

used to test child restraints in the agency's compliance tests. Almost all of the commenters believed that the test seat assembly should be more representative of the seats of newer passenger vehicles.

*i. Seat Back and Cushion Angles.*

Amending the seat cushion angle by increasing it from 8 degrees off horizontal to 15 degrees was generally supported. Several commenters viewed these changes as aligning the bench seat more with the ECE Regulation 44 seat assembly bench. Ford believed that the proposed change to the seat cushion angle would help make rigid attachment LATCH infant seats commercially viable in the U.S., and would help facilitate the use of infant restraints by reducing the need for consumers to add towels or pool noodles as spacers under the restraints. Ms. Bidez and Public Citizen opposed the proposed change to the seat cushion angle, stating that seat cushion angle should represent the average angle of a 9-year-old vehicle, not a new vehicle. Ms. Bidez stated that older seat cushions are more horizontal and do not contain any anti-submarining structural components.

The agency has decided to revise the seat cushion angle as proposed. Increasing seat cushion angle from 8 degrees off horizontal to 15 degrees will make the seat assembly more representative of currently manufactured vehicle seats and will reduce or eliminate the need for supplementary devices, such as rolled towels or swimming noodles, now being used with infant seats to compensate for the difference in seat cushion angle of the current seat assembly and new vehicle seats. The agency does not agree with Ms. Bidez and Public Citizen that the seat assembly should be representative of seats in 9-year-old vehicles. Such a rearward-looking approach ensures the obsolescence of the standard, since seats in the vehicle fleet are already in the process of being replaced by the seats of more modern design.

UMTRI expressed concern that tests of child restraints on a seat assembly with a seat cushion at the proposed 15 degree angle to horizontal generally resulted in decreased head excursion values of about two inches and increased chest accelerations by an average of 4 g. UMTRI suggested reducing the allowable head excursion limit in Standard No. 213 by two inches to compensate for the change. JPMA disagreed with UMTRI's comment that the head excursion limit should be changed, stating its belief that there is no difference in safety since the reference point from which head

excursion is measured is unchanged. JPMA further stated that—

the fact that the increased angle allows the child's head to travel a longer distance in the real world will permit the manufacturers to utilize that additional movement to manage some of the crash energy without making other, perhaps less desirable, changes to other restraint parameters. For example, the harness system could include measures and/or devices to add energy absorption similar to vehicle retractor torsional load limiters, which were implemented with air bags as a means to reduce chest compression. Such devices require that a small amount of additional head excursion be permitted in the real world to achieve a longer ride-down and take advantage of the vehicle's 'crumple zone.' \* \* \*

The agency does not agree that testing on the new seat assembly will result in across-the-board reductions in dummy head excursions as compared to head excursions of dummies tested on the current assembly. It is not evident from the agency's test data that use of the revised test seat assembly will have a positive or negative effect on measured head excursion. Table 4, *supra*, provides test results comparing head excursion measurements in a total of 10 tests using the revised test seat assembly and using the existing test seat assembly (compliance test results). These tests were conducted using (1) the 9-month-old dummy in two different forward-facing convertible restraints, (2) the 3-year-old dummy in two forward-facing convertible restraints and two forward-facing hybrid booster restraints, and (3) the 6-year-old dummy in two backless boosters and in two high back belt-positioning boosters. In three of four tests conducted using forward-facing convertible child restraints, a decrease in head excursion was observed in tests using the revised test seat assembly. However, in tests conducted on the revised seat assembly using forward-facing hybrid boosters, backless and high back belt-positioning booster seats, a marginal increase in head excursion was observed.

While differences of up to +32.4 percent and -24.6 percent were measured in tests using the revised and existing test seat assemblies, there was no distinctive trend across dummy or child restraint types. Thus, the agency cannot conclude that the new seat assembly necessarily results in a less rigorous test of a child restraint's ability to limit head excursion as compared to the existing seat assembly. Further, all measured head excursions on the existing and revised test seat assemblies in NHTSA's program were well within the established 813 mm limit prescribed in FMVSS No. 213. Thus, the agency does not believe that there has been a

showing of a safety need to reduce the head excursion limit to take account of the effect of testing on the new test assembly.

In response to JPMA's comment about increased head excursion benefiting overall child restraint performance due to increased "ride down" of crash forces, the agency agrees that generally speaking, increased ride down can help reduce head, neck and chest accelerations. However, increased ride down obviously must not come at the cost of increased risk of head impacts due to excessive head excursions in a crash. Thus, the agency does not concur with any implication that head excursions beyond what is permitted by Standard No. 213 is acceptable. The agency is concerned that child restraints that might meet the head excursion requirements of the standard when tested on the new test seat assembly might allow excessive head excursion when used in actual vehicles whose seat cushions are more like the current seat assembly. The agency asks the public for help in monitoring this situation and providing information of a real world problem should one occur. If there are unreasonable excessive head excursions due to child restraints being used on vehicle seats that are flatter than the revised seat assembly, reducing the head excursion limit of the standard will be considered by the agency.

Amending the seat back angle by increasing it from 15° off vertical to 22° was widely supported. Several commenters viewed these changes as aligning the bench seat more with the ECE Regulation 44 seat assembly bench, which has a seat back angle of  $20 \pm 1^\circ$ . In response to commenters and in further consideration of the agency's efforts to harmonize its standards where possible, the agency amends the seat back angle by increasing it to  $20 \pm 1^\circ$  to make it consistent with the test seat assembly of ECE Regulation 44. The agency believes that the difference between 22° and  $20 \pm 1^\circ$  is negligible and should have no significant effect on child restraint performance.

*ii. Belt Systems On The Standard Seat Assembly.* The commenters generally agreed with the proposals for amending the seat belts on the test seat assembly. Almost all of the commenters supported increasing the spacing between the anchors of the lap belt from 222 millimeters (mm) to 392 mm in the center seating position and from 356 mm to 472 mm in the outboard seating positions. JPMA stated that it does not object to the proposal, but noted that the potential effect in side impact testing is unknown. Ms. Bidez suggested that the anchors should be set not at an averaged