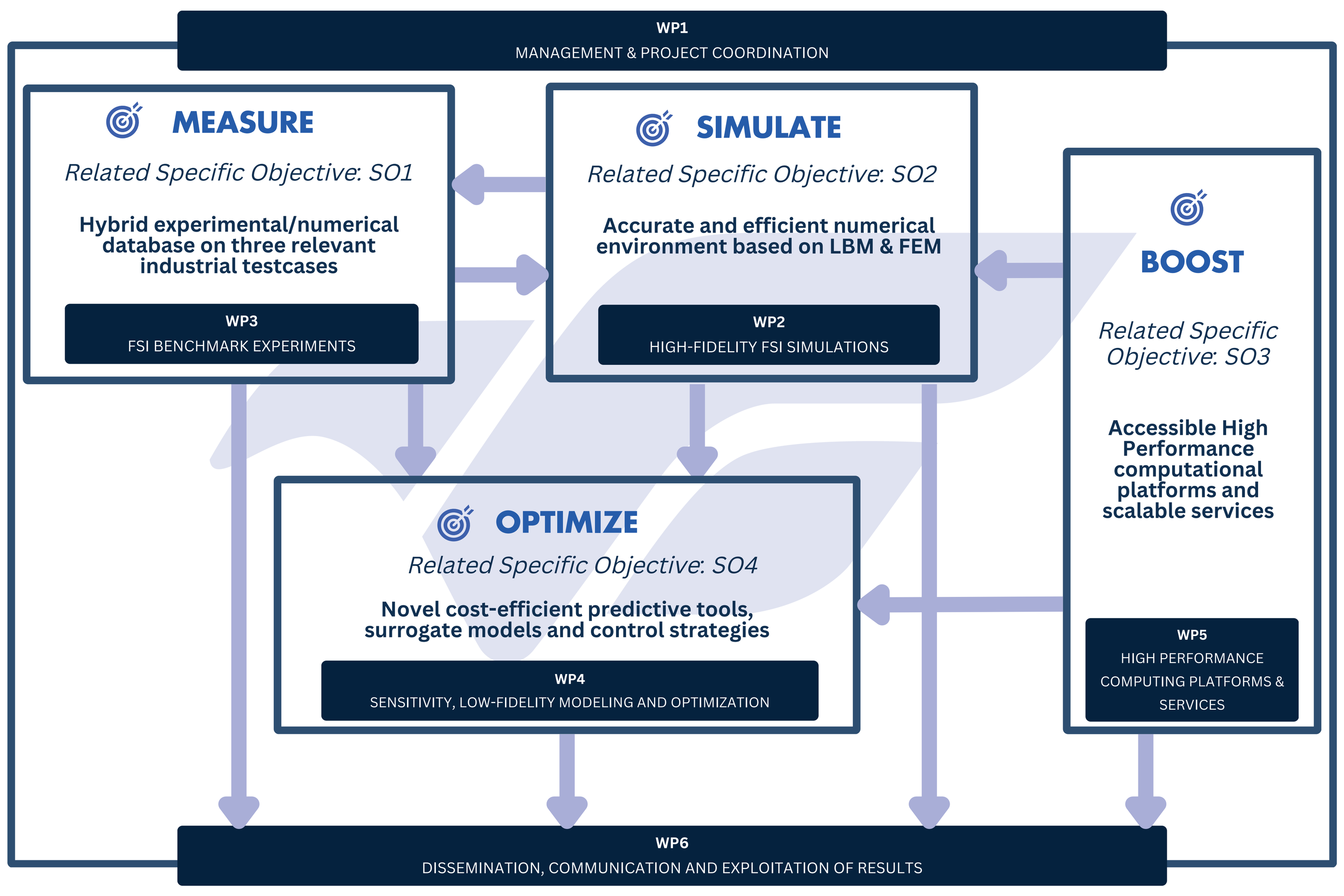
Falcon

Foreseeing the next generation of Aircraft

15	6	4	01/01/24 31/12/27	4.8M€
PARTNERS	COUNTRIES	YEARS		BUDGET

Relying on a sound conceptual methodology



Numerical modeling of realistic fluid-structure interaction (FSI) phenomena

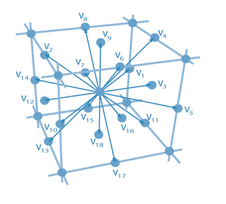
→ **Efficient LBM-based** numerical suite coupling Immersed Boundary Method and FEM in a co-simulation framework

