PASSIVE SAFETY SYSTEMS

Advanced engineering for protection during and after an accident

Mercedes-Benz

An integrated system for your safety.

Since the invention of the automobile, safely delivering drivers and passengers to their destinations has been a core Mercedes-Benz value. Generations of safety leadership comes from engineering every element as part of a unified system.

The passion to build even better automobiles has been part of the Mercedes-Benz brand from the beginning of automobile development. Since their invention by Gottlieb Daimler and Karl Benz, automobiles have become not only faster, but also safer and more comfortable. In addition, their numbers on the road continue to increase. Although traffic density has increased enormously, the risk of accidents has continued to decrease for years.

There are two elemental reasons for this phenomenon. First, great strides have been made in accident avoidance and prevention—a concept known as "active safety" because it usually involves the driver's actions. Secondly, when an accident cannot be prevented, the risk of injury has diminished significantly—known as "passive safety" because these systems take effect on their own during the milliseconds that comprise the course of a collision.

Mercedes-Benz has been deeply involved in this positive trend for generations—conceiving, developing and implementing groundbreaking safety systems. A hallmark of this leadership role is the engineering of each safety advancement to collaborate with the other systems in the vehicle, as well as the laws of physics and human nature. It's a core philosophy of Mercedes-Benz that every vehicle embodies an "integrated safety system."

The invisible revolution.

In 1959, Mercedes-Benz publicly presented the first automobile designed with aspects of passive safety in mind, thus laying the cornerstone for vehicle safety. The breakthrough innovations of this invention were not obvious to the eye, since they included the first safety passenger compartment integrating energy-absorbing crumple zones. These developments trace to a Mercedes-Benz engineer named Béla Barényi—acknowledged by many as the father of passive safety. Thanks to his inexhaustible inventive spirit, Mercedes-Benz is still synonymous with automobile safety leadership today.

Barényi's fundamental principle of passive safety provided the impetus for numerous innovative safety developments, many of which have gone on to become not only the standards of the industry, but also standard equipment on virtually every new automobile. Among the most significant breakthroughs began in 1978, with the Antilock Braking System (ABS). While other manufacturers had briefly offered primitive antilock systems earlier in the same decade, the digital controls and precise wheel-speed sensors of the Mercedes-Benz system set the standard and became a benchmark that remains in effect today. Even more importantly, the abilities that ABS introduced—most notably the individual control of each wheel's brakes—have since become the basis of countless other active safety systems.

Only three years later, front air bags paired with seat-belt Emergency Tensioning Devices (ETDs) made their worldwide debut. The introduction of the Electronic Stability Program® (ESP) followed in 1995—an innovation widely heralded as the most important active safety innovation of the 20th century. More recent developments include Night View Assist (2005), the occupant protection systems of PRE-SAFE® (2002), PRE-SAFE Brake with autonomous partial braking (2006) and autonomous full braking (2009), as well as completely new systems such as Active Blind Spot Assist and Active Lane Keeping Assist (both in 2010).

The Mercedes-Benz integrated safety concept

Safer driving.
Remaining alert, and assisting in time to avoid hazards and collisions.

Dangerous situations.
Preparing to protect when a possible accident is imminent.

During an accident.
Occupant protection that's targeted to the situation.

After an accident.
Helping to assist rescue and minimize subsequent risks.

Mercedes-Benz safety developments are engineered with the goal of providing the utmost protection to all road users—not merely the occupants of a Mercedes-Benz vehicle, but extending to all who share the road, from occupants in other vehicles to cyclists and pedestrians. It all stems from the hope that accident-free driving someday becomes a reality. Mercedes-Benz has long taken this holistic approach to safety—known as the Integrated Safety concept, and the result of decades of research involving not just vehicle development and extensive crash-testing but real world accidents, too.

The Integrated Safety concept.

The Mercedes-Benz concept of Integrated Safety comprises four disciplines: “safer driving,” “dangerous situations,” “during an accident,” and “after an accident”.

Safer driving. This includes all systems and precautions engineered to help the driver respond to challenging driving situations. The support offered by these systems helps the driver remain alert, fit and in control of the vehicle for the duration of a drive.

Dangerous situations. Recently, the understanding of safety has been expanded by introduction of protective measures in the case of imminent danger. “Dangerous Situations“ thus represents a new safety discipline that is focused on the brief threshold between “safe driving” and “during an accident.” This discipline introduces systems that can initiate preventive measures for occupant protection in certain critical driving situations where an accident is deemed likely and imminent—in other words, the moments leading up to a potential collision.

In the event of an accident. Systems that are designed to help protect the occupants become active when an accident occurs—notably the vehicle’s restraint systems. In addition, the intelligently designed body—incorporating an especially rigid passenger compartment surrounded energy-absorbing crumple zones—plays a major role.

After an accident. Once an accident has occurred, the main priority is to help those involved as quickly as possible, in order to avoid the situation becoming worse. Measures designed to make it easier to rescue vehicle occupants are therefore becoming increasingly important.

A tradition of safety innovation.

Safety has a long history at Mercedes-Benz. So does making history, evident in the automotive breakthroughs in many categories that have been introduced under the Three-Pointed Star. The number of advances in driving safety and individual protection that have been pioneered in Mercedes-Benz vehicles is almost beyond calculation.

This brochure is intended to provide useful, enlightening information about these systems, as well as many associated issues, from vehicle loading, to tires. Together, the knowledge and understanding of the objectives, operation, benefits and limitations of the safety systems in a Mercedes-Benz—along with a greater appreciation of the driver’s responsibilities—will bring all of us closer to the long-held goal of an accident-free society.

During an accident.

A collision can start and end in mere milliseconds. How a car responds to protect you in that blink of eye can greatly influence the outcome. A Mercedes-Benz is engineered as an integrated safety system to offer superior occupant protection.

Managing the forces on the vehicle.

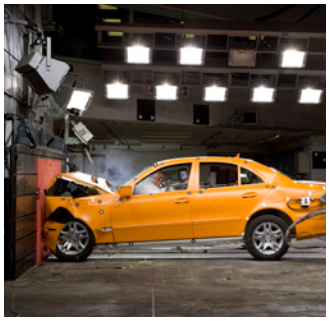
Even with advanced, insightful and even predictive active safety technologies, some accidents are unavoidable. From the first point of impact with a vehicle, obstacle or other object, a Mercedes-Benz is designed to manage an impact in ways that help divert, dissipate and distribute its forces away from the occupants and the passenger cabin.

Preserving the occupant space.

The elaborately engineered body structure of a Mercedes-Benz is engineered to surround a highly rigid passenger cell with areas designed to help absorb some of the energy of an impact through controlled deformation. The advanced crumple zones in today's Mercedes-Benz are the ongoing result of more than 60 years of development, starting with the invention of the very first crumple zone.

Targeted response to the situation.

Sophisticated sensors located throughout the vehicle help detect the type, direction and severity of an impact as it occurs—and in some cases, even before. The extremely rapid response of the vehicle's restraint systems can be tailored more precisely to the situation, to offer occupant protection that can more effectively reduce the severity of injuries—or, ideally, help to prevent injury altogether.



Reducing the rate of deceleration.

One of the most significant contributors to injury in an accident is the deceleration rate of the occupants—or the time it takes to come to rest from the speed prior to impact. Since neither the starting speed nor the final speed (0 mph) can be changed once an accident begins, the passive safety systems work to lengthen the time in between. Even a few added milliseconds can greatly reduce the impact forces experienced by the occupant.

Testing and development.

The standard for safety.

Comprehensive occupant protection.

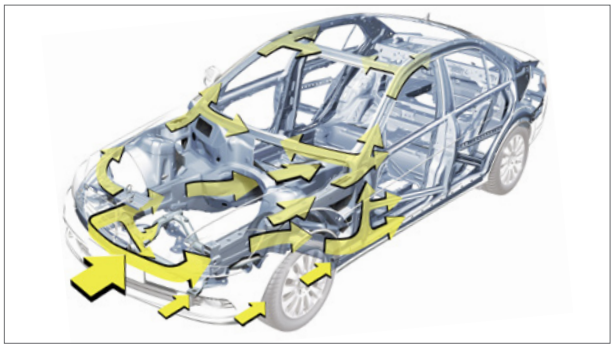
At Mercedes-Benz, safety has been a pillar of the brand for well over half a century. Since the invention of the original crumple zone to the pioneering developments in braking, restraint systems, stability control and more, countless safety advancements have gone on to establish the standards for every automobile on the road. The deep experience of our engineers and the knowledge gained from the Mercedes-Benz accident research team forms the basis for the development of all safety measures and systems that are engineered to work in concert. More than a mere list of safety features, a Mercedes-Benz is engineered as a comprehensive, integrated system to help reduce the possible consequences of an accident.

