NATIONAL SAFETY COUNCIL

Position/Policy Statement

Automotive Safety Technology

NSC Policy Position:

The National Safety Council supports the mandatory or voluntary adoption of new automotive safety technologies in vehicles to help reduce crashes of mitigate the impact of injuries and fatalities resulting from the operation of motor vehicles.[1] Because of the rapid rate of introduction of these technologies and the risk of driver confusion, NSC also supports education programs to ensure the driving public knows what these technologies do and how to use them appropriately. Additionally, NSC supports additional research into potential unintended negative safety consequences that arise as a result of the introduction of new technologies.

Background on traffic crashes

Motor vehicle crashes have been a leading cause of unintentional injury and death in the United States for decades. In 2018, NSC estimates 40,000 people were killed on U.S. roads and another 4.6 million were injured seriously enough to seek treatment and/or medical consultation. The 2018 total represents a decline of just 231 deaths -- roughly 1 percent -- from 2017 figures, but a 14 percent increase from just four years earlier, in 2014. NSC estimates the societal costs in the U.S. of motor-vehicle crashes in 2017 is $433.7 billion.

Vehicle safety technologies to mitigate or prevent crashes, injuries and fatalities

New and evolving vehicle safety technologies are being integrated into vehicles today. They are (1) crash avoidance technologies, which assist drivers in preventing or reducing the severity of a crash; and (2) non-crash safety technologies, which help prevent injuries and fatalities in and around vehicles; and (3) fully automated driving technologies that will work without a human driver. In each of these cases a full understanding of the capabilities of the features, as well as how vehicles so equipped should interact with other roadway users, is necessary to ensure maximum benefit.

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[1] New safety technology is also being added to light and heavy equipment, and this policy supports those additions as well.

Crash avoidance technologies

Driver errors are classified into multiple broad categories. These include recognition errors, such as driver distraction; decision errors, including driving too fast for conditions; performance errors, including poor directional control; and non-performance errors, such as falling asleep.

Crashworthiness advances will improve crash survivability due to improvements in vehicle design and construction. Crash avoidance technologies can help mitigate human error-involved crashes by alerting drivers to hazards or even having the vehicle intervene to avert a potential crash. These systems assist in a variety of ways, including:

- Warning drivers about difficult-to-see hazards in blind zones with aural cues, visual cues or haptic alerts such as lane departure warnings, blind spot detection, and adaptive headlights
- Taking partial control of the car to avoid or lessen the severity of crashes if a driver does not respond quickly enough
- Better illuminating or expanding the view of the driving environment
- Improving the braking stability and steerability of the car in adverse driving conditions

According to the Insurance Institute for Highway Safety, 1 million car crashes could have been prevented in 2014 if vehicles had just two technologies in them – automatic emergency braking and forward collision warning.[2]

Another technology, Driver Alcohol Detection Systems for Safety (DADSS), can help lower U.S. roadway fatalities by preventing drivers under the influence of alcohol from driving by disabling the vehicle from starting. As alcohol-impaired driving is involved in more than a third of all U.S. traffic fatalities, DADSS has the potential to mitigate one of the most common and stubborn behavioral causes of traffic crashes.

Non-crash safety technologies

Pediatric vehicular heatstroke, or hyperthermia, is the leading cause of non-crash vehicle-related fatalities for children 14 years and younger. Fatalities have resulted after children have accessed unlocked vehicles to play, or more commonly, after children have been left alone in vehicles. Through September 2019, pediatric vehicular heatstroke fatalities have been recorded during 11 months of the year in nearly all 50 states, and “near misses” are even more common. These tragedies are 100 percent preventable. Technology exists to remind drivers that passengers may be in the back seat of a vehicle.[3] NSC supports efforts to require automobile manufacturers to include technology in support of preventing child fatalities as a result of being forgotten in vehicles.

NSC supports mandatory or voluntary technology integration into the U.S. fleet

Vehicle safety technologies enter the U.S. vehicle fleet in one of three primary ways: (1) Federal mandates (2) voluntary cooperation and integration by car manufacturers and (3) automakers

[2] Cicchino, Jessica B. 2016. Effectiveness of forward collision warning and autonomous emergency braking systems in reducing front-to-rear crash rates. Arlington, VA: Insurance Institute for Highway Safety.
[3] http://www.gmc.com/gmc-life/suvs/acadia-rear-seat-reminder.html. This is technology that alerts the front seat passenger that a person—most likely a child—is in the rear seat, which will reduce the number of hyper- and hypo-thermia child deaths in the U.S.

recognizing market demand for safety features. The National Safety Council prefers mandates but recognizes voluntary cooperation and integration also promote the proliferation of vehicle safety technologies into the U.S. fleet.

