Change of Hydrodynamic Loads due to Fluid-Structure Interaction during Aircraft Ditching

Micha Überrück* **and Thomas Rung†**

*† Institute for Fluid Dynamics and Ship Theory (FDS)
Hamburg University of Technology (TUHH)
Am Schwarzenberg-Campus 4, D-21073 Hamburg
e-mail: micha.ueberrueck@tuhh.de, web page: http://www.tuhh.de/fds

ABSTRACT

Aviation is an ever growing market with a strong demand for robust and safe product certification. Since seventy percent of the earth's surface is covered with water, an important saftey aspect is the emergency landing on water, so-called ditching. To support the related comissioning an design needs, a potential flow based simulation method has been suggested in [1]. The approach was subsequently refined to cover various effects like ventilation, cavitation or deep immersion influences.

The simulation of A/C loads usually follows a rigid body assumption, which are subsequently imposed on a deformable A/C to investigate the structure response. The present study is devoted to an investigation of load changes induced by a deformation of the fuselage structure. To investigate the two-way FSI-coupling, a partioned Finite Volume Method (FVM) / Finite Element Method (FEM) [2] is used.

Following a validation of the procedure, an application of a generic fuselage section impacting on a free water surface with a vertical speed of $1.5\,\mathrm{m/s}$ is presented. The hydrodynamic loads are compared to the impact of the same but rigid fuselage section.

Acknowledgement

This work has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 724139 (H2020-SARAH). The computing capacities for the simulations were provided by the North-German Supercomputing Alliance (HLRN).

REFERENCES

[1] Söding, H. *Berechnung der Flugzeugbewegung beim Notwassern*. Report Nr. 602, Inst. for Fluid Dynamics and Ship Theory, Hamburg University of Technology, 1999.

[2] Müller, M.; Woidt M.; Haupt, M.; Horst, P. *Challenges of fully-coupled high-fidelity ditching simulations*, 8th EASN-CEAS, MATEC Web of Conferences 233, 00020 (2018)