Each innovation is designed to provide the occupants with the most advanced protection in real-world situations. How a Mercedes-Benz vehicle is designed for the various types of accidents—frontal, side, and rear impacts, as well as rollovers—are covered in the sections that follow. A further comprehensive section deals with the variety of restraint systems tailored to each model and bodystyle, from seat belts and air bags[1] to child safety locks and the specialized needs of open-top convertibles and three-row station wagons or SUVs. This presentation of the Integrated Safety concept of Mercedes-Benz also extends to include pedestrian protection, safeguarding of lithium-ion batteries for hybrid vehicles, the compatibility of vehicles of differing sizes, and the benefits of lasting durability.

Safety in vehicle development.

In the early phase of a vehicle's development, its safety systems are initially laid out with digital prototyping—a combination of computer-aided design and computer-based virtual testing using millions of parameters. Typically, each element of the bodyshell structure is optimized in more than 5,000 virtual crash tests with respect to the geometry, material strength, joining technology, and material characteristics. More than 10,000 calculations are carried out for improvement of pedestrian protection characteristics alone. Through the use of integrated occupant simulations, the interaction of the vehicle structure, restraint systems and occupants in a wide variety of accident situations can be studied, evolved and optimized early in the development process.

Highly protective body structure.



Mercedes-Benz body structures are systematically engineered to manage the forces of a variety of collision types. The basis for the high level of safety provided by a Mercedes-Benz is the fundamental principle of passive safety developed by Béla Barényi—consisting of a highly

protective passenger compartment with integrated, energy-absorbing crumple zones in the front and back. With this approach, the energy-absorbing structure together with the very rigid passenger compartment can limit the effects of decelerating forces on the occupants, to help provide them with the necessary protective space. Since a primary goal is to slow their deceleration during a collision, such features as an energy-absorbing steering column help increase the forward displacement area available for the driver, further contributing to the reduction of chest and head injuries. The rigid passenger cabin teams with the crumple zones and an elaborate network of reinforcements designed to help to divert energy over, under and around the passenger compartment. As a result, the occupant space is engineered to resist critical deformations up to very high impact speeds. Frontal, side, and rear impact tests are supplemented by roof impact tests and dynamic rollover tests so that the passenger compartment can be designed as a protective space for the occupants in virtually all accident types.

Specific bodystyles such as coupes, convertibles, wagons and SUVs further incorporate their own special structural elements to provide a high level of occupant protection even with their unique design characteristics.

Overlap of vehicles in a collision.

Mercedes-Benz research revealed decades ago that real-world accidents rarely parallel the exact conditions of early crash testing into fixed, full-width rigid barriers. Countless other conditions affect the way a vehicle manages the forces of impact, from the highly concentrated forces of a vehicle with a pole or tree, to head-on collisions where both vehicles only partially overlap each other. Mercedes-Benz was among the first automakers to develop and extensively test their vehicles in these partial-overlap—of "offset"—collisions, where only a portion of a traditional front crumple zone is expected to handle all of the collision forces. For decades now, Mercedes-Benz models have incorporated measures to help distribute these offset forces to other areas of the

vehicle, so that more of the car's mass and structure can help to dissipate the forces before they reach the cabin. Perhaps no automaker has more experience in this real-world approach, with the structural design of the newest Mercedes–Benz models reflecting literally generations of further development, refinement and enhancement of this revolutionary concept.

Crash compatibility.

With the rising popularity of SUVs in the 1990s, the issue of how larger, taller vehicles interact with smaller, lighter and lower vehicles in a multi-car collision moved to the forefront. Again, Mercedes-Benz took a leadership role in this issue even before public awareness was common, not only designing and testing smaller models to help them manage the intensity and location of the forces created by a collision with a larger vehicle, but to help ensure that larger Mercedes-Benz models transmit their own forces to smaller, lower and lighter vehicles in a way that is more protective of the occupants of both cars. Multi-level crumple zones and reinforcements in the front, rear and door areas are engineered to manage the forces of a collision with vehicles in a variety of sizes, to help optimize the protection of the occupants in both vehicles.

In addition, several innovative active safety systems can help reduce the severity of an impact for both vehicles involved through the targeted reduction of energy before impact. The optionally available PRE-SAFE® Brake system, for example, can reduce the speed of an impending collision,[2] in essence providing an "electronic crumple zone." Along with the active safety systems of Intelligent Drive and other systems described in this brochure's partner volume, "Active Safety," many Mercedes-Benz models can help minimize the severity of an accident, or even prevent the accident, thereby benefitting all the parties involved in a collision—not just the occupants of the Mercedes-Benz.

Government testing and ratings.

While every automaker must design their vehicles to comply with the needs of the regulatory agencies in the markets in which they sell the vehicles, Mercedes-Benz has often elected to exceed these standards, or even institute design and development improvements before they are regulated. In fact, several safety breakthroughs pioneered on Mercedes-Benz automobiles have gone on to inspire new safety standards for all vehicles.

Actual testing of vehicles is performed only on a limited basis by the most well-known authorities on automotive safety. In the U.S., the Department of Transportation's National Highway Traffic Safety Administration (NHTSA) have long been the official government agency in charge of vehicle safety. More recently, the Insurance Institute for Highway Safety (IIHS) has also become a leading presence in the testing of vehicles and a voice for enhanced vehicle standards. In testing by both organizations, several Mercedes-Benz models have earned their highest ratings not just recently, but year after year, and generation after generation of a model's design. To research the results of the NHTSA "Star Program," visit **safercar.gov** online. To learn more about the IIHS and their "Top Safety Picks," visit iihs.org.

Accident types.

Frontal impact.

The front-end structure, passenger compartment, and even various components within each area are systematically engineered to manage the forces of a serious frontal impact. The energy-absorbing crumple zone and rigid passenger compartment can work together to help limit the effects of decelerating forces on the occupants. This further helps to provide them with the necessary protective space. Since a primary goal is to slow the deceleration of the occupants during a collision, such features as an energy-absorbing steering column increase the forward displacement area available for the driver, further contributing to the reduction of chest and head injuries. The restraint system—including the seat belt, its tensioning and force-limiting devices, and the air bag[1]—further contribute to more favorable deceleration. Together with the highly rigid passenger compartment, they team up for to exceptional occupant protection.

Side impact.

As with frontal impacts, the rigid passenger compartment is a prerequisite for effective occupant protection. In a side impact, the deformation zone available for protection of the occupants is very small in comparison to a frontal impact and requires special measures, including a very rigid side wall structure, cross-cabin reinforcements, as well as a highly effective side-impact restraint system.

In a side impact, the high stability of the passenger compartment is achieved through the use of high-strength steels in the B-pillar, the side sills, doors containing anti-intrusion bars, and a side roof frame that is braced with a variety of structural elements. Structural crossmembers at the base of the windshield, under the front and rear seats, near the front footwells, across the roof, and along the center tunnel help support the bracing of the side wall. They also help to transfer of forces to the opposite side of the vehicle, away from the impact, allowing more of the body structure to help dissipate the impact forces, helping to maintain the occupant space.

The load paths which distribute forces in a side impact are optimized by involving a number of body elements in their distribution. The doors, for example, make a significant contribution to the stiffness of the side structure. Equipped with additional side-impact beams, they are attached to the pillars with sturdy hinges and latches, thus minimizing the penetration of the door into the safety space of the occupants. The interior door trim is designed so that the thorax and thorax-pelvic air bag provide effective support surfaces without protruding areas. These measures help ensure not only that the protective space is maintained in a severe side-impact, but that the space required for effectively deploying the protective systems of the window and thorax-pelvic air bag is also kept available.

In a side impact, the expedient activation of the air bag systems occurs via the central control unit in combination with acceleration sensors in the B-pillar area and pressure sensors in the front door. The body structure and door paneling characteristics, as well as the deployment of the window and thorax air bags, are matched to one another in extensive, integrated simulation calculations, and further refined in testing of actual prototype vehicles.

The interaction between the body structure, seats, interior paneling, restraint system and sensors is improved by numerous simulations and actual tests, to help provide the occupants a superior level of side crash protection.

