ACEA

European
Automobile
Manufacturers
Association

ROAD SAFETY

Safe vehicles, safe drivers, safe roads

WHAT PROGRESS HAS BEEN MADE?

Despite a three-fold increase in traffic, road safety in Europe has improved significantly in the last 30 years. EU road fatalities have been reduced by more than half since 2001, from 54,900 just after the turn of the century to 25,300 in 2017.

Although there are now roughly 60 million more cars on our roads than in 2001, accidents still have gone down significantly. The European Union also has the safest roads in the world, counting 49 fatalities per million inhabitants annually, while the global average is 174 fatalities.

EU AND GLOBAL ROAD FATALITIES PER MILLION INHABITANTS ANNUALLY

ANNUAL EU ROAD FATALITIES

NUMBER OF CARS ON EU ROADS

Nevertheless, all major players in the mobility sector agree that road casualties should be further reduced, with the aim of working towards zero traffic fatalities in the future. The only way to reach this goal is by ensuring that safe vehicles are driven by safe drivers on safe roads. Indeed, further improving road safety does not only depend on equipping vehicles with more safety features. Human error (such as distraction and poor anticipation) is the cause of 90% of today's accidents. This means that we need to combine cutting-edge vehicle technology with improved driver behaviour, better road design and maintenance, and better enforcement of existing traffic regulations.

SAFE VEHICLES

The EU automotive industry invests a large part of the sector's annual €54 billion R&D budget in making passenger cars and commercial vehicles even safer.

Recent advances in vehicle safety have substantially reduced the number of accidents and related injuries over the last few decades.

When looking at vehicle design, the measures to improve road safety can be classified into two categories: active safety and passive safety.

SAFE ROADS

Unclear traffic signs and poor lane markings affect safety, to give just two infrastructure-related examples. Improvements in the design, construction and maintenance of our infrastructure can thus significantly improve road safety.

Roads designed to minimise bottlenecks and to ensure better traffic flow, as well as reducing roadside hazards, can have a major impact on safety. Cleverly-designed infrastructure that encourages sensible, attentive driving will also reduce accidents. Replacing traffic signals with well-designed roundabouts has shown to significantly improve the safety of road junctions, for instance. Urban planning must also take road safety considerations into account.

The quality of roads is another vital element of road safety. Road surfaces of poor quality, or that are deteriorating, can damage vehicles and put road users at risk. The type of road also plays an important role: Europe's fastest roads – expressways with multiple lanes – are statistically the safest, while single carriageways (two-lane motorways) tend to be the most dangerous.

Poor lane markings

Road surfaces of poor quality

Bad road design

Unclear traffic signs

SAFE ROAD USERS

Road users include both drivers as well as pedestrians and cyclists ('vulnerable road users'). Their behaviour is the area with by far the biggest potential for improving road safety. Indeed, 90% of all road accidents today are linked to human error.

In 30% of fatal accidents speeding is the main factor, while distraction causes 10-30% of road deaths. Equally worrying is the fact that 25% of all road fatalities in Europe are alcohol-related. It is vital that drivers are aware of their own limitations, the dangers of speeding or texting behind the steering wheel and of the influence of alcohol or drugs on their ability to control a vehicle.

Education and training are key factors in instilling appropriate behaviour and attitudes in road users. The enforcement of existing traffic laws is also crucial, as about 65% of fatal accidents are caused by violations of traffic rules.

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ACTIVE SAFETY

Active safety technology can prevent accidents from happening altogether or at least actively help the driver to reduce the consequences of an emergency situation. To that end, various safety systems constantly monitor the performance and surroundings of a vehicle. Simply put, active safety systems avoid or mitigate an accident pre-impact, so before it can actually happen.

First wave of active safety

The first wave of active safety technology is already widely fitted to today's passenger cars and commercial vehicles. Approximately 80-90% of the cars on Europe's roads come equipped with technologies such as:

ANTI-LOCK BRAKING SYSTEMS (ABS)

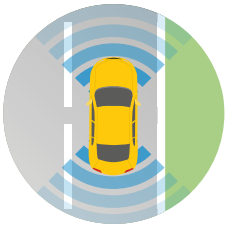
ABS systems help to prevent the wheels of a vehicle from locking when braking heavily, and enable the driver to keep steering.

