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Air Accident Reconstruction and Crashworthiness Analysis

Since 1989, Cranfield has been applying computer simulation methods to reconstruct a number of real world aircraft crashes. The aim of this work has been to provide additional, retrospectively predicted data for use in the accident investigation process. Flight Data Recorders can not, by themselves, present a comprehensive picture of the severe dynamic conditions that often can happen in a crash. Computer simulation can be used, at the discretion of the investigator, to quantify the conditions that prevail during a crash. Output from a computer simulation will typically include predictions of the overall motion of the airframe, its break-up sequence and the magnitude and duration of forces on occupants, seats and overhead bins during impact. This predicted output can be of interest to a number of safety related areas. Firstly, the accident investigator can use it as an aid to understanding the dynamics of the accident. Secondly, output defining the occupant environment during impact can be used to address occupant survivability issues, for example, by correlating predicted injuries with actual injuries. Finally, the wider aircraft design and regulation community can use such data to explore the crashworthiness of new designs in reconstructed crash environments.

This paper outlines the development and recent application of computer simulation methods to aircraft crash analysis.