On bodystyles possessing unique structural designs such as pillarless coupes, cabriolets and roadsters, each is developed from the ground up in its special configuration. As a result, these models are able to meet the high safety standards of Mercedes-Benz even without conventional center pillars or a roof structure. The ability of Mercedes-Benz engineers to achieve this is made evident by being the only automaker to have continuously produced both pillarless hardtop coupes and convertible models for more than the last 50 years—a period during which automotive safety standards and customer expectations have both evolved considerably.

About 40 different crash tests, one shining star.

Brands such as Mercedes-Benz employ a far more extensive program of crash tests, since they supply models all over the world. These global players have to put their cars through more than 24 additional safety tests. For Mercedes-Benz, however, passengercar safety is about more than just rating tests and legal requirements. The Stuttgart-based manufacturer tests its models even more strictly – in nine additional, extremely tough in-house crash tests which, like all Mercedes tests, are based on real-life accidents. Only cars that pass these severe examinations receive the highest accolade in automotive safety: the Mercedes star.

Frontal impact
25% overlap
40 mph
IIHS

Frontal impact
40% overlap
40 mph
deformable barrier IIHS

Frontal impact
100% overlap
30 mph
rigid barrier, 5% female

Frontal impact 2

Frontal impact
100% overlap
25 mph
rigid barrier

Frontal impact
100% overlap
30 mph
rigid barrier

Frontal impact 1

Frontal impact
40% overlap
40 mph
deformable barrier Euro-NCAP

Frontal impact
100% overlap
35 mph
rigid barrier US-NCAP

Frontal impact
40% overlap
35 mph
deformable barrier

Frontal impact
100% overlap
30 mph
rigid barrier, 5% female

Frontal impact
40% overlap
25 mph
deformable barrier, 5% female

Frontal impact
+/- 30° oblique
20 mph
rigid barrier

Frontal impact
+/- 30° oblique
25 mph
rigid barrier

Frontal impact
100% overlap
25 mph
rigid barrier, 5% female

Frontal impact
+/- 30° oblique
30 mph
rigid barrier

Frontal impact
100% overlap
15 mph
rigid barrier

Frontal impact
100% overlap
30 mph
rigid barrier

Frontal impact
100% overlap
30 mph
rigid barrier

Mercedes-Benz | **Safety Rating** | **Statutory**

Roof
roof crush resistance
Frontal
quasi-static

Roof 1

Roof 2

Roof 3

Roof

Front

Rear

Side

Rear-end collision
100% overlap
30 mph
right barrier

Rear-end collision
100% overlap
30 mph
right barrier

Rear-end collision 1

Rear-end collision
70% overlap
50 mph
deformable barrier HI

Rear-end collision 2

Rear-end collision 3

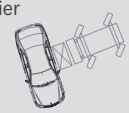
Side impact

Side impact
Crabbed B.
3016 lbs
34 mph

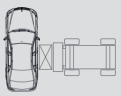
Side impact
90° 30 mph
deformable barrier IIHS

Side impact
Crabbed impactor, 38 mph
deformable barrier SINCAP

Side impact
Crabbed impactor, 34 mph
deformable barrier



Side impact
90°, 30 mph
deformable barrier



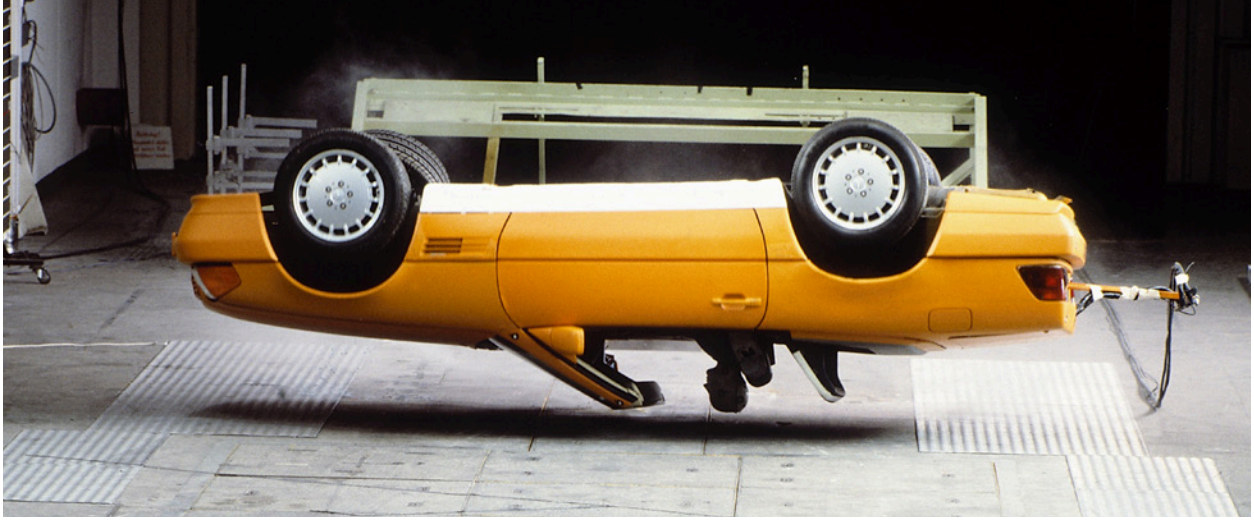
Side impact
20 mph, driver dummy
SID 2s
pole impact 75°

Side impact
90°, 30 mph
deformable barrier
EURO-CAP

Side impact
90°, 18 mph
pole impact
Euro-NCAP

Side impact
90°, 18 mph
pole impact

Side impact
20 mph, driver dummy
EuroSID2
pole impact 75°



Rear impacts.

In a rear impact, the crash energy is directed via the stiff structural elements concealed behind the rear bumper. Using a network of beams, brackets and “crash boxes,” the forces of a rear-end collision are distributed to two rear longitudinal members made of high-strength steel. The fuel tank is located outside of the deformation zones.

As a result, a very large portion of the rear body, with its structures optimized for energy absorption, is available as a deformation path in order to effectively protect the occupants in the event of a rear impact. This remains true on wagon and SUV models with a 3rd-row seat, with special design and material considerations made to help ensure that the rearmost passengers are not seated in the actual rear crumple zone.

In severe rear-end collisions, the seat-belt Emergency Tensioning Devices (ETDs) are activated to help prevent occupants from sliding upwards and above the effective range of their head restraints.

Rollovers.

Especially relevant with open convertibles but true of any bodystyle, rollovers present safety challenges of their own compared to other accident types.

On vehicles with fixed roof structures—including coupes without visible roof supports between the front and rear side windows—extensive development results in a high level of strength to support the weight of the vehicle and maintain the occupant space in the event of a rollover. On many models—a dedicated rollover sensor can also deploy the side curtain air bags to help provide added protection from extreme neck motions, broken glass and some objects that might protrude into the cabin via a broken or open side window.

Convertible models—whether two-seat roadsters or four-passenger cabriolets—are equipped with roll bars for added passenger protection in the event of a rollover.[3]

First introduced to the industry on the 1990 SL-Class, the pop-up roll bar system in many Mercedes-Benz convertibles can activate automatically within a fraction of a second of a detected rollover. Depending on model, the system can be configured as a single structure spanning the rear of the cabin, or as individual roll bars that rise behind each rear seat and incorporate the rear head restraints. SLK roadsters feature high-strength steel roll bars that are rigidly attached to the body and remain in position full-time. On all convertibles, rigid A-pillars (the roof supports at either end of the windshield) extend the protective effect of the roll bar to help ensure that the passenger space is considerably maintained in a rollover.

Integrated restraint systems.

Effective protection in the event of an accident.

Many innovations in automobile safety were first introduced by Mercedes-Benz—often long before competitors offered the same features, and well before any government entity required them. This pioneering approach to vehicle safety has made the Mercedes-Benz brand a worldwide symbol for automotive safety.

Seat belts and air bags are perhaps the most widely recognized and effective passive safety systems. In 1968 Mercedes-Benz customers had the option—for the first time—to equip their new car with 3-point seat belts. In 1980, Mercedes-Benz was the first automaker in the world to offer a driver's air bag[1] in combination with front passenger seat-belt tensioner. These features were first available in the S-Class Sedans and Coupes.

The full benefit of these systems can only be realized if the most basic principle is adhered to: Always fasten your seat belt before a trip begins. While air bags are an important safety feature, seat belts provide the essential foundation for avoiding injury—with the air bags as a supplement to the protective benefit of seat belts.

