Road Safety Factsheet

August 2017

Electronic Braking Systems Factsheet

Brake Assist

Brake Assist (BA) is a technology that ensures that the maximum pressure is applied by the brakes to stop a vehicle in an emergency situation. Some manufacturers also refer to the same system as Emergency Brake Assist (EBA).

How it works and its advantages

When a driver makes an emergency stop the brake pedal has to be pressed, the more pressure applied to the brake pedal, the greater the pressure through the braking system, which is amplified and provided to the brake. In some cases a driver might fail to respond to a hazard up ahead as well as possible and fail to depress the brake pedal fully, meaning that the full pressure of the braking system is not being applied to the wheels.

Brake Assist detects how quickly the pedal is depressed to judge whether the driver wanted to perform an emergency-braking manoeuvre. If it concludes that the situation is an emergency and the pedal isn't depressed fully then it will increase the hydraulic pressure in the braking system to make up the gap.

If the driver successfully avoids the danger and removes or reduces the force on the pedal then the system will also reduce its involvement.

Brake assist and your vehicle

The system will not reduce the stopping distance of the car, but it will make sure that the car is stopped in the shortest distance that it potentially could by compensating for any hesitancy in applying the brakes hard in an emergency situation.

Brake Assist is based on the ABS technology of a vehicle and will not be found on a vehicle without ABS. It should not change how drivers respond to an emergency – you should still brake as hard as possible.

Like all braking systems on a vehicle, it is safest to never get into an emergency situation where you need to use them. The best way of doing this is to ensure there is at least a two second gap between yourself and the vehicle in-front, and to drive at a speed suitable for the conditions.

Road Safety Factsheet: Electronic Braking systems

Autonomous Emergency Braking[1,2,3]

Autonomous emergency braking (AEB) is more advanced than brake assist, applying the brakes automatically without driver input if it deems that the car is deemed to be about to crash.

Although this is typically designed to prevent rear-end shunts, some more advanced emergency braking systems can detect pedestrians and cyclists, too.

How does it work?

The vehicle is fitted with laser and radar systems, which detect objects ahead and how far away they are, combining with information on the speed and trajectory of the car, which determines whether or not an emergency situation is developing. Some cars are also fitted with a camera, and advanced systems can even distinguish between pedestrians and cyclists and non-moving objects such as bollards.

Once a potential collision is detected, the system generally tries to avoid impact by warning the driver that action may be needed. If no action is taken, the system will apply the brakes. Some systems apply full braking force, but some apply it gradually, aiming to reduce the speed at which the collision takes place.

There are different types of Autonomous Emergency Braking systems, which work at different speeds. Some systems only work at lower speeds of 25mph, whereas some work at speeds up to 50mph and a few at motorway speeds.

Advantages of Autonomous Emergency Braking

These systems improve safety by helping to avoid accidents by identifying emergency situations and warning the driver.

Although the system may not always be able to bring the vehicle to a halt, it can reduce the severity of crashes that cannot be avoided by reducing the impact speed of the collision.

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Anti-lock brake systems

Anti-lock Braking Systems (ABS) is a form of electronic braking which was invented to help a driver control a vehicle under heavy braking by preventing the wheels from locking up.

How they work

Braking systems take the force applied to the foot pedal by the driver and transfer it via mechanical system to the brakes on the wheel. The mechanism works by increasing the input force via a servo to the master cylinder, which converts the force into the pressure applied by brakes. The master cylinder has two pressure chambers, both of which are responsible for the braking pressure on two of the wheels and this is to provide an extra level of safety should there be a failure.

During this process there is a chance that the wheels stop rotating before the car comes to a halt. This process is known as 'locking up' and means that the braking force on the wheel is not being transferred efficiently to stop the vehicle due to the fact that the tyre is sliding upon the road.

This leads to a longer stopping distance than if the wheel had not locked because there is reduced grip between the car and the road, which in turn leads to an increased chance of losing control of the vehicle and skidding.

On vehicles without ABS the best method to regain control of the vehicle is to 'pump' the brakes by taking your foot off the pedal and reapplying it, known as 'threshold braking'. This allows the tyres to regain traction upon the road, rather than skid over the surface of it.

ABS works in a similar but much more effective manner. Electric sensors monitor the speed of the wheel as it rotates and detect if it is about to lock up under braking. When this happens the brakes are automatically released and then rapidly reapplied. This process occurs several times to prevent a skid and to ensure that a vehicle can be steered by the driver to avoid a collision.

