6th European Conference on Computational Mechanics (ECCM 6)
7th European Conference on Computational Fluid Dynamics (ECFD 7)
11-15 June 2018, Glasgow, UK

Numerical Investigation of Rectangular Flat Plate Slamming

Jose D. Mesa, Kevin J. Maki

Dept. of Naval Architecture and Marine Engineering, University of Michigan, Ann Arbor, Michigan, USA, jmesa@umich, kjmaki@umich.edu

Keywords: *Plate Ditching, Fluid-Structure Interaction, Slamming Three-Dimensional Effects, Peak Pressure Curvature*

In this paper, we present the hydroelastic assessment of high-speed flat plate slamming events. The complex water entry problem involves the interaction of the structure with a dense fluid and time-dependent wetness. While the majority of the studies of this problem have been focused on the pure vertical motion, in this study, we primarily focus on the effects of large forward speed on the hydroelastic response of the plate.

The fluid-structure interaction (FSI) methodology used in this work is based on a tightly coupled approach between computational fluid dynamics (CFD) and finite element method (FEM). For the fluid domain, CFD with the volume-of-fluid (VoF) method is applied to solve the air-water interface. For the structure simulation, the commercial software Abaqus is used to discretize the structure with linear dynamic finite elements, and modal decomposition is applied to the FEM model to decoupled and truncated the structural system.

The study examines the hydrodynamic performance and global response of two flat-plate structural arrangements and investigates the importance of three-dimensional flow effects. Rigid body and two-way coupled simulations are presented to investigate and assess the hydroelastic effects of hydrodynamic loading during slamming events.