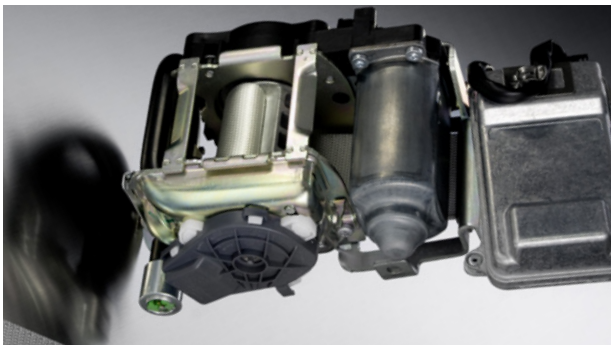
Understanding safety.

In order to understand how seat belts and air bags provide protection, it's important to know how vehicle occupants move during an accident. During most types of accidents, the vehicle is very quickly brought to a complete stop (decelerated) by the collision with another vehicle or object. (In some other accident scenarios, such as a rear-end collision, the vehicle might first be accelerated by another moving vehicle, then rapidly decelerate in a secondary collision.) As a vehicle undergoes deceleration or acceleration its occupants always move in the *opposite* direction of the applied impact force, the a result of inertia and a basic "law of physics." In a frontal collision, the occupants will typically be thrust forward. In a rear-collision, they will tend to move rearward, possibly sliding upward in their seats as a result. The basic rule remains the same, however: In a collision, the occupants typically move toward the source of the impact forces.

A principal risk inherent in this motion is that the occupants will sustain injury as a result of contact with the vehicle's interior surfaces. This risk is minimized by a well-designed restraint system, with primary protection provided by the seat belts, and supplemented by seat-belt tensioners, seat-belt force limiters, and air bags. While the seat belt and air bag provide protection from internal contacts, these safety features cannot prevent injuries which occur as a result of objects penetrating from outside the vehicle.

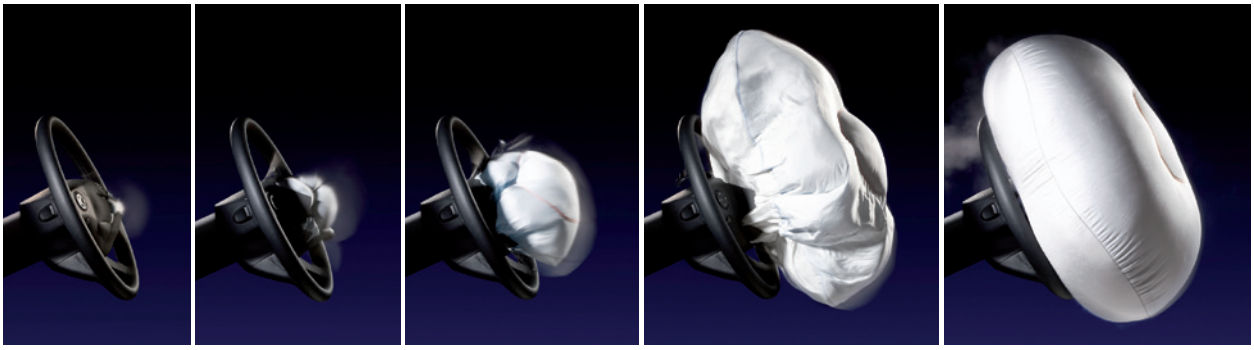
But the overarching principal of reducing injury comes from understanding the concept of deceleration, or how much time an occupant is afforded to come to a stop from the speed of travel immediately prior to impact. In the course of a normal drive, occupants slow from, for example, 50 mph to 0 mph many times in the everyday course of driving and braking. The critical difference between a normal stop and an accident is that, in a collision, this slowing occurs in the blink of an eye rather than a few casual, uneventful seconds.

The deceleration forces that result from a collision are therefore exponentially higher, and they act in three phases: First, when the vehicle makes contact with another vehicle or object. Second, when the occupant makes contact with the restraint systems or interior surfaces. And third, when the occupant's internals contact with the rib cage and other body surfaces. It is therefore the ultimate goal of both the vehicle's body structure and its restraint systems to add as much time to the overall deceleration of the occupant, in an effort to reduce those third-phase forces that can cause the most serious injuries.



The seat belt decides.

The seat belt is the single most important restraint feature in the vehicle because it provides the most effective means of reducing occupant movement during a collision. Therefore, all occupants must properly fasten their seat belts before setting off on their trip—no matter the trip's length, duration or environment, and no matter



which seating position in the vehicle. Only then can the seat belts and restraint systems such as air bags coordinate with one another to help provide the best possible potential protection in a variety of accidents.

Seat belt tensioners and force limiters.

In today's Mercedes-Benz models, as has been the case for decades, front seat belts are equipped with Emergency Tensions Devices (ETDs) and seat-belt force limiters. This is also true for the outboard rear seating positions, including forward-facing 3rd-row seats.

When a seat belt tensioner is activated, the belt is automatically retracted a small amount to help eliminate the slack that may exist prior to an accident. This gives the belted occupant additional time to decelerate or accelerate with the vehicle during a collision, thereby reducing the forces which occur during an accident.

However, it is important to observe that belt tensioners cannot compensate for improper seating positions or incorrectly fastened seat belts, nor can they physically pull occupants back into the seat.

If the seat belt is also provided with a belt force limiter, this feature will limit the peak seat-belt force imparted on the occupant during a collision. The front seat-belt force limiter is specifically designed to work in combination with the front air bag, so that the air bag reduces the force on the seat belt and helps distribute the forces over a larger area of the occupant's torso.

Provided that the ignition is on, ETDs are activated when the vehicle's sensors detect a frontal or rear impact with sufficiently high acceleration or deceleration. The ETDs may also be activated during certain side collisions.

If an additional protection potential is identified for passengers in vehicles equipped with rollover sensors, the ETDs are activated in the event of a lateral rollover.

The seat-belt force limiters come into play in the event of a serious frontal impact, such as when high vehicle deceleration occurs in a longitudinal direction.

Other accident scenarios that may trigger these devices are described in the Operator's Manual. After activation of pyrotechnic safety equipment (such as air bags or ETDs, in which some smoke can be released) the SRS indicator lamp illuminates in the instrument cluster. These devices are designed for a single deployment only, and must be replaced by an authorized Mercedes-Benz dealer.

What happens when an air bag deploys?

At the moment that a collision is detected, an air bag[1] inflates in a fraction of a second. This is to ensure that the air bag is in the correct position to offer its intended protection during the deceleration of the occupant. During a collision, an air bag helps restrain the occupant from excessive motion, but—especially in the case of a front air bag—its principle goal is to allow the occupant to come to a stop more gently than without the air bag. This interaction compresses the air bag and forces its internal gas to escape from a vent engineered to regulate the rate of deflation. This controlled deflation of front and side air bags limits the loads which are imparted to the occupants head and upper body during an accident. After an accident has occurred, the associated air bags are fully deflated, having served their intended purpose. To simplify the explanation, an air bag inflates to get into position, and deflates to help cushion the occupant.

The advantages of the additional air bag protection include reduced risk of injury when the air bag is activated, especially if the seat belt is fastened and the occupant is optimally positioned in respect to the air bags—as upright as possible, and sitting as far as possible from the air bag. It is recommended that the driver position the seat and adjustable steering wheel such that there is at least 10 inches between the air bag cover on the steering wheel and the driver's breastbone.

Activation stages of the ETD and front air bag.

Depending upon the level of deceleration or acceleration detected during a frontal impact, there can be several stages of restraint activation. During the first stage, the ETD will be activated if the seat belt is fastened. In the second stage, the air bag[1] is triggered if deemed necessary based upon collision severity.

Criteria for activation of the ETDs and air bags.

To determine the need for ETD and air bag activation, the air bag control unit employs a complex algorithm which evaluates the time-dependent magnitude and direction of the vehicle's deceleration or acceleration during the earliest phase of a collision. A decision to activate the air bag is based upon the intensity of the vehicle deceleration or acceleration at the very beginning of a collision event. Because it is important that an air bag be in position as early as possible, the decision process must be somewhat predictive. The vehicle's air bag control unit uses available deceleration or acceleration signals to establish the magnitude and principal direction of force.

These values are determined by the distribution of force, the collision angle, deformation properties of the vehicle and the nature of the object or vehicle with which the vehicle collides. The amount of vehicle deformation does not determine whether the air bags should deploy, nor is it an indication that an air bag should have deployed if it does not. Although a vehicle may sustain considerable deformation during an accident, an air bag may not be required if the vehicle collided with a relatively soft structure and did not experience high deceleration.

