

Biofidelity evaluation of current ATDs under seatbelt pre-pretensioner loading in quasi-static conditions

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Abstract

Progress in hazard detection technology has pushed the development of automotive smart restraints such as seat-belt pre-pretensioners. These may now be triggered by warning systems in the pre-crash phase. A force (a few hundred Newton) is applied on the seat-belt with the aim of reducing belt slack and mitigating the out-of-position issue. This technique introduces a new load case for which the current Anthropometric Test Devices (ATDs) have been neither designed nor validated.

The objective of this study is to compare kinematics and seat-belt interaction between different sizes of ATDs (Hybrid III 5th percentile female, prototype BioRID50F 50th percentile female, THOR and BioRID-II 50th percentile males, Hybrid III 95th percentile male) and volunteer subjects (selected to fit ATD sizes on average).

The experiments are conducted under quasi-static conditions in a passenger vehicle in the positions of the driver, front passenger and rear left passenger. Kinematics is tracked via film analysis and seat-belt interaction is monitored by means of belt movement and belt force sensors. Volunteers' reaction and habituation to the load case receives particular attention. Volunteer response corridors will be the basis for a scoring of the biofidelity performance of the different ATDs. Experimental work is currently in progress.