

INSURANCE INSTITUTE FOR HIGHWAY SAFETY

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Jacqueline Glassman
Acting Administrator
National Highway Traffic Safety Administration
400 Seventh Street, S.W.
Washington, D.C. 20590

**Average Fuel Economy Targets for Light Trucks;
Model Years 2008-2011
Notice of Proposed Rulemaking; Docket No. NHTSA-2005-22223**

Dear Ms. Glassman:

The National Highway Traffic Safety Administration (NHTSA) has asked for comments on a Notice of Proposed Rulemaking to upgrade corporate average fuel economy (CAFE) standards for light trucks. The proposed standards would apply to 2008-11 model year vehicles and involve a significant overhaul in the way fuel economy targets are calculated for each manufacturer.

The Insurance Institute for Highway Safety (IIHS) strongly supports this important step of reforming CAFE standards for light trucks. The CAFE calculation procedure that is being replaced has motivated manufacturers to decrease the weight and size of some of their vehicles or to subsidize the sales of lightweight vehicles, thus allowing the automakers to continue selling the more profitable large vehicles. Either approach can compromise crashworthiness (National Academy of Sciences, 2002). Instead of this procedure, NHTSA has proposed calculating fuel economy with a vehicle-attribute system that will encourage automakers to use new fuel efficiency technologies to achieve fuel savings rather than simply making vehicles smaller and lighter. While the choice of vehicle footprint to index the new system does not eliminate the incentive to downweight, it does remove the incentive to subsidize lightweight vehicles. Thus, the proposal reduces the safety implications by focusing on fuel efficiency within size groups.

IIHS's major concern is that the choice of a step function, rather than a continuous function, to assign fuel economy targets to vehicles unnecessarily weakens control on vehicle size -- and safety -- and could reduce actual fuel savings. The following comments enlarge on these points.

Safety Advantage of Proposed CAFE Structure

Under current CAFE standards for light trucks, manufacturers are given a fuel economy target for each model year that is the same as the national fleet target; for 2007 the target is 22.2 miles per gallon (mpg). If the harmonically averaged fuel economy for all 2007 model light trucks

built by a manufacturer does not meet this target, financial penalties are assessed on that automaker. By calculating CAFE under this method, manufacturers who produce larger, less fuel-efficient vehicles can compensate by subsidizing the sales of smaller, lighter, and more fuel-efficient vehicles. Because these lighter and smaller vehicles generally offer less protection to their occupants in crashes, compared with larger vehicles, and because of the increased incompatibility in crashes involving the largest and smallest vehicles, the current CAFE structure has had a negative impact on vehicle safety.

NHTSA has proposed changing to a vehicle-attribute-based CAFE program for light trucks, under which manufacturers would be assigned fuel economy targets based on the size mix of the vehicles they produce. Full-line manufacturers would have lower targets than automakers that produce only small pickups and utility vehicles. IIHS has expressed its support of attribute-based CAFE standards in previous comments to the agency (IIHS, 2004; IIHS, 2003). Such a system would reduce the incentive to downweight and downsize vehicles to achieve better fuel economy. Instead, automakers would be forced to rely more on introducing fuel-saving technologies. An attribute-based system also would eliminate the incentive for manufacturers to artificially increase sales of the smallest vehicles to compensate for the fuel consumption of the largest ones.

These changes should minimize the safety impact as the agency increases future fuel economy requirements for the truck fleet. However, the choice of vehicle footprint as the attribute to assign fuel economy targets and the use of a step instead of a continuous function relating footprint to targets have implications that the agency should note.

Concerns with Footprint-Indexed System

NHTSA has recommended using vehicle footprint to sort light trucks into categories with different fuel economy targets. Footprint is the product of a vehicle's wheelbase and average track width. Using this metric to define CAFE categories is a less intuitive choice than vehicle mass, which is more directly related to fuel consumption. While the effects of mass on vehicle crashworthiness have been observed and documented in many published studies (see, for example, Kahane, 1997; Partyka, 1996; and O'Neill et al., 1974), the relationship between vehicle footprint and safety is less well established. In a frontal crash, the most common type of fatal crash, the ability of a vehicle's structure to protect its occupants is influenced by the physical properties of both the vehicle and struck object as well as the specific impact speed and configuration. The relevant vehicle characteristics include mass, length and stiffness of the vehicle's crush zone, and strength of the safety cage. While vehicle footprint is correlated to some of these properties, it does not directly measure any of them.

