



ADVOCATES  
FOR HIGHWAY  
AND AUTO SAFETY

November 21, 2007

Nicole Nason  
Administrator  
National Highway Traffic Safety Administration  
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West Building  
Washington, D.C. 20590

Dec 4  
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**Petition for Rulemaking Regarding Federal Motor Vehicle Safety Standard No. 208  
(49 C.F. R. 571.208) Occupant Crash Protection**

Dear Administrator Nason:

This petition for a safety standard submitted by Public Citizen and Advocates for Highway and Auto Safety seek revision of Federal Motor Vehicle Safety Standard (FMVSS) 208 to require manufacturers to install a safety belt use warning system for designated seating positions in the rear seat of passenger cars and multipurpose passenger vehicles of 10,000 Gross Vehicle Weight Rating (GVWR) pounds or less. We originally filed this petition for rulemaking in August 2007, but because we no longer see it on the docket, we are again submitting it for NHTSA's consideration. The reasons for the National Highway Traffic Safety Administration (NHTSA) to immediately revise FMVSS 208 to require a rear seat safety belt reminder system include:

- requiring rear seat belt reminders would save hundreds of lives each year, a large percentage of which would be children;
- rear seat belt reminders are necessary to save lives because primary enforcement of seat belt laws does not typically cover rear seat occupants;
- multiple studies have proven that rear seat belt use would increase significantly if rear seat belt reminders were required;
- requiring rear seat belt reminders is consistent with NHTSA's statements, Rulemaking Agenda, and SAFETEA-LU requirements to increase safety belt use for all passengers because implementing rear safety belt reminder systems would be the easiest way to achieve further gains in safety belt use and lives saved;
- rear seat belt reminders are technologically feasible;

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- rear seat belt reminders would be less costly per unit if required in all vehicles; and
- the American public desires rear seat belt reminders.

## INTRODUCTION

Many rear seat occupants in passenger vehicles who currently lose their lives in highway crashes would survive if they used their safety belts. According to data in the Fatal Analysis Reporting System (FARS), in 2004, only about one third of the 2,900 fatally injured rear seat occupants were belted, a figure 15 percentage points below the 46.5 percent safety belt usage rate for fatally injured front seat occupants. About 1,100 of those rear seat fatalities were children between the ages of 5 to 18. If rear seat safety belt usage matched the level of front seat usage, about 289 lives would be saved each year, including over 78 children between the ages of 5 to 18. If rear seat belt use reached 90 percent, 598 lives of back seat passengers would be saved each year, including 211 children between the ages of 5 to 18. Furthermore, because front seat passengers are at risk when their back seat passengers do not wear their safety belt, six or more front seat passengers' lives would be saved each year by rear seat belt reminders.

While increasing safety belt use has been one of the most successful highway safety initiatives over the last 20 years, rear seat passengers are still especially at risk of serious injury or death in highway crashes. For example, front safety belt use increased from 14 percent in 1983 to 80 percent in 2004 due to coordinated campaigns and safety belt laws. Although rear seat safety belt use has increased as well, the gap between front and rear safety belt usage has remained a constant chasm over that period of time. The number of fatally and seriously injured unbelted rear seat occupants will likely continue to grow in the coming years as more children are moved into the back seat of passenger vehicles if rear seat safety belt reminder systems are not required.

Rear seat safety belt reminders would provide a necessary safety measure for rear seat passengers, who are predominately children. A safety standard requiring rear seat safety belt reminder systems is necessary because state safety belt laws and other safety devices do not adequately protect rear seat occupants. For example, only 3 states require belt use at all seating positions by all passengers 6 years of age and older, and only one of those states has primary enforcement of its belt laws.<sup>1</sup> Moreover, although rear seat passengers are especially at risk, NHTSA has failed to take steps to improve safety for rear seat passengers at the same time it has required safety improvements for front seat passengers. While NHTSA requires belt reminder systems for the driver's position and airbags for both front seat positions, there are no parallel requirements that ensure equal safety for rear seat occupants.

This petition for a safety standard is consistent with public positions taken by agency officials and the recommendations of the National Academy of Sciences (NAS). In 2002, Dr. Jeffrey Runge, former NHTSA administrator, urged automobile manufacturers to voluntarily install improved seat belt reminder systems, *including those for rear seats*.<sup>2</sup> A 2003 study by a

committee of the NAS recommended that NHTSA be given the authority to require improved safety belt reminder systems and urged that "[r]ear seat reminder systems should be developed at the earliest possible time."<sup>3</sup>

This petition is also consistent with NHTSA's rulemaking agenda prescribed in the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). SAFETEA-LU requires the Secretary of Transportation to develop strategies for improving safety belt use.<sup>4</sup> NHTSA plans to study the effectiveness of enhanced front seat safety belt reminders and encourage their use;<sup>5</sup> however, a study of rear seat safety belt reminders is not contemplated. Since sufficient data and numerous recommendations already are available, NHTSA needs to revise FMVSS 208 to require rear seat belt reminders to save lives now, for the reasons described above.

A revised occupant protection safety standard requiring rear seat safety belt reminders would have an immediate safety impact. Several manufacturers have already developed enhanced front seat belt reminder technology and installed it in certain vehicle models. Ample research shows that significant numbers of part-time safety belt users are influenced by belt reminder systems to buckle up. Research also shows that well-designed belt reminder systems are both acceptable and desirable to the motoring public. If safety belt reminder systems were installed in rear seating positions, rear safety belt use would increase significantly. Parents would insist that their children buckle up if reminded by dashboard indicators and audible reminders. Belted drivers would also remind adult rear seat passengers to conform to their own belt use expectations.

FMVSS 208 requires automobile manufacturers to provide an audible belt reminder system only for the driver's position: "A seat belt assembly provided at the driver's seating position shall be equipped with a warning system that ... activates a continuous or intermittent audible signal for a period of not less than 4 seconds and not more than 8 seconds and that activates a continuous or flashing warning light visible to the driver . . . for not less than 60 seconds" See FMVSS 208 S4.5.3.3(b). It is common practice for vehicle manufacturers to provide warning systems at the front passenger seating position as well. However, few if any manufacturers equip their vehicles with systems to remind the driver that rear seat passengers are not using their seat belts, despite the fact that non-use of safety belts by rear seat passengers contributes significantly to the annual toll of total deaths resulting from highway crashes.

Thus, pursuant to 49 C.F.R. § 552, Public Citizen and Advocates for Highway and Auto Safety request that NHTSA conduct a rulemaking and issue a final rule amending FMVSS 208 to require manufacturers to install seat belt use warning systems for designated seating positions in the rear seat of passenger cars and multipurpose passenger vehicles of 10,000 GVWR pounds or less.<sup>6</sup>

**I. UNDER-USE OF SEAT BELTS BY REAR SEAT PASSENGERS IS A DEADLY PROBLEM.**

Overall, 31,693 passenger vehicle occupants died in 2004 in highway crashes. About 2,900 of these fatalities were rear seat occupants. The total number of rear seat fatalities is much smaller than the total number of front seat fatalities for a simple reason: rear seat occupancy rates are far lower. However, the observed belt use by rear seat occupants in fatal crashes is also significantly lower than that of front seat occupants, and that rate of usage has not improved as front seat occupants have increasingly buckled up. With this petition for rulemaking, NHTSA has an opportunity to save lives that are needlessly lost every year.

**A. REAR SEAT OCCUPANTS OF VEHICLES WEAR SAFETY BELTS LESS FREQUENTLY THAN FRONT SEAT OCCUPANTS.**

The National Occupant Protection Survey (NOPUS) conducted a study that tabulated safety belt usage in 2004.<sup>7</sup> Front seat passenger safety belt usage was observed to be 80 percent. Rear seat passenger use was observed to be only 47 percent. Notably, that 47 percent includes younger children in child safety seats, who tend to inflate rates of rear seat passenger usage because of a very successful program to federal and state initiatives to ensure that children are restrained.