→ **Novel approach** for LBM-based monolithic FSI solver

→ **High fidelity LBM / FEM FSI simulations** with explicit and implicit coupling

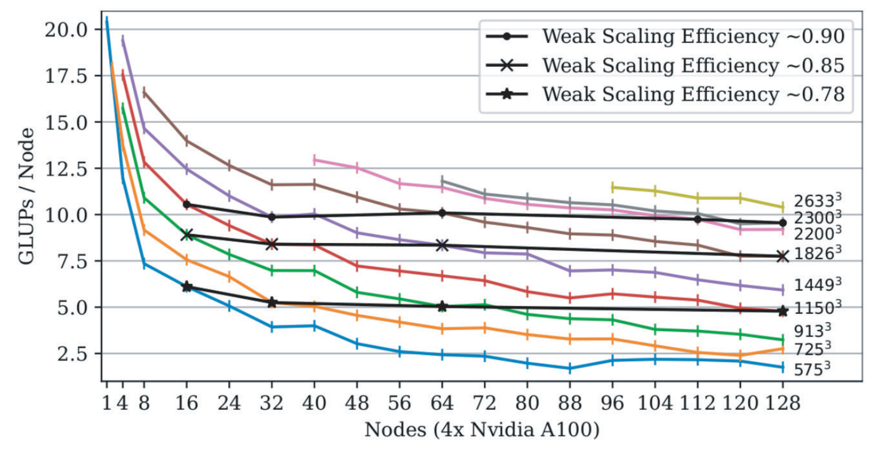
→ **State-of-the-art fluid solvers** (LaBS/ProLB, OpenLB), FEM solvers (Nastran, Espreso)

Model partial differential equations:
→ Navier–Stokes and adjoints
→ Navier–Cauchy and adjoints
→ Additional constraints

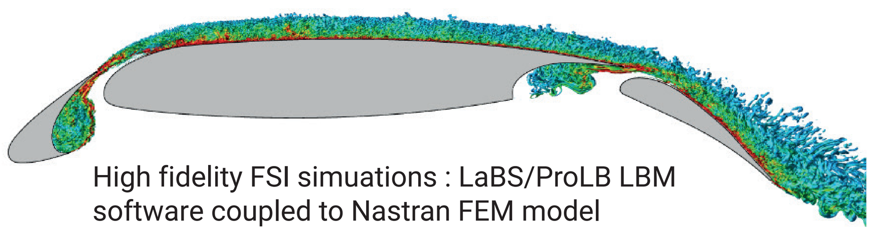


Lattice Boltzmann Methods (LBM)

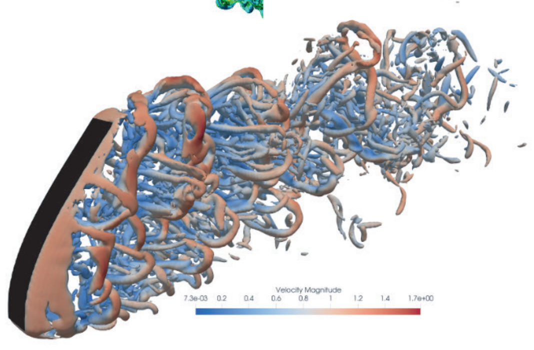
High-fidelity	Platform-agnostic	Mathematical control
Local	Efficient	Sensitivity-based
Monolithic	Scalable	Optimization on HPC



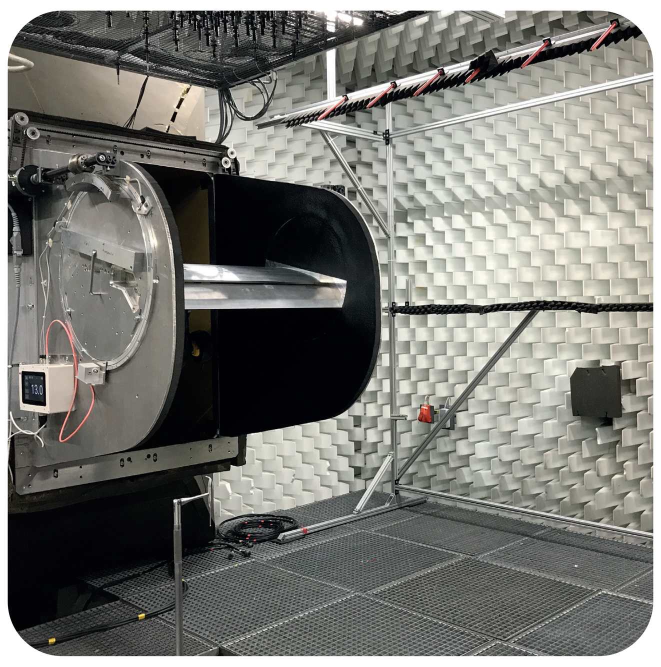
High Fidelity simulations: OpenLB LBM using GPU clusters



