1) Enhanced Reconstruction Methods for Determining Side Impact Injury Risk

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3) Abstract:

Each year in the U.S., vehicle side crashes result in over 6,000 fatalities. Efforts to mitigate this figure depend heavily on predictions of side crash injury risk; the objective of this study is to improve such predictions.

ΔV is a predominant metric of crash injury risk, but is difficult to estimate accurately for side crashes. WinSmash, the crash reconstruction program responsible for most ΔV estimations in the National Automotive Sampling System/Crashworthiness Data System (NASS/CDS), in particular is known to over-predict side crash ΔV by roughly 20% on average. Possible reasons for this are manifold; in this study, we examine the consequences of point-mass assumptions used when generating the WinSmash vehicle "stiffness" coefficients from crash tests. These assumptions neglect the energy that goes into test vehicle rotation and can thereby introduce error into the calculated vehicle stiffness.

Side crash tests from which WinSmash vehicle side stiffnesses had been generated were selected. Using accelerometer data for these tests, the amount of kinetic energy actually dissipated in the tests (accounting for rotation) was determined and new stiffness coefficients generated from this dissipated energy for the tested vehicles. Side crashes involving the tested vehicles were selected from the NASS/CDS and the ΔVs

estimated with WinSmash using the new stiffnesses. Injury risk curves were calculated using both the original and new ΔVs, and compared.

In this paper we present original and recalculated WinSmash stiffnesses for the studied vehicles, original and recalculated ΔVs for NASS/CDS side impact cases involving said vehicles, and injury risk curves generated from both sets of ΔVs.

Our preliminary findings indicate that when vehicle rotation is accounted for, the WinSmash vehicle stiffness is reduced by between 5.30% – 11.5%. This correction alone can reduce estimated ΔV error by as much as 27.8% for individual cases.

4) An oral presentation slot is preferred.