The same disparity is evident in government data. NHTSA's database of fatal crashes gives a snapshot of this disparity:

**Table 1**  
**Belt Use by Fatally Injured Occupants in Passenger Vehicles**  
**2004 FARS\***

Seat Position	Car Fatalities	Car Belt Use By Fatalities % Belted	Light Truck Fatalities	Light Truck Belt Use By Fatalities % Belted	Total Fatalities	Total Belt Use % Belted
Front Seat	17,161	52.4	10,943	37.4	28,104	46.6
Rear Seat	1,720	34.5	1,194	29.6	2,914	32.5
Total	18,881	50.8	12,137	36.6	31,018	45.3

\* FARS 2004 data summarized in Appendix at Tables A8-A10

Table 1 shows that safety belt use for fatally injured front seat occupants is about 46.6 percent. Belt use by fatally injured rear seat occupants is significantly lower — about 32.5 percent. Further analysis demonstrates, however, that the gap in belt use rates is even higher:

**Table 2**  
**Percent of Restraint Use by Fatally Injured Occupants by Age**  
**2004 FARS**

Age	CARS		LIGHT TRUCKS	
	Front Seat	Rear Seat	Front Seat	Rear Seat
0-1*	42.9	81.9	35.3	71.4
2-4*	46.7	75.5	31	67
5-18	49.3	33.3	34.2	28.8
19+	53	23.7	37.7	20.4
Total	52.4	34.5	37.4	29.6
Total 5+ (excluding ages 0-4)	52.5	28	37.4	23.7

\* Reflects success of child safety seat use campaigns and laws.

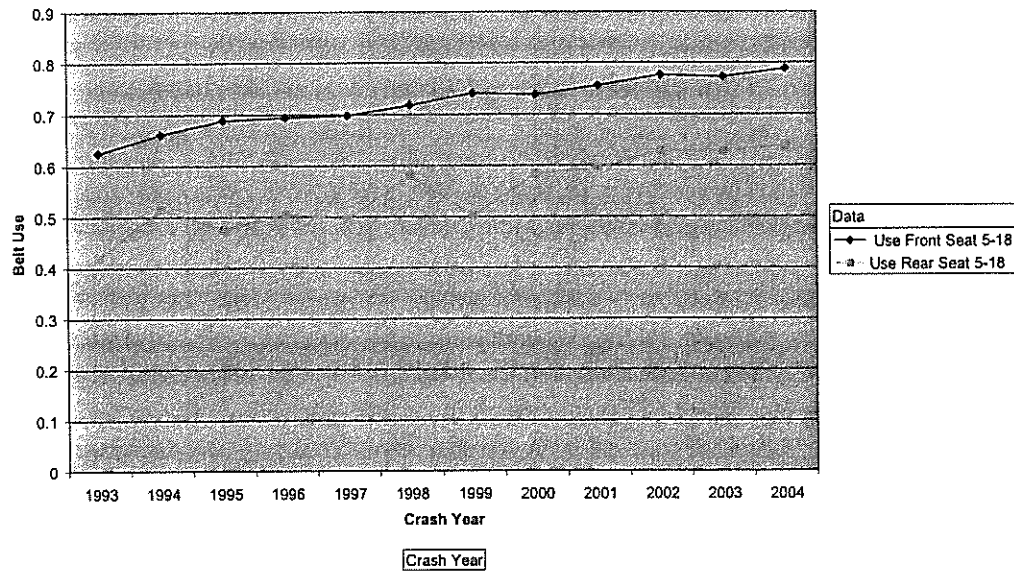
Table 2 shows that, as would be expected, use by fatally injured occupants is highest for very young children seated in child safety seats as required by state law, and the number of rear seat occupants who are belted decreases with age. Back seat occupancy rates for the 5 to 18-year-old cohort is less than one-half of the occupancy rates for the youngest children who are in child safety seats. Thus, removing the generally belted population of the youngest children from the equation would show that rear seat safety belt use is more of a problem than the general use rate of 32.5 percent (see Table 1) suggests.

Table 2 shows that the disparity in safety belt use between front and rear seat occupants is significantly worse (28 percent usage) when very young children, who are typically restrained by child safety seats, are removed from the sample population. About 90 percent of rear seat occupant fatalities were older than 5 years of age and thus not typically put into child safety seats.<sup>8</sup> Adding rear seat belt reminders will, therefore, most significantly influence belt use for passengers ages five and older.

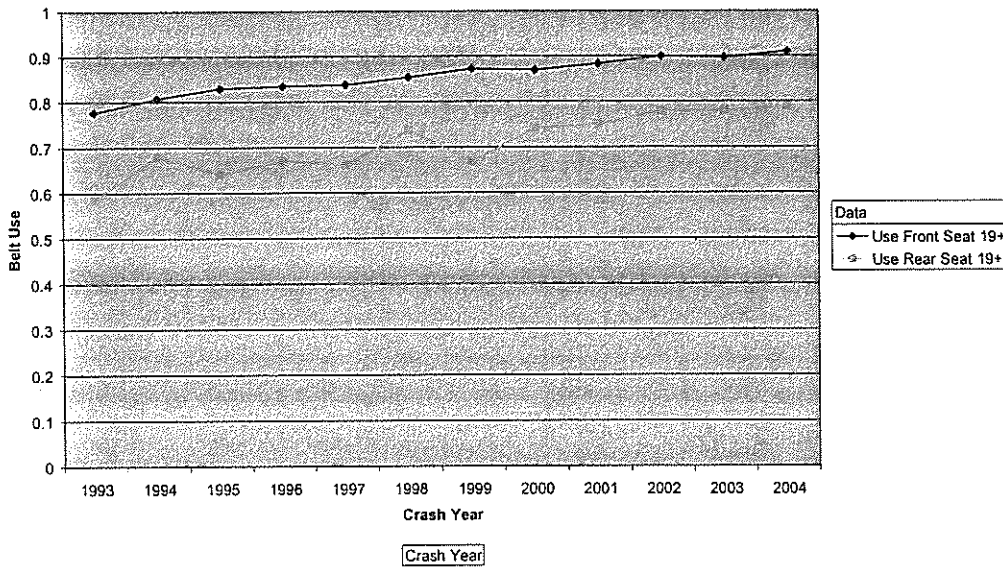
#### **B. REAR SEAT BELT USAGE COMPARED TO FRONT SEAT BELT USAGE IS STAGNANT.**

The 2004 NOPUS compilation reveals another problem: the gap between use of safety belts by front and rear seat passengers has remained constant over the last ten years for both the age cohorts 5 to 18 years-old and 19 years-old and up. Thus, the gap between rear seat safety belt use and front safety belt use has not improved, even though overall safety belt use has increased:

**Predicted Belt Use  
Ages 5-18 Front vs Rear Cars**



**Predicted Use  
Ages 19+ Front vs Rear Car**



**C. THE NUMBER OF CURRENT REAR SEAT PASSENGER LIVES SAVED BY SAFETY BELTS IS FAR TOO LOW.**

The disparity in front versus rear seat belt usage rates has deadly consequences. Although seat belts are equally effective at saving lives in both the front and rear seats, they are saving fewer lives than they should. At the heart of this problem is the gap in belt use rates.

NHTSA has developed formulas to calculate safety belt effectiveness in saving lives.<sup>9</sup> The source, mathematical equations, and explanations for these formulas are contained in the Appendix. Use in Potentially Fatal Crashes (UPFC) measures the difference in safety outcomes that safety belts make for all occupants involved in a potentially fatal crash, including fatally injured unbelted passengers, fatally injured belted passengers, and surviving belted passengers. UPFC is used to calculate safety belt effectiveness because it accounts for both surviving passengers and all passengers fatally injured despite the use of safety belts. Lap and shoulder safety belt effectiveness is typically measured by "paired comparisons," in which restrained drivers are compared to restrained and unrestrained passengers (and vice versa) in the same crash. The total number of potential fatalities is calculated by measuring the effect lap and shoulder safety belt effectiveness and UPFC have on the total number of observed fatalities.<sup>10</sup> The total number of current lives saved is determined by subtracting the total number of fatalities from the number of potential lives saved.<sup>11</sup>

Table 3 summarizes NHTSA's calculations and estimates of the total number of current lives saved by safety belt use. (Because of very successful child safety campaigns and strong child safety seat use laws in the states, child safety seat use is already very high, and children age 5 and younger are not included in the chart.)

**Table 3**  
**Calculated Passenger Vehicle Safety Belt Use by Seating Position**  
**2004 FARS Age 5 and Above**

	CARS		LIGHT TRUCKS	
	Front Seat	Rear Seat	Front Seat	Rear Seat
Total Fatalities <sup>12</sup>	17,109	1,508	10,896	1,040
Percent of Safety Belt Use by Fatally Injured Passengers <sup>13</sup>	52.5	28	37.4	23.7
Estimated Percent of Safety Belt Use by All Passengers <sup>14</sup>	81.3	57.7	75.4	69.7
Percent of Safety Belt Use in Potentially Fatal Crashes (UPFC) <sup>15</sup>	66.7	41	59.9	53.5
Belt Effectiveness Percentage	45	44	60	73
Potential Fatalities	24,458	1,840	17,009	1,706
Current Lives Saved	7,349	332	6,113	666
Current Percentage of Lives Saved by Safety Belt Use	30.05	18	36	39

Potential fatalities represent the number of vehicle occupants involved in serious, potentially fatal crashes. NHTSA has developed formulas (see Appendix) that relate safety belt use by fatally injured occupants (captured by the FARS data base) to "Use in Potentially Fatal Crashes" (UPFC). UPFC differs in theory from the use rate by fatally injured occupants in that it calculates the use rate of all those involved in a potentially fatal crash, including unbelted fatalities, belted fatalities, and those saved by the belt. These formulas take into account the varying effectiveness rates of safety belts at different seating positions. Potential fatalities are then calculated using the UPFC, the number of fatalities in a seating position, and the effectiveness of safety belts at that seating position.

