

information about seat performance in crashes.

DATES: Comment closing date: Comments on this notice must be received on or before December 4, 1989.

ADDRESS: Any comment on this notice should refer to the docket number and notice number and be submitted to the following: Docket Section, Room 5109, National Highway Traffic Safety Administration, 400 Seventh Street, SW., Washington, DC 20590 (Docket hours 8:00 a.m. to 4:00 p.m.).

FOR FURTHER INFORMATION CONTACT: Dr. Richard Stombornc, Office of Vehicle Safety Standards, National Highway Traffic Safety Administration, 400 Seventh Street, SW., Washington, DC 20590 (202) 366-2264.

SUPPLEMENTARY INFORMATION: This notice follows grants of two related petitions for rulemaking concerning Standard No. 207, *Seating Systems* (49 CFR 571.207), Standard No. 208, *Occupant Crash Protection* (49 CFR 571.208), and Standard No. 209, *Seat Belt Assemblies* (49 CFR 571.209). The first petition, from Mr. Kenneth J. Saczalski of Environmental Research and Safety Technologists, Flagstaff, AZ, requests that the agency increase the seat back requirements in Standard No. 207. The second petition, from Mr. Edward J. Horkey of Horkey & Associates, Tempe, AZ, requests that the agency amend Standard No. 208 and Standard No. 209 to change the requirements related to safety belt retractors in passenger cars. The agency has consolidated these two rulemaking petitions in this notice because each petition focuses on the effect of rear impacts on vehicle occupants.

In his petition, Mr. Saczalski informed the agency that he has uncovered what he perceives to be a safety problem related to inadequate seat strength and seat back failure in rear impacts. He explained that as a vehicle safety consultant, he has investigated in the last two years four cases in which occupants suffered serious or fatal injuries as a result of rear impacts. The petitioner attributed this problem to the fact that during rear impact, the seat backs are loaded by the inertia of the occupant's upper body, a factor that the current seat back requirements do not consider. As a result, the petitioner stated that the seat back collapses, allowing the occupants to slide out from under the lap safety belt. This makes it more likely for the occupants to impact against the vehicle's interior or to be ejected.

Mr. Saczalski requested that NHTSA amend Standard No 207 as follows.

DEPARTMENT OF TRANSPORTATION

National Highway Traffic Safety Administration

49 CFR Part 571

[Docket No. 89-20; Notice 1] 1

RIN 2127-AD08 and 2127-AC57

Federal Motor Vehicle Safety Standards; Seating Systems; Occupant Crash Protection; Seat Belt Assemblies

AGENCY: National Highway Traffic Safety Administration (NHTSA), DOT.

ACTION: Request for comments.

SUMMARY: This notice seeks comments on two related petitions for rulemaking from Mr. Kenneth Saczalski and Mr. Edward Horkey which request that the National Highway Traffic Safety Administration (NHTSA) amend Standard No. 207, *Seating Systems*, Standard No. 208, *Occupant Crash Protection*, and Standard No. 209, *Seat Belt Assemblies*. Each petition focuses on an occupant's safety during rear impact. This notice specifically requests comments and data on the interaction of seat backs and safety belts in rear impacts as well as more general

First, he petitioned that the agency reexamine the general performance requirements in Standard No. 207. Second, he requested that Standard No. 207 specify that the load must be both 20 times the weight of the seat back and 20 times the weight of the occupant. Sections S4.2 (a) and (b) of Standard No. 207 currently only require that the seat withstand 20 times the weight of the seat back. Third, he requested that Section S4.2(d)'s seat back moment criterion be increased to 58,000 inch-pounds. Section S4.2(d) currently requires a seat back to resist a moment of 3,300 inch pounds.

Mr. Horkey submitted two petitions to NHTSA related to safety belt mechanisms. The first petition stated that safety belt mechanisms currently installed in many American automobiles are ineffective in rear end collisions, and requested that the agency conduct a defect investigation. The agency denied this petition since it did not appear that there was a reasonable possibility that an order concerning the notification, correction and remedy of a defect would be issued at the conclusion of an investigation.

