

effectiveness of current child restraints. The commenter suggested that it might be more feasible to use the FMVSS No. 208 criteria in FMVSS No. 213 if the agency were to specify a "more realistic crash pulse for FMVSS No. 213, such as the one contained in the FMVSS No. 208 sled test." Graco was concerned that some seats that have historically performed well in the real world and in compliance testing would fail the new criteria.

A few commenters supported while others opposed the proposals to adopt a new chest deflection criterion and to adopt the chest acceleration limits that were scaled for children and incorporated into FMVSS No. 208. JPMA, TraumaLink, UMTRI, SafetyBeltSafe and others opposed incorporation of the proposed chest deflection and reduced chest acceleration limits, because these types of injuries do not occur in children in child restraint systems. These commenters and others suggested that the agency collect data on chest deflection to establish a database that could be used to evaluate these measures more in the future.

Virtually all parties commenting on this aspect of the proposal opposed the modified Nij neck criterion (modified from the criterion in FMVSS No. 208 in that the limits on axial force were excluded). JPMA, SafetyBeltSafe, UMTRI, TraumaLink and others did not support adopting the proposed Nij criterion at this time because the relationship between the criterion and real-world injuries "under the type of loading simulated by FMVSS 213" is "not well established" (quoting UMTRI). SafetyBeltSafe believed that neither Nij as proposed nor Nij with a limit on tension should be used as a

compliance criterion unless these are proven to be useful predictors of child neck injury. The Insurance Institute for Highway Safety (IIHS) was concerned that studies of real-world crashes indicate that neck injuries due to inertial forces appear to be rare, and, the commenter stated, it is not clear how child restraints could be better designed to lower neck injury measures.

VIII. Amendments

a. Updated Bench Seat

1. Post-NPRM Test Program

As discussed in the NPRM, NHTSA had initiated a test program in response to the TREAD Act to assess seat parameters of production seats, working with the U.S. Naval Air Warfare Center Aircraft Division at Patuxent River, Maryland (PAX). PAX analyzed seat geometry data, including seat cushion angle, seat back angle, seat cushion length, seat back length, tether anchor locations, child restraint anchorage system anchor locations, and seat belt locations.

After publication of the NPRM, PAX conducted a series of dynamic tests using a revised test seat assembly that had been constructed incorporating the changes to the test seat assembly proposed in the NPRM. These tests were conducted with the dummies currently specified in FMVSS No. 213 (the newborn and TNO 9-month, and Hybrid II 3- and 6-year-old dummies), and with various types of child restraints (rear-facing infant only, rear- and forward-facing convertible, forward-facing "hybrid boosters" (a child restraint that can be used as a forward-facing restraint with harness for toddlers up to 40 lb and as a belt-positioning booster with children over 40 lb), and both backless and high-back boosters).

The results from this series of dynamic sled tests were compared to actual compliance tests that the agency had conducted to determine what effect, if any, the revisions to the test seat assembly might have on the dynamic performance of child restraints. NHTSA compared measurements taken for seat back rotation in rear-facing tests, and HIC, chest acceleration, and head and knee excursion in forward-facing tests. All of the proposed changes were simultaneously incorporated into the test seat assembly, and were not individually assessed for its effect on child restraint performance.

i. *Seat Back Rotation.* The effect of the revised test seat assembly on measured seat back rotation in rear-facing tests did not show a clear pattern.

Rear-facing tests were conducted using the revised test seat assembly with rear-facing infant only seats using the newborn dummy, and rear-facing convertible restraints using the newborn and Hybrid II 9-month-old dummies. In tests of rear-facing restraints, HIC and chest acceleration are not currently measured, since the newborn and 9-month-old dummies are not instrumented. Further, head and knee excursion are not measured. The only measured parameter in testing rear-facing child restraints is provided in S5.1.4 of FMVSS No. 213, which specifies that when a rear-facing child restraint is tested, the angle between the system's back support surface for the child and the vertical shall not exceed 70°.

The seat back rotation measured in these tests is compared to the seat back rotation measured in NHTSA compliance tests of the identical child restraints in Table 1 below.

TABLE 1.—SEAT BACK ROTATION IN REAR-FACING TESTS

Child restraint	Type	Dummy	Seat back rotation (degrees) relative to vertical— Test seat assembly		Change (%)
			Existing	Revised	
Evenflo On-My-Way	Infant only ...	Newborn	43	51.5	+19.8
Century 560	Infant only ...	Newborn	46	42.5	–7.6
Evenflo On-My-Way	Infant only ...	9-month	57	53.9	–5.4
Century 560	Infant only ...	9-month	52	52.9	+1.7
Century Accel	Convertible ..	Newborn	Not tested	50.7	N/A
Century STE 2000	Convertible ..	Newborn	Not tested	40	N/A
Cosco Triad (LATCH ⁵)	Convertible ..	Newborn	Not tested	43.1	N/A
Century STE 2000	Convertible ..	9-month	42	50.6	+20.5
Cosco Touriva	Convertible ..	9-month	51	63	+23.5

⁵ "LATCH" stands for "Lower Anchors and Tethers for Children," a term that was developed by manufacturers and retailers to refer to the standardized child restraint anchorage system required by FMVSS No. 225. This preamble uses the term to describe either an FMVSS No. 225 anchorage system in a vehicle or a child seat that attaches to an FMVSS No. 225 child restraint anchorage system.