INSURANCE INSTITUTE
FOR HIGHWAY SAFETY

November 2, 2010

Mr. Keith Kiser
Director, Vehicle Programs
American Association of Motor Vehicle Administrators
4301 Wilson Boulevard, Suite 400
Arlington, VA 22303

Proposed Best Practice Regarding Registration and Titling of Minitrucks

Dear Mr. Kiser:

The Insurance Institute for Highway Safety (IIHS) is a nonprofit research and communications organization that identifies ways to reduce the deaths, injuries, and property damage on our nation's roads. We are wholly supported by automobile insurers. I appreciate the opportunity to comment, on behalf of IIHS, on the proposed best practice for registering and titling minitrucks. I also hope you will allow me to use this opportunity to point out that the problem being addressed by the proposed best practice is part of a larger one related to the increasing sales of special vehicles.

IIHS believes that allowing the general, on-road use of vehicles that do not comply with all Federal Motor Vehicle Safety Standards (FMVSS) is inconsistent with 45 years of national efforts to improve vehicle safety. As shown in the attached maps, states are allowing not only minitrucks but also low-speed vehicles (LSVs) that do not meet important FMVSS to operate in mixed traffic on public roads with speed limits up to 45 mph. The proposed best practice attempts to address the minitrucks portion of the problem with the recommendation that these vehicles not be registered for on-road use unless they are certified as compliant with federal regulations and that their on-road use be limited to crossing public highways, consistent with permitted use for other vehicles designed for off-road use. However, the proposed best practice is silent with regard to the issue of LSVs on general public roads, and this has two potentially negative effects on traffic safety. First, LSVs offer even less occupant protection than minitrucks and are likely to proliferate on public roads. Second, states following the proposed best practice still would be registering and titling minitrucks for use on public roads because minitrucks can comply easily with the federal definition of LSV.

The National Highway Traffic Safety Administration (NHTSA) requires that LSVs be capable of operating within the speed range of 20-25 mph and be equipped with head lights, tail lights, brake lights, turn signals, reflectors, parking brakes, rearview mirrors, windshields, safety belts, and vehicle identification numbers. LSVs are not required to meet important FMVSS crashworthiness requirements such has having front airbags. The LSV standard was written for vehicles designed for social and recreational uses *within* planned communities. It is not an appropriate standard to apply to vehicles used on public roads, and NHTSA has made it clear it does not endorse the use of LSVs on general public roads.

Nor does NHTSA endorse the use of minitrucks on public roads. Historically, minitrucks were imported as off-road vehicles, thus evading FMVSS altogether. More recently, however, at least one minitruck manufacturer (Chongqing ChangAn) has opened a plant in the United States and sells the Tiger as an LSV by electronically limiting the operating speed to a maximum of 20-25 mph. The "applicable standards" clause of the proposed best practice permits these vehicles to be titled, registered, and ultimately operated on public roads as LSVs. This is the case even though undoing the speed limiter is only a matter of downloading the appropriate program from the internet. In short, communities and states that permit LSVs to operate in general traffic conditions also would permit minitrucks to so operate, despite the clear contradiction of intended safety standards.

Both minitrucks and LSVs pose safety risks to their occupants. Earlier this year, IIHS conducted a series of crash tests with two GEM e2 LSVs and a ChangAn Tiger Star minitruck to demonstrate the hazards of allowing minitrucks and LSVs to be used on busy public roads with other vehicles. One GEM was evaluated in our 31 mph side crashworthiness test using a moving deformable barrier representing a pickup truck or SUV as the striking vehicle, and the other GEM was impacted by a Smart Fortwo, also moving at 31 mph. The Smart is the smallest passenger vehicle on US roads that meets all federal crashworthiness standards. Driver dummy responses for both GEM tests were compared with those for a similarly tested Smart. The Tiger minitruck was evaluated in a frontal offset test with a Ford Ranger pickup, with the Tiger traveling at 25 mph and Ranger at 35 mph. The Ranger meets all light truck safety standards and is one of the most inexpensive small pickups on the market. It earned an acceptable rating in our frontal crashworthiness test, the lowest rating in its vehicle class. Results from the test series indicated that, had these crashes occurred in the real world, drivers in the GEM and Tiger would have been killed or sustained serious debilitating injuries. In contrast, drivers in the Smart and Ranger would have been protected from serious injury (see attached *Status Report*). Clearly, public safety argues that the only use of either minitrucks or LSVs on public roads should be incidental to their intended use as off-road vehicles.