High fidelity FSI simuations : LaBS/ProLB LBM software coupled to Nastran FEM model



Visualization of the flow structures in the wake of a flexible plate



Extended measurements of FSI phenomena

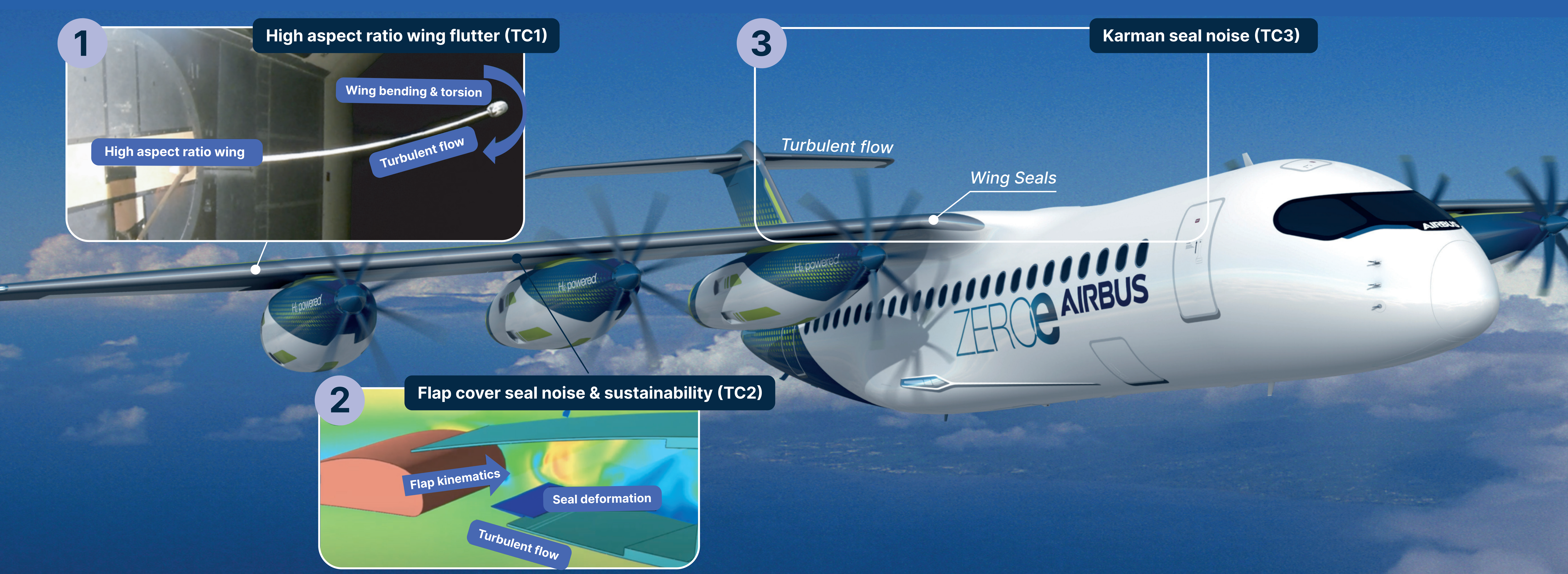
Sensitivity analysis and optimization of aeroacoustics based on high fidelity and Surrogate models

→ **Develop control strategies** based on direct adjoints and differentiable implementations

→ **Identifify most sensitive and optimal control** parameters to enhance aerodynamical performances and reduce noise

→ **Use of a unique hybrid database** (experimental, high-fidelity simulation, sensitivities and physical data) deployed at HPC infrastructures to develop data-driven/surrogate models

A systematic validation procedure targeting industrially relevant test cases



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