

automotive

Safe and Safer

How science is lending drivers a hand

by Paul Sinkewicz



In the groove: Anti-lock brake systems and compulsory seat-belt use (below) are among the biggest vehicular safety advancements in the last few decades.

There is no more sobering sight for a driver than the roadside memorial. They are the stark expressions of grief briefly glimpsed as you speed by. They may be flowers in the shape of a cross, notes taped to a pole or a simple teddy bear with private meaning. But they all say the same thing: "You left us too soon." And, for a while at least, they also break down the comforting delusion of our own invincibility.

Danger has gone hand in hand with driving since the birth of the automobile. Ireland's Mary Ward is widely thought to be the first person killed in an automobile accident. The 42-year-old mother of seven died after being thrown from a steam-powered vehicle driven by a relative in 1869. Designers have been working to make automobiles safer ever since.

Safety on the Side

Seat belts have been in existence since the 1880s, but despite efforts to promote their use in automobiles, they didn't become

standard equipment in a production model until 1958. Saskatchewan made seat-belt use compulsory in 1977 and today leads the country in usage at 92.9 per cent.

Automobile air bags were invented in 1951 and found their way into production vehicles in the U.S. in the 1970s. But at that time they were touted as a replacement for the under-appreciated seat belt and were dangerously overpowered to fulfill the role of primary safety restraint. They were more appropriately marketed as a supplement to seat belts during their reintroduction to vehicles in the 1980s.



What followed was a steady progression of better air-bag technology, resulting in the front and side-curtain air bags of today that swaddle both front- and rear-seat passengers in a protective embrace – even during side-impact collisions and rollovers. The newest generation of air bags is smart, with sensors relaying the weight of the occupant and the position of the seat so that the inflation can



Pop-up pillow: Front and side-curtain air bags provide protection during side collisions and rollovers.

be adjusted in a crash.

Statistics bear out the belief that seat belts and air bags have made a difference. The number of licensed drivers in Canada increased by 5.3 million between 1987 and 2006, with more than 22 million licensed drivers now sharing the roads. During the same period, traffic fatalities decreased from 4,283 in 1987 to 2,889 in 2006, a 32 per cent decline. As well, serious injuries declined by 45 per cent in the same period, while total injuries dropped 29 per cent. Transport Canada now estimates that each year about 1,000 Canadian lives are saved by the use of seat belts; in 2006, some 55 lives were saved by air bags.

Other innovations over the years have also helped make vehicles safer. Padded dashboards were once a technological advancement, while stronger frames and crumple zones came along to help manage the effects of a collision. But these measures, along with seat belts and air bags, amount to “crash-helmet”

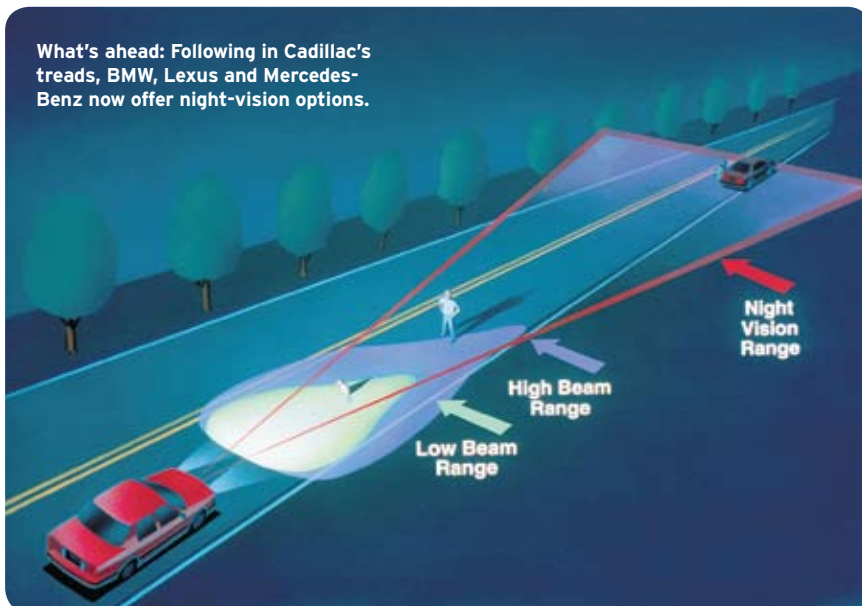
technology – force-counterforce. It’s as if auto-makers are saying: “We know you are going to get into a collision, so brace yourself.” Enter the age of proactive safety features.

Smarter Cars

The modern era of car safety focuses on aids meant to get drivers out of trouble *before* it happens. Statistics show driving has gotten safer in the past 20 years, but motoring is about to take a quantum leap forward in safety as new technology filters its way into affordable production vehicles.

Saskatoon’s Jim Kerr has been teaching automotive mechanics since 1981 and has been writing automotive reviews for 15 years. During his career, he has seen a steady progression of safer cars and believes the microchips now helping drivers stay in control have prevented countless deaths and injuries.

For example, anti-lock brake systems (ABS) use wheel sensors and a decision-making chip to control how much braking



What’s ahead: Following in Cadillac’s treads, BMW, Lexus and Mercedes-Benz now offer night-vision options.



pressure is applied to each wheel. The wheels don't lock up and slide in a crisis, which allows the driver to continue steering the vehicle while braking. "They've kept people in control when they've [jumped] hard on the brakes and reduced the severity of impacts," says Kerr. "People still don't utilize ABS to the full extent in that they tend to still hold the steering wheel straight and just nail the brakes instead of just steering around somebody. But the fact that they do keep the vehicle in control has probably saved a lot of lives."

