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The Honorable James C. Owens
Acting Administrator
National Highway Traffic Safety Administration
1200 New Jersey Avenue, SE
Washington, DC 20590

Request for Comment on Advanced Notice of Proposed Rulemaking; 49 CFR Part 571, Federal Motor Vehicle Safety Standards, Occupant Crash Protection; Docket No. NHTSA-2019-0093

Dear Acting Administrator Owens:

The National Highway Traffic Safety Administration (NHTSA) has requested comments on an Advanced Notice of Proposed Rulemaking (ANPRM) to amend Federal Motor Vehicle Safety Standard (FMVSS) No. 208 to require a seat belt use warning system for rear seats. The Insurance Institute for Highway Safety (IIHS) strongly supports NHTSA's proposal to amend FMVSS No. 208 to include minimum requirements for a rear seat belt warning system. Research on the efficacy of using rear seat belt warnings for increasing seat belt use is lacking, but our research indicates that consumers want information about rear seat belt use. Furthermore, the technology is already required in other markets, thereby facilitating its introduction in the U.S.

IIHS also recommends that NHTSA amend FMVSS No. 208 to lengthen the minimum audible signal duration for the driver seat and extend the requirement to all front seats. Recent IIHS research has found that seat belt warning systems with persistent audible tones lasting at least 90 seconds increase the seat belt use of drivers who do not routinely use a seat belt by 34% (Kidd & Singer, 2019). IIHS estimates that audible warnings lasting at least 90 seconds for front seats could save up to 1,489 lives each year, justifying the recommend upgrade to FMVSS No. 208. Our recommendations for amending FMVSS No. 208 are discussed as follows.

Visual information about seat belt use in rear seats should be required at ignition

NHTSA is seeking comments on whether a seat belt warning system requirement for rear seats should be visual-only, audible-only, or audio-visual. Consumers, specifically those who transport children, perceive value in receiving visual information about rear-occupant belt use (Kidd & McCartt, 2014). Visual displays are efficient at conveying information that is complex, that deals with locations in space, or that does not require immediate action (National Research Council Committee on Human Factors, 1997). Visual displays alone have not been found to be effective for motivating occupants to use a seat belt unless paired with a persistent audible reminder (Freedman, Lerner, Zador, Singer, & Levi, 2007), but consumers may use this information to encourage unbuckled rear occupants to use a seat belt. In Kidd and McCartt's (2014) study, three quarters of drivers who transported a rear child passenger said they would use this information to encourage their child rear-seat passenger to use a seat belt. Similar interventions by a driver or another occupant may increase seat belt use of adult rear-seat passengers (e.g., Jermakian & Weast, 2018).

Currently, there is no affordable technological solution to determine when a human is occupying a rear seat. Visual displays are less intrusive and perceived as less annoying than auditory warnings, which would minimize the impact of false warnings and nuisance alarms from rear seat belt warning systems on consumer acceptance. False warnings are a particular concern for rear child passengers restrained in a

child seat. A child passenger in a child restraint installed using LATCH hardware may be classified as an unfastened rear occupant without specialized electrical connections between the vehicle and child safety seat. Thus, IIHS recommends that visual-only information about seat belt use in rear seats be required when the vehicle is first started to provide information about rear seat belt use that consumers want without invasive false alarms that impact acceptance.

An audio-visual warning should be provided when rear seat belts are unfastened during a trip

IIHS recommends that FMVSS No. 208 be amended to require an audio-visual warning when a rear seat belt is unfastened during the course of a trip. It is reasonable to assume that a passenger is occupying a rear seat when a seat belt is fastened once the vehicle is moving, so an audible warning is justified when a rear seat belt is unfastened. Information about the effect of an audio-visual rear seat belt warning on rear seat belt use is sparse, but research on front seat belt warning systems suggests that an audio-visual warning lasting longer than 8 seconds would be expected to motivate an unbelted rear occupant to refasten the seat belt (e.g., Ferguson, Wells, & Kirley, 2007). Findings from a recent survey of adult rear-seat passengers who do not routinely use a seat belt in the rear seats further supports the use of an audible warning; 62% of respondents said they would be more likely to use a seat belt if there was an audible warning compared with only 50% who said the same about a visual warning (Jermakian & Weast, 2018). Unfortunately, most rear passengers are not unbelted because they unfastened the seat belt during a trip, but rather because they never buckled in the first place (Jermakian & Weast, 2018; Kidd & McCartt, 2014). Hence, an audio-visual change-of-status warning may have a limited effect on increasing rear seat belt use.