In summary, IIHS recognizes and supports the intention of the proposed best practice for registering and titling minitrucks. Clearly, widespread use of these vehicles on public roads in mixed traffic would undo decades of vehicle safety advances, and the proposed best practice limits this problem. However, states should recognize that LSVs on public roads constitute an even greater public safety problem on their own as well as a potential loophole in the best practice effort to limit the operation of minitrucks in that environment. I hope these comments are useful, and I would be happy to provide any additional information that the Committee or others might request regarding our research on the safety of minitrucks and LSVs.

Sincerely,

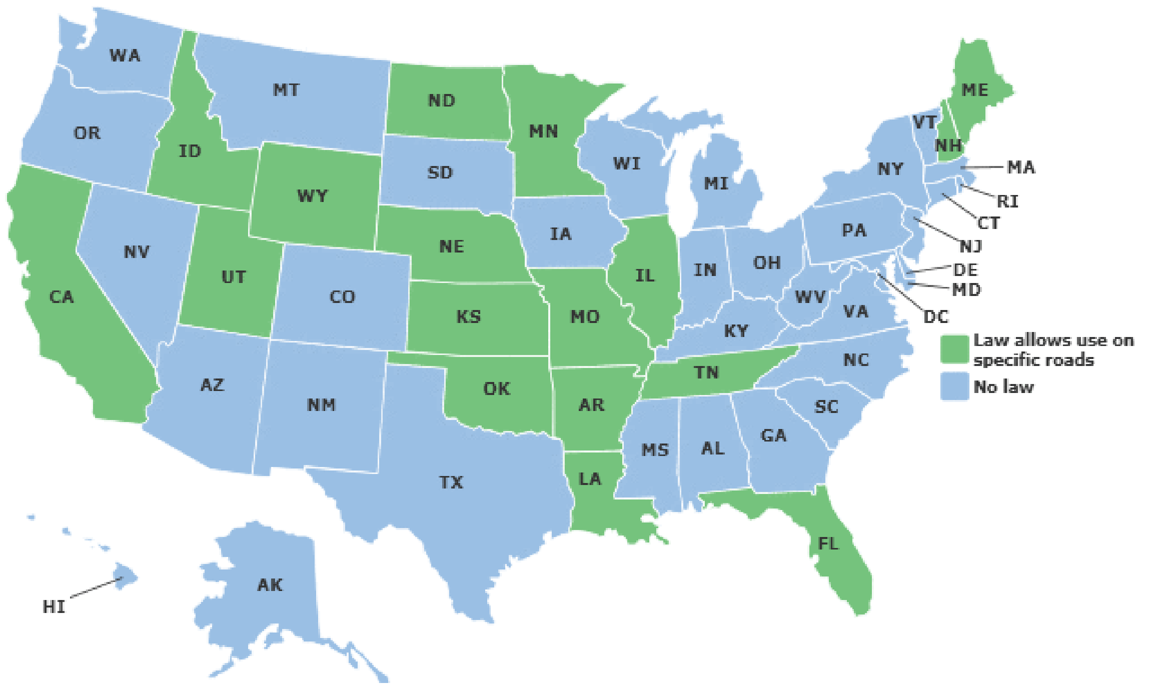
David Zuby
Senior Vice President, Vehicle Research

Attachments

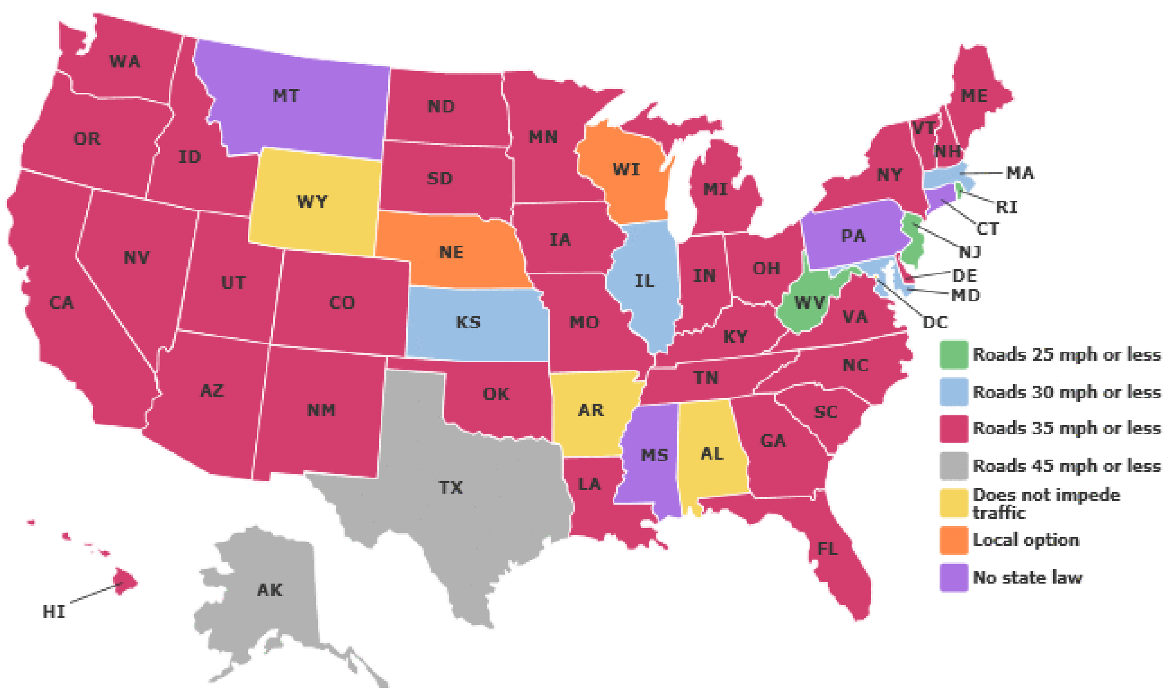
Maps: State laws for minitrucks and low-speed vehicles

