UMTRI TRANSPORTATION RESEARCH INSTITUTE UNIVERSITY OF MICHIGAN

To: National Highway Traffic Safety Administration

From: Kathleen D. Klinich

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Subject: FMVSS 213 NPRM [Docket No. NHTSA–2020–0093]

Thank you for the opportunity to provide feedback on the latest NPRM related to FMVSS 213. This NPRM contains many proposed improvements that will increase safety and usability of child safety seats and reduce the number of pediatric injuries and fatalities due to motor vehicle crash events.

We agree with the proposal to update the standard seat assembly, so it better represents the rear seats of late model vehicles. When compared to the range of lap belt angles in recent vehicles, the current lap belt anchorage geometry represents a shallow belt geometry. Shifting to a belt geometry that is more in the middle of the range seen in the recent fleet will promote belt path locations that will make it easier to install a CRS with a seatbelt.

We agree that it is reasonable to remove the requirement to test with a lap belt only and replace it with a test using a lap-shoulder belt, since lap-shoulder belts have been required in nearly all rear seating positions for 15 years. In our research study on misuse (Manary et al. 2019), we found minimal difference in performance of harnessed CRS when secured by either a lap belt only or a LATCH belt, so we think testing with LATCH securement (along with a lap-shoulder belt condition) should be sufficient for demonstrating that CRS performance would also be acceptable with a lap belt only. In addition, several tests referenced in the NPRM also show minimal difference in response when the same product is tested when secured by either the lap belt or the lap/shoulder belt. However, based on discussion at a recent SAE Child Restraint Committee meeting, there may be an unintended consequence from removing this requirement. If not required to test with a lap belt, some CRS manufacturers may label their products for use only with LATCH or a lap-shoulder belt. This may be a problem in geographic areas with a larger proportion of older vehicles that may only have lap belts in some seating positions.

We support the modification of the standard to allow alternative means of product registration. But we urge caution when allowing flexibility in the standardized form format or language to assure the goals of product registration are achieved. We agree with the flexibility in not requiring specific information to be on a “Warning” label.

We also support the flexibility in labeling requirements regarding the child sizes allowed in each mode. However, we disagree with allowing CRS manufacturers to indicate that children can use forward-facing mode at age one. Since 2011, AAP and the NHTSA CPST curriculum have encouraged children to stay rear-facing as long as possible, at least through age two. Unfortunately, many caregivers rely on state laws and CRS labels to inform their child passenger safety recommendations. (You specifically mention this issue on p. 42 of the NPRM.) It sems to be typical practice to label products to appeal to the widest audience and market share. We could save more lives and prevent more injuries by having 100% of

children using current child restraint products according to best practice recommendations, rather than anything we could do to incrementally improve child restraints using new test procedures. Changing label requirements so they reflect best practice recommendations would be an efficient and inexpensive way to move in this direction. We recommend the minimum occupant weight for forward-facing use be 30 lb, which corresponds to a 75th percentile 2YO.

The minimum allowable levels for booster use should also reflect best practice recommendations. We agree with the proposed minimum weight of 40 pounds for booster use. However, we also think that there should be a minimum age requirement of 4 years.

We agree with the proposed revisions on the ATDs required for each weight range of products, as well as the corresponding height adjustments to match the new ranges:

- weight limit up to 30 lb only with the CRABI 12MO ATD
- weight limit from 30-40 only with the H3-3YO
- weight limit from 40-65 only with the H3-6YO (no more H2-6YO allowed)
- new seating procedure for 3YO RF

We also support the proposal to revise the ATDs indicated for side impact testing to align with the newly proposed weight range mapping for frontal impact testing.

We also agree with the revisions to allow additional types of CRS for use on school buses.

While we think that testing using the updated bench will lead to improved compatibility regarding installation of harnessed CRs using the seatbelt, additional changes could make the testing environment more realistic for booster seat testing and could allow better differentiation of the performance of boosters. Our report to evaluate use of a surrogate seat belt retractor (Klinich et al. 2020) demonstrated its ability to provide a repeatable, more realistic environment for evaluating belt-positioning boosters, which are typically used with a vehicle seatbelt that has a retractor allowing initial spoolout. The fixed shoulder belt anchor on the proposed bench does not simulate this condition. In addition, as noted in our report, it is possible for the ATD to meet the dynamic requirements of FMVSS 213 when there is no booster present, which would allow products to pass that do not actually improve belt fit as belt-positioning boosters are intended to do. In our test series described in this report, when testing with the new bench and surrogate retractors, some boosters allowed the submarining kinematics that we see without a booster. We proposed an additional criteria of limiting the difference between maximum knee and maximum head excursion as a means of differentiating between boosters that promote better kinematics and those that do not. We suggest that the bench be revised to add the surrogate retractor for use in testing boosters and the performance criteria expanded to add limits on knee-head excursion.

