



Airbags

IN 2003, 290,607 people were killed or injured on the roads of Great Britain - 188,342 were car occupants 64.8% of the total.

Table 1 Car User Casualties 2003

	Driver	Passenger	All Users
Fatal	1,169	600	1,769
Serious	11,040	6,251	17,291
Slight	123,786	64,556	188,342
Total	135,995	71,407	207,402

Seat belts have proved to be very effective in reducing such casualties. However, in frontal collisions, car occupants are still injured by being thrown onto unpadding parts of the car interior such as the steering wheel and the dashboard. Therefore, in recent years, airbags have been introduced to provide further protection. However it must always be remembered that air bags are an addition rather than an alternative to seat belts. The study by Simon Barry et al makes it clear that seat belts are not only cheaper and less prone to negative effects than airbags. They are also more effective in frontal collisions and in a wide range of other crashes where an airbag is ineffective.

HOW AIRBAGS WORK

Airbags inflate rapidly (and then immediately deflate), cushioning the occupants and preventing or reducing the level of contact with the steering wheel or dashboard.

They need to inflate at an extremely fast rate in order to be fully inflated by the time a person's body begins to move in reaction to a collision. The bigger the airbag, the faster it has to inflate. In general, European airbags hold 35 litres of gas propellant and fully inflate within 25 milliseconds, which means that they have to expand at anything up to 160 mph. American air bags, usually holding 60 litres of gas, have to inflate even faster. The area of space within the car taken up by the airbag as it inflates is known as the 'airbag deployment zone'. Sensors within the vehicle monitor the direction and severity of an impact and fire the airbag if the severity and direction warrants it. The impact should be greater than 20mph, and in a frontal direction. Rear end shunts should not fire the airbag. As the airbag module fires, it and the gas it generates are hot, so car occupants may suffer minor burns.



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THE EFFECTIVENESS OF AIRBAGS

When airbags were first introduced in the United Kingdom and Europe, the only research on their effectiveness came from the United States of America. These studies looked at the bigger airbags used in America which were designed to protect a driver not wearing a seat belt. (American seatbelt wearing rates were lower than British ones, but are now catching up.) These airbags inflate very fast and have caused some fatalities. The National Highway Traffic Administration in the United States estimates that of 4,000 car occupants saved by airbags another 60 would still have been alive if the devices had not been fitted to the vehicles they were travelling in.

Airbags are now much more common in European vehicles and research on their effectiveness is now available. However a lot of this research is aimed at the development of smart airbags and is looking at cases where injury has taken place. These studies indicate that there may be a correlation between height, weight and driver injuries from airbags. Shorter (under 160cms) and lighter (under 55kgs) drivers who sit closer to the steering wheel suffer more injuries from airbags.

In a review of "Driver Airbag Deployments in Europe and Japan to date", Andrew P Morris et al found that there was some evidence to suggest that unrestrained drivers in frontal impacts are more likely to sustain greater severity of injuries from an air bag. However this must be seen in relation to the severity of injuries that would be sustained by an unbelted driver in a vehicle without an airbag. It reinforces the need to use airbags with seatbelts.

THINGS TO BE AWARE OF WITH AIRBAGS

Rearward Facing Child Seats

A rearward-facing child seat **MUST NOT** be used on the front passenger seat if a passenger-side airbag is fitted, because the child seat projects into the airbag deployment zone. If the airbag is triggered, it will hit the child seat and accelerate both it and the child towards the rear of the vehicle.

Forward Facing Child Seats

There is some indication that even with forward-facing child seats, airbags could impinge on the restrained child, if the car seat is positioned too far forwards or the child seat is not securely fitted.

To prevent this, fit them securely, outside the deployment zone of the airbag. Either fit them in the back of the car if this means that they are clear of any side impact bags, or if it must be fitted in the front, ensure that the car seat is as far back as possible, and stays there, and that this takes the child and seat out of the deployment zone. The car manufacturer will be able provide information on the extent of the deployment zone.



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Pregnant Women

Concerns have been expressed regarding the potential harm airbags may cause to unborn children. An eight-month pregnant woman in the USA reportedly lost her unborn child when an airbag deployed whilst she was in the front passenger seat although she only suffered bruising herself. There has been no similar cases reported in Britain, however as a precaution, pregnant women should have the car seat positioned as far back as possible, to take them out of the deployment zone.

Driver positioning

Airbags are designed to operate with drivers and passengers in the optimum position. If drivers are not, they can be injured when the bag fires.

Nothing should impede the deployment of the air bag. If the occupant's arm gets in the way then injury can occur. Drivers should ensure that they use the "ten to two" or the "quarter to three" position of their hands on the wheel because if they have their arm across the wheel when the airbag fires, the force of the airbag is likely to break the limb.

