The Effects of Various Parameters on Dynamic Loads at the Top Tether Anchor

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INTRODUCTION

- Lower anchors and tethers for children (LATCH) is a standardized method for attaching child restraints systems (CRSS) to vehicle seats, in an effort to reduce misuse and improper installation.¹
- The Federal Motor Vehicle Safety Standard (FMVSS) No. 225 evaluates the strength of the LATCH child restraint anchorage systems in vehicles under a static loading test.²
- The drawback with the static loading evaluation is the dynamic conditions of a motor vehicle crash are not taken into account, and the evaluation of the top tether anchor independently from the lower anchors is not covered by the standard.
- The goal of this study was to further understand the dynamic loads experienced at the top tether anchor and the effect of various parameters on these loads.

METHODS

PHASE 1
- Constructed a finite element (FE) sled test environment simulating frontal impacts, described by the FMVSS No. 213 standard.³
- Sled Test Setup:
  - FMVSS No. 213 test bench
  - Forward-facing CRS
  - Hybrid III 6YO ATD
  - Flexible LATCH system

PHASE 2
- Validated the model with top tether and lower anchor loads from a sled test performed by Transport Canada.

PHASE 3
- Parametric Study 1:
  - Soft, stiff, rigid seat foam stiffness
  - CRS A and CRS B
  - Top tether anchor location: shelf, roof, seatback, and floor
- Parametric Study 2:
  - Top tether angle

RESULTS & DISCUSSION

From Parametric Study 1, the top tether loads ranged from 2.9 - 9.1 kN and top tether anchor location and CRS had noticeable effects on these loads.

From Parametric Study 2, the angle of the top tether was determined as a factor that will directly affect top tether anchor loads.

CONCLUSIONS
- From Parametric Study 1, the top tether loads ranged from 2.9 - 9.1 kN and top tether anchor location and CRS had noticeable effects on these loads.
- From Parametric Study 2, the angle of the top tether was determined as a factor that will directly affect top tether anchor loads.
- Future work is to perform this study in the side impact test scenario.

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REFERENCES