Task 11 – Forces and Vehicle Safety

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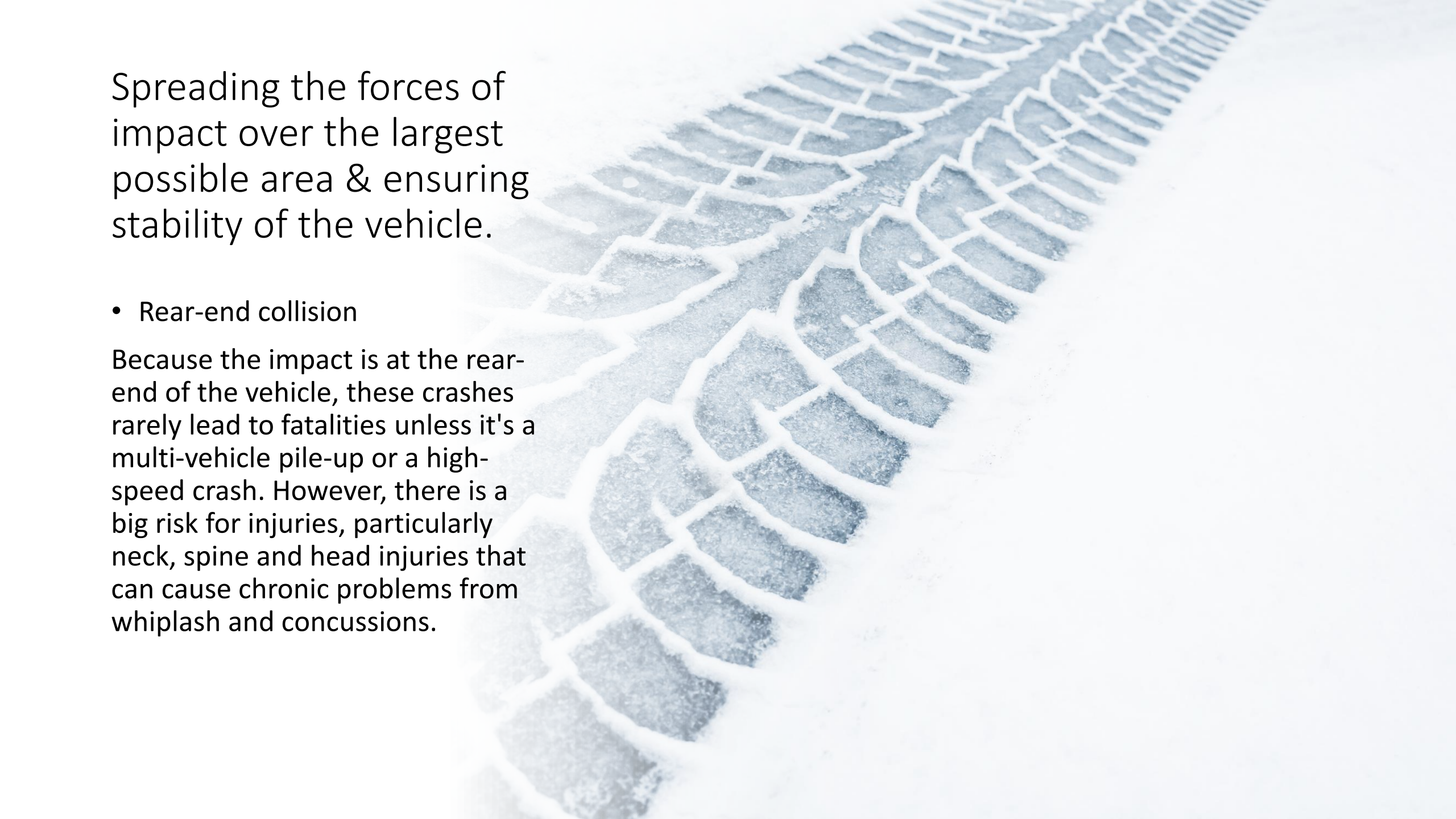
Stopping distance/crumple zones