Insurance Institute for Highway Safety. 2010. Definitely not crashworthy. *Status Report* 45(5):1-3,6-7. Arlington, VA.

Map 1: States with laws allowing minitrucks on roads



Map 2: Roads on which low-speed vehicles are permitted



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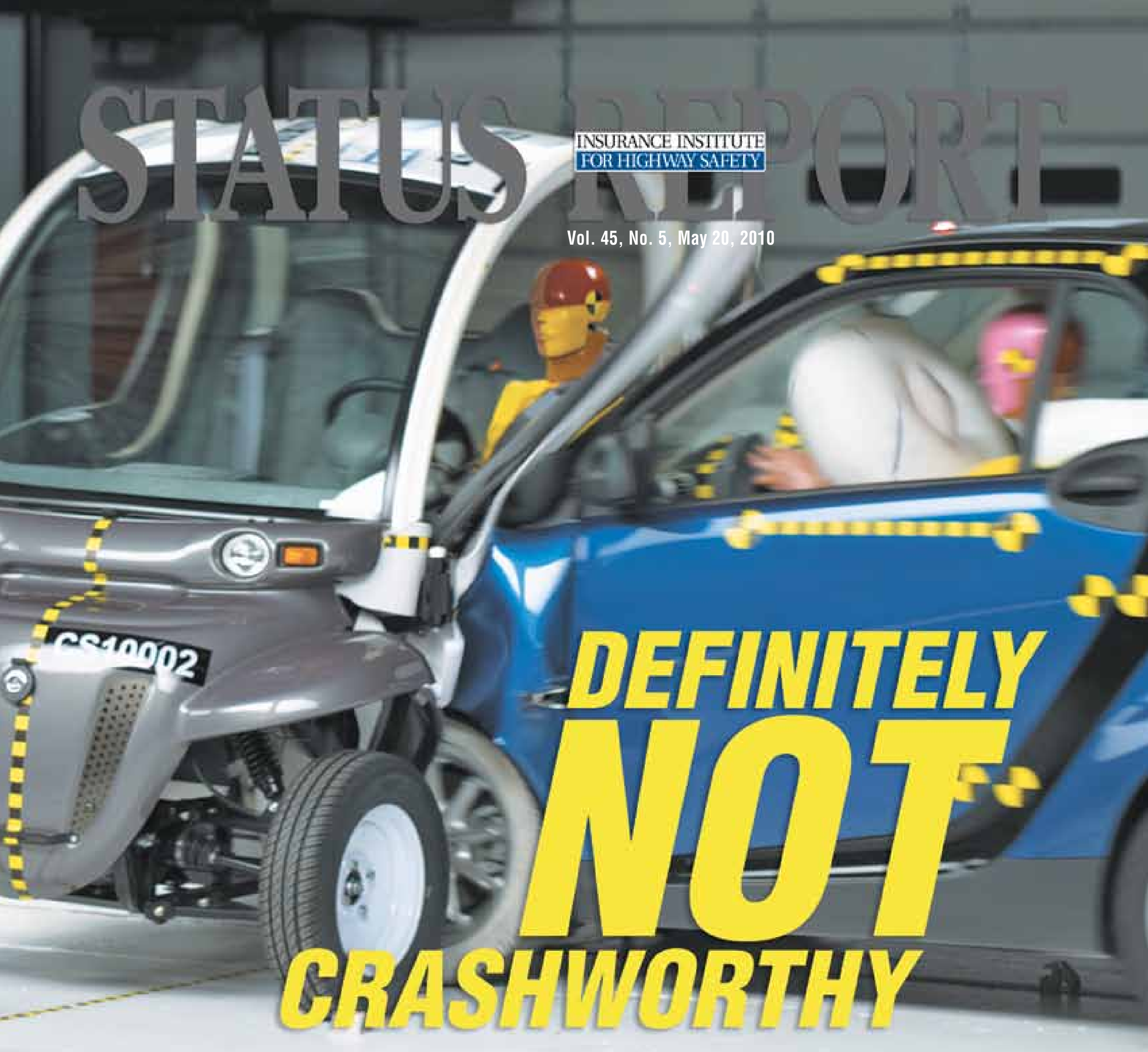


