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Developing Automotive Technologies

by

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Screeching tires, shattering glass, and twisting metal are some of the worst sounds you can hear while driving. Today your chances of hearing that sound are higher than they have ever been. According to the Maryland Motor Vehicle Association between the years of 1998 and 2003 the average number of new cars sold was over 400, 000 (1). Now, just because there are 400, 000 new cars sold each year that does not mean there are another 400,000 new cars on the road each year. Some people sell their old cars and buy new ones, so perhaps only a mere 50,000 new cars join you on the road each year. That would still mean that each year there would be a new 50,000 obstacles you have to avoid hitting to avoid hearing those sounds. Automotive makers recognize that with more drivers on the road and increased risk to driving, cars need to be safer. So technologies are being developed to increase the safety of motor vehicles. “Active” technologies are being developed, technologies that help you survive a crash. As are “passive” technologies that help you avoid a crash. In this paper I will highlight a few of these developing technologies, explain their functions, their drawbacks, and give my own opinion on their effectiveness.

I will focus on the “active” technology Smart Airbags as well as the “passive” technologies Active/Adaptive Cruise Control, the Lane Departure System, Stability Control, and Run Flat Tires. Each technology is either currently being developed or already in use.

The first technology to consider is the Active, or Adaptive, Cruise Control system. This system is very similar to standard cruise control systems, but with an active/adaptive ability added. The system functions like a normal cruise control system, keeping the

speed set by the driver, when activated (Bennett 1). But, the system utilizes radar and/or lasers to monitor other cars in front (Jensen 1). The system allows the car to sense other cars in front (1). Should a slower moving vehicle find itself in front of you your car will detect the other vehicle and automatically slow down (Godwin 1). But, as soon as the slower moving vehicle moves off your car will resume its preset speed (Bennett 1). Jeff Bennett, a reporter from the Detroit Free Press, after testing the system, states “You can cruise home or to work, even in heavy rush-hour traffic, without ever touching the pedals or any buttons” (1).

The second technology I would like to highlight is the Lane Departure Warning System. This system employs the advancements in digital cameras as well as computing speed. The Lane Departure Warning System uses a digital camera mounted on the rear view mirror stand pointing out around 25 meters ahead, which takes pictures of the road surface in front of the car (Bello 1). Then a computer in the car reads the images and comprehends where the car is, in terms of the lane (STCV 1). So if a distracted driver looks away from the road and starts to veer out of their lane, the car will recognize this as an unintended lane departure and attempt to alert the driver. This alert can be anything from the sound your alarm clock makes when not set to music, a simulation of the sound your car makes as it drives over a rumble strip, a visual warning on your dashboard, and in some cases the system may vibrate your steering wheel (Bello 1). This technology is still very new, and not many cars offer it as an option.

Electronic Stability Control, Dynamic Stability Control, Advance Trac, Stabilitrack, Vehicle Skid Control, Traxxar Stability Control, and Precision Control are some of the names given to the next technology by car companies. The Stability Control System monitors each wheel independently maximizing the performance of the car to optimize the cars handling ability (BMW 1). The system also watches the yaw, or rotation around the vertical axis, caused by momentum and compares that to the position of the steering wheel (Lexus 2). These factors most often come together in what is termed under steering. For example, should you make a turn too quickly and start to veer off the road—going where physics would put you—the car will see where you have the steering

wheel pointed, try to put the car where you want it, and not where physics says it should be.

Another technology already being put to use are Run Flat tires. This technology has been progressing since the late 1990's, and now some cars offer the tires as standard (CACIQ 1). These tires will allow a driver to continue up to 50 miles at 55mph, after the tire has been punctured (Tire Rack 2). This will improve safety, limiting tire blowouts and therefore lessening the chances of crashing. Denise McCluggage writes, "Women drivers are still at greater risk than male drivers when stranded at roadside" (1). With Run-Flat tires women would not have to pull over and seek assistance if they lost a tire.

The final technology I would like to look at is a technology that will assist the driver during a collision if the previous technologies fail to abort one. This is the Smart Airbag. Smart Airbags do more than just deploy upon impact. They weigh and sense the mass and location of the seated person (Godwin 3, The Why Files 3). This gives them the ability to deploy with maximum safety (Godwin 3). This also helps put to rest the fears of parents if their child is in the front seat. The system will recognize the lower mass of the child and deploy at a slower/safer rate (The Why Files 2). Smart airbags also include airbags for side impact deployment as well as head protection (IIHS). They are even some experimental airbags made to protect a pedestrian in case of impact (Airbag Institute 1).

Unfortunately, even with all the advantages these technologies offer, they come with disadvantages as well. The technologies will increase comfort, improve safety, and possibly save you money in the future. However, they also cost a considerable amount of money to purchase. And they can also cause a problem of overdependence.