Table 3 shows that, for passenger cars, safety belt use by rear seat occupants only prevents 18 percent of potential fatalities. In contrast, 30 percent of potential fatalities are prevented by safety belt use by front seat occupants. Thus, safety belt use by rear seat occupants saves 40 percent fewer lives than safety belt usage in the front seat, even though safety belt effectiveness is essentially the same for both front and rear seat users.

Although the estimated use of safety belts and UPFC by rear seat passengers in light trucks is high in comparison, rear seat safety belt reminders would still decrease the number of fatalities for these occupants. Most pickup trucks do not have rear seats, so most rear seat occupants in light trucks are in SUVs and minivans. Belt effectiveness in these vehicles is very high (73 percent); as belt effectiveness increases, UPFC and estimated safety belt use increase as well. However, the gap between rear seat and front seat occupants' safety belt use for passengers ages 5 and older in light trucks is still large, so rear seat safety belt reminders would save a significant number of lives.

## **II. REQUIRING REAR SEAT BELT REMINDERS WOULD SAVE A SUBSTANTIAL NUMBER OF LIVES, MANY OF WHICH WOULD BE CHILDREN.**

Safety belts are the single most effective safety device in preventing serious injuries and reducing fatalities in motor vehicle crashes. Rear seat passengers are not using those belts at the same rate as front seat occupants, and the result is that seat belts are not saving enough lives of rear seat passengers. Improving the rear seat safety belt use rate would save hundreds of lives each year, the majority of which would be children.

### **A. REAR SEAT BELT USE WOULD INCREASE IF REAR SEAT BELT REMINDERS WERE REQUIRED.**

The key to saving the needlessly lost lives of rear seat belt occupants is to increase the rate at which those occupants use their safety belts. Rear seat reminders will do just that.



*1. Very few non-users of seat belts are unalterably opposed to belt use.*

Rear seat belt reminders will not force occupants to actually use their belts; instead, they remind those occupants of their failure to use their belts, thus relying on the occupants to respond to the reminder and use their belts. Research into attitudes about belt use reveals that the vast majority of non-users will respond to the reminder signal — which means that rear seat belt reminders will be an effective solution to the problem.

In 2001, NHTSA conducted a telephone survey titled “Motor Vehicle Occupant Safety Survey” (MVOSS) that provided self-reported information on belt use by users and non-users.<sup>16</sup> The MVOSS summarized the reasons why non-users do not wear safety belts. The study grouped occupants into three categories based on frequency of belt use: full-time users, part-time users, and hard-core nonusers. NHTSA concluded that very few drivers (only 4%) were hard core nonusers, while 20% self-described as part-time users. The findings are consistent with those found in Europe; for example, a recent study by the Swedish government found that only a very small percentage of non-users were “hard core” non-users.<sup>17</sup>

The reasons that people give for not wearing safety belts are an important consideration when estimating the contribution that technology such as belt reminder systems could have on belt use. The MVOSS reported the reasons for not using safety belts as follows:

- 59 percent did not use safety belts because they were driving a short distance;
- 53 percent forgot to buckle up;
- 41 percent were in a hurry; and
- 33 percent found safety belts uncomfortable.

In sum, the MVOSS suggests that part-time users are a majority of non-users (twenty out of twenty-four percent) and that within this group, “forgetting” to buckle up (53 percent) is a very significant reason for not using a safety belt. Because so few are hard-core nonusers and so many simply forget to buckle up, rear seat belt reminders will be an effective solution to the problem of insufficient belt use by rear seat passengers.

*2. Empirical data confirm the effectiveness of rear belt reminders.*

Research into belt use behavior by occupants of vehicles that already come equipped with rear seat belt reminders confirms what the attitude research suggests: rear seat belt reminders result in increased belt use.

The Insurance Institute for Highway Safety (IIHS) published a review of a paper authored by its chief scientist, Alan Williams, entitled “The Effectiveness of the Belt-Minder System in Increasing Seat Belt Use.” According to the IIHS 2002 Status Report, “76 percent of drivers in cars equipped with the [Ford BeltMinder system] were using their belts compared with 71 percent of drivers in late-model Fords without the special reminder,” and the public likely accepted belt reminders because “today attitudes toward safety are much different. You’re not

going to have....acceptability problems with new belt reminder systems as long as they're not overly intrusive.<sup>18</sup>

The NAS also reported a second study by Alan Williams in its 2003 research study.<sup>19</sup> This study summarized interviews of 405 owners of vehicles equipped with the FordBeltMinder system in the Boston area about how the chimes and light affected their safety belt usage:

Approximately two-thirds of the 405 drivers interviewed reported that they had experienced the reminder system one or more times when they had neglected to buckle up. Seventy-three percent reported that they buckled up the last time this happened, and 46 percent of all respondents said that their belt use had increased since driving a vehicle with a BeltMinder....Seventy-nine percent reported that they would like a similar device in their next vehicle....Seventy percent had fastened their seat belts in response, and 76 percent reported that their seat belt use had increased since purchasing the vehicle.<sup>20</sup>

The 2003 NAS report also discussed several relevant European studies that found seat belt use would increase as a result of safety belt reminder systems. A 2001 Swedish study evaluated the effect older, less aggressive belt reminder systems had on safety belt use.<sup>21</sup> The study indicated "that only 12 percent of drivers injured in crashes were unbelted in cars with a belt reminder light-and-sound signal, compared to 23 percent in cars without a reminder system, a statistically significant difference."<sup>22</sup> Another Swedish study, based on interviews of observed unbelted occupants found that an aggressive belt reminder system would be acceptable to part-time users.<sup>23</sup> "For example, of the 500 Swedish drivers interviewed after being observed not wearing their safety belts in traffic, 83 percent said they would buckle up if they rented a car with an aggressive audible warning system."<sup>24</sup>

Thus, the evidence from both the Insurance Institute and the NAS is that safety belt usage increases as belt reminder systems are improved. It is highly likely that rear seat safety belt use will increase as well should NHTSA require rear safety belt reminders.

#### **B. THE INCREASED REAR BELT USE RATES WILL SAVE SIGNIFICANT NUMBERS OF LIVES.**

If rear seat belt reminders were required, the difference between the number of rear seat occupant and front seat occupant lives saved by safety belts would shrink. A significant number of lives would be saved by rear seat belt reminder systems. Not only will some of those lives saved be front seat occupants in addition to rear seat passengers, but also many of the lives saved will be children.

1. *Rear seat belt use will save many lives.*

There are at least three possible scenarios that would describe the likely increase in lives saved by requiring safety belt reminder systems for the rear seat:

- Scenario 1: Belt use by rear seat occupants would rise to the level of belt use by front seat occupants. For passenger cars, this would mean rear seat use would increase from 57.7 percent to 81.3 percent. For light trucks, this would mean rear seat use would increase from 69.7 percent to 75.4 percent. (See Table 3, above.)
- Scenario 2: The hypothesis of the Swedish government study noted above was that belt reminders would reach 50 percent of part-time safety belt users and that 75 percent of those people would buckle up. The study found that about 80 percent of non-regular users are part-time users and 20 percent are hard-core nonusers.<sup>25</sup> Assuming this hypothesis for passenger cars, safety belt use by rear seat occupants would increase from 57.7 percent (current use rate) by 12.9 percent to reach 70.6 percent. For light trucks, safety belt usage by rear seat occupants would increase from 69.7 percent (current use rate) by 9.1 percent to reach 70.8 percent. Table 4 below shows the estimated increase in seat belt use by rear seat occupants due to belt reminder systems, assuming the Swedish study hypothesis.
- Scenario 3: Given the success in increasing front seat belt use due to belt reminder systems, state use law requirements and advertising campaigns, and the fact that many rear seat passengers are children whose parents, once alerted, have a keen interest in the safety of their children, it is entirely possible that rear seat belt use could increase to 85 to 90 percent in the future.