ELECTRONIC STABILITY CONTROL (ESC)

ESC helps to prevent a vehicle from skidding (sideways), and the driver from losing control while turning a corner. ESC technology can automatically activate the brakes to help steer the vehicle in the right direction.

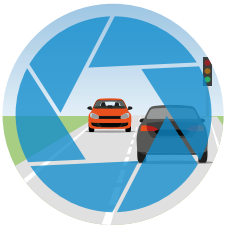
Second wave of active safety

Now, a second wave of active safety measures is being introduced, using cutting-edge technology such as on-board sensors, radar, cameras, GPS and lasers.



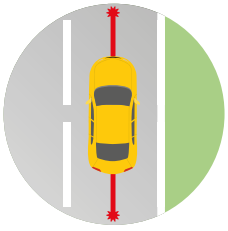
Sensors

Radar



Cameras

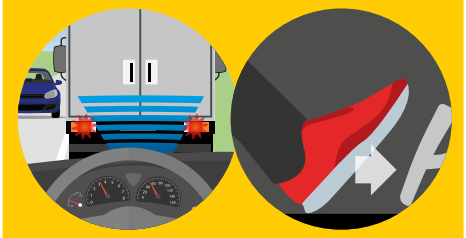
GPS



Lasers

The second wave of active safety innovation includes measures such as:

AUTONOMOUS EMERGENCY BRAKING (AEB) SYSTEMS

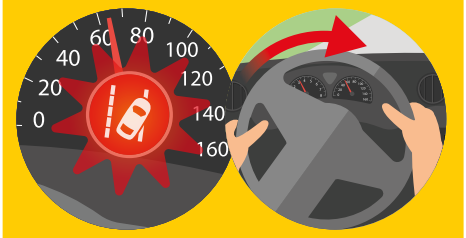


AEB systems start braking automatically if a collision is imminent and the driver is not taking any action (or not fast enough). AEB can detect a potential collision and activate the brakes to avoid it, or at least mitigate its impact.

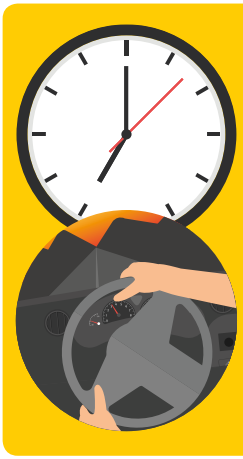
LANE DEPARTURE WARNING (LDW) SYSTEMS

LDW systems warn the driver if he or she leaves a marked lane without using the indicator, or if the vehicle is drifting out of its travel lane.

LANE KEEPING ASSISTANCE (LKA) SYSTEMS



LKA systems apply torque to the steering wheel or pressure to the brakes when a lane departure is about to occur.

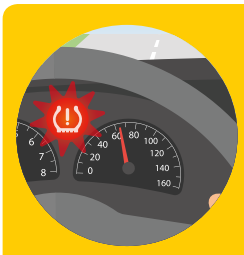


DROWSINESS AND ATTENTION DETECTION SYSTEMS

These assess the driver's alertness (for example by monitoring how long someone has been driving or by analysing how the steering wheel is being operated) and warn the driver to take a break when needed.

SPEED LIMIT INFORMATION (SLI) SYSTEMS

SLI systems inform the driver of the current speed limit by displaying it on the dashboard and/or navigation system. They use cameras to recognise road signs or use speed-limit data from the navigation system. Many SLI systems combine both.



