Vehicles Are Changing In A Big Way

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You may have noticed a few major changes in vehicles since the introduction of ABS braking in the 80's to stability and traction control in the 90's, driven by the significant amount of deaths linked to the Explorer roll over and Firestone tire incidents. Since those two decades of innovation, we are now experiencing and explosion of available technology being installed into entry-level cars, SUV, Crossover and pickup trucks today.

Some of the best technical systems available in cars were only installed in very high end Mercedes S550s etc. Today, you can purchase a 2015 Subaru sedan with a radar collision avoidance system that will apply full braking on its own if you do not react in time to an avoidable collision. The time and distance math we use in our training class is the same principle applied to the unaided braking the Subaru uses if the distance, speed and closing rate trips the computer to apply the brakes without your input. This is on a reasonably priced car!

So if all of the cool stuff from Mercedes is now on entry-level cars what does Mercedes have these days that's cool. That's a subject of the next article, so stay tuned! Until then, here are some basic systems in most cars today and an explanation of how they work.

<u>Electronic Stability Control (ESC)</u>

This technology helps drivers maintain control of their vehicle during extreme steering maneuvers by **keeping the vehicle headed in the driver's intended direction**, even when the vehicle nears or exceeds the limits of road traction.

When drivers attempt an extreme maneuver (for example, to avoid a crash or because a curve's severity has been misjudged), they may experience unfamiliar vehicle handling characteristics as the vehicle nears the limits of road traction. The result is a loss of control. This loss usually results in either the rear of the vehicle "**over steering**," or the front of the vehicle "**under steering**."

A professional driver, with sufficient road traction, could maintain control in an extreme maneuver by using various techniques, such as counter-steering (momentarily turning away from the intended direction). It would be unlikely, however, for an average driver to properly apply counter-steering techniques in a panic situation to regain vehicle control. If you have attended our driver training class we spend a lot of time talking about the average driver and the professional driver capabilities before we go to the driving track

In an ESC-equipped car, the ESC system immediately detects that the vehicle's direction is changing more quickly than appropriate for the driver's intended direction. ESC momentarily applies braking at the selected wheel (Front or Rear L/R) to alter the direction of the vehicle back to the correct path.

HOW ESC WORKS

Electronic Stability Control (ESC) uses automatic braking of individual wheels to prevent the heading from changing too quickly (over steering) or not quickly enough (under steering). ESC cannot increase the available traction, but maximizes the possibility of keeping the vehicle under control and on the road during extreme maneuvers by using the driver's natural reaction of steering in the intended direction.

ESC happens so quickly that drivers do not perceive the need for steering corrections. If drivers do brake because the curve is more or less sharp than anticipated, the system is still capable of generating uneven braking if necessary to correct the heading.

ESC systems exist under many trade names, including Vehicle Stability Control (VSC), Electronic Stability Program (ESP), and Vehicle Stability Enhancement (VSE).

Rollover Air Bags

In addition to protecting drivers' or passengers' heads during a side-impact crash, **some side-impact head air bags**, or "curtains," can **also protect occupants from injury and ejection during a rollover crash**. This is important because ejection causes most injuries and fatalities in rollover crashes - **most people who are killed are not wearing safety belts** to hold them in place.

Not all side-impact head air bags are designed to deploy as rollover air bags. Check with your dealer and vehicle manufacturer for the availability of side-impact head air bags that can also operate as rollover air bags.

HOW ROLLOVER AIRBAGS WORK

If a rollover is detected, the side-impact head air bags are typically triggered in combination with safety belt retractors to remove slack from the safety belt and keep the occupant firmly in the seat. Most side-impact head air bags deploy downward from the overhead roof rail, very close to the side windows. In many cases the rollover sensing system can determine an imminent rollover when the roll angle is very small and all four wheels are still on the ground.

When deployed as rollover air bags, side-impact head air bags will stay inflated longer to help protect the heads of the occupants during the rollover. They also keep the occupants of the outboard seats from being thrown from the vehicle. The combination of these air bags and **properly worn safety belts can significantly reduce the chance of ejection**.