**Table 4**  
**Estimated Seat Belt Usage by Rear Seat Occupants**  
**Assuming the Hypothesis of the Swedish Study**

Vehicle Type	A Percentage of Rear Seat Occupants who are non-users	B Column A * 0.80 (Percentage of Rear Seat Occupants Who Are Part-Time Non Users)	C Column B * 0.50 (Percentage of Rear Seat Occupants Who Are Reached By Belt Reminder Systems)	D Column C * 0.75 (Percentage of Rear Seat Occupants Who Buckle Up As A Result Of Belt Reminder Systems)	E Total Estimated Percent Increase In Seat Belt Usage By Rear Seat Occupants	F Estimated Seat Belt Usage By Rear Seat Occupants With Rear Seat Belt Reminder Systems
Cars	43 %	0.423 * 0.8 = 0.3384	0.3384 * 0.5 = 0.1692	0.1692 * 0.75 = 0.1269	12.69 %	70.39 %
Light Trucks	30.3 %	0.303 * 0.8 = 0.264	0.264 * 0.5 = 0.132	0.132 * 0.75 = 0.0999	9.1 %	70.8 %

Using the 2004 fatality data from Table 3 above, potential benefits from rear seat safety belt reminder systems are quantified in Table 5, which shows that a significant number of lives would be saved under each scenario.

**Table 5**  
**Predicted Annual Life Savings**  
**from a Requirement for Rear Seat Safety Belt Reminders**

	CARS		LIGHT TRUCKS	
	Front	Rear	Front	Rear
Fatalities <sup>26</sup>	17,109	1,508	10,896	1,040
Percentage Used by Fatally Injured Passengers <sup>27</sup>	52.5	28	37.4	23.7
Percent of UPFC <sup>28</sup>	66.8	41	59.9	53.5
Percent of Estimated Use	81.3	57.7	75.4	69.7
Belt Effectiveness Percentage	45	44	60	73
Potential Fatalities	24,458	1,840	17,009	1,706
Current Lives Saved	7,349	332	6,113	666
Potential Lives Saved under Scenario #1		541		746
Increase in Lives Saved under Scenario #1		209		80
Lives Saved under Scenario #2		439		795
Increase in Lives Saved under Scenario #2		107		129
Potential Lives Saved under Scenario #3 (85 percent)		578		889
Increase in Lives Saved Under Scenario # 3 (85 percent)		246		223
Potential Lives Saved under Scenario #3 (90 percent)		629		795
Increase in Lives Saved under Scenario # 3 (90 percent)		297		302

Scenario number one assumes that rear safety belt reminder technology would lead to rear safety belt use equal to front seat use.<sup>29</sup> For passenger cars, this would result in 209 additional lives (age 5 and over) saved when belt reminder technology are present in the passenger car fleet. Scenario number one would also result in 80 additional lives saved for light truck occupants. Many of those saved would be children aged 5 to 18.

Scenario number two assumes that belt reminder technology would reach 50 percent of part-time users and that 75 percent of these people would then routinely buckle up. This assumption is based on the methodology of a Swedish government study discussed earlier.<sup>29</sup> For passenger cars, this would save an additional 107 lives (ages 5 and over). This scenario would also significantly increase rear safety belt use among the occupants of light trucks, saving an additional 129 additional lives. Again, many of those saved would be children aged 5 to 18.

Scenario number 3 assumes that rear seat belt use would rise to either 85 or 90 percent as future efforts to increase overall occupant safety belt use succeed. At 85 percent overall safety

belt use, there would be a net increase of 246 lives saved in cars and 223 additional lives saved in light trucks. At 90 percent usage, there would be a net increase of 297 lives saved in passenger cars and an increase of 302 lives saved in light trucks. As was the case under scenarios 1 and 2, many of those lives saved would be children aged 5 to 18.

Moreover, it is very likely that the estimates for additional lives saved for each scenario are low because of NHTSA's longstanding underestimation of safety belt effectiveness. It is difficult to understand how NHTSA could conclude that the effectiveness of safety belts remained constant from 1993 to 2004, yet that is exactly what the agency has done. (See Appendix Tables A6 through A8 below.) NHTSA's stagnant estimate fails to reflect progress in safety belt technology, the investment manufacturers have made in safety belt technology, and improvements to the crash energy management of vehicle structures over this period of time. There are numerous on-the-shelf restraint technologies available that have significantly improved the performance of basic safety belts.<sup>30</sup> Although they are not all installed in the vast majority of vehicles on the road or new vehicles being produced, the minority of cars that do have these improved safety belt technologies necessarily contribute to an overall increase of safety belt effectiveness, which NHTSA fails to recognize. As a result, the number of potential lives saved under each scenario is likely underestimated because the number of potential lives saved will increase as these and future improvements are installed and safety belt effectiveness rises.

2. *A significant number of front seat occupant lives will also be saved.*

There are additional safety benefits for both restrained and unrestrained front seat occupants that would result from increasing rear safety belt use. Two papers have examined how unrestrained rear seat passengers can increase the risk of serious injury or death for both restrained and unrestrained front seat passengers.

The injury mechanism is simple. Unrestrained rear seat passengers can be thrown forward, especially in frontal crashes, and can seriously injure or kill front seat occupants. Similarly, restrained rear seat occupants are at greater risk if other rear seat co-occupants are not restrained. Cummings and Rivara found that "when a front target with an unrestrained rear occupant was compared with a front target with a restrained rear occupant, the relative risk for death was 1.04 for an unrestrained front target and 1.2 for a restrained front target. For a restrained side target, the risk of death was greater (relative risk 1.15) if the target had an unrestrained occupant beside him/her compared with a target next to a restrained occupant."<sup>31</sup> Cummings and Rivara estimated that as many as 6 front seat fatalities annually could be prevented if rear seat occupants were restrained. Ichikawa estimated an even higher relative risk to front seat occupants from unrestrained rear seat occupants in a study using Japanese vehicle fatality data.<sup>32</sup>

3. *Many of the lives saved by rear seat belt reminders will be children.*

A 2003 NHTSA evaluation noted a study about child occupancy trends entitled *Moving Children from the Front Seat to the Back Seat*.<sup>33</sup> The study examined a variety of safety issues

related to moving children from the front to the rear seat. An interesting finding was that about 35 percent of children 8 to 12 years of age still rode in the front seat as of 2001, but that front seat occupancy is gradually decreasing (it was about 40 percent in 1995). Other studies have confirmed this trend.<sup>34</sup> This change was due in part a nationwide advertising campaign to reduce child passenger fatalities implemented by the government in coalition with other groups. The trend indicates that there will very likely be more children riding in the rear seat in the future as additional educational campaigns promote the rear seat as the safer location. Unfortunately, unless rear safety belt use is increased, the overall safety of children might decrease as a result of this trend. Indeed, there is evidence that unrestrained children in the back seat may be at greater risk for serious injury or death than restrained children in the front seat.<sup>35</sup>

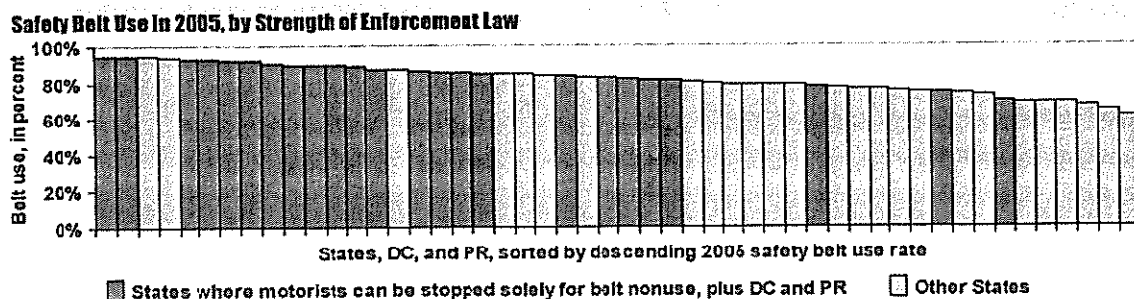
The group of passengers who would be most affected by rear seat belt reminders, occupants ages 5 and older, currently makes up a disproportionate number of rear-seat fatalities. For example, in 2004, 686 of the 1,720 fatally injured rear seat occupants were between the ages of 5 and 18 years old, even though the rear seat occupancy rate for the 5 to 18-year-old cohort is less than one-half of the occupancy rate for the youngest children (aged 0-4) who are typically placed in child safety seats. (See Appendix, Tables A8 and A10.)

Accordingly, as rear seat belt reminders increase seat belt use rates, many of the lives that will be saved will be children.

### III. A FEDERAL REQUIREMENT OF REAR SEAT BELT REMINDERS IS A NECESSARY SOLUTION.

State laws do not provide an adequate solution. As of June 2006, all states except New Hampshire have safety belt laws; however, belt use laws in only 25 states and the District of Columbia are primary, meaning police may stop vehicles solely for belt law violations. Police authority to enforce belt laws in other jurisdictions is limited.