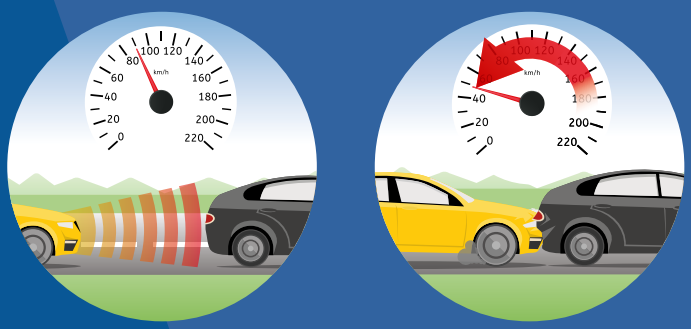
TYRE PRESSURE MONITORING SYSTEMS (TPMS)

TPMS monitor the air pressure of a vehicle's tyres and report this information in real time to the driver, for example using a 'low pressure' warning light to indicate under-inflated tyres (which can cause accidents).

INTELLIGENT SPEED ASSISTANCE (ISA) SYSTEMS

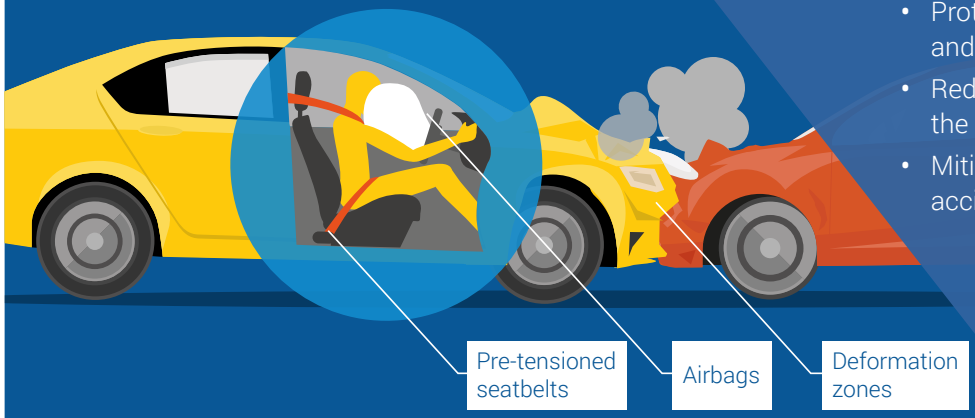
ISA systems can actively prevent drivers from exceeding the speed limit using road-sign recognition cameras and GPS-linked speed limit databases.

If a collision is really unavoidable, active safety systems are also able to reduce the impact. Slowing down the speed of a vehicle before impact can save lives, for example.



PASSIVE SAFETY

Passive safety systems



- Protect the occupants of a vehicle and other road users if a crash occurs
- Reduce the impact of an accident or the level of injury
- Mitigate the consequences of an accident **during and after impact**

Passive safety systems protect the occupants of a vehicle and other road users if a crash occurs. They do this by reducing the impact of an accident or the level of injury. In other words, passive safety technology is all about mitigating the consequences of an accident during and after impact.

Today, a range of built-in mechanisms protect occupants of a car in case of a crash, such as:

AIRBAGS

Airbags are cushions that are inflated extremely quickly upon impact (and subsequently deflated) to protect passengers during a collision. They provide a soft restraint between the occupants and the vehicle interior during the crash, which can reduce or even prevent injuries.

Early airbags protected front-seat occupants from frontal collisions. Since the turn of the century, they are combined with more advanced side-impact airbags as well.

SEATBELTS

Seatbelts (or safety belts) are restraint systems that keep passengers correctly positioned during an accident or sudden stop, thereby reducing the impact of the vehicle interior on the body and preventing people from being ejected.

Seatbelts have significantly evolved since they were first introduced. Today's seatbelts are pre-tensioned: they are tightened almost instantly upon impact in order to prevent passengers from being jerked forward excessively.

DEFORMATION ZONES

Also known as crumple or crush zones, deformation zones take out the kinetic energy of a crash in a controlled way. This is done through specifically designed areas of the vehicle that deform and crumple during an accident to absorb the impact.

However, passive safety systems are only really effective if vehicle occupants are wearing seatbelts, which means that seatbelt reminder systems – and enforcement – are also important.

HOW CAN WE AVOID SOLVING THE SAME PROBLEM TWICE?