Looking at the advantages, comfort, as a positive aspect, can be both physical as well as psychological. Active/Adaptive Cruise Control can bring physical comfort by allowing less need for the driver's foot to hold down the gas pedal (Bennett 1). The Active Cruise Control also provides psychological comfort by letting the driver relax as he knows the

car will slow down and speed up as safely as possible (Godwin 1). Many of the other technologies also offer psychological comfort.

The Stability Control brings psychological comfort to the driver because he or she knows that should they hit ice, the car will handle the temporary loss of partial traction (BMW 1). The lane departure system will notify the driver that the car is leaving the lane, by alerting a tired or unfocused driver. The driver will find comfort in knowing the Smart Airbag will not deploy too violently, potentially injuring their child in the front seat (IIHS 1). And knowing that your car can continue on even with a flat tire, means a driver does not have to stop in a area in which they do not feel comfortable (McCluggage 1). Each of these technologies allows the driver to feel safer in their car, therefore lowering the stress of driving allowing for safer driving. And, safety is the technologies' purpose for being created.

Safety is the principal benefit of these technologies. Each technology improves safety a great deal. The Stability Control, by influencing each wheel independently, allows the car to make turns faster (BMW 1). By providing more control and by keeping traction on a slippery or wet road surface, this new Stability Control enhances the ability to dodge a renegade object in its pathways (Lexus 2). Keith Russell, the Executive Director of the Driving School Association of the Americas says, "...[Stability Control] is a significant advancement in the fight to reduce auto collisions and fatalities..." (ESC 1). The Lane Departure System will notify a tired or unfocused driver that the car is leaving the lane, eliminating the chance the driver will cause a crash by leaving their lane (STCV 1). Francis Memole, Vice President of Business and Development of the Iteris system, a developing lane departure warning system says, "[The Lane Departure Warning System] is a break through product for the automotive industry and we believe it has the potential to be the most significant safety innovation for passenger cars since the advent of the seatbelt" (Iteris 2). The Adaptive Cruise Control will keep the car, while set in cruise control, from rear-ending another vehicle (Bennett 1). And should the car require assistance, it will "ask" the driver to acquire control of the car (Jensen 2). ELESYS, Automotive Electronic Safety Systems says Adaptive Cruise Control is "the next

generation of driving safety” (www.elesys-na.com 1). The Smart Airbags will factor in the weight of the occupant, the speed of the vehicle, and the location of the occupant of the seat using ultrasound, lessening the trauma caused by deployment (The Why Files 3). Smart Airbags also include the addition of airbags in various locations such as side impact airbags, pedestrian impact airbags, and even head protecting airbags (IIHS 1). The President for the Insurance Institute for Highway Safety says, “The need for head protection in side impacts has been obvious for some time... Now we know side airbags can change this and do a good job of protecting heads” (IIHS). The Run Flat Tires will allow the driver to continue to a safe destination and minimize the dangerous conditions of driving with a flat tire (Tire Rack 2).

Money is a consideration that influences the decision of car buyers greatly. These technologies can help you save money long term. These technologies, by helping in the avoidance of crashes, will save the driver money. If you don't crash you don't have to repair your car and your insurance rate will not increase as a result. Even with these technologies you can still crash, but it is probable that with the technologies, one will have a better chance of preventing a crash. These technologies may save you money long term, but when bought they add a considerable amount of money to the cost of one's car, suggesting one of the negative aspects of these technologies.

The disadvantage of initial price is the main negative aspect of these technologies. Each technology, because of its newness, is quite expensive. The cost of adding Active or Adaptive Cruise Control to a car will increase the price of the car between \$1,900 and \$2,600 (Bennett 1). Tomiji Suhimoto, Honda's Chief Safety Engineer, says, “Everybody wants a sophisticated safety device, but their priorities change when they hear the price” (Zaun 2). Adding Stability Control to a car will increase the price anywhere from \$400 to \$1,100 (Ulrich 1). Lane Departure Systems combine a computer and a digital camera, so to get an understanding of the price of this system, add those two objects' prices together and you will have an idea of the price increase (Reed 1). Run Flat Tires are becoming standard features on many higher model cars, such as the Corvette (McCluggage 1). However, Goodyear is working on affordable versions of their Run

Flat Tire, the Extended Mobility Tire, which would cost around ten to twenty percent more than standard tires (Goodyear 1). Smart Air bags are becoming more and more popular, and therefore, becoming standard on many cars (waw.wardsauto.com 1).