The chart below illustrates that high safety belt use rates are directly related to primary enforcement of safety belt laws. Safety belt use is generally higher in states with primary enforcement of belt laws.



\* Chart available at: <http://www-nrd.nhtsa.dot.gov/departments/nrd-30/ncsa/>

A requirement for rear safety belt reminders is necessary because primary enforcement of state safety belt laws is limited even within states that have primary enforcement laws. According to the IIHS, as of June 2006, only 19 states' primary enforcement laws cover rear seat passengers. Moreover, **only 1 of those states, South Carolina, has a primary enforcement law covering all passengers 6 years of age and older.**<sup>36</sup> Thus primary enforcement of belt laws does not influence many rear seat passengers to buckle up in the majority of states. Safety belt reminder systems would provide the incentive to buckle where state belt enforcement laws have failed.

#### **IV. REQUIRING REAR SEAT BELT REMINDERS IS CONSISTENT WITH NHTSA'S POLICY, RULEMAKING, AND THE DOT/NHTSA TRANSPORTATION REAUTHORIZATION LEGISLATION.**

##### **A. A NEW STANDARD IS CONSISTENT WITH NHTSA'S POLICY.**

Former NHTSA Administrator Dr. Jeffrey Runge strongly endorses seat belt reminder technology. On February 25, 2002, he wrote to all passenger vehicle manufacturers asking them to consider voluntarily upgrading the belt reminder systems in their vehicles:

The American people win when vehicle manufacturers demonstrate good corporate citizenship by going beyond the minimums required under the safety standards. Innovation beyond the standard allows greater flexibility in product design, while allowing those products to reach consumers faster and keep them safer....Ideally, the systems should cover rear seating positions as well as front. Together we can realize dramatic increases in seat belt use in the United States.<sup>37</sup>

Dr. Runge's letter cited both the Ford upgraded belt reminder system and the IIHS research.

NHTSA has an obligation to carry out needed safety research and development to reduce deaths resulting from traffic crashes. *See* 49 U.S.C. § 30101(2). NHTSA sponsored a 2003 National Academy Study (NAS) study entitled "Buckling Up Technologies to Increase Seat Belt Use" in part to learn about the effectiveness of belt reminder systems in reducing deaths. Rear seat safety belt reminder systems were strongly endorsed by the report.<sup>38</sup> After considering the importance of increasing safety belt use and securing public acceptability of enhanced reminder technology, the committee recommended the following:

Congress should provide NHTSA with more flexibility and the authority to require more effective belt reminder technology; ...

NHTSA should encourage the industry to develop and deploy enhanced belt reminder systems; ... and ...

**Rear seat reminder systems should be developed at the earliest possible time . . . to take advantage of the benefits of restrained rear occupants to the safety of both front and rear-seat occupants. Until that time, manufacturers should provide systems that notify the driver if rear-seat occupants either have not buckled up or have unbuckled their belts during a trip.**<sup>39</sup>

With the research already done, NHTSA now must proceed to a response based on that research: require rear seat belt reminders.

## **B. MERE STUDY IS INSUFFICIENT.**

Congress demanded that NHTSA focus on the problems of rear seat belt use. The DOT/NHTSA Transportation Reauthorization legislation requires a study of safety belt use technologies: "The Secretary of Transportation shall conduct a review of safety belt use technologies to evaluate progress and to consider possible revisions in strategies for achieving *further gains* in safety belt use. The Secretary shall complete the study by July 1, 2008."<sup>40</sup> This mandate requires a study of safety belt use technologies for all seating positions. In fact, language restricting the study to front safety belt use technologies was removed from the legislation.

**NHTSA should recognize that implementing rear safety belt reminder systems would be the easiest way to achieve further gains in safety belt use and lives saved.** A safety standard requiring rear safety belt reminder is necessary at this time to save lives because it would close the gap between rear seat and front seat safety belt use rates. Merely studying the effectiveness of rear seat safety belt reminder systems would be an inadequate response and, given that no vehicles have rear seat safety belt reminder systems, impossible to accomplish. Rear seat occupants make up a larger population of potential new safety belt users than front seat occupants do, and many rear seat occupants are children, who could be reminded to buckle up by their parents.

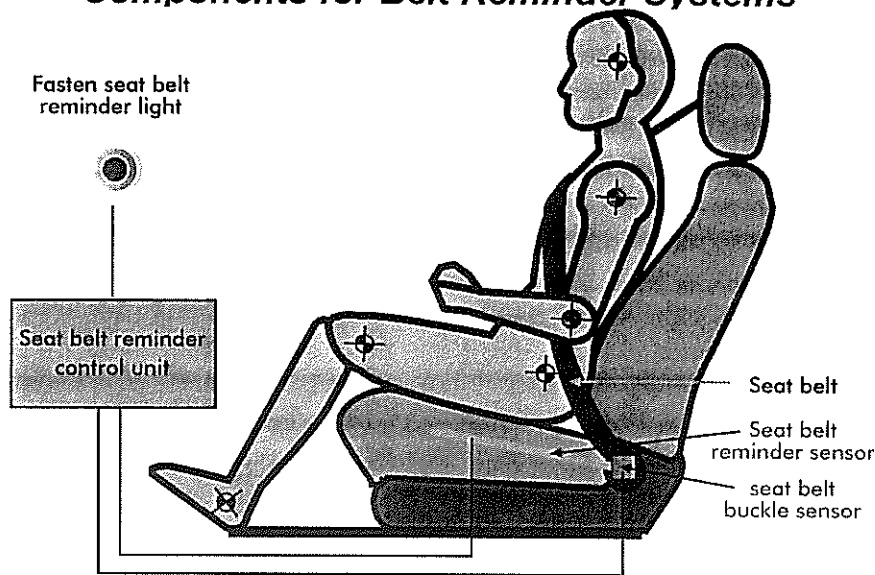
This requirement is separate from but consistent with NHTSA's plans to conduct a study of safety belt reminder systems. NHTSA's priority plan for calendar years 2003 through 2006 noted the agency would "[s]tudy the effectiveness of different safety belt reminders and other technologies for increasing belt use," with the goal of reducing ejection related deaths that could be prevented by safety belts.<sup>41</sup> The January 2005 update to NHTSA's Vehicle Safety Rulemaking and Supporting Research Priorities noted that NHTSA would "conduct research on effectiveness of advanced reminders in CY 2005-2006 and make a rulemaking decision on next steps in 2007."<sup>42</sup> NHTSA's study will evaluate the effectiveness and acceptability of several different types of safety belt reminder systems currently offered by a number of manufacturers. Observations of actual belt use will be compared with survey data to determine the extent which reminder systems increase belt use and driver acceptance of the different approaches to reminder system design. When NHTSA completes this study and receives permission from Congress to require enhanced performance reminders, the new, enhanced reminder requirement should also apply to the rear seat.



## V. REAR SEAT BELT REMINDERS ARE TECHNOLOGICALLY FEASIBLE AND COST EFFECTIVE.

Safety belt reminder systems encourage drivers and passengers to wear a safety belt through the use of physical reminders, *e.g.*, warning lights and audible chimes. The systems are comprised of three basic components: 1) a sensor in the seat which detects occupancy; 2) a sensor in the safety belt buckle; and 3) and a control unit for a reminder system that generally features both flashing lights and an audible chime.

### *Components for Belt Reminder Systems*



Although FMVSS 208 requirements governs only the driver position, modern restraint system design with frontal airbags already requires occupant sensing and safety belt use sensor technology for both front seat occupants. Almost all frontal air bag systems rely on sophisticated suppression sensors to accurately measure occupant size in order to mediate airbag deployment when small children or children in child safety seats are seated in the front passenger seat.

Affordable technology is readily available that could easily be employed in the rear seat of passenger cars to provide accurate belt reminder systems. Rear seat occupant sensors would only need to distinguish between packages or other items and rear seat passengers to avoid reminder warnings. A less complex and less costly version of the same type of capacitive sensing technology that is used in the front seat could be used to design rear seat safety belt reminders. Low cost 2-D or digital cameras could also be used to detect the presence of a rear seat passenger. In addition to being cheaper than sensor technology, these cameras have been demonstrated to be highly reliable. They are not used in the front seat because complex sensors

are needed to determine the appropriate force of airbag deployment for front seat passengers, which is dependent on the passenger's size. The same sensors in the safety buckle that are used in the front seat could be used in the back seat and the control unit and associated tones or lights would be the same as well. Overall, it is highly likely that safety belt reminder systems could provide a very effective strategy for saving lives at minimal additional cost to manufacturers and consumers.