Solving the same problem twice will not reduce road fatalities. Instead, the focus should be on the most effective solutions with the strongest positive outcome. When considering safety measures with an effect on the same type of accidents, synergies have to be factored in. Otherwise time and money will be spent on solving issues that can be completely or partially solved through other measures.

For instance, when considering specific measures to tackle driver distraction, it should be recognised that such accidents will already be reduced by autonomous emergency braking (AEB) and lane departure warning (LDW) systems. At the same time, AEB will also prevent or reduce the severity of frontal and side crashes.

The same applies to trucks. When addressing vision-related accidents with heavy-duty vehicles, research shows that active safety systems are more effective in reducing fatalities and injuries than passive measures, such as low-entry 'direct vision' cabs for trucks. Systems to detect vulnerable road users (such as pedestrians or cyclists), for example, can reduce fatalities by 1.53% compared to only 0.95% in the case of low-entry cabs.

Direct vision
low-entry cabs

Active safety measures
to detect vulnerable road users

WHAT ROLE DO ROAD USERS AND INFRASTRUCTURE PLAY?

Road safety is a complex phenomenon, depending on lots of different factors and interactions. Vehicle technology is just one piece of this complex safety puzzle. Equally important factors are the behaviour of drivers and other road users, the maintenance and design of road infrastructure, traffic rules and their enforcement, as well as vehicle fleet age and composition, to name just a few.

Focusing on one of these factors, while neglecting the others, will not yield the greatest benefits to society. So, if we are to make progress on road safety we need to put more emphasis on an integrated strategy. In other words, we need to ensure that safe vehicles are driven by safe drivers on safe roads.

WHY SHOULD WE FOCUS ON ACTIVE SAFETY IN THE FUTURE?

Over the past decades, passive safety systems have made a major contribution to road safety by reducing the consequences of accidents. As a result, most European vehicles now score highly in crash tests. However, passive safety technology is reaching a level of maturity, so further room for improvement is limited.

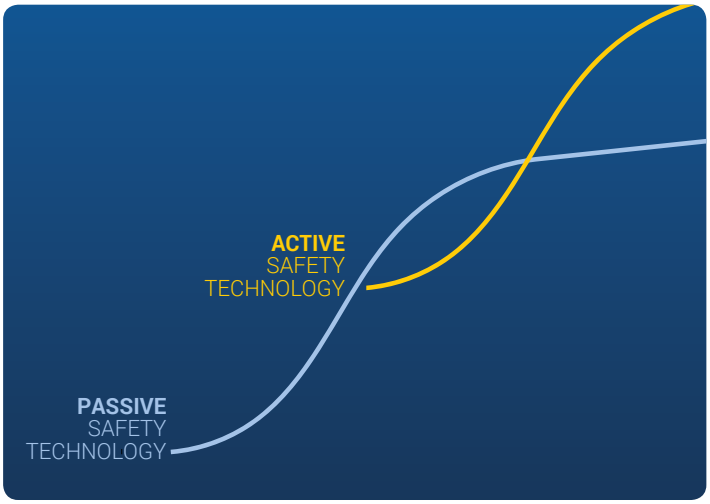
Now, active safety measures offer huge potential to further improve road safety by avoiding emergency situations altogether, or at least by actively helping the driver to manage them properly.

Looking ahead, it is clear that active safety should take priority when it comes to directing future investments or drawing up new vehicle safety regulations. Simply because it can deliver greater benefits and avoid accidents completely, rather than 'only' mitigating the effects of a crash.

Active safety measures should be the focus of:

Future investments

New vehicle safety regulations



That does not mean that passive safety measures will disappear from vehicles. On the contrary, they will continue to save many lives in the future. However, the most effective passive technologies have already been introduced and additional passive measures will only deliver incremental improvements at disproportionate cost. Instead, optimal results can be achieved in a cost-effective way by investing in active safety measures.

Moreover, fitting extra passive safety measures to vehicles can also have a negative impact on other key priorities such as the environment. This is because passive safety measures add weight to vehicles, which increases CO2 emissions.

> "All mobility players agree that road safety must be further enhanced, with the aim of working towards zero traffic fatalities in the future."

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