TRB SPECIAL REPORT

Buckling Up

Technologies to Increase Seat Belt Use

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Using seat belts is one of the most effective strategies available to the driving public for avoiding death and injury in a crash. Today, however, nearly 35 years since the federal government required that all passenger cars be equipped with seat belts, approximately one-quarter of U.S. drivers and front-seat passengers are not buckling up.[1] Belt use rates in the United States lag well behind the 90 to 95 percent usage rates in Canada, Australia, and several northern European countries.

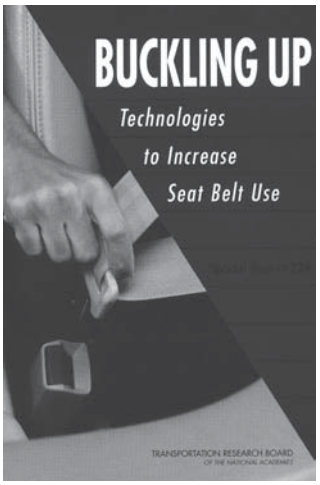
Properly used, seat belts can reduce the risk of fatal injury for front-seat occupants by about 45 percent in cars and by about 60 percent in light trucks driven as passenger vehicles. According to the National Highway Traffic Safety Administration (NHTSA), each percentage point increase in belt use should result in an estimated 250 lives saved per year.

[1] Statistics cited in this article were valid in 2003, when the study was completed.

Study Charge

Congress requested that the National Research Council (NRC) of the National Academies conduct a study to examine the potential benefits and public acceptability of technologies to boost seat belt use, such as reminder systems that exceed regulatory requirements. Under the auspices of the Transportation Research Board, NRC convened an expert committee (see box, page 37) to carry out the study, which was funded by NHTSA.

The committee's findings and recommendations, published in Special Report 278, *Buckling Up: Technologies to Increase Seat Belt Use*, include legislative and regulatory actions to enable installation of effective and acceptable new belt use reminder technologies in passenger vehicles.



TRB Special Report 278, *Buckling Up: Technologies to Increase Seat Belt Use*, is available from the online TRB Bookstore, www.TRB.org/bookstore/. (View the book online, www.TRB.org/publications/sr/sr278.pdf.)

Past Strategies

The requirement to install lap and shoulder belts in all new passenger vehicles was one of the original standards stemming from federal legislation in 1960 to improve highway safety. The availability of belts, however, was not enough to motivate use by drivers and passengers. Few motorists—perhaps only 10 to 15 percent—buckled up voluntarily.

A new agency then, NHTSA began promoting airbags, automatic belt systems, and 60-second flashing light and buzzer warnings to remind motorists to buckle up. Technical and political factors, however, delayed the introduction of airbags and automatic belts. As an interim measure, NHTSA mandated that all model year (MY) 1974 passenger vehicles be equipped with an ignition interlock to prevent the engine from starting if any front-seat occupant was not buckled up.

The ignition interlock requirement, however, met with strong opposition for a variety of reasons, including belt comfort, sensor accuracy, and public acceptance. Congress promptly enacted legislation prohibiting NHTSA from requiring either ignition interlocks or continuous buzzer warnings of more than 8 seconds. NHTSA then implemented the requirement of a 4- to 8-second warning light and buzzer system that is activated when front seat belts are not fastened at the time of ignition. This standard remains in effect.

NHTSA subsequently focused on restraint systems that required no action on the part of the motorist—such as air bags, which provide supplemental protection to seat belts. The agency also began strongly encouraging states to pass belt use laws. The laws were introduced rapidly and have contributed to sharp increases in belt use. Observed belt use rates today are approximately 75 percent. The rate of belt use gains, however, has slowed in the past decade.

Changing Nonusers

Many drivers and vehicle occupants report that they understand the safety benefits of belts, but that they have not acquired the habit of buckling up on all trips. For these part-time users, who constitute roughly one-fifth of drivers, belt use is situational—they tend to buckle up when the weather is poor or when they are taking longer trips on riskier, high-speed roads. The behavior of this group may be open to change through new reminder systems.