DEFINITELY NOT CRASHWORTHY

If vehicle size and weight influence crashworthiness — and they do — then small electric vehicles and minitrucks are even less crashworthy than the smallest cars. Low-speed vehicles (LSVs) are designed for tooling around residential neighborhoods, and minitrucks are for hauling cargo off-road. These vehicles are fuel-efficient and cheap to own but aren't built to protect people in crashes and don't meet all federal motor vehicle safety standards. The problem is that states now are allowing them on busy public roads alongside larger, faster-moving vehicles. Environmentalists are lobbying to expand their use as tax credits make buying some of these golf-cart-like vehicles practically free. New Institute crash tests show the deadly consequences of mixing these vehicles with regular traffic.

"By allowing LSVs and minitrucks on more and more kinds of roads, states are carving out exceptions to 40 years of auto safety regulations that save lives," says David Zuby, the Institute's chief research officer. "It's a troubling trend that flies in the face of the work insurers, automakers, and the federal government have done to reduce crash risk."

Practically every state allows LSVs, also called neighborhood electric vehicles, on certain roads, mostly with 35 mph or lower speed limits. Eight years ago just over a dozen states permitted them (see *Status Report*, April 6, 2002; on the web at iihs.org). Now 46 do. The National Highway Traffic Safety Administration (NHTSA) defines appropriate performance and safety standards but has no say in where LSVs are driven. The same goes for minitrucks, which are legal to operate on some roads in 16 states, even though they weren't designed to meet US safety or emission standards. The trend to grant minitrucks access to regular roads began in 2007 and is growing at a quick pace.

"On one hand you have NHTSA saying these vehicles were meant for low-risk, controlled environments or farm use, and on the other hand states are pushing them out onto the highways," Zuby points out.

LSVs are essentially souped-up golf carts that were envisioned as a low-cost, eco-friendly way to tool around gated communities in the Sun Belt where they would have little interaction with larger vehicles.

NHTSA doesn't require LSVs to have airbags or other safety features beyond belts since they are intended for low-risk driving. Most minitrucks in the United States are used right-hand-drive vehicles imported from Japan, where they can operate on roads as long as they pass inspection every 2 years. Vehicles that fail often end up exported to North America. Also known as Kei-class vehicles, minitrucks are smaller than conventional pickups and weigh about 1,500 pounds. They must be imported with governors to limit speeds to 25 mph or less to be exempt from Clean Air Act provisions but can go much faster.

NHTSA in 1998 established safety standards for LSVs to be used on "short trips for shopping, social, and recreational purposes primarily within retirement or other planned communities with golf courses." They must be able to go at least 20 mph but no faster than 25 mph. Basic features are required: headlights, taillights, brake lights, turn signals, reflectors, parking brakes, rearview mirrors, windshields, safety belts, and vehicle identification numbers.

Minitrucks weren't an issue when NHTSA wrote LSV rules. The agency in 2006 amended the standards to include vehicles with gross weight ratings up to 3,000 pounds, and now 4 states require minitrucks to meet LSV standards. Still, NHTSA believes minitrucks should keep off the road. In a July 2009 letter of interpretation, the agency said that because "these vehicles are not manufactured to meet US safety standards, NHTSA cannot endorse their use on public highways."

The Energy Department estimates there were 45,000 LSVs on

PRACTICALLY EVERY STATE NOW ALLOWS LSVS ON CERTAIN PUBLIC ROADS, MOSTLY WITH 35 MPH OR LOWER SPEED LIMITS. MINITRUCKS ARE LEGAL TO DRIVE ON SOME PUBLIC ROADS IN 16 STATES, AND PRESSURE IS ON FOR WIDER USE. LOST AMID THE TALK ABOUT SO-CALLED SUSTAINABLE TRANSPORTATION IS ANY REGARD FOR THE SAFETY OF PEOPLE WHO RIDE IN LSVS AND MINITRUCKS.

