2D Local Fuselage Deformations during Water Impact

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ABSTRACT

During an aircraft ditching event, high local loads can occur, that might cause deformations of the cross section. These deformations may reach from elastic deformations to plastic deformations and rupture.

The 2D+t simulation tool *ditch* [1] evaluates the ditching loads on the rigid cross section aircraft (cf. Fig 2). Aiming to consider load changes due to cross-section deformations requires the implementation of a deformation procedure. The presentation addresses a deformation model that complies with the parameterized numerical framework. The main advantages such parameterized tools are real-time efficiency, stronger robustness and negligible preprocessing effort, which should be preserved by the deformation model. A natural first candidate towards a deformable structure refers to a simple A/C beam model [2] to capture the global deformation. However, local deformations in impact-critical regions of the fuselage are of course not extractable by such models. Therefore, a supplementary approach is investigated, which employs a finite number of 2D cross sections (cf. Fig. 1) in line with the beam segmentation. Similar to the load model, the deformation model is also defined in the 2D+t way and the structure dynamics is not resolved but modeled to support the efficiency.

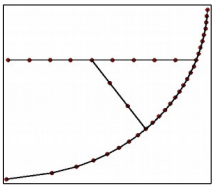

Figure 1: Lower part of the 2D half model of one cylindrical cross section.

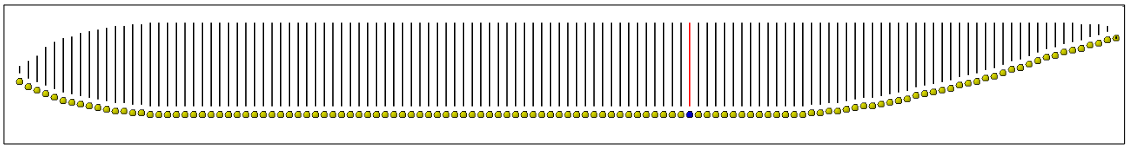

Figure 2: Fuselage Discretization in Sections. The hydrodynamic forces are evaluated on the submerged sections.

The presentation discusses the parametrization of such models, reports on validations and outlines further improvements.

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