last 30 years, the growing amount of air traffic means that many European Union (EU) citizens are still exposed to high noise levels.

Intensified research and innovation activities are therefore needed to reduce all aviation impacts and emissions (CO^2 and non-CO^2, noise, manufacturing) for the EU to reach its policy goals towards a net-zero greenhouse gas emissions by 2050. One of the main levers to decrease CO^2 emissions is to reduce the airframe structural weight.

As an answer, the four-year project FALCON's (Foreseeing the next generation of Aircraft) ambition is to develop a hybrid approach combining cutting-edge

numerical and experimental methods to analyse fluid-structure interaction, better predict and control the aircraft aerodynamic unsteady loads, thus improving the aeroelastic properties and sustainability of aerostructures and reducing the related aerodynamical noise. This will ultimately contribute to upscale the current design capabilities of the European aircraft industry while enhancing the digital transformation of the European supply chain.

Building upon three industrial test cases and tight links with key European partnerships such as Clean Aviation, four specific objectives will be pursued:

- To capture the essential fluid-structure interaction phenomena occurring in realistic aeronautical conditions combining experiments and simulations through the establishment of a reference set of industrial test cases.
- To simulate the aeroelasticity and related noise emissions occurring in realistic aeronautical conditions thanks to high-fidelity and high-performance Lattice Boltzmann Method frameworks.
- To increase the use and access of high-scalable high-performance computing frameworks for industrial fluid-structure interaction applications, while obtaining cost-efficient and timely results.
- To control the aeroacoustics and aeroelastic instabilities originating from fluid-structure interaction using multi-fidelity optimization.

The project will push forward the industrial leadership of aeronautical industry in Europe, aligning the outcomes of the project towards noise and fuel reductions.

FALCON held its first consortium meeting on 31 January – 1 February 2024 in Marseille (France) with the participation of all 15 project partners and their affiliated entities from 6 countries. The official Launch allowed the consortium members to discuss the project's objectives and the industrial test cases.

As a partner in the Horizon Europe FALCON research project, LBRG at KIT is delighted to be part of this important opportunity to improve the sustainability of global air transport. PD Dr. Mathias J. Krause and Dr. Stephan Simonis (both members of Steering Comittee of FALCON) said: "At KIT, we develop consistent mathematical models, robust numerical methods and highly efficient algorithms to accurately simulate the fluid-structure interaction between air flow and flexible aircraft wings and compute sensitivities. Based on these computational predictions, we can optimize future airplane designs towards lower fuel consumption and noise reduction."

To learn more about FALCON visit the project's website at https://falconproject.eu

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