- Stopping distance can minimise personal injury as even if you keep a safe stopping distance, without functioning brakes, there's no guarantee you'll be able to avoid a collision if something unexpected happens on the road. Your braking distance is the distance it takes for your car to come to a complete stop from when the brake is first applied.
- Crumple zones, crush zones, or crash zones are a structural safety feature used in vehicles, mainly in automobiles, to increase the time over which a change in velocity occurs from the impact during a collision by a controlled deformation; in recent years, it is also incorporated into trains and railcars.
- Centre gravity: The centre of gravity which is also known as the centre of mass is a theoretical focal point of the vehicle where all its components, weight and forces act effectively. In simpler words, it is the point where all the weight of the vehicle resides.

Spreading the forces of impact over the largest possible area & ensuring stability of the vehicle.

- Rear-end collision

Because the impact is at the rear-end of the vehicle, these crashes rarely lead to fatalities unless it's a multi-vehicle pile-up or a high-speed crash. However, there is a big risk for injuries, particularly neck, spine and head injuries that can cause chronic problems from whiplash and concussions.



Minimizing contact of the person with the interior of the vehicle

Tips for reducing the risk of an accident

1.Reduce distractions. Distracted driving is one the many possible causes of an accident, contributing to 21% of fatal collisions every year. ...
2.Respect the rules of the road. ...
3.Practice safe driving habits.

How cars are designed to minimise impacts

Also known as a crush zone, **crumple zones** are areas of a vehicle that are designed to deform and crumple in a collision. This absorbs some of the energy of the impact, preventing it from being transmitted to the occupants.

Keeping the person inside the vehicle – inertia

- The object that remains at rest is the car, at a constant speed and in a straight line, the unbalanced force being the seatbelt that forces the person back, and from breaking through the windshield. Things used to keep the person in the vehicle:
- Seatbelts
- Airbags
- Breaker

Honda Civic – describe safety features

- Blind-spot monitoring that indicates when vehicles pass on the right or left of your sedan, as well as auto high beam headlights and cross-traffic monitors.
- Airbags. Front airbags have been standard on all new cars since 1998 and light trucks since 1999
- Antilock brakes (ABS)
- Traction control
- Electronic stability control
- Safety-belt features
- Newer safety features - accident-avoidance systems
- Tire-pressure monitors
- Telematics

