PRESS RELEASE

Kharkiv, November 2023

Completion of Clean Sky 2 AMBEC Project by Ukrainian Consortium

The development of the gas turbine industry is guided by the instant growth of thermodynamic cycle parameters and, at the same moment, by the reduction of the engine's overall size, including the size of a bearing chamber. These trends lead to higher rotational speeds of turbomachinery, higher temperatures, pressures and velocities of airflow through the gas path.

The AMBEC project has developed an experimentally validated methodology able to calculate heat transfer coefficients and fluid distribution in different zones of the bearing chamber depending on the key engine operation parameters. This methodology will help to improve the design of compact bearing chambers in a hot environment.

To achieve this, the AMBEC consortium has designed and manufactured a complex test vehicle and test bench that enabled sophisticated experimental studies of heat transfer and fluid flows in the bearing chamber, including measurements of oil film thickness and real-time determination of the heat transfer coefficients (HTCi) and their accuracy.

In parallel, the AMBEC methodology for the calculation of the working process in the bearing chamber was developed based on the application of advanced CFD simulation methods.

An extensive test campaign was implemented to collect data on real processes in the bearing chamber depending on the engine operation modes. In total, 103 different test points were studied. Following the comparison of test data and numerical simulation results, the AMBEC methodology was adapted and validated for further application in the aircraft engine industry.

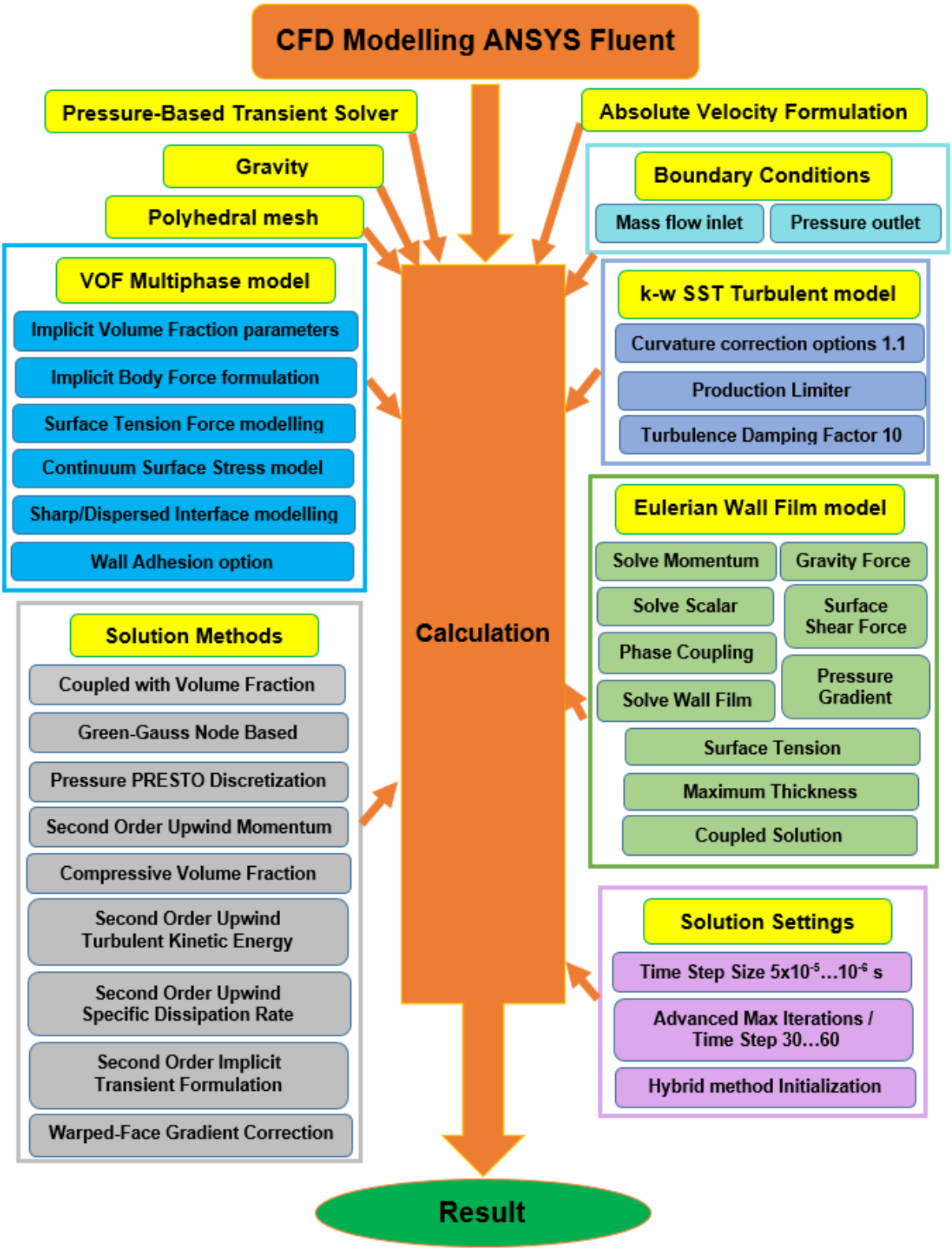
The AMBEC methodology will enable to use of less oil flow rate in the engine and less secondary airflow rate for a reliable bearing operation. In its turn, less power will be required to drive the oil pumps and less fuel will be taken to output the same thrust rate. Less fuel consumption means less environmental impact in terms of CO2 and NOx emissions. Fuel savings will make air travel affordable for the European community. The same effect is expected to be obtained for cargo aviation.

On the other hand, less time and costs will be spent to design and optimize the bearing chamber thanks to the developed methodology application. Hence, the total costs of the engine development will also be lower. In the long prospective, the competitiveness of European engine developers will be improved.

Originally planned for 3 years, the project was extended to 66 months due to delays caused by COVID-19 and suspension caused by the Russian aggression against Ukraine. The AMBEC team – National Aerospace University “KhAI”, Zaporizhzhia Machine-Building Design Bureau “Ivchenko-Progress” SE and Motor Sich JSC – adapted to the circumstances to implement the planned project activities in the best possible way and deliver the results obtained within the project for the benefit of the Clean Sky 2 programme implementation.

The AMBEC project has received funding from the Clean Sky 2 Joint Undertaking under the European Union’s Horizon 2020 research and innovation programme under grant agreement No 785493

Advanced Modelling Methodology for Bearing Chamber in Hot Environment



AMBEC's methodology for CFD modelling of thermal and hydraulic processes in the aircraft engine bearing chamber

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