The other drawback, I feel, caused by these technologies is actually an advantage, taken to an extreme. The advantage of psychological comfort when taken to an extreme becomes a weakness, if the driver depends too much on the technology. Should a driver depend too much on the Stability Control System and drive wildly, problems will arise. Even though the system shifts power around in attempt to hold control, once the force of friction is reached, the system will not work any more. If the driver depends too much on the Lane Departure System while driving tired, the system will wake them up if they leave their lane. But, the system has limits. If the road can't be seen either in snow or heavy rain, or if perhaps there is no road or markings of a road to follow, then the system becomes obsolete (Iteris 1). The Active Cruise Control can only apply up to twenty percent of the cars maximum breaking power (Jensen 1). If the driver should become irresponsible and let the system drive itself and then needs to stop, the driver will have to be paying attention, because the car will not be able to stop itself. With the Smart Airbags, a parent might become foolish and allow their infant to sit up front feeling that the airbag will know it is a young child and not deploy the bag, and then in a crash the bag is deployed—at a safer speed—and still harm the child, showing overdependence on the technology. Similarly, with Run Flat Tires, if the tire goes flat and the driver feels they have time to drive on the tires because that is their reason for existing, they may continue to drive around more than they should. After fifty miles the tires will lose their ability to function creating dangerous driving conditions.

So there are positive and negative aspects of these technologies. One has to weigh the positive and negative aspects and decide if it's worth speeding money on and using these technologies.

Currently BMW is running a commercial depicting its Stability Control System, XDrive, as little guardian angels watching over each wheel. But are these technologies best

described as angels, or are the technologies better represented by demons? Don Sherman from *Popular Mechanics*, says “its like having God as your copilot” in reference to the Stability Control (ESC 1). While I would not go that far, these technologies are not perfect. However I do believe they can make your car much safer. I believe that the positive aspects provided by these technologies—safety, comfort, and long term money savings—far outweigh the negative aspects of over dependence and high initial price.

I feel the over dependence problem is an acceptable risk. Compare automotive technology’s advantages and disadvantages to medicine’s advantages and disadvantages. Both improve safety, comfort, and save money long term. If you get a flu shot now, you won’t be in the hospital with it later. Unfortunately they both also share similar negative aspects. Both have a high initial cost, and medicine, too, can pose the problem of over dependence. Yet we still use medicine. Because of the good medicine can do, we accept the problems it can have on a few. There is the same parallel of potential with over dependence and automotive technologies.

According to the National Highway Safety Transportation Administration, forty-three percent of all fatal accidents in 2001 involved either lane or road departure (Reed 2). Even though the Lane Departure Warning System would not be able to completely eliminate all road and lane departure accidents, it would lower the percentage of crashes, thereby lowering the number of fatalities. And similarly to the use of medicine, I feel the benefits of the lives saved would far outweigh the few who would depend too highly on the technology, thereby causing problems.

AAA Foundation for Traffic Safety states that twenty five percent of all accidents—some 1.5 million—are caused by driver distraction (Reed 2). With Smart Cruise Control watching the road, in conjunction with the driver, even eliminating one percent would prevent some sixty thousand accidents.

And for all the crashes that still occur, Smart Air Bags will have a better chance of saving your life, your passenger’s life, and even pedestrians’ lives than conventional air bags.

The other negative aspect that needs to be addressed is the problem of high initial cost. This problem can be dismissed using the relation to medicine as well. Medicine can also cost a great deal of money when first purchased, but because it can prevent injury and/or lessen problems later on, we still choose to buy it. It would be similar with Automotive technology. Purchasing the technologies now, could save you lots of money later, in auto repairs or even your life. But I have already used the medicine comparison. So I'll use another argument to show that high cost isn't a real problem.

When you see a commercial for cars on television, the cars usually cost around fifteen to twenty-five thousand dollars. I drive a low model Toyota Echo, and it costs around \$10,000. My car doesn't have any of the technologies mentioned so far, and when you buy a car that costs \$5000 to \$15,000 more than my automobile, you probably aren't paying the \$1,500 to \$2,500 these new technologies can cost (Bennett 1). You pay extra for more horsepower, power windows and locks, or bigger wheels. You pay more money, not for safety, but for ease and style. The point I am trying to make is that the one to two thousand dollars it would cost to outfit your vehicle with these technologies, is already being spent just on other items. So you have to choose between your safety and how your car looks, or how convenient it is to drive. And if you chose style, then think of your family, passengers, other motorists, and even pedestrians.

So if there is no large problem with either over-dependence or high cost, the only reason to not use these technologies is choice. You drive fine now without these technologies, so why shouldn't you spend your money on a CD player and not on Stability Control? Well you do drive fine now, just as people drove fine before they had seat belts. Similarly, you drive fine now, just as people drove fine before Airbags. When you drive it not only affects your safety, but the safety of everyone around you whether driving or not. Each day driving becomes more and more dangerous. And each day automotive technology is being developed to make our lives much safer through the use of it.

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