FMVSSS No. 208 should be amended to specify an audible signal duration lower limit of 90 seconds for front seats

NHTSA seeks comment on whether to remove the upper limit for the audible signal duration of the driver's seat belt warning in FMVSS No. 208. The current audible signal duration upper limit is ineffective for increasing seat belt use and must be revised (e.g., Cohen & Brown, 1973; Robertson & Haddon, 1974). Seat belt warning systems that exceed the upper limit have been shown to increase seat belt use up to 6 percentage points relative to vehicles that have warning systems that do not exceed it (e.g., Ferguson, Wells, & Kirley, 2007; Freedman, Levi, Zador, Lopdell, & Bergeron, 2007), but recent IIHS research demonstrates that some approaches are more effective for increasing seat belt use than others. IIHS found that seat belt warning systems with at least 90 seconds of audible signal increased the seat belt use of drivers who occasionally used a seat belt up to 34.3% relative to a warning system that only provided an infrequent audible signal of a shorter total duration (Kidd & Singer, 2019). In this study, IIHS estimated that increasing the seat belt use of unbelted front-seat occupants by 34.3% could save up to 1,489 lives each year. The life-saving potential of amending FMVSS No. 208 to address not only rear-occupant belt use but also the belt use of front occupants is too great to ignore. Hence, IIHS recommends that NHTSA remove the audible signal duration upper limit requirement from FMVSS No. 208 and replace it with a 90-second audible signal duration lower limit for every front seat.

Requirements for occupant detection technology or technology to address intentional or inadvertent defeat should not delay life-saving amendments to FMVSS No. 208

As noted in the ANPRM, there are many technical and cost challenges associated with accurately detecting occupants and seat belt use in rear-seating positions such as variation in occupant characteristics (e.g., adults versus child restraints), cargo, and seating configurations among other factors. Similar challenges also exist when detecting whether an occupant is misusing a seat belt or trying to intentionally defeat a seat belt warning system. About 1 in 5 drivers who only occasionally used a seat belt in IIHS's recent study of seat belt warning systems circumvented a vehicle seat belt warning system

(Kidd & Singer, 2019), so a small proportion of rear occupants would likely do the same. However, it is our understanding that technological solutions to address these issues are still being refined, and the challenges with applying these solutions to rear seats that can be removed or reconfigured are not trivial. Consequently, IIHS recommends that NHTSA move forward with amending FMVSS No. 208 without requiring occupant detection or technological solutions for addressing defeating behavior to avoid delaying requirements for improved seat belt warning systems. However, NHTSA should not ignore these issues, so IIHS recommends that the agency conduct research to continuously evaluate the need to require rear-occupant detection or technology that would prevent occupants from defeating a seat belt warning system.

NHTSA should proceed with nonregulatory approaches if rulemaking is unsuccessful

IIHS believes that the amendments to FMVSS No. 208 recommended previously are practicable and would improve motor vehicle safety by protecting the public against an unreasonable risk of death or injury. However, if NHTSA determines that the amending FMVSS No. 208 does not satisfy the requirements and considerations of 49 U.S.C. 30111 or chooses not to proceed with rulemaking, then IIHS urges NHTSA to proceed with nonregulatory alternatives. Nonregulatory approaches like voluntary guidelines for front and rear seat belt warning systems and establishing criteria in NCAP to promote these systems are reasonable. NHTSA also should consider partnering with other organizations to establish a voluntary commitment with automakers to equip new passenger vehicles with front and rear seat belt warning systems, similar to the commitment IIHS and NHTSA established with automakers to speed the adoption of automatic emergency braking.

Amendments to FMVSS No. 208 should be consistent with existing requirements from other organizations

NCAP programs around the world have specified minimum requirements for front and rear seat belt warning systems, and many requirements are similar. IIHS is developing a program to evaluate front and rear seat belt warning systems and used requirements from other NCAP programs as a model when empirical data was lacking. IIHS recommends that NHTSA do the same when amending FMVSS No. 208 to facilitate the introduction of improved seat belt warning systems currently available in other markets into the U.S. market.

IIHS's evaluation procedure is being developed with existing requirements from other organizations in mind. IIHS will provide the most credit to vehicles that have a seat belt warning system that provides the following features: an audible warning lasting at least 90 seconds when a front-seat occupant is not using a seat belt; visual information about seat belt use in rear seats for at least 60 seconds when the vehicle ignition is turned on; and an audio-visual warning lasting at least 30 seconds when a rear seat belt is unfastened. The European New Car Assessment Programme's (Euro NCAP) (2017) requirements and Regulation No. 16 from the United Nations Economic Commission for Europe (2018) specify similar criteria.

IIHS's audible signal requirements deviate from requirements set by other organizations in two ways. First, audible signals separated by more than 3 seconds are not combined when determining audible signal duration. Euro NCAP permits gaps between consecutive signals of up to 10 seconds. Gaps in consecutive signals help reduce annoyance from audible seat belt reminders (Kidd, 2012), but it is unclear if these signals are as effective at increasing seat belt use as audible signals without gaps, like those examined in IIHS's recent research (Kidd & Singer, 2019). Second, other organizations require audible signals to be "loud and clear" or "easily recognized" by the driver, but IIHS will specify minimum acoustical parameters that must be met to accomplish this objective. The acoustic characteristics of existing audible seat belt warnings vary widely, and some warnings are easier to discern than others.

