

Explore Applications of Momentum Group Activity

Working together in groups of 3-4, read the following prompt. Afterwards, research the topic given and write a one page report. Make sure your report answers all the questions provided at the end of the prompt. Once your report is done, present it to the class. You may choose a representative or present as a group.

Staying Safe at Every Speed

According to Transport Canada, almost 3000 people per year die in traffic accidents in Canada. This number is high but only half the rate of traffic fatalities that occurred in the 1970s. Many factors have cut the number of fatalities, but advances in vehicle safety devices have played a huge role. In fact, Transport Canada reports that seat belts save 1000 Canadians lives every year.

Motor vehicle safety devices either help prevent accidents or help protect us in an accident. Anti-lock brakes give the driver more control over the vehicle when stopping suddenly, helping to avoid surprises in the road. Active head restraints cushion a passenger's head in a rear-end collision, avoiding damage to the neck (**Figure 1**).



Figure 1 Active head restraints protect a passenger's head and neck during low-impact rear-end collisions.

Scientists and engineers design safety devices by analyzing the transfer of energy and momentum in collisions. Years of collision data provide information on how long it takes to stop a car and how much force a human body can tolerate. We know more about how the parts of a vehicle will bend or break during a collision, and how a passenger's body will respond. Armed with data, technicians can try to improve devices and build new ones to efficiently and safely absorb energy and momentum.

Seat belts, for instance, work by holding the passenger to the seat. This simple action means that the passenger will slow down with the car, reducing the chance of injury. Active head restraints work by narrowing the space between the passenger's head and the headrest, reducing the chance of whiplash, and injury caused by jerking the neck back quickly.

The Application

Transport Canada requires motor vehicles to have seat belts. Vehicle makers add many other devices as standard features, such as airbags. Other devices are only optional, such as electronic stability control. Drivers can choose to have these features installed at an additional cost.

Although we would always like to drive the safest car possible, sometimes the cost of a device does not seem worth paying for. Consumers have to make careful decisions on safety when purchasing a new car or an old car without modern devices. Understanding more about how safety devices work and how they keep us safe can help us make a good decision.

Research

Suppose that a family friend plans to buy a new car. Choose one motor vehicle safety device (other than seat belts). Prepare a presentation to help your friend decide whether to have this device installed in the new car. Conduct library or Internet research to learn about your chosen safety device. Be sure to investigate the following:

- how the device works
- how the device applies the concepts of energy and momentum to help prevent a collision or too protect you in a collision
- the cost of installing the device
- statistics or estimates of accidents prevented or lives saved by the device
- limitations or problems with the device
- continuing research to improve the device

Summarize

Summarize your research:

- How does the device keep you safe?
- What technology does the device use?
- How does the device use principles of energy and momentum?
- What research is being undertaken to improve the device?

Communicate

Prepare a presentation of your findings to your classmates. You may choose a representative or present as a group.