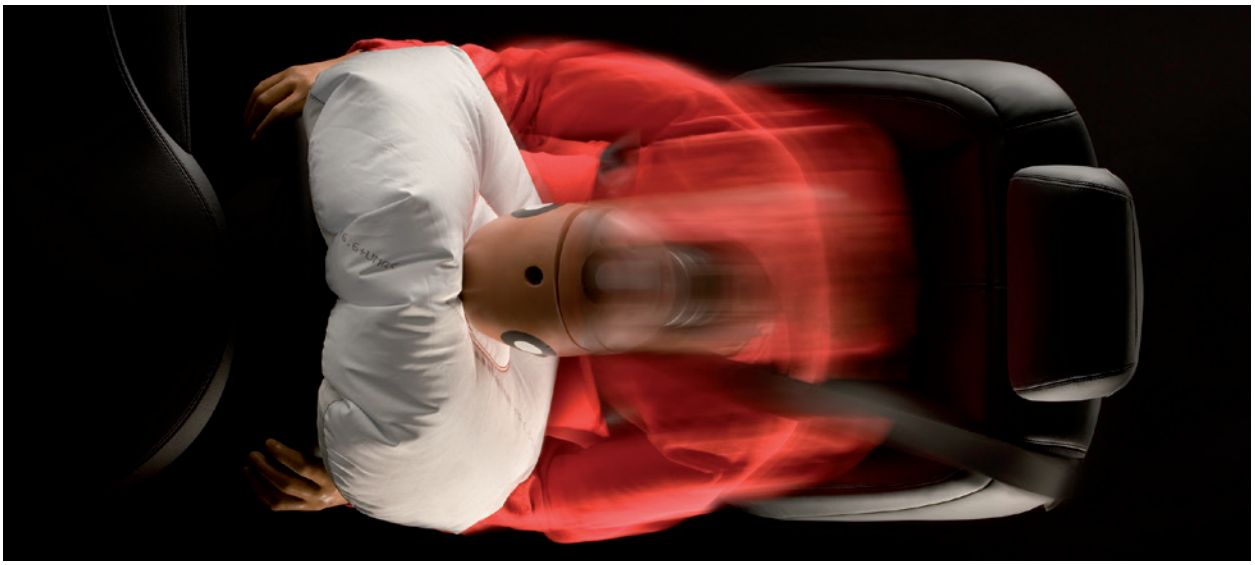
Conversely, there may be accident scenarios in which the vehicle sustains minimal deformation during a collision, yet the air bags are required because the vehicle collided with rigid structures (such as the structural members of another vehicle) that induce high deceleration.

The vehicle speed prior to collision and the occurrence of injuries sustained during a collision are not reliable indicators that an air bag should—or should not—have deployed. Apart from the severity of the accident and the physical resilience of the occupants, the severity of injuries often depends on the type of collision and the deformation properties of the object which was struck during the accident.

Unique features with dual-stage front air bags.

If the vehicle is equipped with adaptive dual stage front air bags, as virtually all new Mercedes-Benz models are, the air bag will fill with sufficient propellant gas in the first stage to reduce the risk of injuries. If the air bag control unit senses further vehicle deceleration and deems that the second stage is necessary, the air bag will inflate within milliseconds with the maximum volume of propellant gas. This allows the air bag to provide a higher degree of cushioning when impact forces are higher, and a gentler cushioning when system sensors deem this a more appropriate course of action.

If the vehicle is also equipped with sensors to determine the weight of the front passenger, this information—combined with deceleration rates and seat belt use—will be used in deciding whether to activate the seat belt force limiter and second-stage air bag deployment.



Air bag types.

Front air bags for the driver and front passenger.

The driver's air bag is contained within the steering wheel, while the passenger's front air bag is packaged above the glovebox (in some older models, the passenger air bag is packaged within the former glovebox location). Each is identified by an "SRS air bag" or "air bag" label.[1]

Upon activation, a front air bag helps prevent or minimize contact between the occupant's head and chest and the interior of the vehicle. To achieve this task, the driver's front air bag inflates in front of the steering wheel, while the passenger's front air bag inflates in front of and above the right side of the upper dashboard.

The driver or front passenger air bags are activated during collisions which quickly impart high vehicle deceleration or acceleration acting in a longitudinal direction (along the length of the car), also depending on seat belt use. They are deployed independently of other air bags that may be installed in the vehicle in most situations.

In the event of a detected rollover (in vehicles equipped with a rollover sensor), the air bags are not triggered unless the system has identified a high deceleration of the vehicle in the longitudinal direction.

In vehicles with Automatic Child Seat Recognition (ACSR), the front passenger's front air bag is deactivated if a child seat with ACSR transponders has been detected on the passenger seat. In this case, the "Passenger air bag OFF" indicator lamp is illuminated. This lamp may be located in the central dashboard, or in the overhead area above the inside rear view mirror. It is sometimes labeled with an icon of an inflated air bag and the numeral "2."

In vehicles with front passenger seat occupant detection, the passenger's front air bag is only activated if the sensed weight of a properly seated occupant exceeds a minimum weight threshold. Certain seating positions can cause the sensor not to accurately measure the weight of the occupant. The front passenger should sit squarely in the seat with both feet on the floor. Under no circumstances should the passenger's feet or legs be placed atop or against the dashboard.

Knee air bags for driver and front passenger.

A knee air bag can help reduce injuries to the knees and lower legs. Depending on the design of the vehicle, the early restraint of the pelvis provided by the knee air bag can lead to better synchronization of occupant and restraints based on the vehicle's deceleration. This provides more efficient utilization of the available area for the occupant's forward displacement. In this way, the deceleration forces acting on the occupant, particularly in the upper body area, can be further reduced.

The knee air bag is located below the steering column behind the dashboard cover. The knee air bag is triggered simultaneously with the corresponding front air bag and inflates below the steering column or in the knee area of the front passenger. Models may be equipped with a knee bag for the driver alone, for both the driver and front passenger, or not equipped with knee air bags at all.

Side-impact air bags.

Upon activation, a side-impact air bag has the task of providing protection for the rib cage (but not for the head, neck or arms) of the occupant experiencing impact during lateral collisions with a high detected level of vehicle deceleration or acceleration.

A side-impact air bag may be installed either in the door trim panel, in the seat side bolster, or in the area between a rear door and the seatback. In either case, the side-impact air bag inflates below the side window and adjacent to the seated occupant's rib cage or thorax.

Details regarding installation may be found in the Operator's Manual for each vehicle.[4]

The criteria for the activation of a side-impact air bag are similar to those for a front air bag in a frontal collision. Nonetheless, the accident situation must be detected far more quickly, as the distance between the occupants and the collision object is significantly less than in a frontal collision, and there is no "side crumple zone."

Side-impact air bags are activated using in accidents in which high lateral vehicle deceleration or acceleration is detected by the system. The air bag(s)[1] are deployed only on the side of the collision. In vehicles with passenger seat occupancy detection, the front passenger's side-impact air bag does not activate unless the detected weight of a properly seated occupant exceeds the minimum weight threshold and the seat belt is fastened. The side-impact air bags are deployed independently of the front air bags and seat-belt ETDs. They are also not deployed in the event of a rollover unless high lateral vehicle deceleration is independently detected.

Pelvic air bags for driver and front passenger.

Depending on the vehicle design, a pelvic air bag can reduce the forces acting on the front-seat occupants. They are located in the sides of the front seatbacks, to enhance protection against injury to the pelvic area and indirectly to the chest area in the event of a sufficiently severe side impact. The pelvic air bags are triggered simultaneously with the side-impact air bags.

Head protection systems.

Depending on the vehicle bodystyle, side curtain air bags (installed in the roof frame), head protection air bags (installed in the door, usually in convertible models), or head-thorax air bags (installed in the seat, also typically in convertible models) are used. The principal accident scenarios in which these systems are activated are described below. Further details regarding activation of the head protection systems can be found in the Operator's Manual, as there are differences from one Mercedes-Benz model to another based on their design.

Side curtain air bags.

Models with fixed roofs (sedans, coupes, wagons and SUVs) are equipped with side curtain air bags. When a side curtain air bag is activated, it has the task of providing protection for the head of the occupant exposed to the lateral impact.