US roads in 2008. New LSVs qualify for up to a $2,500 tax credit under the American Recovery and Reinvestment Act of 2009. States also offer tax incentives.

Even though LSVs aren't designed to mix with fast-moving traffic, Alaska and Texas recently decided to give them access to public roads with posted limits up to 45 mph. Alaska Senator Bert Stedman, who sponsored his state's bill, says this "new breed of vehicles is a growing sector of the auto industry and can help provide cheaper, sustainable transportation."

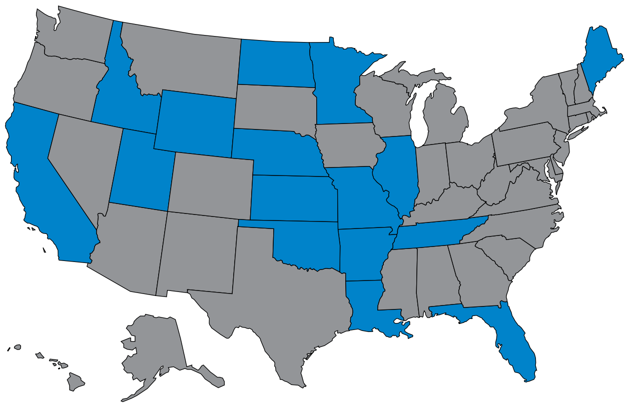
As Stedman notes, LSVs are environmentally friendly and cheap to own. So what's not to like? Plenty when it comes to sharing the road with larger vehicles.

Zuby says that "lost amid the talk about so-called sustainable transportation is any regard for the safety of people who ride in LSVs and minitrucks. We're all for green vehicles that don't trade safety for fuel efficiency."

For eco-minded consumers, a better choice for regular traffic is a crashworthy hybrid like the Toyota Prius or another fuel-efficient car. Also worth a look are the Nissan Leaf and Chevrolet Volt, two battery-powered cars slated for delivery later this year.

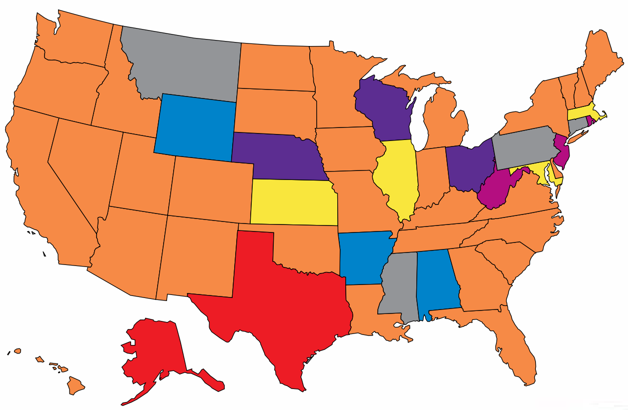
Crash tests demonstrate risk: To show that LSVs and minitrucks are no match for even the smallest of regular cars and pickups, Institute researchers tested two GEM e2 electric vehicles and a Changan Tiger Star minitruck. The GEMs were in side tests, one using a moving deformable barrier and the other using a Smart Fortwo as the *(continues on p. 6)*

STATES WITH LAWS ALLOWING MINITRUCKS ON PUBLIC ROADS



■ allows use on specific roads
■ no state law
go to iihs.org/laws for details

STATES WITH LAWS ALLOWING LOW-SPEED VEHICLES ON PUBLIC ROADS



■ 25 mph or less
■ 30 mph or less
■ 35 mph or less
■ 45 mph or less
■ doesn't impede traffic
■ local option ■ no law

NEW ESTIMATES OF BENEFITS OF CRASH AVOIDANCE FEATURES ON PASSENGER VEHICLES

Current crash avoidance features could prevent or mitigate about 1 of every 3 fatal crashes and 1 of every 5 serious or moderate injury crashes involving passenger vehicles. As many as 1.9 million crashes could be prevented or mitigated each year. This is the Institute's latest estimate of the safety potential of equipping all passenger vehicles with 4 crash avoidance features already on the market. The Institute shared its first effectiveness estimates in 2008 (see *Status Report*, April 17, 2008; on the web at iihs.org). Now that more systems are on the road, the updated projections take into account limitations of current systems.

The fresh numbers follow the 2009 release of survey results indicating most early adopters are using the crash avoidance features in Volvos and Infinitis to be safer drivers (see *Status Report*, Nov. 9, 2009; on the web at iihs.org).