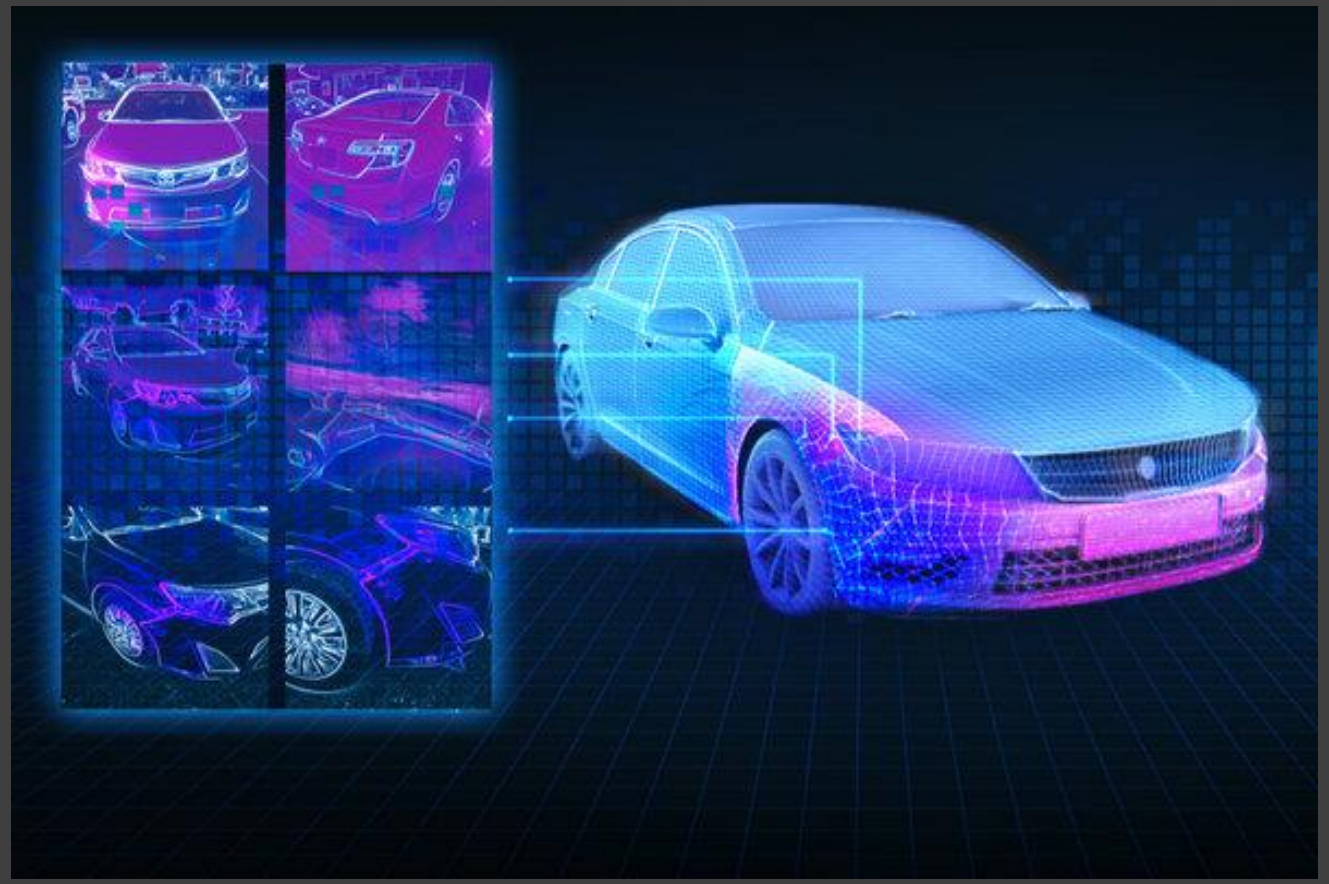
Each safety feature explained

- Crumple zones:
- A crumple zone helps to redistribute the force of an impact on a vehicle. This is achieved by crafting the front and rear of the vehicle from a material that is designed to bend or collapse into itself upon impact.
- In a crash, crumple zones help transfer some of the car's kinetic energy into controlled deformation, or crumpling, at impact. This may create more vehicle damage, but the severity of personal injury likely will be reduced.
- lowered suspension lets your car sit closer to the ground and increases stability through turns or during emergency manoeuvres. More aerodynamic. With the car sitting lower, there's less air going underneath, which can reduce the amount of drag imposed on the vehicle. Improved handling.
- The seatbelt acts as the unbalanced force on the driver, stopping his speed and direction. Seat belts are designed to stop when there is a jerk and it absorbs your energy, since all moving objects have energy.

Cadillac Coupe DeVille 1956- describe the unsafe safety features

- Unsafe features: seat belts were not standardly installed.
- No temperature sensor
- Some vehicle makers do not recommend
  refinishing sensors with minor finish damage

Lack of Safety Features



- Seat belts protect the occupant from flying through the windshield when a car crash occurs
- Crumple zones spread the impact of the crash so that less energy is transferred to the driver
- Airbags activate when they sense and prevent the driver/passenger to stop them from hitting the interior of the car

Summarise the role safety in a car design

- Safety features such as **seatbelts, airbags and crumple zones** are now used in modern cars. Crumple zones change the shape of the car, which increases the time taken for the collision. These crumple zones are areas of a car that are designed to deform or crumple on impact.

- Vehicle safety features can significantly improve safety and are becoming more widely available. Technologies like autonomous emergency braking (AEB), blind-spot monitoring and lane-support systems can reduce the risk of a crash. Side curtain airbags can reduce the severity of an injury if a crash cannot be avoided.

Suggest improvements using principles of physics

- Better seat belt design and strength. It would improve the impact by decreasing injuries in a car collision, stopping the inertia and/or the person from flying out of the windshield by securing them to the car seat better.