At least two major domestic manufacturers are already selling vehicles with enhanced belt reminder systems. Ford Motor Company is selling vehicles with the FordBeltMinder system. Regular belt reminder systems trigger a warning chime and flashing light when the vehicle is started with an unbelted front seat passenger. Without the BeltMinder system, the warning chime and flashing light would both dissipate after 4 to 8 seconds. The BeltMinder system resumes both the warning chime and the flashing light about 65 seconds after starting the engine when the vehicle is moving more than 3 mph if a front seat passenger is still unbelted. The advanced warning cycle repeats for up to five minutes after it is deployed, far more than the time period required system required by FMVSS 208. FordBeltminder was phased-in for right front-seat passengers beginning in model year 2003 vehicles.

General Motors Corporation also recognizes the benefits of improved safety belt use reminder systems. Currently, driver position belt reminder systems in the majority of new GM vehicles include an 8-second chime and 20-second solid warning light, followed by an additional 55 seconds of flashing light. In model year 2004 full-size pick-ups and sport-utility vehicles equipped with automatic front seat air bag suppression systems, front seat passengers are also reminded electronically to fasten their belts.

Ford and General Motors sales show the industry is capable of developing and marketing cars with superior belt reminder systems. NHTSA should require all manufacturers to go further by extending existing front seat belt reminder technology to the rear seat.

## **VI. THE AMERICAN PUBLIC DESIRES REAR SEAT BELT REMINDERS.**

The 2003 NAS report favorably described data presented by General Motors on reminder system acceptability. The data was collected from consumer testing in California and reported that among those consumers, "81 percent indicated interest in an enhanced belt reminder system for front seat occupants. **Seventy-one percent thought that the systems should be extended to rear seat occupants, particularly drivers of sport utility vehicles (SUVs) and vans who frequently transport children** and find it difficult to see whether their children are buckled up."<sup>43</sup>

The NAS report also summarized information provided by Ford Motor Company from surveys completed by owners of vehicles with the FordBeltMinder enhanced reminder system. Overall, user satisfaction was high. "Eight of ten owners said they would purchase a vehicle with a belt reminder in the future. More than 7 in 10 would recommend the BeltMinder to other drivers, and **almost 90 percent of Ford drivers with the BeltMinder want the system for their passengers.**"<sup>44</sup>

Another NHTSA study entitled “Qualitative Research Regarding Attitudes Towards Four Technologies Aimed at Increasing Safety Belt Use” conducted focus group research on belt reminder technology. The study confirmed that consumers both accept and desire improved belt reminder systems, especially consumers who transport children:

Most respondents reacted positively to the concept of a reminder indicating whether or not passengers were buckled. In particular, this resonated strongly among respondents who frequently transport children in their vehicle. They explained it would help them ensure children were buckled up and prevent them from needing to look back to check, which could lead to a dangerous driving situation. Others stated they liked this concept because as drivers they felt responsible for the safety of their passengers and this device helped them ensure that safety.<sup>45</sup>

Clearly, the American public desires rear seat reminders for the benefit of their passengers’ safety.

## **VII. RULEMAKING SOUGHT**

Based on the data and analysis presented in this petition, Public Citizen and Advocates for Highway and Auto Safety request that NHTSA conduct a rulemaking to revise FMVSS 208 to require manufacturers to install a seat belt use warning system for designated seating positions in the rear seat of passenger cars and multipurpose passenger vehicles of 10,000 GVWR pounds or less.

NHTSA is responsible for implementing safety standards that save passengers’ lives. Current efforts to increase safety belt use have been successful, but many passengers still do not buckle up and the gap between rear seat and front seat safety belt usage remains a huge problem. A safety standard requiring rear safety belt reminder systems would save hundreds of lives each year, many of which would be children.

Sincerely,

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# APPENDIX:

## FORMULAS REGARDING SAFETY BELT USE AND LIVES SAVED<sup>46</sup>

### SAFETY BELT USE IN FATAL CRASHES (uf)\*

Estimates of safety belt use by fatally injured occupants are based on data in the FARS system. According to NHTSA, "these estimates are believed to be more accurate than use rates of survivors because most of those killed either die on impact or are unconscious or disabled. This facilitates an accurate observation of their belt use by police or emergency personnel. In addition, FARS analysts can utilize medical or autopsy reports to verify belt use."

\* Source: NHTSA, Estimating the Benefits from Increased Safety Belt Use, June 1994

### SAFETY BELT EFFECTIVENESS RATES (e)

The effectiveness of safety belts against occupant fatalities varies by seating position and vehicle type:

	CARS		LIGHT TRUCKS	
	Front Seat	Rear Seat	Front Seat	Rear Seat
Safety Belt Effectiveness Rate	45	44	60	73

### USE IN POTENTIALLY FATAL CRASHES (UPFC)

$$UPFC = uf / [(1-e)*(1-uf)]$$

According to NHTSA, "an estimate of the usage rate of those who were involved in potentially fatal crashes is derived as follows:

Assumptions:

- safety belt effectiveness against fatalities is 45 percent
- 33 percent of those killed were wearing safety belts

Persons involved in potentially fatal crashes can be divided into three groups

1. safety belt users who were saved by the belt
2. safety belt users who were killed
3. Non-users who were killed."

The formula is used to determine the aggregate usage rate measures the total incidence of safety belt users as a function of all occupants involved in potentially fatal crashes.

### **POTENTIAL FATALITIES (PF)**

$$PF = n / [1 - (UPFC * e)]$$

Where n equals the total number of fatalities.

### **PREDICTED USE**

NHTSA has developed a statistical relationship (Blincoe et al, "Estimating Benefits from Increased Safety Belt Use," NHTSA Technical Report, DOT 808 133) that uses safety belt use by fatally injured occupants to predict safety belt use in the general driving population. Since NOPUS and other observational data is not collected on rear seat occupants on a yearly basis or with as much statistical rigor as front seat safety belt usage, NHTSA's formula is used in this paper for this purpose.

Estimating Use Rate From UPFC:

$$\text{Use Rate} = (-0.43751 + \sqrt{(0.191415 + 1.88996 * UPFC)}) / 0.94498$$

### **CALCULATING CURRENT SAVINGS (CS)**

There are two different methods:

$$CS = PF - n; \text{ or}$$

$$CS = PF * UPFC * e$$

### **CALCULATING FUTURE SAVINGS (FS) FROM AN INCREASED RATE OF SAFETY BELT USE**

$$FS = PF * u_i * e$$

Where  $u_i$  = increased rate of safety belt use.

### **CALCULATING NET LIVES SAVED (NLS) FROM AN INCREASED RATE OF SAFETY BELT USE**

$$NLS = FS - CS$$

## LINKING CHANGES IN UPFC TO OBSERVED USAGE RATES

Most users will want to reflect change in terms of observed use. However, the relationship between change in UPFC and observed use is not linear – it is curvilinear. Therefore, at current usage levels, a 1 percent change in observed use will result in more than a one percent change in UPFC.

$$\text{UPFC} = 0.43751 * u + 0.47294 * u^2$$

## TABLES\*

\* The Excel Spreadsheets used to create these tables are enclosed in electronic format. These spreadsheets also contain the formulas and calculations used in the tables.

### TABLES A 1 – A3

#### Calculation of Lives Saved Assuming Scenarios 1-3 Benefits of Belt Reminder Systems for Rear Seat Occupants Ages 5 and Above

	CARS		LIGHT TRUCKS	
	Front Seat	Rear Seat	Front Seat	Rear Seat
Fatalities	17,109	1,508	10,896	1,040
Percentage Used by Fatally Injured Passengers	52.5	28	37.4	23.7
Percent of UPFC	66.8	41	59.9	53.5
Percent of Estimated Use	81.3	57.7	75.4	69.7
Belt Effectiveness Percentage	45	44	60	73
Potential Fatalities	24,458	1,840	17,009	1,706
Current Lives Saved	7,349	332	6,113	666

Table A1

#### Scenario # 1: Rear Seat Usage Equals Front Seat Usage

	CARS	LIGHT TRUCKS
New Use Percentage	0.812776	0.754412
New UPFC	0.668024	0.599231
Future Savings From Increased Use Percentage	540.7615	746.4493
Net Savings From Increased Use Percentage	209.0015	80.04044

**Table A2**

**Scenario # 2: Assuming the Hypothesis of the Swedish Study**

	<b>CARS</b>	<b>LIGHT TRUCKS</b>
New Use Percentage	0.703962	0.788214
New UPFC	0.542362	0.638681
Future Savings From Increased Use Percentage	439.0389	795.5907
Net Savings From Increased Use Percentage	107.2789	129.1819

