

# Expert Interview: Safety Features

Expert information in this interview has been provided by:

Rolin E. Barrett, Jr., Ph.D., P.E.  
Consulting Engineer and Accident Reconstruction Specialist  
Barrett Engineering

Eric Klang, Ph.D.  
Director, Undergraduate Program  
Mechanical & Aerospace Engineering  
Faculty Advisory, Wolfpack Motorsports

*Interviewer:* What is the history of safety for cars?

*Expert:* Basics such as brakes, tires, and suspensions have continuously been improved in both racing and passenger cars.

In passenger cars, the beginning of occupant protection was to basically make the passenger compartment safer beginning with the windows, windshield, and that kind of thing. That kept out road debris and kept birds from flying into your face while you were driving - laminated glass has saved thousands of lives. Later, cars had padded dashboards and low profile knobs and handles to protect passengers when they were thrown around the inside of the car during an accident. At about the same time, seatbelts became available. Designs that allowed the chassis to deform during an impact began to appear. As vehicles became safer new problems were uncovered. Not everyone used seatbelts and often those who did sustained injuries that the seatbelt could not avoid. Airbags were introduced to address these problems.

Finally, the roads themselves have been improved. Dangerous intersections have been eliminated, curves straightened, signs improved and roadside hazards removed – all in an effort to improve safety.

*Interviewer:* Of course these safety devices must be in good working order to be effective. What sort of problems might occur regarding the integrity of the safety equipment?

*Expert:* The safety equipment is often designed for one severe accident. But sometimes that safety equipment can be damaged or consumed in a small accident. If an accident is severe it may cause a high-rate load to be applied to the seatbelt system. And so the seatbelt system may be weakened. They may have damaged the fibers of the seatbelt in a severe enough accident. But consider that a large heavy driver is going to load that seatbelt more than a small lightweight driver. So a small accident involving a heavy driver or heavy passenger could actually compromise that system at a much earlier value than for a small light driver or passenger in the same situation.

Now as far as the integrity of the safety equipment goes... for example, if you take damage to your brakes, your brakes may not be operable when you need them. An impact from debris on the road such as a piece of metal or a brick or a concrete block, rock, something of that nature, could compromise the ability of the brakes to work.

Also, what happens when the guardrail does its job and ends up crushed? It's a lot cheaper to have that barrier deformed and replaced than to repair the person who could be injured badly. The barrier deforming and absorbing the blow is a small price to pay to save a human life or protect from serious bodily harm. But of course the barrier needs to be replaced or repaired to ensure continued safety.

*Interviewer:* You mentioned designs that allowed the chassis to deform during an impact. What does this mean and what is a chassis?

*Expert:* First the chassis is the backbone of the car – its frame and body. In many modern passenger cars the frame and body have been combined into a “unibody”. During a crash the chassis gets bent and/or crushed depending on the severity of the accident. This is significant because energy is absorbed by the car when it is crushed. Energy that the car absorbs means there is less energy for the occupants to absorb during a crash.