Mr. Horkey's second petition asked for rulemaking to change the type of safety belt mechanisms required in automobiles. He submitted additional information, including a sketch and a video, to illustrate his claim that in a rear impact, the occupant may suffer an injury caused by what he terms "the slingshot effect." (The agency notes this phenomenon is also referred to as a "rebound effect.") Mr. Horkey theorized that in a rear impact, an occupant is pushed rearward against his or her seatback, which stores the energy and then propels the occupant forward. However, after the occupant is pushed rearward by the rear impact, the vehicle deceleration sensitive emergency locking retractor (ELR) on some safety belts could move to the unlocked position if there is no tension in the belt. As a result, when the occupant is subsequently thrown forward, the occupant is more likely to strike the vehicle's interior surfaces because the belt does not restrain the occupant's forward motion if the ELR is not locked. Mr. Horkey requests that the regulations require the "use (of) the older rotary inertia reel type mechanism." Mr. Horkey reasons that his proposal "would insure holding the occupant in either direction and would not loosen or disengage if a vehicle's accelerations change during a crash."

After carefully reviewing the issues raised in the petitions, NHTSA has determined that the two petitioners'

theories concerning seat back strength, the "slingshot effect," and the effectiveness of ELRs, warrant further consideration. Therefore, on July 24, 1989, the agency decided to grant the petitions and is now requesting detailed comments and data on the issues raised in the petitions and related matters. As more information becomes available, the agency will be able to determine what appropriate measures, if any, are needed to address this situation. NHTSA emphasizes that the grant of these petitions and the issuance of this request for comments does not necessarily mean that a notice of proposed rulemaking (NPRM) will follow. In accordance with statutory criteria, NHTSA will determine whether to issue an NPRM after it evaluates the comments it receives.

Issues for Consideration

To assist in evaluating the requested changes to Standard No. 207, Standard No. 208, and Standard No. 209, the agency is interested in obtaining comments, accident data, and other information relating to the following issues.

1. In analyzing Mr. Saczalski's and Mr. Horkey's petitions, NHTSA reviewed data and studies related to the interaction of seat back strength and safety belt retractors, especially in rear impact situations. The agency notes that there are two competing schools of thought related to the proper performance of seats in rear impacts. Some safety experts, such as Mr. Saczalski, argue that the seat back requirements should be increased. This would result in stronger, stiffer seats that would be less likely to break during an impact. Other safety experts, such as Mr. Horkey, believe that the seat should be used as an energy absorber in rear impacts and that seats should collapse in a controlled manner. According to these theorists, requiring a stronger seat back would exacerbate the "slingshot effect" because a stiffer, stronger seat back stores and then releases greater amounts of energy. As a result, they contend that a stronger seat would result in more serious injuries, especially whiplash and other neck injuries.

In light of this background, NHTSA requests detailed comments about the "slingshot effect." In particular, does the "slingshot effect" provide a realistic hypothesis for a failure mode for safety belt operation in rear impacts? What are estimates of injury frequency and severity to belted occupants as a result of the "slingshot effect?" Conversely, what are estimates of injury frequency and severity to rear seat occupants,

caused by front seats collapsing rearward? Have manufacturers received complaints about the "slingshot effect" in vehicles? How is the "slingshot effect" related, if at all, to seat or seat back design, especially in relation to seat back strength requirements?

The agency is aware of studies which conclude that the "slingshot effect" is only relevant to low speed impacts, because at higher speeds (over 30 mph) the seat backs deform. The agency seeks comments concerning how different speeds at the time of rear impact affect the "slingshot effect."

2. At present, section S4.3(j) of Standard 209 requires that an ELR "shall lock before the webbing extends 1 inch when the retractor is subjected to an acceleration of 0.7g." The agency notes that ELRs were developed to overcome deficiencies with automatic locking retractors (ALRs), such as cinch up. The ELR retractor permits free movement of the webbing during non-crash conditions and can be manufactured to lock up as a result of webbing acceleration, vehicle acceleration or both. The agency notes that some foreign manufacturers include ELRs with two inertial sensing modes (i.e., "dual-mode sensing ELRs"). One mode is sensitive to webbing acceleration, and the other to vehicle acceleration. The dual-mode sensor provides fast response and lock up in the vehicle acceleration mode and also locks the webbing whenever the occupant is thrown against it. It also permits the user to test the belt locking mode by jerking on the webbing. This action causes lock up in the webbing acceleration sensing mode. Accordingly, it is possible that requiring dual mode ELRs would negate injuries caused by the "slingshot effect." NHTSA requests detailed comments about the effectiveness and costs of dual-mode ELRs.

In particular, are dual-mode ELRs compatible with other designs such as motorized automatic safety belts? In the case of motorized automatic safety belts, could the motor withdrawal rate cause reel lockup when the occupant enters the car? Are any manufacturers currently using or planning to use dual-mode ELRs in their vehicles? If so, have they observed or do they anticipate any safety benefits with these ELRs?