**Table A3**

**Scenario # 3: Assuming an Increase to 85 or 90% Percent Use**

<b>Assuming an Increase to 85 Percent Use</b>		
	<b>CARS</b>	<b>LIGHT TRUCKS</b>
New Use Percentage	0.85	0.85
New UPFC	0.713583	0.713583
Future Savings From Increased Use Percentage	577.612	888.8946
Net Savings From Increased Use Percentage	245.8812	222.4857
<b>Assuming an Increase to 90 Percent Use</b>		
	<b>CARS</b>	<b>LIGHT TRUCKS</b>
New Use Percentage	0.90	0.90
New UPFC	0.77684	0.77684
Future Savings From Increased Use Percentage	628.848	967.6934
Net Savings From Increased Use Percentage	297.088	301.2845



**TABLE A4-A5**  
**Calculation of Front Seat vs. Rear Seat Safety Belt Use from Use by All Fatally Injured Occupants in FARS for years 1993 Through 2004**

**Table A4: Passenger Cars**

YEAR	Belt Use Percentage for Fatally Injured Occupants		Belt Effectiveness Percentage		UPFC		Predicted Use	
	Front Seat	Rear Seat	Front Seat	Rear Seat	Front Seat	Rear Seat	Front Seat	Rear Seat
1993	0.383	0.227	0.45	0.44	0.532319	0.344002	0.695023	0.507797
1994	0.411	0.239	0.45	0.44	0.559222	0.359312	0.719352	0.524436
1995	0.416	0.263	0.45	0.44	0.564297	0.389214	0.723886	0.555891
1996	0.436	0.253	0.45	0.44	0.584294	0.376869	0.741583	0.542988
1997	0.445	0.268	0.45	0.44	0.593136	0.395327	0.749326	0.562220
1998	0.460	0.318	0.45	0.44	0.607662	0.454338	0.761940	0.621422
1999	0.462	0.282	0.45	0.44	0.609579	0.412232	0.763595	0.579524
2000	0.473	0.320	0.45	0.44	0.620043	0.455621	0.772590	0.623648
2001	0.488	0.317	0.45	0.44	0.634096	0.453194	0.784568	0.620305
2002	0.492	0.326	0.45	0.44	0.637801	0.463437	0.787707	0.630265
2003	0.520	0.360	0.45	0.44	0.663265	0.501114	0.809070	0.666146
2004	0.524	0.345	0.45	0.44	0.666836	0.484687	0.812037	0.650645

**Table A5: Light Trucks**

YEAR	Belt Use Percentage for Fatally Injured Occupants		Belt Effectiveness Percentage		UPFC		Predicted Use	
	Front Seat	Rear Seat	Front Seat	Rear Seat	Front Seat	Rear Seat	Front Seat	Rear Seat
1993	0.210	0.210	0.60	0.73	0.399240	0.496102	0.566251	0.661144
1994	0.226	0.239	0.60	0.73	0.421957	0.537719	0.589349	0.699947
1995	0.238	0.223	0.60	0.73	0.438467	0.515261	0.605829	0.679329
1996	0.256	0.216	0.60	0.73	0.462428	0.505051	0.629288	0.669830
1997	0.269	0.264	0.60	0.73	0.479159	0.570539	0.645380	0.729439
1998	0.278	0.231	0.60	0.73	0.490473	0.526640	0.656129	0.689821
1999	0.275	0.257	0.60	0.73	0.486726	0.561614	0.652580	0.736072
2000	0.312	0.270	0.60	0.73	0.531335	0.578035	0.694123	0.745726
2001	0.313	0.279	0.60	0.73	0.532494	0.589018	0.695183	0.758076
2002	0.325	0.291	0.60	0.73	0.463437	0.603196	0.707656	0.703654
2003	0.354	0.242	0.60	0.73	0.501114	0.541799	0.736088	0.763055
2004	0.374	0.296	0.60	0.73	0.484687	0.608953	0.754412	

**Tables A6-A7**  
**Calculation of Front Seat vs. Rear Seat Safety Belt Use from Use by Fatally Injured**  
**Occupants Ages 5 and above in FARS for years 1993 Through 2004**

**Table A6: Passenger Cars Ages 5 to 18**

YEAR	Belt Use Percentage for Fatally Injured Occupants		Belt Effectiveness Percentage		UPFC		Predicted Use	
	Front Seat	Rear Seat	Front Seat	Rear Seat	Front Seat	Rear Seat	Front Seat	Rear Seat
1993	0.317	0.169	0.45	0.44	0.457663	0.266410	0.624662	0.419171
1994	0.351	0.232	0.45	0.44	0.495798	0.350411	0.661153	0.514759
1995	0.378	0.204	0.45	0.44	0.524927	0.313962	0.688248	0.474448
1996	0.384	0.225	0.45	0.44	0.531267	0.341426	0.694061	0.504986
1997	0.388	0.218	0.45	0.44	0.535468	0.332358	0.697897	0.495020
1998	0.409	0.282	0.45	0.44	0.557183	0.412232	0.717526	0.579524
1999	0.435	0.223	0.45	0.44	0.583305	0.338844	0.740714	0.502159
2000	0.432	0.285	0.45	0.44	0.580333	0.415816	0.738099	0.583155
2001	0.452	0.294	0.45	0.44	0.599947	0.426483	0.755257	0.593890
2002	0.477	0.324	0.45	0.44	0.623815	0.461171	0.775816	0.628070
2003	0.473	0.324	0.45	0.44	0.620043	0.461171	0.77259	0.628070
2004	0.493	0.333	0.45	0.44	0.638725	0.471324	0.788488	0.637874

**Table A7: Passenger Cars Ages 19 and Above**

YEAR	Belt Use Percentage for Fatally Injured Occupants		Belt Effectiveness Percentage		UPFC		Predicted Use	
	Front Seat	Rear Seat	Front Seat	Rear Seat	Front Seat	Rear Seat	Front Seat	Rear Seat
1993	0.349	0.164	0.45	0.44	0.493600	0.259428	0.659083	0.410755
1994	0.416	0.168	0.45	0.44	0.564297	0.265018	0.723886	0.417499
1995	0.418	0.212	0.45	0.44	0.566319	0.324516	0.725687	0.486319
1996	0.440	0.191	0.45	0.44	0.588235	0.296565	0.745041	0.454632
1997	0.450	0.211	0.45	0.44	0.598007	0.323203	0.753570	0.484854
1998	0.465	0.240	0.45	0.44	0.612446	0.360577	0.766067	0.525700
1999	0.464	0.196	0.45	0.44	0.611492	0.303293	0.765244	0.462358
2000	0.477	0.210	0.45	0.44	0.623815	0.321888	0.775816	0.483385
2001	0.49	0.216	0.45	0.44	0.635951	0.329751	0.786140	0.492136
2002	0.492	0.234	0.45	0.44	0.637801	0.352962	0.787707	0.517516
2003	0.528	0.243	0.45	0.44	0.670391	0.364362	0.814984	0.529743

2004	0.53	0.237	0.45	0.44	0.672162	0.356777	0.816450	0.521625
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**Table A8-A10**  
**2004 Passenger Vehicle Occupant Fatalities by Location**

**Table A8: Passenger Cars**

Age	FRONT SEAT				REAR SEAT			
	Total Fatalities	Belted Occupant Fatalities	Unbelted Occupant Fatalities	Safety Belt Use Percentage	Total Fatalities	Belted Occupant Fatalities	Unbelted Occupant Fatalities	Safety Belt Use Percentage
0-1	22	9	13	42.9	99	81	18	81.9
2-4	30	14	16	46.7	113	85	28	75.5
5-18	2236	1102	1134	49.3	686	228	458	33.3
19+	14873	9008	8153	52.4	822	593	1127	34.5

**Table A9: Light Trucks**

Age	FRONT SEAT				REAR SEAT			
	Total Fatalities	Belted Occupant Fatalities	Unbelted Occupant Fatalities	Safety Belt Use Percentage	Total Fatalities	Belted Occupant Fatalities	Unbelted Occupant Fatalities	Safety Belt Use Percentage
0-1	18	6	12	35.3	62	44	18	71.4
2-4	29	9	2	31.6	92	62	30	67
5-18	843	288	555	34.2	413	119	294	28.8
19+	10053	3790	6623	37.7	627	128	499	29.6

**Table 10: Totals**

	CARS			LIGHT TRUCK			TOTAL
	Front Seat	Rear Seat	Total	Front Seat	Rear Seat	Total	
Total Fatalities	17,161	1,720	18,881	10,943	1,194	12,137	31,018
Total Belted Occupant Fatalities	9,008	593	9,601	4,093	353	4,446	14,047
Total Unbelted Occupant Fatalities	8,153	1,127	9,280	6,850	841	7,691	16,971
Total Safety Belt Use Percentage	52.4	34.5	50.8	37.4	29.6	36.6	45.3

## REFERENCES

<sup>1</sup> [http://www.iihs.org/laws/state\\_laws/restrain3.html](http://www.iihs.org/laws/state_laws/restrain3.html)

<sup>2</sup> See February 25, 2002 letter from Jeffrey W. Runge, M.D. to Honda, BMW, DaimlerChrysler, Ford, Daewoo, GM, Hyundai, Subaru-Izuzu, KIA, Lotus, Mazda, Mitsubishi, Nissan, Porsche, Suzuki, Volkswagen, Volvo, Mercedes-Benz and Saab.

