ASTURIES - Agile Simulation of TURbulent IntErnal flowS

A scientific challenge invites teams of 3 to 4 scientists to propose innovative research, new or disruptive topics, to reduce identified barriers, but also to promote interdisciplinarity and dissemination of information.

In the context of **internal turbulent flows,** relevant to aeronautic and the automotive propulsion and energy production sectors, ASTURIES aims at **developing an innovative Computational Fluid Dynamics (CFD) methodology**.

The next generation of industrial CFD tools will be based on the only approach compatible with admissible CPU costs in a foreseeable future, hybrid RANS/LES. However, state-of-the-art hybrid RANS/LES methods suffer from a severe limitation: their results are strongly user-dependent, since the local level of description of the turbulent ow is determined by the mesh designed by the user.

In order to lift this technological barrier, an agile methodology will be developed: **the scale of description of turbulence will be locally and automatically adapted** during the computation based on local physical criteria independent of the grid step, and the mesh will be automatically refined in accordance. Such an innovative approach requires the use of advanced near-wall turbulence closures, as well as high-order numerical methods for complex geometries, since low-dissipative discretization is necessary in LES regions. Moreover, the identification of relevant physical RANS-to-LES switchover criteria and the refined validation of the method will strongly benefit from dedicated experiments.

In order to successfully address such a multi-disciplinary challenge, ASTURIES brings together specialists of high-order numerical methods, advanced turbulence modelling and experiments.

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