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The Honorable Steven Cliff
Acting Administrator
National Highway Traffic Safety Administration
1200 New Jersey Avenue SE
Washington, DC 20590

Request for Comment; Federal Motor Vehicle Safety Standard 213; Child Restraint Systems, Incorporation by Reference; Docket No. NHTSA-2020-0093

Dear Acting Administrator Cliff:

The Insurance Institute for Highway Safety (IIHS) welcomes the opportunity to comment on the National Highway Traffic Safety Administration's (NHTSA's) Notice of Proposed Rulemaking (NPRM) to modernize Federal Motor Vehicle Safety Standard (FMVSS) 213, Child Restraint Systems. IIHS supports the decisions to update the seat assembly and belt system to make them more representative of the vehicle fleet and to change labeling requirements to encourage children to remain in age- and size-appropriate restraints for longer but suggests that NHTSA reconsider the petition to incorporate a floor into the regulatory bench. We also recommend adding a simulated retractor to the belt system and collecting more child-specific crash data to be able to monitor existing and emerging issues in child passenger safety.

Updating the Representative Seat Assembly and Belt Type (Sections III–IV)

IIHS agrees that the test bench used in FMVSS 213 should be more representative of the vehicle environment and supports the proposed geometry and stiffness changes to better align with characteristics of rear seats in the vehicle fleet. The seat belt anchorage locations seem a reasonable compromise between anchorage locations in the vehicle fleet and the constraints and practicalities of the testing environment. In addition, IIHS agrees that seat characteristics for the front and side test benches should be harmonized, as there is no reason why the representativeness of a seat would differ between real-world exposure to front- and side-impact crashes.

IIHS agrees with the proposal to update the belt system to a Type 2 (lap/shoulder) belt, as lap and shoulder belt systems best represent most rear seat configurations in the fleet. However, IIHS recommends that NHTSA incorporate a simulated retractor into the belt system, since more vehicle-like performance of the seat belt is a critical element for the meaningful assessment of boosters. In the FMVSS 213 test, the belt system is locked and tensioned pretest, which limits its representativeness when used with boosters. In Transport Canada's testing, booster performance and occupant kinematics differ substantially between the test bench and the vehicle environment (Tylko et al., 2016, 2017). Since booster seats necessarily work in tandem with the vehicle belt system, it is critical that the test environment mimic the vehicle environment as closely as is practicable, including the incorporation of a retractor. NHTSA has sponsored research that showed belts with a simulated retractor resulted in occupant kinematics that were more representative of the vehicle environment (Manary et al., 2019). Transport Canada has conducted similar research and reported similar findings (Tang et al., 2019). The current requirements of FMVSS 213, with the locked and tensioned belt, can be passed without the use of a booster at all (Klinich et al., 2010), highlighting the inability of this regulation to meaningfully discriminate booster performance.

Retractors are present in all rear-seat lap/shoulder belts, so a retractor must be included as a minimum for more realistic testing of booster performance. However, NHTSA should additionally test boosters using load-limited belts, as load-limiters are already present in nearly a third of rear seats in new vehicle models and that proportion is expected to grow rapidly in response to IIHS's rear-seat safety ratings, which will be introduced later this year. The closer the laboratory test is to the real-world environment, the more likely that improvements in child safety seat performance will reduce injury risk to children in crashes.

Denial of Petition Regarding a Floor (Section V)

IIHS recommends that NHTSA reconsider the denial of Volvo's petition to add a floor to the regulatory bench. Further, NHTSA should perform the necessary research to determine whether child restraints with support legs may be a beneficial addition to the U.S. market and should be accommodated in the regulation. Support legs offer potential safety improvements and may be a reasonable solution to U.S.-specific challenges, such as tether nonuse in pickups. An unintended consequence of denying the petition outright may be that child restraints with support legs, which have proliferated in Europe, will not enter the U.S. market, and this may be a net loss for child passenger safety in the U.S.

Child restraints with support legs offer multiple potential benefits. They increase stability and reduce the variability in child restraint installation in real vehicles (Sherwood et al., 2007). The additional stability also allows the option for larger children to remain rear-facing for longer. In testing, support legs reduce head and neck forces in the dummy, reduce child restraint rotation and consequently, reduce rebound (Patton et al., 2020; Sherwood et al., 2007).