3. NHTSA also seeks comments related to the costs of requiring the dual-mode ELRs as compared to single-mode sensing ELRs. One domestic manufacturer informed the agency that dual-mode ELRs would cost about 30 to 40 cents per reel for each dual-mode ELR or between \$1.20 and \$1.60 per

vehicle for four reels. NHTSA requests cost estimates, especially from those manufacturers that currently use or are developing these ELRs.

4. NHTSA is concerned about consumer acceptance of different types of retractors. The agency notes that some consumers may not like the dual-mode ELRs because sudden movements could cause the belt to lock. This might cause some consumers to believe that the belts were less comfortable or more inconvenient. If a significant number of consumers had this perception, then the agency would have to factor this "cost" (i.e., lowered safety belt use) into its analysis. On the other hand, NHTSA notes that some consumers do not believe that a vehicle sensitive retractor is working properly, since they cannot lock it up by pulling rapidly on the webbing. Being able to test the belt with the dual mode retractor might help instill trust in the belt system's value in a crash. If so, this could increase belt use. Accordingly, the agency seeks comments on whether and how the use of dual-mode ELRs would affect the comfort, convenience, and use of the safety belt system. In particular, would requiring the use of dual-mode ELRs affect occupants during ingress or egress?

5. NHTSA notes that Mr. Saczalski petitioned the agency to conduct a general review of Standard No. 207's performance requirements. Accordingly, while this notice focuses on the interaction of the seat back strength requirements and safety belt retractors in rear impacts, the agency welcomes additional comments on other matters relating to seat back performance in other crash situations. What relation do the seat back performance requirements in general have to injuries in front impacts? in side impacts? in vehicle rollovers? What types of injuries are seen in side and front impact and vehicle rollover accidents that could possibly be mitigated by practical seat design modifications? Are there any

innovative designs to absorb and control energy in the side and front impacts or rollovers? From a design standpoint, how is the optimum seat strength determined? What are the seat back and seat back latch force deflection characteristics of current production seats? Are current or strengthened seat back latches effective in mitigating injuries of either front seat or rear seat occupants? What would be the increases in cost and weight for increasing seat strength to withstand a 56,000 inch pounds moment?

6. On a related topic, NHTSA has contemplated changing the measurement and evaluation of seat performance. Accordingly, it seeks comments on the following matters. How should seat performance be measured? To measure seat back and head restraint performance, should the agency adopt an instrumented dummy as used in Standard No. 208 *Occupant Crash Protection* test? Would a dynamic test that measured the response of the neck, head and chest of a Hybrid III dummy provide a realistic test procedure for a seat, the restraint system and head restraint in a rear impact? Other impacts? What type of injury criteria should we measure on a dummy in a rear impact test? Other impacts? In particular, what should the neck criteria be in a rear impact test? Would a currently produced seat pass a 30 mile per hour impact test, without "killing" the dummy? What would be objective force/deflection requirements for Standard No. 207, to define a seat failure, rather than the term "shall withstand"?

Submission of Comments

Interested persons are invited to submit comments. It is requested but not required that 10 copies be submitted.

Comments must not exceed 15 pages in length. (49 CFR 553.21) Necessary attachments may be appended to these submissions without regard to the 15-page limit. This limitation is intended to

encourage commenters to detail their primary arguments in a concise fashion. If a commenter wishes to submit certain information under a claim of confidentiality, three copies of the complete submission, including purportedly confidential business information, should be submitted to the Chief Counsel, NHTSA, at the street address given above, and seven copies from which the purportedly confidential information has been deleted should be submitted to the Docket Section. A request for confidentiality should be accompanied by a cover letter setting forth the information specified in the agency's confidential business information regulation 49 CFR part 512.

All comments received before the close of business on the comment closing date indicated above for the proposal will be considered, and will be available for examination in the docket at the above address both before and after that date. To the extent possible, comments filed after the closing date will also be considered. Comments received too late for consideration in regard to the final rule will be considered as suggestions for further rulemaking action. Comments on the proposal will be available for inspection in the docket. The NHTSA will continue to file relevant information as it becomes available in the docket after the closing date, and it is recommended that interested persons continue to examine the docket for new material.

Those persons desiring to be notified upon receipt of their comments in the rules docket should enclose a self-addressed, stamped postcard in the envelope with their comments. Upon receiving the comments, the docket supervisor will return the postcard by mail.

Issued on September 29, 1989.

Barry Felrice,

Associate Administrator for Rulemaking.

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