



# FACT SHEET

## Module 4.1

## Air Bags and Collisions

### How do airbags prevent automobile injuries?

Moving objects have **momentum**. (Momentum is the product of the mass and the velocity of an object.) Newton's First Law of Motion says that unless an outside **force** (Force is a push or pull which causes acceleration, or a change in the shape of an object, or a reaction. A force is measured by the change in momentum produced in one second. A force cannot be seen, only its effects can be seen.) acts on an object, the object will continue to move at its present speed and direction.

Automobiles consist of several objects, including the vehicle itself, the passengers inside and any other loose objects in the vehicle. Unless the objects inside the car are restrained they will continue moving at whatever speed the car is traveling even if the car is stopped by a crash.

Changing or stopping an object's momentum requires a force acting over a period of time. If momentum changes instantly, as in a car crash, the force is very, very great! If the momentum can be changed over a period of time, even a fraction of a second, much less force needs to be applied with less damage or injury.

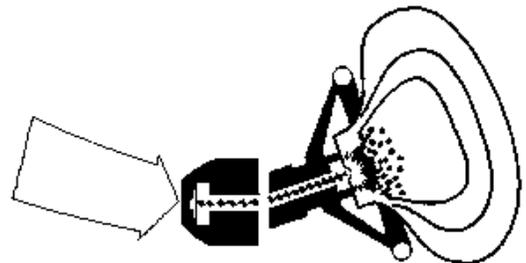
In a head-on collision, if a passenger flies into the dashboard of a car, their momentum is instantly stopped, and serious injury is often the result. If the passenger is restrained by a seatbelt, their momentum is reduced more gradually by the constant and smaller force of the belt acting over a longer period of time. Seatbelts can reduce the impact of a passenger to one-fifth of the impact suffered by the body of the car.

Passive restraint laws, combined with an interest in air bags have made vehicle safety a selling feature on automobiles. An air bag is made of a coated fabric and is stored in a module mounted on the steering wheel. Crash sensors, which activate upon impact at speeds of 10-15 miles per hour, are mounted in several locations on the car chassis.

In a crash, the sensors ignite a chemical, sodium azide, which releases harmless nitrogen gas to instantly inflate the bag. As the driver or passenger is thrown into the bag, it applies a restraining force. Even though this entire process happens in only 1/25th of a second, the added time is enough to prevent serious injury.

Air bags are not intended to replace seat belts. They are part of a supplemental restraint system. Seat belts are still necessary because air bags only work in front-end collisions of more than 10 miles per hour. Only a seat belt can help in side impacts, rear-end collisions, side swipes and secondary impacts.

Do you always buckle your seat belt when you are in the car?  
Would you want to have air bags in your car?



#### Resources

Keller, Maryann N. "Better Safe Than Sorry." Motor Trend, January 1990, p 122.  
Knepper, Mike. "Proper Restraint." Home Mechanix, September 1989, pp. 72-77.  
Spencer, Peter L. "The Trouble With Air Bags." Consumers' Research, January, 1991, pp. 10-13.