The agency has stated that the goal of this rulemaking is for the "[r]eformed CAFE proposal [to] encourage broader use of fuel saving technologies, resulting in more fuel-efficient vehicles and greater overall fuel economy" (70 Fed. Reg. 51455 (Aug. 30, 2005)). The proposal is likely to have this effect. However, there are at least two ways that automakers could achieve CAFE improvements under the new standards without incorporating new fuel-efficiency technologies. The first way is to redesign vehicles with larger footprints in order to put them in categories with more relaxed fuel economy targets. If the accompanying mass increase were small, a vehicle might meet its new, lower fuel economy target even though actual fuel consumption would not decrease; consumption could even increase because of slight additional mass or aerodynamic drag. NHTSA has stated that it believes manufacturers will not be able to easily alter the footprints of their vehicles to place them in categories with more relaxed fuel economy targets. It is true that vehicle footprint may not be modified easily without a complete vehicle redesign, but when vehicles are redesigned it may be much easier, especially when the design being replaced falls just under a footprint boundary. One example is the Ford Explorer; the 2001 model would have fallen in the proposed footprint category with an economy target of 24.5 mpg when the new system has been completely phased in for model year 2011; the 2002 model would have been in the 27.1 mpg category. Between these model years there was an increase of about 2 inches in both track width and wheelbase while curb weight increased only 100 pounds and overall length decreased about 1 inch. Thus, it appears that altering a vehicle footprint to achieve a lower fuel economy requirement would not be so difficult.

For safety, the implications of this strategy are unclear. If automakers were to use this method to comply with stricter fuel economy targets, the result actually could be an improvement in vehicle safety, as larger vehicles theoretically could provide greater occupant protection. However, IIHS agrees that there are fuel-efficiency technologies that should be incorporated into vehicle design to improve fuel economy. This would not only result in less fuel consumed by trucks but also limit the application of such technologies for the purpose of increasing vehicle horsepower, as now is the case. Increasingly powerful vehicles lead to faster travel speeds and riskier driving that, in turn, lead to more crashes and injuries. IIHS believes NHTSA's new CAFE structure should strive to prevent artificial compliance with higher fuel economy targets that fails to actually save fuel, even though in this case the safety effects are unclear.

A second way vehicles could meet stricter CAFE requirements without incorporating new fuel-efficiency technologies is by reducing mass while maintaining size so as to fall in the same footprint-based category. The lighter vehicle would consume less fuel but be subject

to the same target as the previous, heavier design. Reducing mass reduces, on average, a vehicle's ability to protect its occupants. The size of the effect on overall safety depends on how an automaker achieves the reduction in mass and which light trucks are made lighter. Automakers could use lighter materials, maintaining the same size and structural performance as the heavier vehicle being replaced. In this case, the effect on occupant protection would be limited because size would be maintained. Still there would be a reduction in crashworthiness because decreased size and weight have separate effects on a vehicle's ability to protect its occupants (National Academy of Sciences, 2002; Kahane, 2003). Although the potential safety cost is greater when both decrease, a decrease in mass alone will, on average, reduce the crashworthiness of the light truck fleet. On a societal basis, in which both the occupants of a vehicle and other road users are considered, the safety cost of reduced mass would be most apparent if the weight reductions were to occur among the smallest and lightest trucks. If the weight reductions were concentrated among the heaviest light trucks, then the increased crash injury risk for occupants of these trucks could be offset by decreases in the risks they pose to other road users. It appears that decreases in mass among vehicles weighing more than 5,000 pounds could result in net societal safety benefits (Kahane, 2003).

Another way automakers could reduce mass is by reducing vehicle size. Although somewhat limited, there still is room within NHTSA's proposed system of footprint categories to retain the same fuel economy target but reduce size as a means of reducing mass and increasing fuel economy. If this flexibility is used, the safety of the resulting vehicle would be compromised by reductions in both size and weight. The increased safety risk posed by this strategy applies across all vehicle sizes although, again, the net societal costs are likely to be greater when the weight and size reductions occur among the smallest trucks.

