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ON EFFICIENT MODELING OF HIGH-VELOCITY FLUID SOLID IMPACT

Abstract

Estimating damage that can be caused by aircraft impact is important in proportioning or retrofitting certain building structures. Simulating an aircraft impact on a structure requires expensive modeling and computational efforts. This study investigates if an aircraft model assembled using simplified geometry and an approximate mass distribution will lead to calculated damage those for an “exact” model.

Reliability of models assembled using Ls-Dyna 3D was tested against a series of seven fluid-structure impact tests and for an F4 Phantom aircraft impacting a concrete block. Impact studies of the two F4 aircraft models, a detailed and a simple model, on a deformable structure were conducted for various initial aircraft speeds.

The applicability of a simple model representing a commercial aircraft impacting a structure was then tested for the case of the attack on the World Trade Center. Calculated column damages in the façade and interior column core of the WTC building model were compared for two Boeing 767 aircraft models differing in their complexity. A sensitivity study of the structural damage to variations in the initial aircraft attitudes was also conducted. Results of this study support the assumption that a simple aircraft model is able to caused equal damage to a structure as an “exact” model by requiring less labor and computational time.