Automotive Safety Council

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Docket Management Facility
U.S. Department of Transportation
1200 New Jersey Avenue SE
West Building Ground Floor
Room W12-140
Washington, DC 20590-0001

National Highway Traffic Safety Administration

[Docket No. NHTSA-2020-0075]

Temporary Exemption Petitions: Shoulder Belt Requirement for Side-Facing Seats on Motorcoaches

Subject: **Request for Comments:**

The Automotive Safety Council (ASC) is an industry trade association of 48 of the world's leading suppliers of Autonomous, Crash Avoidance and Occupant Protection automotive safety systems to the automobile industry. The mission of the Automotive Safety Council is to improve the safety of people through-out the world through the development, production and implementation of the latest automotive safety equipment by preventing accidents, protecting occupants and pedestrians when in a collision and to notify emergency responders after the collision when necessary.

The ASC is providing comments to the recently published RFC document requesting comments pertaining to Shoulder Belt Requirement for Side-Facing Seats on Motorcoaches. The ASC appreciates the opportunity to comment on this topic.

Overall Comments:

We fully support the goal to provide the same level of crash protection to all vehicle occupants. In this spirit there is concern whether adequate protection is provided for occupants in side-facing seats when compared to the protection for occupants in forward-facing seats. As demonstrated in the tests referenced in the August 18, 2010 NPRM (Docket NHTSA-2010-0112) "The unbelted dummies and lap belted dummies generally exhibited higher injury values than dummies secured with lap/shoulder belts" for forward and oblique loading conditions. For side facing seats the NPRM proposed to "permit lap belts in side-facing seats because we are unaware of any demonstrable increase in associated risk".
In the absence of any significant epidemiological research done to improve our understanding of the injury risks and countermeasure needed to protect occupants in side-facing seats, we are not confident that either lab belts, or lap/shoulder belt systems alone provide adequate protection for side-facing occupants. Regardless of whether these petitions for temporary exemption are granted, we urge the NHTSA to promote further research toward understanding injury risk in side-facing seats, and to establish performance based safety standards to ensure adequate occupant protection - not only side-facing seats in motorcoaches, but also future passenger cars:

- Passenger vehicles with side-facing seats (one of several unconventional seating configurations anticipated for highly automated vehicles) are generally subjected to more severe crash pulses than motorcoaches and will likely be produced in larger volumes.
- Limousines – which may in the future, be subject to the same Federal standards for safety belts, seats, and seat assemblies as other passenger cars (ref. House Bill H.R.2 Moving Forward Act, Sec. 32006).

Specific Comments:

1. To consider the level of protection offered by shoulder belts for side-facing seats, it is necessary to also consider the location of the D-Ring with respect to the occupant. The D-Ring location dictates how the shoulder belt is routed across the thorax of the occupant. A D-Ring located toward the rear of the vehicle from the occupant positions the shoulder belt such that it may slip off the occupant in a frontal crash, providing little (if any) additional restraint in a frontal crash from what is offered by the lab belt alone. Likewise, a D-Ring located toward the front of the vehicle from the occupant places the shoulder belt in a more favorable position to provide additional restraint, but also could introduce added injury risk.
2. In responding to these petitions, it is also important to consider the number of occupants per side-facing seat (larger side facing seats may contain multiple occupants), and placement of several side facing seats together that could result in harmful occupant-to-occupant interaction in a crash, as being examined for reducing injury in far-side crashes (see comment #6 below).
3. In the August 18, 2010 NPRM (Docket NHTSA-2010-0112) it was stated that the NPRM responded to H–99–47 and H–99–48, which requested (NHTSA) to "develop performance standards for motorcoach occupant protection systems that account for frontal impact collisions, side impact collisions, rear impact collisions, and rollovers, and apply those standards to new motorcoaches". The relative merit of a lap and shoulder belt systems vs lap belt only should be evaluated and weighed within this broader scope. It seems likely that lap and shoulder belt systems provide superior protection to side-facing occupants of vehicles subjected to some lateral impact crashes and rollovers.

4. The motorcoach crash test conducted by the NHTSA (August 18, 2010 NPRM, Docket NHTSA-2010-0112) produced a crash pulse of only 13 g at 125 milliseconds in a frontal crash. Passenger vehicles generally produce a much more severe crash pulse (25–70 g's) in the same crash mode. It is highly anticipated that future passenger vehicles (particularly highly automated vehicles) will offer unconventional seating configurations – including side-facing seats. Such vehicles may be produced for public use within a few years, without guidance or safety standards in place to ensure adequate occupant protection. The objective should be to ensure all occupants, in all seating configurations provided, are equally protected in a crash.
5. There is insufficient data to allow a direct recommendation for allowing these temporary exemptions. It should be understood though, that there is also insufficient data to conclude that either a 2-point or 3-point seatbelt system provides an adequate level of crash protection for side-facing seats in a frontal crash.
6. A reasonable approach may be to consider injury risks in far-side impact crashes, as considerably more work has been done to understand injury risk in this mode than for side-facing seats.
    a. A study presented at the 2017 Stapp Conference (Vol. 61) by Yuichi Kitagawa (Toyota Motor Company) includes PMHS response to simulated far-side impact tests with a lateral acceleration pulse of 14 g's. The tests reported used 3-Point belt systems only – so no comparison was made against a 2-Point belt system.
    b. A related study was presented by Pintar in 2007 (Stapp Car Crash Journal, Vol. 51, pp.313-360) titled "Comparison of PMHS, WorldSID, and THOR-NT Responses in Simulated Far Side Impacts". Shoulder belts placed on both inboard and outboard sides of the PMHS were tested. Here it was concluded that "inboard shoulder belts that were positioned directly over the shoulder, as well as countermeasures that promoted alternate load paths such as shoulder and thorax restraints, reduced head excursion and helped contain the occupant". It was also found that the inboard positioned shoulder belt resulted in a carotid artery tear on the outboard side due to tensioning on one PMHS.
    c. In 2013 (Stapp Car Crash Journal, Vol. 57) Forman (University of Virginia) provided additional PMHS test results for the far-side crash mode. In this study it was found that an outboard positioned shoulder belt can still provide some restraint to the upper body (especially when a belt pretensioner is activated) even in cases where the belt slips off the shoulder.

In conclusion, the ASC welcomes this opportunity to comment on Shoulder Belt Requirement for Side-Facing Seats on Motorcoaches. We welcome any invitation to visit the NHTSA office for a detailed discussion of these comments should the need arise.

Sincerely,

Douglas P. Campbell
President
Automotive Safety Council