OCCUPANT RETENTION IN REAR IMPACT

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ABSTRACT

From an automotive safety occupant protection standpoint, effective occupant restraint requires a system capable of providing non-injurious occupant ride down of anticipated crash forces. This is not only the case for frontal collisions, where occupant restraint is provided primarily by seatbelts and airbags, but is also critical for other crash modes such as side impacts, rear impacts, rollovers, as well as multiple impact events. In the rear impact crash mode, occupant restraint is provided primarily by the seatbacks and to some extent the seatbelts.

Foundationally, therefore, what becomes fundamental to the seatback's role in rear occupant protection is its ability to contain the occupant within the seat, preventing occupant ramping, as well as preventing the seat's, and/or its occupant's, dangerous intrusion into the rear occupant's survival space where contact with rear compartment components and/ or rear seated occupants can present a significant injury risk.

An analysis is presented of a series of rear impact sled testing conducted by the authors that evaluates the timing, position and extent of the front seatback's reward displacement toward and into the rear occupant compartment as well as consideration of the front seat occupant's ramping potential and its injury potential relative to the rear compartment. Additionally, three other series of testing are presented which assess various seat designs occupant retention capabilities. Lastly, a matched-pair comparison test series is presented which evaluates occupant motion in rear impact with and without use of a typical vehicle body mounted 3-point seatbelt. Discussion of restraint system performance observed in all the testing is included along with ATD biofidelity and thigh-gap considerations. The data collected and presented includes accelerometer instrumentation and high speed video analysis.