IIHS believes that human factors design recommendations from NHTSA (Campbell et al., 2016) can be used to specify parameters that ensure audible seat belt warnings are loud and distinct in a typical vehicle cabin environment. IIHS will submit its seat belt reminder system evaluation protocol to the docket once it is finalized.

Summary

In conclusion, IIHS supports rulemaking to amend FMVSS No. 208 to require rear seat belt reminders. There are a number of technical challenges with providing rear seat belt warnings, so the requirements must strike an appropriate balance between providing information about rear seat belt use and avoiding false warnings that could negatively affect consumer acceptance. IIHS believes that rear seat belt reminders that provide visual information about rear seat belt use at ignition and that notify the driver and other occupants when a rear seat belt is unfastened strikes this balance, has the potential to increase rear seat belt use, and will be acceptable to consumers. Moreover, IIHS strongly urges NHTSA to strengthen existing seat belt warning requirements in FMVSS No. 208 by requiring an audible seat belt warning lasting at least 90 seconds and by extending these requirements to all front seats. Seat belt use dramatically reduces fatality risk in a crash (Kahane, 2000). Seat belt warning systems with persistent audible signals lasting at least 90 seconds increase seat belt use and can save up to 1,489 lives each year (Kidd & Singer, 2019).

Sincerely,

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References

Campbell, J.L., Brown, J.L., Graving, J.S., Richard, C.M., Lichty, M.G., Sanquist, T., …& Morgan, J. (2016). *Human factors design guidance for driver-vehicle interfaces* (Report No. DOT HS 812 360). Washington, DC: National Highway Traffic Safety Administration.

Cohen, J.B & Brown, A.S. (1973). *Effectiveness of safety belt warning and interlock systems* (Report No. DOT HS 800 859). Washington, DC: National Highway Traffic Safety Administration.

European New Car Assessment Programme. (2017). *Assessment protocol—Safety assist* (Version 8.0.2). Retrieved from https://cdn.euroncap.com/media/32283/euro-ncap-assessment-protocol-sa-v802.pdf

Ferguson, S.A., Wells, J.K., & Kirley, B.B. (2007). Effectiveness and driver acceptance of the Honda belt reminder system. *Traffic Injury Prevention, 8*(2), 123–129.

Freedman, M., Lerner, N., Zador, P., Singer, J., & Levi, S. (2009). *Effectiveness and acceptance of enhanced seat belt reminder systems: Characteristics of optimal reminder systems* (Report No. DOT HS 811 097). Washington, DC: National Highway Traffic Safety Administration.

References (continued)

Freedman, M., Levi, S., Zador, P., Lopdell, J., & Bergeron, E. (2007). *The effectiveness of enhanced seat belt reminder systems—Observational field data collection methodology and findings* (Report No. DOT HS 810 844). Washington, DC: National Highway Traffic Safety Administration.

Jermakian, J.S. & Weast, R.A. (2018). Passenger use of and attitudes toward rear seat belts. *Journal of Safety Research, 64*, 113–119.

Kahane, C.J. (2000). *Fatality reduction by safety belts for front-seat occupants of cars and light trucks: Updated and expanded estimates based on 1986–99 FARS data* (Report No. DOT HS 809 199). Washington, DC: National Highway Traffic Safety Administration.

Kidd, D.G. (2012). Response of part-time belt users to enhanced seat belt reminder systems of different duty cycles and duration. *Transportation Research Part F, 15*, 525–534.

Kidd, D.G. & McCartt, A.T. (2014). Drivers' attitudes toward front or rear child passenger belt use and seat belt reminders at these seating positions. *Traffic Injury Prevention, 15*, 278–286.

Kidd, D.G. & Singer, J. (2019). The effects of persistent audible seat belt reminders and a speed-limiting interlock on the seat belt use of drivers who do not always use a seat belt. *Journal of Safety Research, 17*, 13–24.

National Research Council Committee on Human Factors. (1997). *Tactical display for soldiers: Human factors considerations*. Washington, DC: The National Academies Press.

Robertson, L.S. & Haddon, W., Jr. (1974). The buzzer-light reminder system and safety belt use. *American Journal of Public Health, 64*(8), 814–815.

United Nations Economic Commission for Europe. (2018). Agreement Addendum 15: Regulation No. 16, Revision 9. Retrieved from https://www.unece.org/fileadmin/DAM/trans/main/wp29/wp29regs/2018/R016r9e.pdf