Variable Ride-Height Suspension (VRHS):

Depending on conditions such as vehicle speed and terrain, Variable Ride-Height Suspension (VRHS) raises or lowers the ride height of the vehicle while it is in motion. Some VRHS systems operate automatically, while others require the driver to select the appropriate mode. VRHS systems can have a favorable effect on a vehicle's likelihood to roll over because they lower the height of the vehicle's center of gravity and improve its **Static Stability Factor** (SSF) rating for highway driving.

VRHS systems exist under many trade names, including Electronic Height Control (EHC), Active Height Control (AHC), and pneumatic suspension systems.

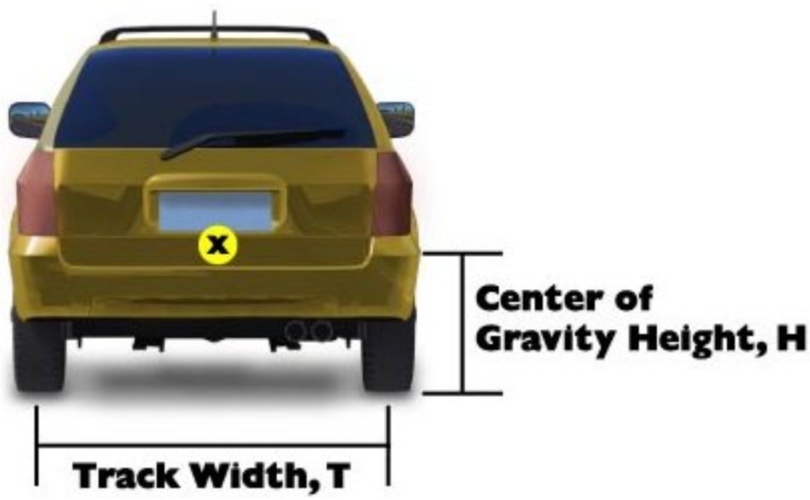
HOW VRHS WORKS

In general, during off-road, lower-speed conditions, the vehicle will ride higher to allow for increased ground clearance. During on-road, higher speed conditions, the vehicle will ride lower. The vehicle riding lower by several inches is less top-heavy, has a higher **SSF**, and is less likely to roll over in a crash.

What is a Static Stability Factor (SSF) and how is it computed?

The Static Stability Factor (SSF) of a vehicle is an at-rest calculation of its rollover resistance based on its most **important geometric properties**. SSF is a measure of **how top-heavy a vehicle is**.

A vehicle's SSF is calculated using the formula SSF=T/2H, where T is the "track width" of the vehicle and H is the "height of the center of gravity" of the vehicle. The track width is the distance between the centers of the right and left tires along the axle. The location of the center of gravity is measured in a laboratory to determine the height above the ground of the vehicle's mass. The lower the SSF number, the more likely the vehicle is to roll over in a single-vehicle crash.



In Conclusion:

With the introduction of new vehicles every year, PFC updates our professional driver training programs to meet the demands of changing technology. At PFC we also employ 2015 vehicles in the training fleet to allow all students to experience the new vehicle changes first hand. Without this current knowledge, a professional driver may find him or herself operating a vehicle that will not perform the maneuvers as they were trained to perform them previously using old technology as the new vehicle technology will limit his or her input under certain conditions.

Ongoing training in up to date vehicles is required to keep a skill level commensurate with today's fleet of new vehicles, especially the 2015 models. In a recent vehicle test session at Mid-Ohio Race Track with the Ford Motor Company; Chevrolet and Dodge, our PFC driver training instructors were able to spend time behind the wheel of several 2015/16 vehicles, including 2015 police interceptor sedans and utility vehicles. All of the vehicles have ESC or greater systems, some with all wheel and other unique systems that managed the vehicle through several high speed evolutions. As an operator we must change what we do behind the wheel to compensate for these changes. Some vehicles in 2015, such as the vehicles tested in this session will no longer have the ability to turn off the ESC. No switch on the dash or computer program that will allow the operator to isolate these systems. That fact alone requires retraining operators of newer vehicles to fully comprehend the impacts of ESC when you or the vehicle are at maximum limits.

My thanks to safecar.gov and the NHTSA for data included this article.

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