It takes approximately three decades for vehicle safety technologies to fully integrate into fleets, according to a 2012 study[4] by the Insurance Institute for Highway Safety's Highway Loss Data Institute (IIHS-HLDI).[5] Consequently, the used car market exposes poorer owners to a higher risk without being able to afford the newer cars with these safety features.

There currently are four crash avoidance technologies that have been federally mandated to be included in cars starting by a specified date:

1. Tire pressure monitoring systems (September 2007)
2. Electronic stability control[6] (September 2011)
3. Anti-lock braking systems (September 2011)
4. Rearview visibility systems (May 2018)

Non-crash safety technologies are relatively newer and engaged as a segment of substantial evidence of their efficacy in reducing crashing and mitigating injuries. For example, the *Rear Seat Reminder* feature became standard with all 2017 GMC Acadias voluntarily.[7] Nissan began adding a similar feature in 2018 select vehicles. Hyundai has added the feature in select 2019 vehicles.

Method 1: Federal mandates

An IIHS study from 2014[8] looked specifically at the proliferation of safety technologies with high crash mitigation potential in the U.S. driving fleet. The study found that federal mandates significantly sped up their introduction by as much as eight years than without a mandate. These included hypothetical and existing mandates. (See Figure 1)

The study identified two main reasons for the increase:

1) As cars without these technologies age out of the fleet and car manufacturers must integrate mandated technologies into new cars, the proportion of cars with the new technologies becomes higher than cars without them.
2) Federal mandates prompt manufacturers to begin integrating these technologies into cars even before the deadline for the mandate. This helps explain the rapid adoption of rear cameras and rear parking sensors. The rearview visibility system rule[9] mandating

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[4] http://www.iihs.org/media/db4aeba1-6209-4382-9ef2275443fcccea/536403661/HLDI%20Research/Bulletins/hldi_bulletin_28.26.pdf

[5] This study included a variety of safety features, from passive features such as safety belts and airbags to active features such as electronic stability control and anti-lock braking systems.

[6] Traction control, which is required for most electronic stability control systems to function, could also be considered a federally mandated system as a result of the electronic stability control mandate.

[7] http://www.gmc.com/gmc-life/suvs/acadia-rear-seat-reminder.html. This is technology that alerts the front seat passenger that a person—most likely a child—is in the rear seat, which will reduce the number of hyper- and hypo-thermia child deaths in the U.S.

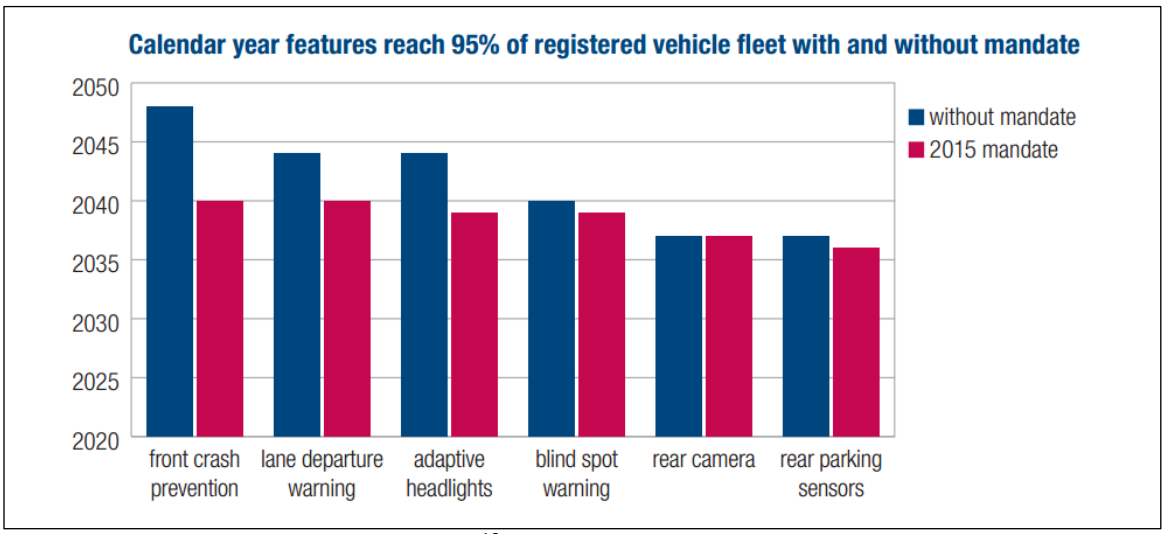
[8] http://www.iihs.org/media/31d3dcc6-79d5-48a8-bafb1e93df1fb16f/324452632/HLDI%20Research/Bulletins/hldi_bulletin_31_15.pdf