In addition to general safety benefits, support legs may be particularly well-suited as a potentially more user-friendly anti-rotation device than top tethers. Despite two decades of use, LATCH has not successfully eliminated misuse, in particular tether nonuse, and there is no evidence to suggest that support legs would increase confusion or misuse. NHTSA should revisit all options that may help improve safety, reduce misuse, and increase the use of anti-rotation devices. In the U.S., about half of parents do not use the top tether, and tether use is substantially lower in pickups than in other vehicle types (Eichelberger et. al, 2014; Jermakian & Wells, 2011). Pickups continue to be an extremely popular vehicle choice and given the substantial misuse and confusion over correct tether use in pickups, and the lack of intuitive engineering solutions to these challenges (Klinich et al., 2018), allowing support legs might be a more practical and effective solution for increased anti-rotation device use and reduced misuse.

Another potential benefit of support legs is reduced reliance on the characteristics of the vehicle seat for a good, stable child restraint installation. The new FMVSS 213 representative seat assembly aims to be more vehicle-like in its characteristics, but rear seats are likely to change, most immediately in response to a new frontal crash test with a rear-seated occupant that IIHS will introduce later this year. This new test program may influence rear seats in ways that impact child restraint installations such as changes to seat cushion length and stiffness. Support legs reduce the dependence of child restraint performance on the characteristics of the seat cushion and offer the potential to minimize incompatibilities as automakers change their rear seat environment.

Finally, the NPRM outlined some challenges to incorporating a floor such as the lack of requirements for floor strength in the FMVSS. Europe had similar challenges as child restraints with support legs entered the market prior to the European i-Size regulation (R145specifying floor strength; their experience may provide a roadmap for managing potential incompatibilities and, ultimately, implementing a floor strength requirement in U.S. vehicles. Support legs are likely to offer a safety benefit even in the absence of a floor strength requirement, as child restraint rotation will be reduced even if floor deformation occurs. Child restraints and vehicles work together, and to suggest that incremental progress cannot be made on the child restraint side without immediate commensurate change on the vehicle side may effectively stall innovations that could ultimately improve safety for child passengers.

Communicating with Today's Parents: Labeling Requirements (Section VIII.b)

IIHS supports changing labeling requirements to increase the minimum weight for forward-facing restraints to 26.5 pounds (12 kg), which represents a 95th percentile 1-year-old. There is consensus among experts that children should remain rear-facing until at least age 1, and there is substantial real-word, theoretical, and laboratory data that shows transitioning from rear-facing to forward-facing much later, to age 2 or older, is beneficial (Durbin et al. 2018; Jakobsson, 2017; Sherwood et al, 2007). As a result, IIHS supports the labeling change to 26.5 pounds for rear-facing as a step in the right direction to keep the largest percentage of the youngest passengers rear-facing for longer.

IIHS supports changing labeling requirements to increase the minimum weight for boosters to 40 pounds (18.2 kg) and has recommended this change to NHTSA in a previous comment (IIHS, 2014). Although IIHS agrees with the change, the Sivinski (2010) study used to support this change is inadequate to justify the decision. IIHS has previously commented on the referenced study, highlighting our concerns over the validity of the analyses due to insufficient or unreliable injury and restraint detail in the crash data and an insufficient sample size, which led to unstable and unreliable results (IIHS, 2011).