The 4 new technologies the Institute studied include lane departure warning/prevention, forward collision warning/mitigation, side view assist (also known as blind spot detection), and adaptive headlights. In line with the 2008 study, a main finding is that lane departure warning has the potential to prevent or mitigate the most fatal crashes, while forward collision warning appears to have the greatest promise for reducing crashes of lower severity. Side view assist doesn't show as much potential simply because not as many serious crashes are relevant to this technology.

"This is a best-case-scenario estimate," explains Anne McCartt, the Institute's senior vice president for research. "We're not sure yet if the benefits will play out in everyday driving. A lot depends on whether the systems work as they're designed to and then whether drivers take the right corrective actions in response."

The Institute's earlier projections were based on ideal systems and ideal drivers. Researchers projected what future features might accomplish. This time around, they restricted the analysis to current systems and their limitations, including if bad weather affects operation. Crash data are from the National Automotive Sampling System General Estimates System and the Fatality Analysis Reporting System.

"The 4 kinds of crash avoidance technology we studied are relevant to about a third of crashes," McCartt points out. "These features

ANNUAL CRASHES POTENTIALLY PREVENTED OR MITIGATED BY TYPE OF SYSTEM

	ALL	INJURY	FATAL
Forward collision warning	1,165,000	66,000	879
Lane departure warning	179,000	37,000	7,529
Side view assist	395,000	20,000	393
Adaptive headlights	142,000	29,000	2,484
Total unique crashes	1,866,000	149,000	10,238

PERCENT OF CRASHES POTENTIALLY PREVENTED OR MITIGATED BY CRASH AVOIDANCE FEATURES

	ALL	INJURY	FATAL
All passenger vehicle crashes	5,825,000	698,000	33,035
Total unique crashes	1,866,000	149,000	10,238
Percent of crashes	32%	21%	31%

are in some passenger vehicle models right now, and we expect them to go into more and more new passenger vehicles during the upcoming model years."

Forward collision warning: More passenger vehicle occupants die in frontal crashes than in any other kind of crash. This technology detects when a vehicle is too close to one in front or to an object and then alerts the driver. In some cases this feature initiates braking and tightens safety belts if the driver doesn't respond promptly.

Forward collision warning has the potential to prevent or mitigate as many as 1.2 million crashes, or 20 percent of the 5.8 million police-reported passenger vehicle crashes that occur each year. The technology could prevent or mitigate as many as 66,000 crashes involving serious and moderate injuries as well as 879 fatal crashes each year. These estimates don't count injury crashes involving pedestrians or bicyclists. Some technologies in the works aim to safeguard these vulnerable groups. A new finding is that an additional 80,000 nonfatal injury crashes and 4,754 fatal crashes each year could be prevented or mitigated by systems that can detect pedestrians or bicyclists.

Lane departure warning: Head-on crashes, sideswipes, and crashes into off-road objects might be prevented by camera-based systems to detect when a driver begins to drift from a lane without signaling a turn. Then the system warns the driver to act, and sometimes is accompanied by a prevention feature that actively resists moving out of a lane. This technology has the potential to prevent or mitigate as many as 37,000 nonfatal injury crashes, 7,529 fatal crashes, and about 179,000 crashes a year overall. Current systems have some limitations, though. They don't operate at less than about 40 mph and won't give reliable warnings if lane markers are absent or obscured.

Side view assist: Mirrors on the rear and side help drivers keep track of nearby motorists, but blind spots on either side still allow adjacent vehicles to "hide." Side view assist uses sensors to detect vehicles approaching from behind and entering blind spots. Crashes that side view assist might address make up about a quarter, or 395,000, of lane-changing crashes per year. These involved 20,000 moderate-to-serious injury and 393 fatal crashes.

Adaptive headlights: These improve nighttime visibility on curves by pivoting as drivers steer around bends and corners. The count of relevant crashes amounts to roughly 142,000 per year, including nearly 2,500 fatal ones.

For a copy of "Crash avoidance potential of four passenger vehicle technologies" by J.S. Jermakian, write: Insurance Institute for Highway Safety, 1005 N. Glebe Rd., Arlington, VA 22201, or email publications@iihs.org.

LARGE TRUCKS TO BENEFIT FROM TECHNOLOGY DESIGNED TO HELP PREVENT CRASHES

Big rigs have the laws of physics on their side, so protecting occupants of smaller vehicles when they collide with them is challenging. The key is preventing these often-deadly crashes in the first place. A new Institute analysis indicates that a combination of 4 crash avoidance features has the potential to prevent or mitigate more than 1 of every 4 large truck crashes, 1 of every 3 injury crashes, and about 1 of 5 fatal crashes if every rig had them.