Stability control systems have also had a major impact on safety, according to Kerr. Power or braking is automatically applied as needed to each wheel to optimize vehicle control, despite varying traction at the four corners, or to correct understeer or oversteer. Further refinement to stability control looks like the most promising safety advancement in the next few years, says Kerr.

"I think we're going to see faster, better systems that are less intrusive. Having said that, they've made remarkable leaps in just the last five years in how these systems work . . . They keep pushing the air-bag technology, but I don't think that's going to be the next big step. I think it's going to be in better stability control – more intuitive stability control right across the board – because it's a great equalizer. [The technology] can take somebody with very little skill and put them up at the edge of handling on slippery road conditions with somebody that's got a lot of skill."

Getting a Heads-Up

Another aid to highway travel now available on some vehicles is a warning when another vehicle is in the infamous blind spot. Audi's Side Assist System uses radar to detect other vehicles before a lane change, while Volvo's Blind Spot Information System uses cameras to alert the driver to danger. Both systems use indicators near the

Defence mechanisms: A lane-change warning system uses radar and side-mirror indicators to help motorists avoid a collision; a camera between the rear-view mirror and windshield detects lane markings and alerts straying drivers (right).

outside mirrors to warn the driver. Lane-departure warning systems work by tracking highway lines and audibly alerting drowsy drivers to the fact they are drifting out of their lanes. BMW alerts drivers with a vibrating steering wheel.

Night vision moved from the realm of Navy SEALs to middle-aged commuters when Cadillac put it into its DeVille from 2000 to 2005. According to Transport Canada, pedestrians and bicyclists made up more than 15 per cent of traffic fatalities in Canada in 2006. In Saskatchewan, that translated into eight pedestrians and two bicyclists. And many highway accidents in the province are a result of hitting animals unseen until it's too late. Using two competing versions of heat-sensing infrared technology, the next generation of night vision promises to give drivers a few extra seconds of reaction time to avoid a collision. BMW, Lexus and Mercedes-Benz are now offering night-vision options, with other automakers working on their own versions for the near future.

The Tech Advantage

Lexus is on the cutting-edge of driving safety with its Advanced Pre-Collision System (APCS), which recently earned the automaker the 2008 Pyramid Award for Innovation in Safety (presented by CAA). The APCS uses a grille-mounted radar, infrared and cameras to give the computer a three-dimensional look at the driving landscape. A separate camera watches the driver to gauge whether his or her attention is directed at the road ahead. If a collision appears likely, the system will warn the driver while tightening up the seat belts, priming pressure to the brakes and making the steering tighter to minimize response

time. In the event the driver fails to respond to the imminent collision, the system will automatically begin braking. Unfortunately, the APCS is only available as an add-on to the Lexus LS 600h L, with its daunting starting price tag of \$125,000.

Still, Jim Kerr doesn't see this type of technology as being as effective as better driver training would be at saving lives. "Right now the technology is expensive, so until it migrates down to the cheaper cars, we're not seeing a big benefit to a lot of people," he says. "I think we're going to see a progression in that we will get this type of stuff on cheaper vehicles, but it gets to the point where you're dealing with only two per cent of the situations. I think better driver training would more than compensate for those types of systems."

So perhaps responsibility for safety will always rest ultimately on human shoulders. As Kerr says: "You can build a car a thousand times safer, but you put an idiot in it, and they can still kill themselves." ▣

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smooth rides ahead

All hail the underappreciated automotive engineer. Today we are safer in our vehicles than ever before - and also happier. Advances in construction materials, drivetrain technology and electronic conveniences have made driving a pleasure, even on the most hectic of days.

■ **Driving Comfort** It is now possible to cocoon yourself in a climate-controlled vehicle with heated leather seats, which remember how you like them adjusted, while listening to your team's road game live on satellite radio. But for true driving bliss, taking the stress out of a trip beats any other innovation. And unhappy kids mean stress. So thank you, engineers, for the ability to keep the children cheerful in the back of the van with a movie on the flip-down video screen with headphones around their ears. Ahhh, peace and quiet.

■ **Performance** Gearheads love talk about horsepower and speed, but modern performance owes a lot to high-strength alloys such as aluminum that have produced lighter engines and stronger frames. The rising cost of fuel, and the threat vehicle emissions pose to the environment, mean doing more with less is the smartest move we can make. Advanced plastics, alloys and carbon composites may be the least sexy part of cars to drivers, but they are the building blocks of the next age of automobiles.

■ **On the Way** There is a high-tech tussle on right now to see which new technology will power vehicles of the future. For all the promise of ethanol and hydrogen fuel cells, advances in storing electricity may give the electric car the brightest future. General Motors has vowed to get its Chevrolet Volt concept car into showrooms by 2010 for around \$30,000. If engineers can work out how to stabilize the temperature of the lithium-ion batteries, and make them durable, the car could change the automotive world.

Drunk or sleepy drivers account for many road tragedies every year. Nissan hopes science can help. It's developing a multi-level driver evaluation system. It will sense alcohol in sweat through sensors on the gearshift and disable the vehicle. A facial recognition camera and software will also determine if the driver is alert and reacting appropriately. □ -P.S.

