C31 Occupant Excursion and Restraint System Performance in Rollover Testing

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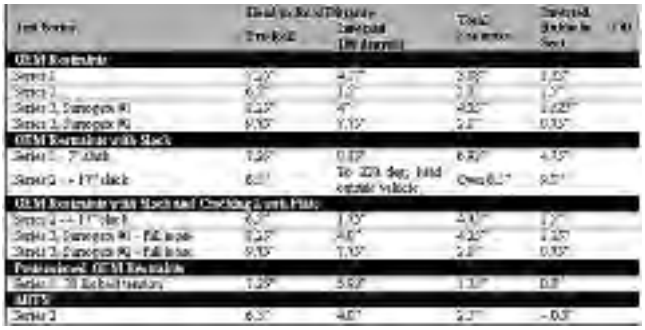
After attending this presentation, attendees will have a better understanding of the effect of seat belt looseness, or slack, and its relationship to occupant excursion during a rollover by evaluating various restraint system designs and configuration in rollover-type test environments.

This presentation will impact the forensic science community by occupant protection. Research has shown that the potential for injury can be decreased by closely coupling the occupant to the seat. The presented testing studies the ability of various restraint systems to control occupant excursions out of the seat.

Providing effective occupant protection in automotive rollover crashes requires supplying the occupant with a restraint system proven effective in this accident mode. Preventing occupant ejection and providing restraint through the rollover sufficient to prevent potentially injurious contacts with interior vehicle components are paramount for effective occupant protection. Research has shown that the potential for injury can be decreased by closely coupling the occupant to the seat. The presented testing studies the ability of various restraint systems to control occupant excursions out of the seat. This presentation will give attendees a better understanding of the effect of seat belt looseness, or slack, and its relationship to occupant excursion during a rollover by evaluating various restraint system designs and configuration in rollover- type test environments.

A series of roll spit tests were performed utilizing production sport utility vehicles (SUVs) with a female occupant (5th to 25th percentile) positioned in one of the front seating positions. Measurements were taken of the occupant's initial upright clearances to the surrounding vehicle structure. The vehicle occupant compartment was then rotated to an inverted orientation, 180 degrees of rotation (unless otherwise noted), and the excursions and clearances were recorded. Various restraint systems were considered and subjected to testing, including the original equipment manufacture (OEM) as well as other restraint systems designs seen in production. The observed results of the testing are summarized in the following Table.



The testing demonstrates that occupant excursions in vehicle rollover circumstances are dramatically affected by the chosen restraint system. Slack in an OEM restraint system increases the occupant excursion from that of a normally tight OEM restraint system. This additional excursion can greatly increase the occupant's potential for injurious contacts with the interior of the vehicle during a rollover and/or contribute to the occupant's partial or full ejection. Various restraint system components added to the tested vehicles demonstrate a decrease in the occupant's excursion; and therefore, a decrease in injury potential. Simply adding a cinching latch plate, even allowing slack in the torso belt, is seen to prevent vertical excursions beyond that of a tight belt configuration. A pretensioned belt or all-belts-to-seat (ABTS) restraint system shows a large decrease in the amount of occupant excursion. **Rollover, Restraint, Excursion**

 ** Presenting Author*