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Fluid-Structure Interaction Simulations of a Three-Dimensional Flexible Hydrofoil BRENT CRAVEN, ROBERT CAMPBELL, Applied Research Laboratory, The Pennsylvania State University, YOUNG HWANG, THAD MICHAEL, SETH SCHROEDER, Naval Surface Warfare Center, Carderock Division — The deformation of a three-dimensional flexible hydrofoil was studied using two strongly-coupled partitioned fluid-structure interaction (FSI) approaches. Open-source (OpenFOAM), commercial (Abaqus), and custom software are coupled using two different mesh deformation and load/deflection interpolation methods. These approaches were used to carry out high-fidelity FSI simulations of the flow-induced deformation of the hydrofoil at various angles of attack. Large hybrid unstructured computational meshes, exceeding 20 million computational elements, were utilized to demonstrate the practical feasibility of the FSI approaches. Experimental validation of the computational results is presented that includes a comparison with particle image velocity (PIV) measurements of the flow field, force and moment data, and optical measurements of hydrofoil deflection.

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