The side curtain air bag deploys in the area of the side windows between the A-pillar (the roof support between the front door and windshield) and the C-pillar (the roof support between the rear door and rear window). It is usually inflated by a gas generator located to the side, behind the B-pillar (the center pillar behind the front door), or near the C-pillar on coupes with no visible B-pillar. In the event of a sufficiently severe side collision, the side curtain air bag can provide early lateral support for the head. It is designed to reduce the lateral oscillatory motion of the head, and the likelihood of head impact with the side windows, roof pillars and roof frame.

Through the large coverage of the side window area, the side curtain air bag can offer added protection against objects that penetrate the passenger compartment area. It also reduces the risk that the occupants will be thrown outward, and can enhance the protection for their arms.

The side curtain air bags are activated during collisions which quickly impart high vehicle deceleration or acceleration acting in a lateral direction, in which case they are deployed only on the side where the collision occurs. In the event of a lateral rollover in a vehicle with a rollover sensor, it will also be deployed if the air bag control unit determines that added protection may be provided by the side curtain air bag. In this case the

side curtain air bags are activated simultaneously on both sides of the vehicle. They are typically deployed independently of the front air bags.

Head-thorax air bags.

Some vehicles, typically convertible models, are equipped with head-thorax air bags instead of side curtain air bags and front side-impact air bags. When activated during a lateral collision, it's designed to provide protection for the head and rib cage of the occupant exposed to the lateral impact.

The head-thorax air bag inflates in the area of the front side window and upper door. Head-thorax air bags are activated during accidents which quickly impart high vehicle deceleration or acceleration acting in a lateral direction. They are deployed only on the side of the collision, and independently of the front air bags.

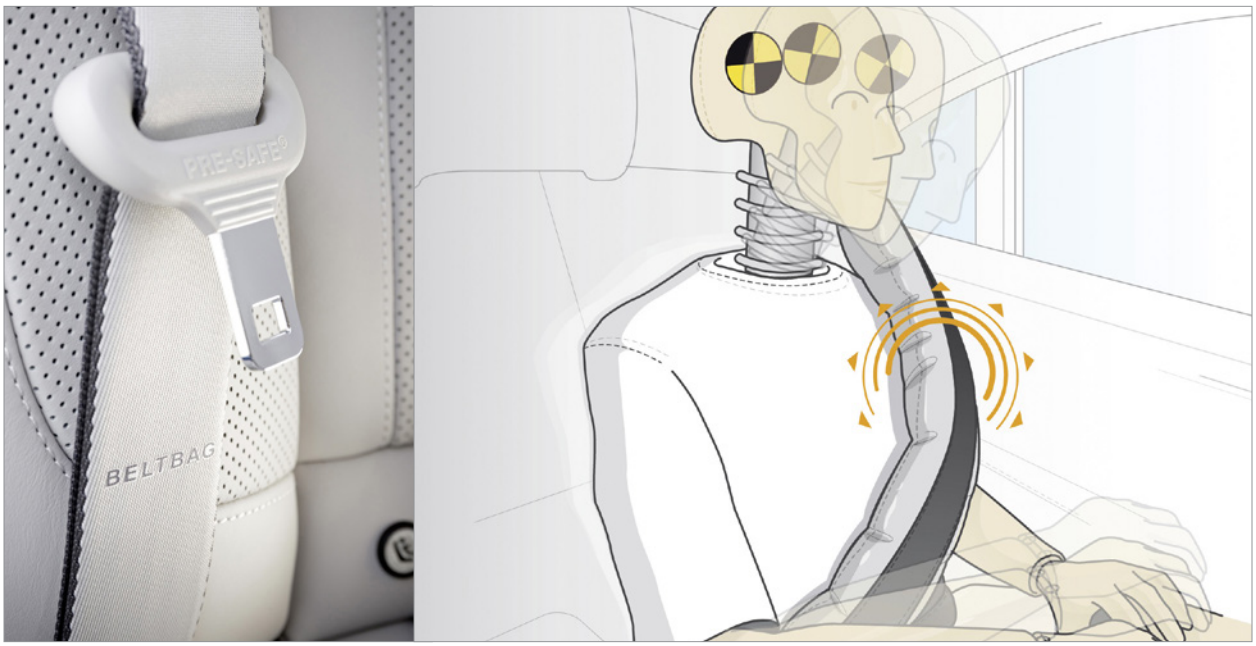
Rear seat-belt air bags.

A new feature available starting with the 2014 S-Class is a system of air bags[1] and active buckles for the outboard rear seating positions. The air bags are integrated within the webbing of the seat belts, and are designed to deploy during certain frontal impacts, as determined by the SRS control unit. The belt bags are visually distinguished by the edges of the belt webbing in a contrasting color, and a small identifying label near the end that is fastened into the seat-mounted buckle receiver.

The belt bags are combined with active buckle receivers with a number of functional benefits. The receivers are illuminated via LED and rise a few inches when the door is opened and the passenger is first seated, to encourage their use and assist the user in fastening the belt. After fastening, the receivers retract to their normal position.

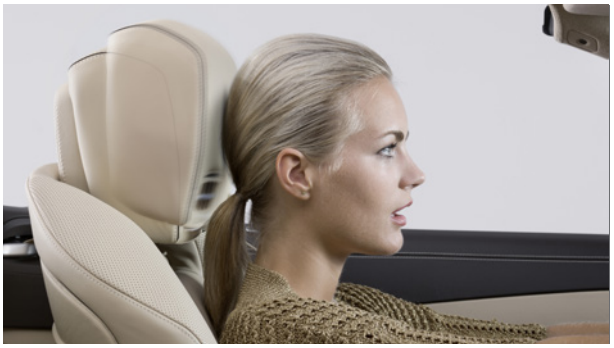
In a collision of sufficient severity, the receivers also incorporate belt tensioners that, much like the ETDs on the front belts, help to remove slack from the seat belts in an accident. The belt bags themselves inflate in the wearer's thorax area via gas generators, splitting pre-determined tear seams in the belt webbing, to enlarge the belts' overall surface area. Combined with the tensioning effect, this helps to distribute the forces between the belt and the belted occupant more favorably in a collision. It also helps the belts be more effective if the passenger has the seat in a reclined position as a collision occurs.

Please see the section later in this brochure on child safety seats, as well as your Operator's Manual, for more information regarding the use of Genuine Mercedes-Benz Accessory child seats that are designed to be specifically compatible with the belt bags.



Additional protection.

NECK-PRO head restraints.



The crash-responsive NECK-PRO® active head restraints for the driver and front passenger are standard equipment in many Mercedes-Benz models. This important safety feature improves the protection of the front occupants during a rear impact by reducing the risk that the occupant will experience whiplash injury.

Even on models with conventional head restraints, their protective ability is greatly enhanced by proper positioning of the head restraint prior to driving. When adjustable, occupants should always position their head restraint so that the top of the restraint is near the top of their head, and where fore–aft adjustment is possible, with approximately 1–1.5 inches between the surface front of the head restraint and the back of the head.

The NECK-PRO head restraints are connected to an electronic control unit, which evaluates the longitudinal deceleration or acceleration of the vehicle at the start of a collision. If the control unit detects a rear collision that exceeds a certain severity threshold, pretensioned springs inside the head restraints are triggered. The release of these springs moves the head restraint forward and upward toward the seated occupant. The head of the occupant is then supported early on in the collision, which can significantly reduce the strain on the cervical vertebrae and associated muscles and soft tissue.

After activation, the NECK-PRO head restraints may be manually reset to their initial positions. (See the vehicle's Operator's Manual for more information.) After a manual reset, the NECK-PRO restraints are immediately ready for further use. It is important to note that aftermarket head-restraint coverings may prevent the intended operation of NECK-PRO head restraints and should not be installed.

NECK-PRO "luxury" or "comfort-type" head restraints are available on some models, and provide two additional flexible side wings. These side bolsters are individually adjustable to provide the desired level of lateral support for added comfort.

Through the targeted design of the front seats and their head restraints, an exceptional level of protection can be achieved, even in purely passive systems that are provided in some Mercedes-Benz models. In the event of a rear impact, the occupant is pushed deeper into the seat cushion by inertia. If the head restraint is correctly adjusted, the head and upper body are accelerated simultaneously and the cervical vertebrae are spared.

Child safety seats.

Child safety is an important component of the Integrated Safety concept of Mercedes-Benz. In order to help protect children, the Mercedes safety engineers are constantly developing intelligent solutions which serve as a role model to the entire industry. In an accident, the risk of injury for unsecured children is seven times higher than for children protected by properly used restraint systems. Further, the seating location of a child is of great importance, due to the location of air bags[1] and benefits shown by statistical research.

