Simulations of airplane and helicopter ditching using Smoothed Particle Hydrodynamics

I. Hammani[1], A. Vergnaud[1], G. Oger[1], B. Bouscasse[1], D. Le Touzé[1], S. Marrone[2], M. De Leffe[3], A. Bannier[3], L. Chiron[3], Y.Jus[4], M.Garnier[4]

[1] Ecole Centrale de Nantes, LHEEA, CNRS UMR 6598
[2] CNR-INM, Romes
[3] NEXTFLOW Software, Nantes
[4] BV Solutions, Nantes

ABSTRACT

The present work has been performed in the context of the European H2020 project SARAH (Increased Safety and Robust certification for ditching of Aircrafts and Helicopters) dedicated to improving the safety during aircraft ditching, together with a better understanding of the physics involved during those crucial events. Both numerical and experimental aspects are explored during this project. The present study focuses especially on the application of Smoothed Particle Hydrodynamics (SPH) method to the simulation of airplane and helicopter ditching. This method has proved to be particularly adapted to complex free surface impact cases on a calm free surface [1] as well as in presence of waves [2].

For the helicopter ditching study, the simulations deal with various impact configurations and for different wave conditions. The numerical solutions are systematically compared with the experimental results (impact forces, local pressures, trajectories etc…) obtained at the wave basin of Ecole Centrale Nantes.

For the airplane ditching study, the SPH simulations are dedicated to reproduce some experimental impacts performed in the towing tank of the CNR-INM in Rome [3]. The time evolution of forces and local pressures are studied, and a special attention is also paid to the detection of cavitation pockets which seem to occur during high speed impacts, strongly affecting the resulting flow.

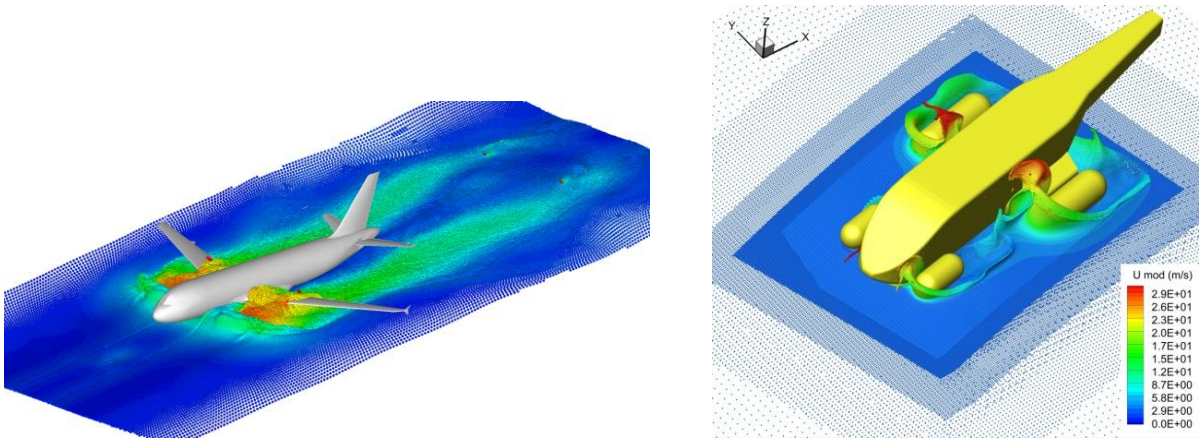

Figure 1. SPH simulation of airplane and helicopter ditching.

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