C35 Seat Belt Failure in a Vehicle-to-Vehicle Frontal Crash

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The goal of this presentation is to present objective, scientific evidence of seat belt failure that occurred under controlled, repeatable test conditions. This testing proved that production seat belts do fail under foreseeable conditions that are well within design guidelines.

This research impacts the public that wears seat belts in motor vehicles. Any seat belt or other restraint system that can fail under such low loads is a significant hazard to the public. This research should be of interest to vehicle crash investigators, safety officials, and vehicle designers.

The objective of this presentation is to present dynamic crash testing depicting a failure of a production seat belt in an offset frontal collision. This test proves conclusively that even under intended design conditions, in a relatively low change-of-velocity impact that failed to deploy airbags, a properly-attached, apparently functional and undamaged production seat belt failed to remain latched. This has significant safety implications for the public, as well as vehicle designers, safety officials, and crash investigators.

A vehicle-to-vehicle crash test was conducted by a certified test labo- ratory that regularly performs similar crash testing for government safety agencies and auto manufacturers. A bullet vehicle traveling approximately 60 mph struck a stationary vehicle in the right rear quarter panel. The change in velocity of the bullet vehicle was low enough that airbags did not deploy.

A ballast dummy was restrained with the OEM lap-shoulder seat belt in the driver seat of the bullet vehicle. The seat belt was placed around the ballast dummy per normal test procedures. The belt can be seen around the dummy in pre-test photos and in high-speed video. The belt restrained the dummy through the initial phase of the collision, until crush was complete, at approximately the point of vehicle separation. The bullet vehicle began to ramp up over the target vehicle, and began to roll over after impact. The left front seat belt buckle then failed to remain latched and the seat belt flew out the driver window. The ballast dummy then was ejected from the vehicle during the rollover. A repeat test was conducted with identical vehicles and impact configuration, with no seat belt failure. This test series proved that restrained occupants can be subjected to seat belt failure, ejection and increased injury risk, even with seat belts that apparently meet applicable U.S. Federal Motor Vehicle Safety Standards.

Reasonably similar failures have been seen in a wide variety of seat belts found in other vehicles from various manufacturers. The defects in this seat belt system are not apparent to the average consumer, and are not clearly visible by external examination of the seat belt mechanism.

Seat Belt Failure, Occupant Protection, Frontal Impact

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