"These add up to 107,000 large truck crashes a year, including 12,000 nonfatal crashes and 835 fatal ones," says Anne McCartt, Institute senior vice president for research. The findings are important because per unit of travel large trucks are involved in more fatal crashes than other vehicles — 2 per 100 million miles traveled in 2008 compared with 1.4 for cars and 1.8 for light trucks.

Each year about 384,000 crashes involve large trucks, and about 4,100 of them are fatal. Side view assist, or blind spot detection, appears to be the most promising new feature for reducing such crashes. Stability control and lane departure warning show the most potential to lower fatal crashes.

Trucks have big blind spots. Side view assist uses cameras or radar sensors to monitor areas alongside trucks and alert drivers of vehicles in their blind spots. Among the 97,000 annual large truck crashes involving intentional lane changes, this feature could prevent or mitigate nearly 39,000 crashes, or 10 percent of police-reported crashes, including 2,000 injury and 79 fatal crashes.

A number of safety-conscious carriers, mostly large fleets, have outfitted their rigs with crash avoidance features even though no federal mandates or tax breaks exist to help defray up-front costs or put them on even footing with their competitors. Considering that trucks have a life span of 10 years or more, equipping entire fleets with crash avoidance systems is a pricey investment in gear and training that requires faith the benefits will pan out.

"Some operators, particularly smaller independents, may be holding back," McCartt says, "because there's no mandate to level the playing field. Until more trucks have the technology, we won't know if it works like it's supposed to."

Institute researchers examined 2004-08 crash data for single-unit trucks and tractor-trailers, correlating relevant crashes with features designed to prevent them. Considering the limitations of current systems such as how bad weather affects sensor readings, the researchers esti- *(continues on p. 7)* *(continued from p. 2)* striking vehicle. The Smart is the smallest passenger vehicle on US roads that meets crashworthiness standards. The Tiger struck a Ford Ranger XL regular cab pickup truck in a frontal offset test. The Ranger is one of the least pricey small pickup trucks on the market. It earns an acceptable rating in the Institute's frontal crashworthiness test, the lowest rating in its vehicle class.

The test dummies in the GEMs and the Tiger recorded indications of seriously debilitating or fatal injury to drivers in real-world crashes. In contrast, the Smart performed well and the Ranger reasonably so in similar crash tests.

"There's a world of difference between vehicles that meet crashworthiness standards and those that don't," Zuby says. "It may be time for Congress to step in to extend federal passenger vehicle safety standards to LSVs or else restrict them to the low-risk traffic environments they were designed to navigate."

Congress in 2009 asked NHTSA to study the safety and fuel-economy ramifications raised by the expanded use of low-speed vehicles on 40 mph or slower roads.

GEM tests: The first GEM test was a side impact in which a moving barrier representing a pickup or SUV crashes into the test vehicle at 31 mph. It's the most demanding test the Institute runs. Dummy measures suggest severe or fatal injury to a real person. In contrast, the Smart's airbags and safety cage protected the dummy from serious injury in an earlier side barrier test.

To show that the injury risk isn't only due to the aggressive barrier, a second test was run with a Smart crashing into a stationary GEM at 31 mph. The Smart's front in-

DANGER AHEAD: **Low-speed crashes with larger vehicles are risky for people in LSVs like this GEM (bottom right) involved in an Arizona crash on a mixed-use road bordering a community college and airport. Traveling at about 10 mph, the GEM driver turned left into the path of a Dodge pickup just behind her in the adjacent lane. The pickup driver braked but couldn't stop in time. The truck hit the GEM's rear driver side and spun it around. The woman driving the GEM was ejected out the passenger side and landed about 20 feet away. Police say she suffered a concussion. Ejection is a common problem when golf-cart like vehicles crash because most don't have doors. In Florida a man was ejected from the GEM he was driving when it was hit in the side by a Ford Ranger pickup at 20 mph in an intersection. The GEM driver's leg was broken. In another Florida crash, a woman was injured when she was thrown from a GEM in a 25 mph collision with a Honda Element.**

truded into the GEM's side so much that the belted dummy's head came close to hitting the Smart's windshield. The GEM dummy had injury measures indicating serious or fatal injury for real occupants.

"Watch the test footage, and it's obvious how devastating the side crash is to the GEM. It doesn't resist the crash forces at all," Zuby says. "GEMs and other LSVs weren't designed to protect people in a crash with a microcar like the Smart Fortwo, let alone larger cars, SUVs, and pickups in everyday traffic."

People in GEMs are protected by little more than safety belts and thermoplastic body panels. Doors are optional, though the crash-tested models had them. GEM e2 prices start at $7,395.