IIHS's recommendation to increase the minimum booster weight is based on the assertion that children weighing less than 40 pounds, who represent midsize 5-year-olds, are likely too small to take full advantage of vehicle-based countermeasures. The primary function of booster seats is to elevate children and correctly position vehicle lap and shoulder belts on their smaller anatomy so they can take advantage of vehicle countermeasures designed for larger occupants. Boosters on their own are not child restraints, and they necessarily work in tandem with the vehicle environment and restraints to provide optimal protection in a crash. Based on child anthropometry data (Snyder et al., 1977) combined with IIHS booster measurements, the seated height of a midsize 5-year-old in a booster seat is within a few inches of the seated height of an average 12-year-old child or small adult female seated on the vehicle seat. IIHS has positioned a 5th percentile female dummy in the rear seat of IIHS's side-impact test program since its inception in 2003. In the most recent 5 years of side-impact evaluations, 100% of more than 250 vehicle makes and models have received the top ratings for injury mitigation for the rear-seat occupant. In these tests, injury risk to rear-seat occupants is reduced by a combination of vehicle countermeasures such as curtain airbags, door structural improvements, and voluntary padding of the beltline. The recent phase-in of ejection mitigation requirements (FMVSS 226) has expanded the curtain airbag coverage even further, broadening the occupant size range likely to benefit from these important countermeasures.

Later this year, IIHS is introducing two new crash tests focused on rear-occupant safety: a more stringent side-impact test and a moderate overlap frontal crash test with a 5th percentile female dummy in the rear seat. We expect both tests will incentivize occupant protection improvements for their respective crash modes that are important for rear-seated occupants in the size range covered by children in booster seats. Strengthening FMVSS 201 requirements to include testing of the rear-seat beltline also would help ensure benefits for smaller occupants.

Child Passenger Safety Issues Arising from Research Findings (Section XI)

NHTSA has requested comments on special product types that have some design characteristics that are different than traditional child safety seats, such as inflatable boosters. Many of these products are aimed at ultraportability or ease-of-use in travel situations. As mobility changes, this is an important market segment to understand and monitor, yet the current FMVSS 213 sled test with its performance criteria and test dummies, is not sufficient to discriminate good and poor performance among child safety seats (Klinich et al., 2010; Tylko et al., 2016, 2017).

To better understand these challenges, IIHS is collaborating with the University of Virginia (UVA) on a simulation-based study to understand the role of booster characteristics on important occupant kinematic measures. Preliminary results from the study, which uses the PIPER pediatric human body model, suggest that boosters with low stiffness (such as inflatable boosters) likely result in less robust performance compared with high-stiffness boosters when evaluating across a range of initial child postures and potential booster designs. Specifically, compared with low-stiffness boosters, high-stiffness boosters offer protection from submarining across a wider variety of booster parameters and child postures and can provide good restraint even when these negative factors are present. An initial slouching posture is also an important risk factor for submarining, suggesting the importance of booster designs that encourage comfortable, upright seating and discourage slouching postures. This study is exploratory but has proven insightful in understanding the influence of booster design on important occupant kinematic measures, especially since the current physical tools and regulatory test are not sensitive enough to differentiate performance.

The NPRM requests comment on the safety need for a compression test to prevent low-stiffness boosters. IIHS supports the introduction of a quasi-static compression test as one way to ensure minimum stiffness requirements for boosters.

The Need for More Child-Specific Data

Many of the potential child passenger safety issues raised in this NPRM could be better informed with better real-world data. The child passenger safety community will continue to have questions on issues such as the appropriate child size or age for important restraint transitions (rear-facing to forward-facing or forward-facing to booster) that should be informed by the decades of real-world child safety seat experience in the U.S. Yet the Sivinski study (2010) highlights the challenges of studying child passenger safety issues with currently available data sets and points to the importance of building better databases for studying crashes involving children. IIHS encourages NHTSA to expand its data collection efforts to include a child crash surveillance system providing detailed and reliable data on child safety seat use and injuries for a representative national sample of crashes involving children. If the current rate of child-specific data collection continues, there will continue to be insufficient data to study the very questions that have arisen in this NPRM.

Conclusion

In summary, IIHS supports NHTSA's efforts to modernize the FMVSS 213 regulatory seat assembly and belt system but recommends adding a simulated retractor as a critical element for evaluating booster seats. IIHS supports child safety seat labeling changes to delay premature transitioning to forward-facing child restraints and ensure booster seats are not marketed to children too small to take advantage of vehicle countermeasures. IIHS also recommends that NHTSA consider the potential safety benefits of child restraint support legs to the U.S. market and collect more child-specific crash data to be able to monitor existing and emerging issues in child passenger safety and inform current and future rulemaking.

Sincerely,

Jessica S. Jermakian
Vice President, Vehicle Research

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