

# **A Comparative Analysis of Occupant Response Between Sub-Scale and Full-Scale Tests of Fokker F28 Aircraft Hardware**

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## **Abstract**

In 2019, the National Aeronautics and Space Administration (NASA) Langley Research Center (LaRC) conducted a full-scale crash test of a Fokker F28 MK1000 aircraft. This test concluded a multi-year research effort in which two component fuselage sections of a matching Fokker F28 aircraft were previously tested under similar vertical impact conditions. Due to facility and cost constraints of full-scale testing, aircraft are typically evaluated through component level tests (i.e. vertical drops of fuselage subsections or isolated seat tests). Although more practical, these tests are limited in their ability fully replicate the complex multi-axis loading environment induced on the occupants during a full-aircraft crash event. Because of this, there is risk that component level testing does not provide a complete assessment of vehicle crashworthiness. Comparative analysis between full-scale and component level testing of the Fokker F28 aircraft provides an excellent opportunity to evaluate differences in crashworthiness prediction made between these levels of test fidelity.

In this study, Anthropomorphic Test Device (ATD, a.k.a crash test dummies) responses measured during the Fokker full scale impact test were compared to those measured in the component fuselage section drops. A variety of ATD configurations (5<sup>th</sup>, 50<sup>th</sup>, 95<sup>th</sup>) and positions (upright, braced) were tested in both the full-scale and component tests. ATD injury metric response comparisons were made across these ATD variations in addition to comparisons made with respect to ATD location within the vehicle. Results found the addition of horizontal impact velocity, achieved in the full-scale testing, along with aircraft structural effects altered ATD based crashworthiness assessment of the vehicle.