The advantages of ABS

Although the ABS will not decrease a vehicle's stopping distance compared to an identical vehicle without ABS, it ensures that the shortest distance in which a vehicle can be brought to rest is achieved. It is particularly effective in doing this on surfaces which are wet or icy upon which a vehicle is much more likely to skid.

The main benefit of ABS is the control that a driver has over the vehicle's steering. In an emergency the driver of a vehicle equipped with ABS will have a better chance of steering around the obstacle due to the reduced risk of skidding.

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Anti-lock brake systems and your vehicle

When buying or driving a new car, find out if it has ABS, as this will greatly affect what you should be doing in an emergency situation. Consult the vehicle's handbook, which will tell you what active safety features your vehicle has and also what warning lights will be displayed should there be a failure.

When hiring a car or taking out a new company pool car, ask what safety features the car has and whether it has ABS.

What to do in an emergency situation

If your vehicle has ABS, in an emergency situation firmly press the brake pedal and keep your foot hard on the brakes.

It is likely that you will feel feedback from the ABS on the brake pedal in the form of vibration or pulsation. This can be an unfamiliar and may be an uncomfortable experience but it is proof that the ABS is working and the correct course of action is to keep your foot hard on the brakes.

As previously stated, the main advantage with ABS is the increased control over the steering. In situations such as when a small obstacle appears in the road or attempting to remain in the same lane when braking – this can be invaluable. However, care should always be taken to avoid any rash steering manoeuvres that would increase the severity of the collision.

Although ABS ensures that the minimum stopping distance is achieved, it is still important to drive at a safe speed for the conditions and leave a gap of at least 2 seconds between yourself and the vehicle in front in order to reduce the chances of needing to make use of the ABS.

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Electronic Stability Control

The Electronic Stability Control (ESC) is a further evolution of electronic braking technology such as ABS and also uses other systems such as traction control. It is intended as a way of correcting situations in which a driver has made an error by stabilising the vehicle quickly so as not to make any dangerous situations worse.

It will work in circumstances where steering is needed in order to turn the vehicle more effectively so as to provide a decreased risk of skid or loss of control.

Other names for ESC

Different manufacturers use systems designed to achieve the same results in the same way but have used different names. The following systems used by different manufacturers are equivalent to ESC,

- Electronic Stability Program (ESP)
- Dynamic Stability Control (DSC)
- Vehicle Stability Control Systems (VSCS)

How it works and its advantages

There are many situations where a vehicle could lose grip with the road, for example; entering a corner too fast, losing control of the vehicle due to an inappropriate driving speed for the conditions, and after steering sharply to avoid an unexpected obstacle. In order to detect a problem of this nature, the Electronic Stability Control works by monitoring the position of the steering wheel and comparing it with the direction that the car is heading.

The ESC then works out the extent of the problem, it can calculate the speed of the tyres using the sensors which are already present as part of the ABS. The forces which are changing the vehicles heading can then be computed, for example the rotation of the car around its centre of gravity or the forces acting to push it out of line on a bend.

The system then restores the stability and control of the vehicle, by reducing the engine power to slow the car down, and braking individual wheels to rotate the car to face the direction wanted by the driver.

Electronic Stability Control and your vehicle

You should find out from your driver's handbook if your car has a form of ESC and how it communicates with you that it is working when you start the car. If you are hiring a car you should enquire if it has stability control. Electronic Stability Control and other equivalent systems are designed to compensate for driver misjudgements and aid in keeping control of the vehicle during emergency manoeuvres. It cannot prevent all accidents involving skids and relies on the driver knowing the correct speed and behaving appropriately to the road conditions.

References

[1] Car Advice (2014) 'Braking assistance technology explained: ABS, EBD, BA and autonomous emergency braking' URL:http://www.caradvice.com.au/281461/braking-assistance-technology-explained-abs-ebd-ba-and-autonomous-emergency-braking/ Date Accessed: 17/08/2017.

[2] What Car? (2015) 'Autonomous emergency braking explained' URL: https://www.whatcar.com/news/autonomous-emergency-braking-explained/ Date Accessed: 17/08/2017.

[3] Euro NCAP (2017) 'Autonomous Emergency Braking' URL: https://www.euroncap.com/en/vehicle-safety/the-rewards-explained/autonomous-emergency-braking/ Date Accessed: 17/08/2017,