Hearing Loss

This is another issue, which has been raised around airbags, that hearing loss may occur as a result of air bag inflation in low speed crashes. Donald F Huelke in his study "Hearing Loss and Automobile Airbag Deployments", concluded that this is an infrequent occurrence. However with more airbags in smaller cars, the occurrence may become more common with trauma being caused both by the increased pressure within the vehicle and the noise of the airbag firing. This is an issue which will require further investigation as more data becomes available.

Shorter lighter drivers

As has been stated, the research shows that shorter lighter drivers under 55 kgms and 160 cms are at greater risk of being hurt by their airbag. Smaller drivers will normally move their seat closer to the steering wheel and control pedals, and hence, closer to the airbag deployment zone. Therefore, it is possible that they would be hit by the airbag while it is inflating. Other factors that may increase the risk are pre-collision braking, slack seat belts and/or seat belt stretch. Shorter, lighter drivers should therefore ensure their seatbelt is in good condition and that it is holding them firmly in position and that their seating position takes them out of the deployment zone for the airbag.

Drivers with disabilities

TRL carried out research for the then DETR to investigate the effects of airbags on steering devices for disabled drivers attached to the rim of the wheel of a car, because worries had been expressed that such devices could cause injury when the airbag fired. The adaptations tested, "a steering spinner", "a steering spinner with infra red unit and a "tetraplegic grip" allowed the airbag to inflate fully without damage to either the device or the user. However steering devices with a fixing bar which crosses the centre of the steering wheel should not be used with an airbag. (For further information, please see MAVIS Fact Sheet 05.) If a driver's stature or



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disability requires them to sit within the deployment zone or they need to place their arm across the wheel to steer, then the use of an airbag may be contra indicated.

A number of motor manufacturers are developing 'smart' airbag systems, which, can detect seat and driver position and alter the performance of the airbag accordingly. Some have already begun to install 'restricted' smart airbags, which only inflate if sensors indicate that a person is sitting in the seat. These developments will hopefully resolve some of the current problems associated with airbags.

CONCLUSION

Airbags are an effective secondary safety measure that reduces the risk of injury for vehicle occupants, in more severe collisions. RoSPA supports the fitment of airbags in vehicles if they are used in conjunction with - but not in place of - seat belts.

However, a number of problems with airbags have been identified, although many of these relate to American airbags. UK car users can avoid such problems by the following steps:

- Seat belts should always be worn properly, and should be adjusted so as to be as tight as possible across the body. Drivers and front seat passengers should ensure that as far as possible they are sitting squarely in their seat
- Rearward-facing child seats **MUST NOT** be placed on the front passenger seat if a passenger airbag is fitted.
- If a rearward-facing child seat must be used, the passenger airbag must be disengaged first. (This should only be done by a main distributor, or qualified vehicle engineer. Check whether it voids the vehicle warranty or affects the driver's insurance policy).
- A forward facing child seat should only be used in the front seat if it can be positioned so the child is out with the deployment zone of the airbag.
- The driver's seat should be positioned as far back as possible while ensuring that the driver can safely and comfortably operate all of the vehicle's controls.
- Drivers should always use the ten-to-two or quarter-to-three hand position on the wheel, when driving. If the airbag fires with their arm across the wheel, the impact will break the arm.
- Disabled drivers who need to sit within the deployment zone of the airbag or who need to drive with their arm across the steering wheel, may be unsafe with an airbag.
- Airbags should be replaced if they deploy and most manufacturers recommend replacement of unused airbags after 10 years. Check manufacturers guidance.



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- Clear guidance from manufacturers, vehicle dealerships and garages should be available, and where the use of an airbag is contra indicated for safety reasons it should be easier to have them disabled.

REFERENCES

Parenteau,CS, Shah M, Desai T, and Frampton R, US and UK Belted Driver Injuries with and without Airbag Deployments – A Field Data Analysis 1999 Society of Automotive Engineers, Inc.

Lau I V, Horsch J D, Viano D C, Andrzejak D V. Mechanism of Injury from Air Bag Deployment Loads. Accident Analysis and prevention Vol25 No1 pp29-45 1993

Morris A P, Thomas P Brett M. Foret-Bruno J-Y, Thomas C, Otte D and Ono K. “A Review of Driver Airbag deployments in Europe and Japan to Date”, National Highway Traffic Safety Administration, 15th International Conference on the Enhanced Safety Vehicles Congress, Melbourne Australia, May 1996, 122-131. ISBN DOT HS 808 465

Buckley G, Setchfield N and Frampton R Two case reports of possible noise trauma after inflation of air bags in low speed crashes. British Medical Journal 1999, no 318 pp499-500

Barry S, Ginpil S, O'Neill TJ, The Effectiveness of Air Bags Accident Analysis and Prevention 31 (1999) pp781-787

Huelke DF, Moore JL, Compton TW, Rouhana SW, Kileny PR Hearing Loss and automobile airbag deployment Accident Analysis and Prevention 31 (1999) PP789-792