Fluid-Structure Interaction for Cavitating Impact Flows

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ABSTRACT

To investigate aircraft ditching, a variety of topics need to be addressed. One aspect refer to the deformation of A/C-structure due to the large impact forces. Moreover, due to the high forward speed and the curved hull shape, cavitation and ventilation occur during the early impact. Both phenomena limit the suction forces and influence the A/C loading and thus its deformation as well as the dynamics.

In order to examine the interaction of fluid and structure in two phase flow phenomena, several high-speed impact experiments were performed in two test series by CNR INSEAN. In the first series, flat/mildly curved and partly deforming plates of different thicknesses were examined which did not feature cavitation or ventilation. In a recent second series, longitudinal curvature of the investigated models yielded significant cavitation and ventilation during the impact.

To support an adequat physical modeling by low-fidelity simulation methods, these experiments are computed with two-phase flow URANS methods [1, 2]. For the deforming plates, fluid-structure interaction simulations are performed with the generic C++ framework Comana [3] to manage the FSI data transfer. The presentation will compare the results of the FSI-computations with experiments.

Acknowledgements

This work has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 724139 (H2020-SARAH).

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