In models with more than two seats, the rear seat is the safest location for the proper installation of an approved child safety seat. However, since this is not always possible, whether in a two-seat car or because the rear seat might be otherwise occupied, Mercedes-Benz introduced automatic child seat recognition as early as 1997, an industry first under the name BabySmart.™

Every Mercedes-Benz model with rear seats—including both the second and third rows of wagons and SUVs, when so configured—is equipped with a system of child seat attaching points designed to be compatible with the latest industry standards, known as LATCH, or Lower Anchors and Tethers for Children. The lower anchors consist of ISOFIX mounting points located at the base of the seatback, where it meets the cushion. Beneath clearly labeled decorative covers reside a pair of square metal "loops" that can be manually extended to accept the corresponding anchor points on compatible child seats. To secure the top of the child seat, top tethers are provided either on the rear shelf of sedans, coupes and cabriolets, or in the floor behind the seatback of wagons and SUVs. These are usually located under a decorative

cover identified with an icon of a boat's anchor. The top tethers and anchors are designed to be used together to properly secure a LATCH-compatible child safety seat.

The best possible protection for small passengers can only be provided by child restraint systems. The findings from accident research and accident statistics show that in the event of an accident, the risk of injury for a child secured with an adult seat belt is more than double that of a child secured by an appropriate child's restraint.

On models with rear seat-belt air bags, only use a child safety seat that is compatible with the belt bags.[1] The deploying belt bags may damage a non-approved child restraint system. Please see your Operator's Manual or Mercedes-Benz dealer for further information for models so equipped.

The reason that a conventional seat belt is not the best restraint system for a child is due to the specifics of a child's body structure. Adults and children not only differ in size and weight, but also in body structure and proportions. The head of a newborn infant is approximately one third of the child's body weight, whereas with adults, it is typically less than one fifth.

Bone structure and strength are also markedly different. Because of these differences, children need restraint systems that are precisely tailored to meet specific requirements based upon their age group, height, and weight. Mercedes Benz offers different child seats that are custom-tailored for the body characteristics of each age group, and designed to work with the vehicle itself.

The passenger compartment, seats, air bags, and seat belts in a Mercedes-Benz are engineered to form an optimally matched system. The child seat builds upon these protective functions and ensures that small passengers are also secure in the event of an accident. Mercedes-Benz child seats must pass a stringent regimen of laboratory and crash tests. This not only includes the stringent tests required by various regulatory agencies around the world, but also rigorous internal testing.

Mercedes-Benz offers three removable child seats as Genuine Mercedes-Benz Accessories, thereby offering increased protection for children in all age groups. The restraint systems are available at all authorized Mercedes-Benz dealers.

Since a child's rate of growth can vary substantially, the age recommendations for the various child seat models serve only as a point of reference. Deviations may arise in individual cases. Therefore, the selection of a child seat should always be oriented to body weight, and the weight range of the child seat should be fully utilized to the upper range, if possible, before changing over to the next larger model. It is extremely important that the growing child's head never extends above the back of the child seat.

Child safety locks.

Children can be naturally curious in any situation, and riding in an automobile is no different. Even when secured into a child seat, the various switches and controls on the nearby door panel can be tempting. For this reason, every Mercedes-Benz with a rear seat is equipped with features that allow the driver to disable certain controls in the rear cabin. Child safety door locks are operated by a small lever on the trailing edge of the open door. When the lever is set to the clearly labeled position, the interior door handles are rendered inoperative. In this setting, an unlocked rear door can only be opened via the outside handle, to help prevent a child from opening the door while the vehicle is in motion, or before the driver is ready for the child to exit the vehicle.

In addition, a sliding switch near the driver's power window switches disables the window switches in the rear cabin, along with power rear seat controls when so equipped. The controls on the driver's door remain active, so that the driver may open and close the rear windows as desired.

Rear seat and cargo area safety.

In addition to the rear-cabin seat belts and tensioners described earlier, the rear seating areas of all models are designed with consideration to their varying uses.

In most E-Class Wagon models, a rear-facing 3rd-row seat provides room for two additional passengers. Safety features include a 3-point seat belt and head restraint for each passenger, as well as an interior release for the liftgate. If the third row of seats is not needed, it can be easily stowed beneath the luggage compartment floor. The rear crumple zone is uniquely configured to accommodate for this seat.

The GL-Class SUV offers a pair of forward-facing seats for its third row. Each seat is equipped with a 3-point seat belt with an Emergency Tensioning Device (ETD) and belt-force limiter. Also, the side curtain air bags[1] span all three seating rows on each side of the vehicle.

In station wagons and SUVs, as well on sedan and coupe models with folding rear seatbacks, Mercedes-Benz has designed the seatbacks to be significantly more rigid than required by regulation. Cargo can be practically and securely fastened in the load compartment by means of floor-mounted tie-down rings provided as standard equipment, and with a variety of custom-fitted cargo nets and other items available as Genuine Mercedes-Benz Accessories.

On all models with folding rear seatbacks, their latches incorporate red-color telltales that are visible near the top of the seatback when the seat latch is not fully secured. In addition to being readily apparent when a seatback is returned to its upright and locked position, most are also visible to the driver in the rear view mirror. In most models, the release levers for the folding seatbacks are located either in the trunk or in the cargo area near the liftgate area. This not only facilitates the extension of the cargo space from the cargo area itself, but is designed to help prevent unlatching of the seatbacks by children seated in the rear cabin.

On the E-Class Wagons, the combined luggage cover and partition net assembly attaches to the bodyshell via sturdy yet convenient mounting points. The mesh net can be extended vertically to fixtures in the ceiling, in either of two positions: When the 2nd-row seatbacks are upright, the net can divide the “standard” cargo area from the first two rows of seating. And when all the rear seats are folded down, it can be extended upward at the forward edge of the expanded cargo floor, to divide the front row from the entire expanded cargo area. Please note that, even though the large-mesh net is of sturdy construction, cargo should always be secured using the floor-mounted tie-downs, and pets should be properly restrained.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After an accident.

The moments after an accident present dangers of their own, but they also offer opportunities to help limit further injury, prevent additional mishaps, and assist in the rescue of the occupants. A Mercedes-Benz is engineered to keep protecting.

Safeguarding the occupants.

Once the seat belts, tensioning devices and air bags have done their job, measures are taken to allow their gases to vent from the cabin. In addition, automatic shutdown of numerous vehicle functions helps to reduce the risk of fires and other hazards after an accident. A Mercedes-Benz will also take measures to help its occupants find their way safely out of the vehicle, even on a dark night.

Alerting passersby.

The aftermath of an accident can be a hazard to other drivers, especially if the vehicles come to rest in travel lanes or intersections. A Mercedes-Benz will take action to help make its presence apparent automatically.

Reaching out for assistance.

The SOS feature of Mercedes-Benz mbrace® will initiate a call to the mbrace Emergency Response Center if an air bag or seat-belt Emergency Tensioning Device (ETD) is activated. While mbrace subscribers can also place such a call themselves at any time, the Automatic Collision Notification feature does not require any driver input to transmit the pertinent information of the accident, including its location and the vehicle information, to trained responders who'll contact local rescue services.

Assisting in rescue.

From turning on the vehicles exterior and interior lights, to automatically unlocking the doors, moving the power steering column upward and releasing seat-belt tension, a Mercedes-Benz helps those who come to aid the occupants after an accident. In addition, the mbrace Emergency Response Center will stay on the line both with the occupants and emergency services providers until the rescuers are on the scene.

Continued protection.

Safeguarding the occupants.

Mindful response within the cabin.

The quick rescue of occupants after an accident is part of the Integrated Safety concept. When an accident occurs that results in the activation of an air bag[1] or the pyrotechnic Emergency Tensioning Devices (ETDs) for the seat belts, the system's sophisticated electronic controls team with the vehicle's networked technology to help protect the occupants from further injury.

Since the gas generators for the air bags and ETDs can release a small amount of smoke into the cabin during their deployment, the side windows, if closed, will be lowered by a small amount to allow the gases to vent from the cabin after a frontal impact.

To help the occupants find their way about the cabin, the vehicle will automatically turn on some interior lights. On models with a power steering column with an "easy-exit" feature, the steering column is designed to automatically move upward, to assist the driver in exiting the vehicle.