Continuous Function versus Step Function

The agency has proposed using a step function to assign fuel economy targets based on six footprint categories and has asked for comments on the relative merits of using a continuous function instead. As the previous comments indicate, IIHS expects that NHTSA's proposed changes to CAFE calculations for light trucks will reduce the safety costs associated with future increases in light truck fuel economy requirements. However, these comments also indicate a number of scenarios under which the safety and/or fuel economy benefits of the proposed CAFE standards could be thwarted. Most of these potential problems stem from the agency's decision to use a step function. A continuous function would reduce or even eliminate the incentive to redesign vehicles with minimally larger footprints to face lower fuel

economy targets. It also would remove any incentive for downsizing to achieve weight reductions within categories of footprint.

The problem with the step function is that it produces relatively large spans of vehicle footprints, across which vehicle weights and fuel economy can vary significantly. As a result, vehicles that fall near an upper boundary of the step-function system can obtain a large benefit in meeting fuel economy targets with minimal increases in footprint; by the same token there can be significant decreases in the size and weight of these vehicles, as long as such decreases do not place the vehicles below the lower boundaries of their current steps. A continuous function could be developed with minimal additional research by making use of the agency's product plan and technology introduction data to yield a curve that approximately fits the proposed step-function categories.

The 2005 Chevrolet TrailBlazer EXT is an example of a vehicle that has the potential to take advantage of the edge effects of the proposed step function. This design would require a track width increase of only 1.5 inches to be categorized differently and be subject to a 1.5 mpg lower fuel economy target. To receive the same decrease in economy target under a continuous function, the TrailBlazer's footprint would have to change by about the entire range of one of the proposed footprint categories, assuming the continuous function was based on these categories. Such a redesign would be unlikely.

NHTSA has attempted to reduce manufacturers' ability to redesign vehicles into footprint categories with lower fuel economy targets by setting category boundaries so that most vehicles fall near the lower end of each footprint range. But not all vehicles are at the lower boundary. In addition, the proposed boundaries are based on vehicle designs at a set point in time and, presumably, these boundaries would need to be adjusted in the future for the categories to remain weighted toward the bottom. With a continuous function defining fuel economy targets, this issue of boundary limits would not need to be revisited. The entire function relating fuel economy targets to footprint would be adjusted upward when a higher level of overall CAFE is desired, but no extra effort would be needed to minimize the edge effects.

A continuous function also would give more credibility to the agency's argument that market preferences will serve as a restraint against unnecessary vehicle footprint changes. The changes some vehicles (e.g., the TrailBlazer) would require to cross boundary lines in a step-function system would be small enough to escape the notice of customers. With a continuous function, customers would be more likely to notice any design changes that achieved a substantial CAFE benefit.

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Two advantages NHTSA listed for a step function were that it would be "easier for the public to understand than a continuous function, and would facilitate product planning" (70 Fed. Reg. 51439 (Aug. 30, 2005)). It is possible that a step function would make product planning easier, but only if boundaries never needed to be adjusted to minimize edge effects. As far as the general public is concerned, there seems to be minimal interest in the specific details of how CAFE compliance is calculated for each manufacturer. It is unlikely that this will change based on whether or not a step function is used.

Vehicle Classification

The proposed CAFE standards should diminish the practice of passenger cars being adapted to meet the classification requirements of light trucks. These vehicles no longer should be needed to balance the larger vehicles in the fleet with respect to fuel economy. In fact, some of these models may be subject to higher fuel economy targets if classified as light trucks. As the agency monitors the effects of the new CAFE structure, it should pursue any future opportunity to expand the attribute-based CAFE system to include passenger cars as well. The crashworthiness of the entire vehicle fleet would benefit from size- or weight-indexed CAFE standards.

In conclusion, IIHS supports the proposed change in light truck CAFE to incorporate a vehicle-attribute-based system. The specific potential effects of the proposed footprint-indexed system are somewhat more obscure than those of a mass-indexed system, but even given the continued possibility of downweighting under proposed standards it is unlikely that such downweighting would occur to the same extent as under the current system. By eliminating the practice of offsetting sales of large vehicles with small ones, the proposal also would reduce incompatibility within the light truck fleet. This should result in fewer fatalities and injuries in light truck crashes.

Sincerely,

A handwritten signature in black ink, appearing to read "Adrian K. Lund", is written over a vertical red line.

Adrian K. Lund, Ph.D.
Chief Operating Officer

cc: Docket Clerk, Docket No. NHTSA-2005-22223

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