It would be beneficial to use the same bench conditions in frontal and side impact testing of child restraint systems. In particular, if the belt anchorage locations don't match, it could lead to challenges in designing belt paths that are optimized for both impact directions. A potential issue with the bench is that there is currently only one supplier in the US for the seat foam. While this makes it easier to obtain than the ECE foam available from only one supplier in Europe, it could be problematic that there is only one source for the foam. In addition, the increase in the height of the seat back means that the foam needs to be assembled with two pieces of foam, as they are no longer able to manufacturer a one-piece seatback with the molds they have available. It would probably improve repeatability if NHTSA could

facilitate development of a larger mold at the manufacturer so the seatback could be manufactured in one piece. Based on the data you provide, the new foam specifications should prevent bottoming out of RFCRS, an artifact of the current bench, as seen by the lower chest *g* values in the pairwise comparisons of tests performed on the current and proposed benches. The new foam also seems to reduce the unrealistic head contacts previously seen with the H36YO.

We disagree with the exclusion of a floor specification. Support legs are widely used with European child restraints and have potential safety benefits. You argue that adding a floor specification isn't necessary, because we already have the option to include a tether which also prevents forward rotation. At the same time, you point out that only about half of caregivers use the tether despite targeted education efforts. It may be possible that support legs are easier to use than tethers because you don't need to locate the vehicle anchor, or are harder to overlook, and could provide similar benefit. In addition, tether anchors in pickup trucks are particularly hard to use (Jermakian et al. 2014), and the option of a floor leg might benefit children who travel in these extremely popular vehicles. The absence of a floor specification in the standard may be preventing development of child restraint features that could improve safety. While we think the standard should require that a product passes requirements with and without use of a support leg, and/or tether, the specification of a floor in the 213 standard could offer a chance to develop features that might have lower misuse rates than tethers. Similar to how NHTSA has surveyed rear seat characteristics to determine specifications for a new bench, they could perform a research study to study rear seat geometry and determine an appropriate specifications for a floor. An alternative would be to adopt floor specifications used in European regulations to improve harmonization. The concern about vehicles with a storage compartment under the floor is not warranted, as very few vehicles have this feature, and if the product needs to pass the test without the support leg, it would still have acceptable performance if for some reason the compartment failed. The argument that people will not use the support leg because people don't use the tether is not supported by evidence.

We agree with the decision not to increase the crash pulse severity, as field data already show that CRS designed to the current severity level are extremely effective in preventing pediatric death and injury in the wide range of crash severities that happen in the field.

We agree with the proposal to truncate HIC calculation to the first 175 ms for all boosters tested, not just the backless versions as proposed, to avoid influence of contact with unrealistic rear structures of the bench.

A challenge with using inflatable boosters properly is that there is no way for the consumer to check that the booster is fully inflated. We support adding the compression test used in CMVSS 213 as an effective way to ensure appropriate resistance to downward deflection that would mitigate the issue.

We suggest that a harness system be required for children weighing under 40 lb. because they are so effective in many types of crashes. This would prevent manufacturers from marketing the less-effective style of shield booster.

As you reference, NHTSA funded research to develop virtual child models of different dimensions that could be used to check whether a CRS could accommodate children of different sizes (Jones et al. 2018, Kim et al. 2015). Many infant carriers used to be labeled with a 35 lb capacity, but once one manufacturer increased to a 40 lb capacity, it seems like all manufacturers followed. In most cases, it

does not appear that any changes were made to the dimensions of these products to allow use by larger children, and requirements based on the virtual tools could help consumers choose more usable products.

With an update of the UMTRI website in November 2021, the link to the virtual tools can now be found at https://umtri.umich.edu/tools-for-child-restraint-design/

References

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