Chrysler Group Global Electric Motorcars, the largest producer of low-speed electric vehicles, makes GEMs. The company notes its vehicles comply with LSV standards limiting maximum speeds to 25 mph and says customers typically drive GEMs on roads with speeds of 35 mph or less. It "recommends the operation of GEM vehicles within the standards set forth by NHTSA."

Most states limit LSVs to 35 mph or slower roads, but it's clear that even these speeds — 31 mph in the side tests — can be fatal. Another problem is that even though LSVs are limited to 25 mph, other vehicles go faster, so it's wrong for states to imply that traveling on 35 mph public roads is safe for them. NHTSA's recommendation that LSVs should be restricted to low-risk roads extends beyond speed limits to describe the nature of roads suitable for LSVs.

"Driving to the clubhouse is a lot different from driving to Walmart," Zuby says. "LSVs are great for short trips on quiet roads but not busy ones."

Frontal test of Tiger: The Institute conducted a frontal offset test between a 2008 Tiger Star minitruck going 25 mph and a 2010 Ranger going 35 mph. The Ranger has standard front and side airbags and electronic stability control. The Tiger has safety belts but no airbags. Without airbags, the Tiger driver dummy's head hit the steering wheel hard. Measures indicate the likelihood of serious neck injury. In contrast, the Ranger dummy emerged unscathed.

The Tiger's outdated cab-forward design put the dummy's legs into the crush zone, resulting in severe injuries. The left leg and right foot were trapped by the clutch pedal and intruding structure. It's the kind of damage the Institute routinely saw when it began offset tests in 1995.

Unlike most minitrucks, Tiger Trucks aren't used imports. They are assembled with US and foreign parts in Oklahoma. The company says its vehicles aren't intended for use on public roads and notes that some models meet LSV and emission standards.

Minitrucks are fuel-efficient but not necessarily environmentally friendly since their classification as off-road vehicles exempts them from emission requirements. They run on gasoline, diesel, gasoline/ethanol blends, or battery power, depending on the model. Prices typically start at about $7,000-$8,000 and can go much higher.

For on-road driving, Zuby recommends consumers bypass minitrucks and spend more on a standard pickup to get crash protection and a vehicle that's okay to drive on all roads.

(continued from p. 5) mated how many crashes could be prevented. For example, forward collision warning/mitigation could prevent 37 percent of large truck front-to-rear crashes. This technology uses cameras, radar, or sensors to monitor a truck's path and alert the driver of a potential collision with a vehicle or object. Some systems require drivers to react to warnings, while others may automatically brake or steer a truck to reduce crash severity or avoid a crash altogether.

Fatigue is a persistent problem in the trucking industry. Truckers' long work hours cause sleep deprivation and disrupt normal rest cycles (see *Status Report*, Feb. 14, 2009; on the web at iihs.org). Lane departure warning and prevention systems can help drowsy or distracted drivers focus on the road and recognize the need for a rest break. Cameras track a truck's position within the lane and alert the driver if the truck is in danger of straying across lane markings. The technology is relevant to about 10,000 crashes a year.

About half of all truck driver deaths, compared with about 1 of 4 car occupant deaths, occur when trucks roll over. Two kinds of stability control systems intervene when truck motion becomes unstable, risking rollover, jackknife, or other loss of control. The first, which activates when a truck and/or trailer accelerates laterally, could prevent 13,000 single-vehicle large truck crashes a year. Electronic stability control incorporates roll stability with directional stability to prevent understeer or oversteer. It could prevent another 10,000 large truck single-vehicle crashes a year. Both kinds of stability control also address multiple-vehicle crashes. Combining 2-vehicle crashes with relevant single-vehicle ones, about 31,000 large truck crashes a year are relevant to stability control. Of these, 7,000 involve injuries and 439 involve fatalities.

ANNUAL LARGE TRUCK CRASHES POTENTIALLY PREVENTED/MITIGATED, BY TYPE OF SYSTEM

	ALL	INJURY	FATAL
Lane departure warning	10,000	1,000	247
Electronic stability control	31,000	7, 000	439
Forward collision warning	31,000	3,000	115
Side view assist	39,000	2,000	79
Total unique crashes	107,000	12,000	835

PERCENT OF LARGE TRUCK CRASHES THAT POTENTIALLY COULD BE PREVENTED/MITIGATED

	ALL	INJURY	FATAL
All crashes	384,000	37,000	4,151
Total unique crashes	107,000	12,000	835
Percent of crashes	28%	34%	20%

For a copy of "Crash avoidance potential of four large truck technologies" by J.S. Jermakian, write: Publications, Insurance Institute for Highway Safety, 1005 N. Glebe Rd., Arlington, VA 22201; or email publications@iihs.org.

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