Crash Simulation of FMVSS No. 214 Safety Performance

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Motivation

1) How do design modifications that result in non-compliance for one of the configurations affect the other two load cases?

2) Is it feasible to use a dynamic performance measurement as a surrogate for the static test?
Approach

Model Validation

Vehicle Selection

Simulation Study

Background

FMVSS No. 214 Crash Simulations

Mutual effect of non-compliance
Vehicle Selection

Vehicle 1: Toyota Camry Sedan
FE model exists

Vehicle 2: Nissan Roque Crossover SUV
FE model is being developed

Sedan and SUV vehicles present different characteristics relevant for side impact, i.e. different mass, seating and sill height
Test and simulation showed good correlation with respect to vehicle pulse, barrier and vehicle deformation.
Test and simulation showed excellent correlation with respect to vehicle pulse, and maximum exterior vehicle deformation.
Test and simulation showed good correlation with respect to resistance force versus intrusion, initial, intermediate, and peak force values.
Different design modification were developed that resulted in non-compliance for each of the three configurations.
Simulation Study – Effect of FMVSS No. 214 - Static Non-compliance

Case Study indicated **FMVSS214-MDB compliance** despite **FMVSS-214-static non-compliance**
Case Study indicated **FMVSS214-Pole compliance** despite **FMVSS-214-static non-compliance**
Case Study indicated **FMVSS No. 214-static compliance** despite **FMVSS No. 214 MDB non-compliance**
Case Study indicated **FMVSS No. 214-Pole compliance** despite **FMVSS No. 214 MDB non-compliance**
Sill, seat cross member, and reinforcement components were weakened to produce FMVSS No. 214-Pole non-compliance.
Simulation Study – Effect of FMVSS No. 214 - Pole Non-compliance

Case Study indicated **FMVSS No. 214-static compliance** despite **FMVSS No. 214 Pole non-compliance**
Simulation Study – Effect of FMVSS No. 214 - Pole Non-compliance

Case Study indicated **FMVSS No. 214-MDB compliance despite FMVSS No. 214 Pole non-compliance**
Ongoing Work I – SUV Simulation Study

A FE model of a SUV Crossover vehicle is currently being developed to conduct similar simulation study.
Can a performance criteria be defined that could eliminate the static door crush test by moving the door strength requirements into the dynamic side impact test(s)?
Preliminary FMVSS No. 214 Study Conclusions

• The three configurations engage different main load paths
• Structural modifications that resulted in non-compliance for one of the load cases did not result in non-compliance for the other two configurations
• There are limitations of using measurements from the dynamic test(s) to indicate door crush resistance as measured by the static test
• Feedback is welcome and can potentially be considered in the ongoing research
Acknowledgment

This research is funded by the National Highway Traffic Safety Administration (NHTSA).

The GMU Team would like to recognize the valuable contributions from many NHTSA representatives.

Special thanks to Sanjay Patel, Louis Molino, and Steve Summers.
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Thank You

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