Transport Aircraft Water Mishap Kinematics & Regional Jet Mishap Kinematics

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Abstract:

The presentation will describe two studies conducted as one project[1] to investigate the kinematics for two sets of mishaps. One study investigated 22 water entry mishaps and the other investigated 24 regional jet mishaps. The purpose of the study was improve the understanding of transport aircraft crashworthiness by quantifying the kinematics of the crashes and the outcomes. Ultimately the goal is improve the survivability of water mishaps and regional jet mishaps by understanding characteristics and outcomes of these event.

The mishaps selected were those with thorough and readily available investigation reports and deemed to be potentially survivable. Data on mishap kinematics, damage, placement of occupants, and occupant outcomes were extracted from the reports. The mishaps in each study were assigned to mishap scenarios unique to that study. The data were then used to develop correlations between crash kinematics and the mishap outcome as represented by aircraft damage and occupant injury severity. The two mishap types, water entry and regional jet, are treated separately and equally in the analysis.

For the water mishaps, the report first characterizes the ditchings looking especially at the pilots' available thrust to control the aircraft attitude. For each mishap scenario, the report develops correlations between the kinematic parameters of the mishaps and the resulting mishap damage and injury fractions. Data were also extracted on emergency evacuations, and door and exit functionality. The damage and the injuries are allocated to five segments of the aircraft fuselage: cockpit, forward cabin, overwing cabin, aft cabin, and tail. Predictive models are developed for injury fraction using binary logistics regression on the kinematics data.

For the regional jet mishaps, the report identifies each mishap with a mishap scenario. For each scenario, the report develops correlations between the kinematic parameters and the resulting mishap damage and injury fractions. The damage and injury data are allocated to five fuselage segments and analyzed accordingly. Predictive models are developed for injury fraction using the binary logistics regression on the kinematic data. The data on emergency evacuations and exit functionality are also reported by scenario.

The purpose of this presentation is to make the conference attendee aware of the study and the contents of the report. The presentation will describe the mishap selection criteria, the data extracted, and the mishap scenarios. The presentation will report selected results from the analyses.

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[1] Study of Transport Aircraft Water Mishap Kinematics and Regional Jet Mishap Kinematics; Labun, L.C.; Cress, J.P., DOT/FAA/TC-17/52. October, 2017.