

Water impact simulation using a dedicated Fluid Structure Interaction (FSI) method for helicopters ditching analysis

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ABSTRACT

As part of the European research, one aim of the project SARAH is to develop a calculation tool to simulate the emergency landing of aircrafts and helicopters (ditching). Indeed, aircrafts and helicopters often travel above water and thus have to prove a safe landing under emergency conditions. The specific challenge is to improve the safety during ditching from increasing the understanding of the physics and the influence of environment with this kind of tool.

The Smoothed Particle Hydrodynamics (SPH) method is well suited for modelling violent free-surface flows and complex phenomena in a general manner. The simulations have been performed with SPH-flow, a CFD software, developed by Nextflow Software and Ecole Centrale of Nantes, which solves the compressible Euler equations with a Smoothed Particle Hydrodynamics method [1].

Initially, the floats were considered as rigid structures fixed to the helicopter. Therefore, the helicopter and the floats were modelled as a single rigid free body that impacted the water surface from a set of initial conditions.

The main objective of this work is now to model the deformation of the inflatable floats. For that, a coupling between the Finite Element (FE) software Abaqus and SPH-flow has been developed in order to simulate the coupled flow and reaction of the helicopter structure. The coupling is first tested and validated in the case of a flexible sphere impacting the ground and the water surface compared to experimental data obtained by Malleron [2] then Halbout [3]. Then, a dedicated FE model is developed for the entire helicopter equipped with the deformable floats. The Fluid-Structure Interaction method is finally applied to the helicopter equipped with its deformable floats and compared to experimental data from tests in the Hydrodynamic and Ocean Engineering Tank of the Ecole Centrale of Nantes.

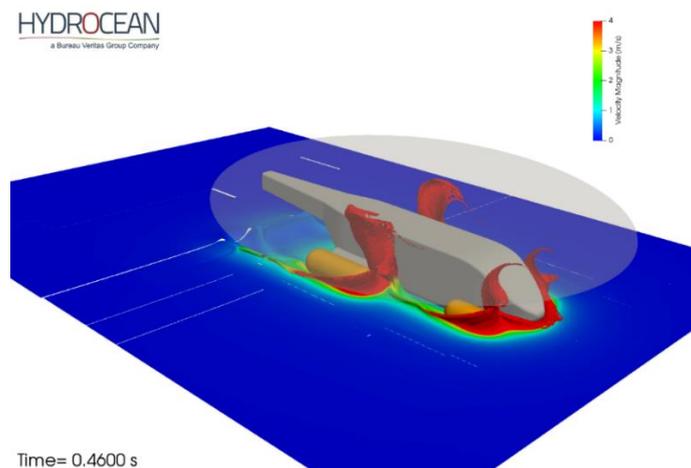


Figure 1: Helicopter ditching in the case of rigid floats

REFERENCES

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