[9] http://www.nhtsa.gov/About+NHTSA/Press+Releases/2014/NHTSA+Announces+Final+Rule+Requiring+Rear+Visibility+Technology

back-up cameras was released in 2014, but did not go into effect until 2018. However, car manufacturers began adding rearview visibility systems such as back-up cameras into cars in anticipation of a potential federal mandate. Mandates themselves, as well as the potential for a mandate, can spur adoption by car manufacturers.

Additionally, according to regulatory impact analyses, mandatory inclusion of crash avoidance technologies will help save lives and mitigate injuries. (See Table 1)

Figure 1: Effect of federal mandates on vehicle safety technology proliferation



Source: Highway Loss Data Institute[10]

Table 1: Effect of crash avoidance technologies on injuries, fatalities

Feature	Effective date	Lives saved*	Injuries mitigated*
Electronic Stability Control	Sept. 1, 2011	5,300 to 9,600 per year	156,000 to 238,000[11] per year
Tire Pressure Monitoring Systems	Sept. 1, 2007	119 to 121 per year	8,373 to 8,568[12] per year
Rearview Visibility Systems	May 1, 2018	58 to 69 per year	1,125 to 1,332[13] per year

* Based on when technology is fully implemented in U.S. driving fleet

[10] http://www.iihs.org/media/31d3dcc6-79d5-48a8-bafb1e93df1fb16f/324452632/HLDI%20Research/Bulletins/hldi_bulletin_31_15.pdf
[11] http://www.nhtsa.gov/DOT/NHTSA/Rulemaking/Rules/Associated%20Files/ESC_FRIA_%2003_2007.pdf
[12] http://www.nhtsa.gov/cars/rules/rulings/tpmsfinalrule.6/tpmsfinalrule.6.html
[13] https://www.federalregister.gov/articles/2014/04/07/2014-07469/rear-visibility-federal-motor-vehicle-safety-standards

Method 2: Voluntary cooperation and inclusion agreements

Beyond the formal regulatory process which can take many years, as was the case with the electronic stability control[14] and rearview visibility system[15] final rules, gains in car safety technology adoption can be achieved through voluntary agreements from car manufacturers. A recent example of a voluntary inclusion agreement on vehicle safety technology was announced on March 17, 2016 by the National Highway Traffic Safety Administration (NHTSA) and 20 manufacturers to make automatic emergency braking (AEB) a standard feature on nearly all new car models sold in the United States by Sept. 1, 2022.[16] AEB is capable of intervening if a driver fails to respond to an impending crash in time. It can apply maximum force to the brakes, preventing a crash or reducing its severity.

According to NHTSA, the voluntary agreement will speed up the proliferation of AEB in the U.S. driving fleet three years sooner than a formal federal mandate.[17] The agreement also may prevent an estimated 28,000 crashes and 12,000 injuries by 2025.[18] Since the announcement, Toyota pledged to make AEB (and its accompanying forward collision warning feature) standard in the majority of its models by 2018.[19] As of March 31, 2019 Toyota has equipped 90 percent of its 2.5 million vehicles with AEB technology.[20]

Additionally, the U.S. Department of Transportation has proposed changes to NHTSA's 5-Star Safety Rating Program, also known as the New Car Assessment Program (NCAP), to include ratings on crash avoidance technologies and assessing pedestrian protection in the design of bumpers, hoods, and their material construction.[21] NSC supports the proposed changes, which provide consumers with information about crash avoidance technology safety benefits and encourage manufacturers to produce vehicles with technologies that will save lives. The new NCAP program will include an "intense consumer awareness effort to help vehicle shoppers understand how the new ratings can guide their new-car buying decisions."[22]

