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Epsilon Aerospace Computational Mechanics

Monday, 30 November 2020 15:45 (30 minutes)

The Epsilon Aerospace Computational Mechanics research programme finds relevance in the Aerospace and Defence industry. The areas of development are in Weapon Systems Integration (WSI) and Unmanned Aerial Vehicles (UAV's). The state-of-the-art Computational Fluid Dynamics (CFD) and Finite Elements Methods (FEM) numerical techniques are used routinely as a necessary part of the design process. High Fidelity CFD models are required to determine an extensive Aerodynamic load matrix for specific flight manoeuvres at relevant points in the flight envelope. The acquired Aerodynamic load matrix is input in the FEM structural analysis and UAV performance characterization. The use of High-Speed Computing (HPC) allows high fidelity CFD/FEM to be feasible and practical tools in development. The RANS turbulence modeling approach is implemented in OpenFoam with the use of the HISA (High Speed Aerodynamic) and SIMPLE (Semi-Implicit Method for Pressure Linked Equations) solvers to solve for high-speed and low-speed Aerodynamic flow, respectively. HISA is a robust aerodynamic solver that was developed at the Aeronautic Systems Competency Area of the Council for Scientific and Industrial Research in South Africa in collaboration with Flamengro, a division of Armscor SOC Ltd. The turbulence/transitional physical models are typically solved on a 20 Million element mesh. The typical HPC hardware usage is 10 compute nodes in MPI with an average wall-time of 18 hours. The key research programme outcome is the development of optimal products that satisfy customer specification.

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