<sup>3</sup> Buckling Up Technologies to Increase Seat Belt Use, Special Report 278, 2003, Transportation Research Board, National Academy of Sciences, at 13, available at <http://newton.nap.edu/html/SR278/SR278.pdf>

<sup>4</sup> Safe, Accountable, Flexible, Efficient Transportation Equity Act, Pub. L. No. 109-59, § 10306 (2005)

<sup>5</sup> NHTSA VEHICLE SAFETY RULEMAKING PRIORITIES and SUPPORTING RESEARCH: Calendar Years 2003-2006 § I(A)(1)

<sup>6</sup> Although safety belt reminder systems are required only for the driver's seating position, right front passenger reminder systems are provided in 100% of the passenger vehicle fleet. The industry provides front seat passenger reminder systems in part because current designs of advanced air bags include occupant and belt use sensors to suppress air bag deployment for small occupants and children in child safety seats. Thus, this petition for rulemaking only addresses rear seat safety belt reminder systems.

<sup>7</sup> National Occupant Protection Use Survey: Shopping Center Study, 2004, NHTSA

<sup>8</sup> Public Citizen recommends child restraints for kids up to 8 years of age. See Public Citizen with Tab Turner and Susan Lister, *The Forgotten Child: The Failure of Motor Vehicle Manufacturers to Protect 4-to-8-year-olds in Crashes*, available at <http://www.citizen.org/documents/auto3.pdf>. Advocates for Highway and Auto Safety recommends, in its model law, that children up to age 8 be secured in an age/size appropriate child restraint system.

<sup>9</sup> Wang J, Blincoe, L., Beltuse Regression Model 2003 Update, May 2003, NHTSA Research Note

<sup>10</sup> See Appendix for an explanation that  $PF = \text{number of fatalities} / [1 - (\text{UPFC} * \text{Lap and shoulder safety belt effectiveness})]$

<sup>11</sup> See also Appendix for an explanation that  $\text{current savings} = \text{potential fatalities} - \text{fatalities}$

<sup>12</sup> Age 5 and up from 2004 FARS

<sup>13</sup> Calculation is weighted by the total number of fatalities. (See Table 2, above)

<sup>14</sup> Use in the general population is always higher than use in potentially fatal crashes because, on average, occupants in fatal crashes are more of the risk taking population. This may be due in part to differences in the usage of belts by daytime versus nighttime drivers, and to the higher-risk behavior of those people within the driving population that tend to be involved in fatal crashes. For a more detailed analysis, see Public Citizen's report *Rolling Over On Safety*, at page 14, available at [http://www.citizen.org/documents/update\\_w\\_appx.pdf](http://www.citizen.org/documents/update_w_appx.pdf).

<sup>15</sup> See Appendix for an explanation that  $UPFC = \text{Use rate of fatally injured occupants} / [(1 - \text{Lap shoulder belt effectiveness}) * (1 - \text{Use rate of fatally injured occupants})]$

<sup>16</sup> Block, A., 2000 Motor Vehicle Occupant Safety Survey, Seat Belt Report, 2001, NHTSA.

<sup>17</sup> Larsson P. *Seat belt reminder systems*. Vägverket, Sweden: Swedish National Road Administration, Traffic Safety Department, 2000

<sup>18</sup> IIHS Status Report, Vol. 37, No. 2, at 2, February 9, 2002 (citing Williams, A.F., et al, The effectiveness of the belt-minder system in increasing seat belt use)

<sup>19</sup> Williams, A., Wells, J., Driver's Assessment of Ford's Belt Reminder System, 2003, Traffic Injury Prevention

<sup>20</sup> Buckling Up Technologies to Increase Seat Belt Use, *supra* at 77

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- <sup>21</sup> Bylund, P., and U. Bjornstig. 2001. Use of Seat Belts in Cars with Different Seat Belt Reminder Systems. A Study of Injured Car Drivers. In 45<sup>th</sup> Annual Proceedings, Association for the Advancement of Automotive Medicine, San Antonio, Tex., Sept. 24-26, pp. 1-9.
- <sup>22</sup> Buckling Up Technologies to Increase Seat Belt Use, *supra* at 64
- <sup>23</sup> Dahlstedt, S. 1999. *Non-Users' Motives for Not Wearing the Seat Belt*. VTI Rapport 417, Swedish National Road and Transport Research Institute, Linköping, Sweden.
- <sup>24</sup> Buckling Up Technologies to Increase Seat Belt Use, *supra* at 65
- <sup>25</sup> Larsson, *supra*
- <sup>26</sup> Age 5 and up from 2004 FARS
- <sup>27</sup> Ages 5 and above
- <sup>28</sup> Use in Potentially Fatal Crashes (See Appendix 1)
- <sup>29</sup> Larsson, *supra*
- <sup>30</sup> These technologies include pretensioners, emergency locking retractors to prevent safety belt spool-out, and safety belts integrated into vehicle seats. For a complete list of available technologies and their effectiveness see Public Citizen's Comments on Notice of Proposed Rulemaking; Roof Crush, available at [http://69.63.136.213/documents/372656\\_web.pdf](http://69.63.136.213/documents/372656_web.pdf).
- <sup>31</sup> Cummings, P., Rivara, F., Car Occupant Death According to the Restraint Use of Other Occupants, Jan., 2004, Journal of American Medical Association
- <sup>32</sup> Ichikawa, M., Wakai, S., Mortality of Front-Seat Occupants Attributable to Unbelted Rear-Seat Passengers in Car Crashes, Jan., 2002, LANCET
- <sup>33</sup> Kindelberger, J. and Starnes, M., Moving Children from the Front Seat to the Back Seat: The Influence of Child Safety Campaigns, November 2003, NHTSA Research Note
- <sup>34</sup> Nichols, James L., Child Passenger Safety: A Review of Post 1996 Trends, available at <http://www.kidsinback.org/docUploads/Report%2Edoc>
- <sup>35</sup> Braver ER, Whitefield R, Ferguson, SA. Seating positions and children's risk of dying in motor vehicle crashes. *Inj Prev*. 1998; 4:181-187
- <sup>36</sup> See [http://www.iihs.org/laws/state\\_laws/restrain3.html](http://www.iihs.org/laws/state_laws/restrain3.html)
- <sup>37</sup> Runge letter, *supra*, at 2
- <sup>38</sup> Buckling Up Technologies to Increase Seat Belt Use, *supra*
- <sup>39</sup> Buckling Up Technologies to Increase Seat Belt Use, *supra* at 13 (emphasis added).
- <sup>40</sup> Pub. L. No. 109-59, § 10306 (emphasis added)
- <sup>41</sup> NHTSA VEHICLE SAFETY RULEMAKING PRIORITIES and SUPPORTING RESEARCH, *supra* at § I(A)(1)
- <sup>42</sup> Pub. L. No. 109-59
- <sup>43</sup> Buckling Up Technologies to Increase Seat Belt Use, *supra*, at 74 (emphasis added).
- <sup>44</sup> Buckling Up Technologies to Increase Seat Belt Use, *supra* at 62 (citing Ford Motor Company and Global Consumer Insights 2001, at 5) (emphasis added).
- <sup>45</sup> Bently, J.J., R. Jurrus, and N Beuse. 2003. Qualitative Research Regarding Attitudes Towards Four Technologies Aimed at Increasing Safety Belt Use. Report 2003-01, at 16. Equals Three Communications, Inc., Md.
- <sup>46</sup> Blincoe, L., Estimating the Benefits from Increased Safety Belt Use, NHTSA Technical Report, DOT 808 133, June 1994; Wang, J., and Blincoe, L., BELTUSE Regression Model Update, NHTSA Research Note, June 2001; and Wang, J., and Blincoe, L., BELTUSE Regression Model 2003 Update, NHTSA Research Note, May 2003.