Data Collection and Integration

Whether through federal mandate or voluntary cooperation and inclusion agreements, the continued proliferation of new technologies is leading to a growth in opportunities to leverage data for safety. As advanced vehicle technologies are tested in real-world scenarios, understanding the circumstances and causes surrounding failures and malfunctions, including at lower levels of automation, will help make this technology stronger and safer, and ensure failures are less likely to occur as technology evolves. Technologies such as electronic logging devices, and sensor or engine control modules in the commercial truck and bus section, have the ability to collect this data for further use by industry, government, safety advocates and other stakeholders in their collective efforts to improve these technologies and save lives. NSC fully supports the leveraging of data to improve safety, including in the advancement of advanced

[14] http://www.nhtsa.gov/DOT/NHTSA/Rulemaking/Rules/Associated%20Files/ESC_FR_03_2007.pdf
[15] https://www.federalregister.gov/articles/2014/04/07/2014-07469/rear-visibility-federal-motor-vehicle-safety-standards
[16] http://www.nhtsa.gov/staticfiles/nvs/pdf/AEB_FactSheet_031616.pdf
[17] http://www.nhtsa.gov/About+NHTSA/Press+Releases/nhtsa-iihs-commitment-on-aeb-03172016
[18] http://www.nhtsa.gov/staticfiles/nvs/pdf/AEB_FactSheet_031616.pdf
[19] http://www.consumerreports.org/car-safety/toyota-to-hit-safety-goal-well-before-2022-target/
[20] https://www.forbes.com/sites/tanyamohn/2019/03/31/automakers-report-progress-on-equipping-vehicles-with-automatic-emergency-braking-toyota-leads/#123e1fe85aee
[21] https://www.gpo.gov/fdsys/pkg/FR-2015-12-16/pdf/2015-31323.pdf
[22] http://www.nhtsa.gov/About+NHTSA/Press+Releases/2015/nhtsa-proposes-new-5-star-safety-ratings-12082015

driver assistance systems and automated vehicle technologies. Issues surrounding data ownership and vehicle and driver liability concerns need to be explored and resolved.

Education as the solution to the information gap around automotive safety technologies

Equipping more vehicles with advanced safety technologies should prevent crashes and reduce injuries and fatalities. However, to be effective, drivers must be educated on how to identify and use these systems correctly. Not knowing the capabilities and limitations of these systems could be dangerous to drivers and those operating around their vehicles. The National Safety Council has a long history of leading effective national education campaigns including the Airbag and Seatbelt Coalition of the 1990s, such as the current *MyCarDoesWhat* campaign and the recently launched Partners for Automated Vehicle Education (PAVE). Addressing the gaps in knowledge, helping to facilitate acceptance and adoption, and increasing defensive driving techniques used on the roads are the core purposes behind each and every highway safety campaign NSC develops. As new technologies are introduced, new gaps in public understanding will be identified, and new campaigns will need to be created that reach the owners and operators of vehicles. Current education campaigns are described below.

Background

Vehicle safety technologies as well as drivers' relationships to their vehicles are changing rapidly. NHTSA predicts this relationship will change more in the next 10 to 20 years than it has in the previous 100 years.[23]

New crash avoidance technologies are made available in cars with each model year – and individual systems continue to be updated through software upgrades even after installation – so it can be difficult for drivers to understand which systems their car has and how to interface with them correctly. In 2018, almost 17.2 million passenger cars and trucks were sold. The average age of cars and trucks in operation in the United States in 2018 was 11.8 years old.[24] Many drivers are not introduced to newer crash avoidance technologies until they rent a newer car, drive a friend's newer car or visit a dealership to test drive new cars.

A vehicle does not have to be new to be confusing. An early safety technology introduced into the fleet, ABS or Antilock Braking Systems was first seen in some vehicles as long as 40 years ago. The technology was mandated in 2011 as part of Electronic Stability Control federal motor vehicle safety standard. Braking technology prior to the mandate required drivers to pump the brakes in a skid. In a vehicle with ABS, drivers apply firm pressure if traction is lost to bring the car to a stop. Deliberate education is required to ensure drivers trained on older vehicles understand the safest way to bring a vehicle to a stop is to apply consistent, firm pressure to the brake pedal. It is clear that today, after over 16 years of use, many motorists still do not understand the safe use of ABS.