At the same time, the vehicle will shut off its fuel supply, when a specific threshold is reached, and switch off its engine. Some models will also switch off the climate control blower and air conditioner compressor, while turning on the system's recirculation mode. All of these measures are to help prevent the entry of refrigerant gases, external smoke or other potentially harmful vapors from the car's running gear into the cabin.

Alerting passersby.

Action to help the vehicle be noticed.

Whether the vehicle leaves the roadway in an accident or comes to a stop in the middle of a travel lane or intersection, a Mercedes-Benz takes measures to help make its presence and the situation more visible.

Automatic activation of the hazard flashers can help passersby—both other drivers or pedestrians—spot the disabled vehicle. This can help to prevent other vehicles from colliding with the wreckage, allow people to identify the situation and call for help, and help the car be seen or found if it has left the main roadway.

Reaching out for assistance.

Automatic notification of an accident.

The Mercedes-Benz mbrace® system[5] that's standard in every new Mercedes-Benz offers its subscribers a wide array of security features, in addition to its numerous conveniences. After an accident, Automatic Collision Notification is among the most helpful and reassuring.

If an air bag[1] or seat-belt ETD is activated, the vehicle's electronic controls instantly alert the on-board mbrace system to initiate an SOS call to the dedicated, 24-hour Mercedes-Benz Emergency Response Center. Trained experts who receive the call will automatically be made aware of key information that's transmitted by the vehicle, including its location and last known compass heading, its model and color information, the occurrence of air bag or ETD deployment, and the subscriber's information on file with Mercedes-Benz. Subscribers with certain medical concerns can even provide critical medical information, confidentially, to Mercedes-Benz before a collision ever occurs, so that rescuers can be made aware if needed.

Subscribers can also initiate an SOS call on their own, by pressing the SOS button in the vehicle or using the mbrace Mobile App on their compatible smartphone.

Once the call is connected, mbrace personnel will attempt to communicate with the vehicle occupants via its built-in speakerphone. Even if the occupants cannot speak or respond, the mbrace personnel will contact local rescue services or police, and stay on the line as needed until help arrives on the scene and the customer feels comfortable completing the call.

Assisting in rescue.

Measures to help those who help you.

Many of the features and systems already described that are designed to help occupants exit the vehicle after an accident also help rescuers in assisting them as well. Further, several features, such as automatic shutdown of the vehicle's engine, fuel supply, climate control, help minimize the risks posed to on-scene responders. On HYBRID models, additional protective measures include shutting off the high-voltage system and isolating the vehicle power supply from the car's electrical system.

Mercedes-Benz mbrace can also make it easier for the emergency responders to locate the vehicle. With the calm composure that comes from professional training and experience, mbrace personnel can communicate the vehicle location information provided by its onboard GPS, along with other helpful information, without those who have just suffered an accident needing to speak clearly or at all, or even know their location. While one cannot predict when an accident can occur, one can prepare in many ways for one, and subscribing to mbrace is one way that can be reassuring when you need it, or even if you never do, just by knowing its benefits are there for you.

In addition, Mercedes-Benz provides guidelines for rescue workers via the Internet, including many model-specific rescue instructions, at **aftersales.mercedes-benz.com/info/rescueguide**, to assist in their practical training or if a situation-based need arises.


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READY
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AIRBAG

Driver education.

From a teenager getting behind the wheel for the first time, to an enthusiast seeking the most confident control of a high-performance automobile, Mercedes-Benz offers two distinct programs to help any driver become a safer, and smarter, driver.

The Mercedes-Benz Driving Academy.

Located in Los Angeles, California, the Mercedes-Benz Driving Academy offers a unique and comprehensive approach to helping teen drivers get far more than their license. Using a integrated combination of classroom theory and behind-the-wheel practice, students benefit from a wide range of practical knowledge that helps them learn proper vehicle control, develop positive attitudes and the decision-making skills that helps them avoid dangerous situations rather than only responding to them.

Coaching students rather than simply instructing them is what sets the Mercedes-Benz Driving Academy apart from traditional driver training. This interactive, more involved approach helps new drivers be more self-aware, more confident, and better equipped with genuine knowledge—far beyond the mere memorization of rules and regulations that appear on a state driving exam.

Using a variety of Mercedes-Benz vehicles, from compact sedans to larger SUVs and even a manual-transmission sports car, students learn about the laws of physics, the value of making good decisions quickly, and the real-world issues of sharing the road with other drivers. Parents are also made a part of the process, by sharing coaching tips and holding feedback sessions after each lesson.

Classes are also available for older and more experienced drivers who wish to polish their skills, learn more about topics such as distracted driving, or even master a manual transmission. All lessons include complimentary pickup and dropoff, and dedicated one-on-one behind-the-wheel lessons the Academy's expert, experienced coaches.

To learn more, visit **mb-drivingacademy.com**

The AMG Driving Academy.

The skills required to handle a high-performance vehicle may seem at first to be rooted only in enthusiasm and excitement, but at the very core is an appreciation of driving safety. The AMG Driving Academy is geared to owners of AMG vehicles, the members of the Mercedes-Benz family renowned for their extreme performance capability. The AMG Driving Academy helps their drivers develop their own capabilities to match the automobiles themselves. With Basic, Advanced and Pro Training options, drivers learn a comprehensive set of performance driving skills using a wide array of AMG models, and on the finest racing circuits in the country.

With one-on-one guidance from professional instructors, the experience will undoubtedly leave any participant exhilarated. But the more lasting benefit of experiencing the AMG Driving Academy is a far better understanding of how a car responds to countless driving situations. While the training takes place on a racetrack, the lessons apply to many situations drivers encounter on everyday roads, from sharp corners to sudden braking. Drivers graduate the AMG Driving Academy with greater confidence and capability, and a greater sense of the value of safe driving.

To learn more, visit **AMGacademy.com**

Learn more.

We hope we have helped you understand more about the complex subject o f safety and wish you many more enjoyable trips in your Mercedes-Benz.

The content provided in this brochure, as well as its Active Safety Systems companion brochure, is not considered a substitute for reading the detailed safety systems information provided with each vehicle.

Additional information about the safety systems in your vehicle is available in your Operator's Manual. You may also download a PDF of your vehicle's Operator's Manual, view how-to videos for your vehicle's features, and learn more about your vehicle at **MBUSA.com/owners**

1 WARNING: THE FORCES OF A DEPLOYING AIR BAG CAN CAUSE SERIOUS OR FATAL INJURIES TO A CHILD UNDER AGE 13. THE SAFEST SEATING POSITION FOR YOUR CHILD IS IN THE REAR SEAT (WHEN SO EQUIPPED) BELTED INTO AN APPROPRIATE, PROPERLY INSTALLED CHILD SEAT, OR CORRECTLY WEARING A SEAT BELT IF TOO LARGE FOR A CHILD SEAT. SEE OPERATOR'S MANUAL FOR ADDITIONAL WARNINGS AND INFORMATION ON AIR BAGS, SEAT BELTS AND CHILD SEATS, INCLUDING THE USE OF APPROVED CHILD SEATS WITH THE AVAILABLE REAR SEAT-BELT AIR BAGS.

2 PRE-SAFE Brake is included with option DISTRONIC PLUS® adaptive cruise control. DISTRONIC PLUS is no substitute for active driving involvement. It does not adapt cruising speed in response to stationary objects, nor does it predict the curvature and lane layout of the road ahead or the movement of vehicles ahead. It is the driver's responsibility at all times to be attentive to traffic and road conditions, and to provide the steering, braking and other driving inputs necessary to retain control of the vehicle. Drivers are cautioned not to wait for the DISTRONIC Proximity Warning System before braking, as that may not afford sufficient time and distance to brake safely.

3 The roll bar system is designed to enhance the level of rollover protection compared to a vehicle without one. No system, regardless of how advanced, can eliminate the chance of injury in an accident. Please always wear your seat belt.

4 Side-impact air bags are not available on G-Class models.

5 All Mercedes-Benz mbrace services operate only where cellular and Global Positioning System satellite signals are available, which are provided by third parties and not within the control of Mercedes-Benz USA, LLC. An mbrace Package trial period is offered on new, Certified Pre-Owned and pre-owned sales and leases at an authorized Mercedes-Benz dealer. Subscriber Agreement is required for service to be active. Some services are only available on select vehicles. Your PIN is required in order to use certain services. Some services may be limited or restricted in some areas. Apps may be introduced and updated at varying dates, and may also require a vehicle software update. Driver is responsible for complying with traffic and other laws. See your dealer or MBUSA.com/mbrace for details, including a list of compatible smartphones.