Hard-core nonusers comprise approximately 4 percent of drivers, but this same group has significantly more traffic violations, higher crash involvement rates, higher arrest rates, and higher rates of alcohol consumption than those who buckle up all or part of the time. Sixty percent of drivers in severe crashes were reportedly not wearing seat belts. These nonusers pose risks to themselves and to others and are therefore an important audience to reach; however, reminder systems may not be effective.

Technology Revisited

Federal law restricts NHTSA's regulatory scope in new seat belt use technologies, but manufacturers are not prevented from providing new technologies voluntarily. Ford Motor Company, for example, equipped selected MY 2000 vehicles with BeltMinder™, a system of warning chimes and flashing lights that operates intermittently for up to 5 minutes to alert and remind the unbelted driver to buckle up.

Many other companies plan to deploy enhanced belt reminder systems incorporating technologies that go beyond the current 4- to 8-second warning. No manufacturers are developing interlock systems as original equipment, although technologies such as a seat belt shifter lock—which prevents the changing of gears unless belts are buckled—soon may be available as an after-market option in the United States.

Today's environment is far more conducive than that of the early 1970s to the introduction of technologies for increasing seat belt use. Belt use is compulsory for adults in all but one state; belt use rates are significantly higher; belts are better designed; and sensing technologies are more sophisticated and reliable.

Nevertheless, the pace and type of technology introduction continue to be affected by the interlock experience. Industry is sensitive to consumer acceptance of what may be perceived as intrusive systems, and NHTSA's regulatory scope remains limited.

Findings

After reviewing the literature, as well as the results of in-depth interviews and focus groups conducted by NHTSA, and after briefings by industry and government officials, the committee concluded that new seat belt use technologies—particularly the enhanced belt reminder systems—have the potential to increase belt use and to be received favorably by most consumers. Part-time users, for example, apparently would welcome a reminder to buckle up.

More aggressive systems, such as transmission interlocks, probably would be necessary to reach hard-core nonusers, but the in-depth interviews and focus groups conducted for this study suggest that required interlocks would have a low acceptability. This suggests that interlocks should be considered only for certain high-risk drivers.

In addition, the legislation prohibiting NHTSA from requiring new seat belt use technologies is outdated and unnecessarily restrictive. Although industry is introducing new systems on some models, NHTSA does not have the legislative authority to establish minimum performance standards.

Recommendations

The committee's recommendations, briefly summarized below, are detailed in the full report. In general, the recommendations are designed to encourage and facilitate the installation of effective new seat belt use technologies.

The committee recommends that Congress amend the statutory restrictions on belt reminder systems immediately, providing NHTSA with more flexibility and authority to require effective belt reminder technologies, if necessary. Moreover, industry voluntarily should provide new systems in the front seats of every new light-duty passenger vehicle, and these systems should have audible and visible indicators that are not easily disconnected.

To ensure that the most effective systems are introduced, NHTSA should monitor and evaluate deployment closely. If industry does not move promptly, NHTSA should mandate the most effective acceptable systems and should conduct another independent review in 5 years to evaluate progress.

The recommended strategy includes a program of behavioral research and field testing to ensure that NHTSA can base any needed regulations on good science. Although the immediate emphasis is on front-seat reminder systems, aggressive development of effective rear-seat reminder systems also should be pursued.

Seat belt use technologies should be viewed as complements to other proven strategies for increasing belt use. These include enactment of primary seat belt use laws that enable police to pull over and cite drivers who are not buckled up, as well as publicly promoted enforcement programs.

Seat belt reminder systems may not be adequate for reaching hard-core nonusers. In the near term, NHTSA and the private sector should strongly encourage research and development of seat-belt interlock systems for specific applications. For example, the courts could require the use of interlocks for motorists convicted of driving impaired; parents could install interlocks on vehicles driven by teenagers; insurance companies could lower premium rates for young drivers of vehicles with interlock systems; and fleet owners could install interlocks.

If these efforts and the introduction of enhanced belt reminder systems fail to reach high-risk drivers, however, the issue of requiring interlocks should be revisited in a few years.

The author, Senior Program Officer in TRB's Division of Studies and Information Services, served as Study Director for this project.

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