Thus, there are two core educational challenges to the proper use of crash avoidance technologies to help prevent crashes, injuries and fatalities:

[23] http://www.nhtsa.gov/staticfiles/rulemaking/pdf/Automated_Vehicles_Policy.pdf
[24] https://news.ihsmarkit.com/press-release/automotive/average-age-cars-and-light-trucks-us-rises-again-2019-118-years-ihs-markit-

1) Many drivers don't realize they have crash avoidance technologies, including older technology, such as ABS or TPMS, and are unsure how to properly interface with the technology.
2) Drivers may be startled or surprised when systems activate. According to the University of Iowa, 40 percent of drivers had experienced a situation in which their car acted or behaved in a way they were not expecting.[25]

Drivers may have difficulty understanding the specific technologies featured in their vehicles, and some may overestimate its capabilities. The Insurance Institute for Highway Safety found in two of their studies that the names manufacturers use for automated systems can mislead drivers and drivers often don't understand the information communicated to them through system displays.[26] As these technologies progress, education is necessary to ensure that drivers understand the vehicle's available technologies, the way these new technologies operate, and the limitations.

National consumer education on in-vehicle safety technologies

To address knowledge gaps and consumer confusion about new vehicle safety technologies, driver assist technologies and autonomous vehicles, NSC supports the need for sustained national education campaigns.

Nationally launched on October 7, 2015, *MyCarDoesWhat* aims to accomplish the following:

- Increase U.S. drivers' knowledge of crash avoidance technologies in their vehicles with a campaign focused on how to interact with them appropriately
- Educate dealers about the technology to help them better inform consumers
- Reduce crashes, injuries and fatalities with this knowledge and increase use of defensive driving skills
- Encourage drivers to be more active and engaged in understanding crash avoidance technologies in their vehicles
- Help pave the way for consumer acceptance of driver-assist and fully autonomous vehicles

To address another key problem area that will only become more critical in the future as more and more technology is added to vehicles, NSC launched the *Check To Protect* national campaign in June, 2017 to encourage drivers to check the recall status of their vehicle and have open recalls fixed immediately. This campaign comes at a time when an unprecedented number of vehicles, 53 million, are on the road without having their vehicles fixed.

To further support consumer education NSC recently joined the Partners for Automated Vehicle Education (*PAVE*) coalition. *PAVE* unites industry leaders, consumer advocates, educators, regulators, municipalities and other automated vehicle stakeholders in the common belief that in order to realize the safety, mobility, economic and sustainability benefits of highly automated vehicle, we must invest in robust public education efforts that increase knowledge and drives consumer acceptance of AV technology. The goal of *PAVE* is to inform and educate the public and policymakers on the facts regarding automated vehicles through an educational website and social media, "hand-on" demonstrations, educational toolkits for auto dealers, and policy-maker workshops.

[25] http://ppc.uiowa.edu/sites/default/files/national_consumer_survey_technical_report_final_8.7.15.pdf
[26] https://www.iihs.org/news/detail/new-studies-highlight-driver-confusion-about-automated-systems

NSC supports adding the role of "point-of-sale" car dealers to expose buyers to the use of these advanced technology systems with videos and other types of media before a vehicle is allowed to be driven off the lot.

Finally, NSC supports extending and updating NCAP and the U.S. Department of Transportation's stated intention to launch an intense consumer awareness effort to help vehicle shoppers understand how the new crash avoidance technology ratings should guide their new-car buying decisions. This awareness, according to NHTSA, will continue to help generate consumer demand for these safety features to be incorporated into future models. IIHS also rates vehicles on safety features and systems, and those ratings also encourage the inclusion of more effective systems on vehicles.

Defensive driving skills to support the use of vehicle safety technologies

NSC has been a leading expert and educator on defensive driving skills since 1964 – educating over 1 million people each year in this important area. NSC recognizes the power of defensive driving skills training in reducing crashes, saving lives and preventing injuries. This education includes awareness of advanced driver-assistance systems (ADAS) that along with defensive driving techniques they may prevent or mitigate crashes.[27]

As previously mentioned, human errors are involved in the majority of U.S. car crashes.[28] The most common error types and examples of how they can contribute to crashes, include:

- **Recognition errors** (41 percent of crashes), such as failing to scan the road and notice hazards
- **Decision errors** (33 percent), such as not choosing the right defensive driving skill or maneuver for a particular hazard
- **Performance errors** (11 percent), such as failing to slow by a sufficient amount when while approaching an exit
- **Non-performance errors** (7 percent), such as falling asleep behind the wheel

One method NSC uses to mitigate human-error-involved crashes is to teach and remind drivers of the following defensive driving skills:

- Recognizing hazards in the driving path and scanning ahead
- Understanding when and how to use defensive driving skills
- Executing driving maneuvers swiftly enough to evade harm
- Knowing when they are fit to drive

Educating the public in defensive driving and ensuring drivers remain vigilant behind the wheel are two of the core challenges to reducing human-error-involved crashes. ADAS technologies represent a new tool in supplementing existing defensive driving skills – as long as drivers know how to interact with the systems appropriately. Some technologies provide the driver with additional opportunity to recognize hazards such as blind spot monitoring systems, to avoid incidents. Other technologies, such as collision avoidance systems take the action away from the driver. It is critical that drivers understand the difference between and limitations of advisory

[27] NSC courses will integrate crash avoidance technologies in its DDC courses in Spring 2018.
[28] http://www-nrd.nhtsa.dot.gov/pubs/812115.pdf (report is an analysis of a previous survey)

systems and autonomous features of their vehicles and know what their responsibilities are behind the wheel.
Below are a few examples of how crash avoidance technologies can help reduce the effect of human-error-involved crashes. By combining these systems with recognition, skill and performance training, drivers will be much better equipped to drive safely.

- *Adaptive headlights* provide drivers a better view along their driving path by swiveling to illuminate curves in the road (**recognition errors**)
- *Forward collision warning* sensors alert drivers when they're approaching a hazard – a slowing or stopped car, for example – prompting the driver to steer to safety, brake or take another action (**recognition**, **decision errors**)
- *Automatic emergency braking* (AEB), in combination with *brake assist*, can intervene and stop for the driver sooner and stronger than an average person's reaction time would allow (**recognition**, **performance errors**)
- *Drowsiness alert* can warn the driver if it detects he or she may have become drowsy (**non-performance errors**)

Research into potentially negative unintended safety consequences as a result of the introduction of new technologies into motor vehicles.

As new technologies are introduced into motor vehicles, several observers noted unintended safety consequences. In particular, there may be a tendency for the driver either to become engaged in inappropriate tasks with ADAS systems engaged, with assumption that his or her full attention is not required. Alternately, it may be the case that drivers are not focusing on the task of driving to the degree necessary to maintain safe operation, because many believe that the ADAS system will control the driving task. Drivers simply may not understand the limitations of the technology.[29] It is critical that consumers understand that these technologies are secondary measures activated only when the human operator fails first and are not to be relied upon to replace the driver. More research is required to help understand the human/machine interface and the safety implications of the introduction of these technologies.

Public Policy

NSC will continue to work with policymakers at all levels of government to promote safety technology that can prevent fatalities. Some of the topics on which NSC is working include:

- Advancing consumer education endorsed by industry coalitions and/or government officials on appropriate use.
- Endorsing transparency of ADAS vehicle manufacturers through regular reporting requirements related to, but not limited to, operation and operational limitations to NHTSA or another appropriate government entity
- Sharing data to identify advanced technology that works and use of this data to require proliferation of the technology
- Supporting increased investment at NHTSA and other agencies so that they can better understand new technology and its implications
- Understanding new forms of education and driver coaching that may become available as new technologies, including driver monitoring technologies, are developed and introduced

[29] https://newsroom.aaa.com/2018/09/drivers-rely-heavily-new-vehicle-safety-technologies/

- Including safety technology in the new car assessment program (N-CAP) for auto ratings
- Determining the applicability of safety standards to all types of vehicles on the roadways
- Monitoring new technologies use patterns and adoption issues to understand the unintended driving errors and other consequences that maybe inadvertently introduced into the driving environment

Conclusion

The National Safety Council supports the mandatory, manufacturer generated or voluntary inclusion of new automotive safety technologies in vehicles to help reduce crashes, injuries and fatalities resulting from the use of motor vehicles.

Additionally, NSC strongly supports education as a powerful tactic to reduce injuries and save lives. NSC will seek to expand and extend national driver education campaigns, as well as extend the education of vehicle safety technologies into defensive driving skills courses. NSC will broaden partnerships to fund updates to the educational media and current campaigns we operate, and seek to form or expand coalitions and utilize our own networks to present these materials to key audiences.

This position statement reflects the opinions of the National Safety Council but not necessarily those of each member organization.

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