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NRSP Thought Leadership: High Occupancy Vehicle Safety

This Thought Leadership article aims to raise awareness of the dangers of increased crash risk in High Occupancy Vehicles (HOVs) and the potential for injury or fatality in the event of a HOVs crash. This document provides a definition of high occupancy vehicles, injury statistics, rollover risk, and safety technologies available along with strategies to prevent rollovers and ensure safer HOV activities.

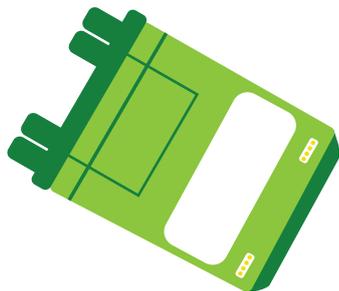
Road fatalities in Australia

HOV passengers are more than three times as likely to die in a rollover event than those of ordinary passenger cars.

3 X



22%



What is a High Occupancy Vehicle?

A High Occupancy Vehicle (HOV) is an on-road vehicle which carries 9 to approx. 25/30 passengers and is below heavy vehicle classification of 4.5 tonnes.

Why are HOVs a problem?

- Rollover crashes are more likely in HOVs
- HOVs tend to be older
- HOVs tend to have less safety technologies
- HOVs are commonly used in remote areas
- HOV occupants have a higher likelihood of severe injury in the event of a crash

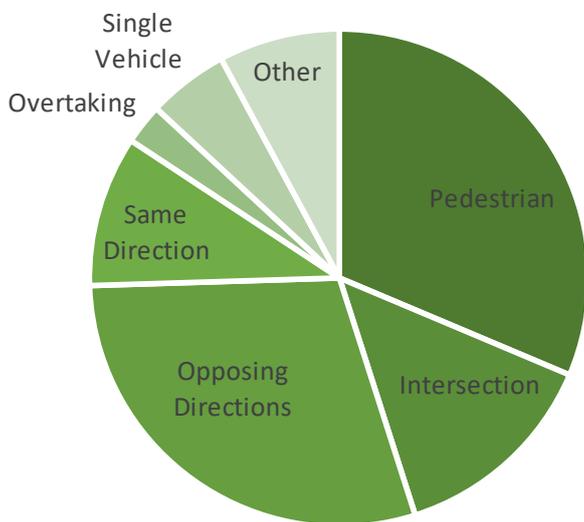


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Crash Risk

Almost all road crashes are caused by, or involve, human error.

The following graph shows the most common crash events for fatal HOV crashes in Australia.



Pedestrian

The most common event for fatal HOV crashes involve pedestrians. Most of the pedestrian crashes involve a pedestrian stepping off the kerb and being struck by the front of the HOV.

Rollover Events

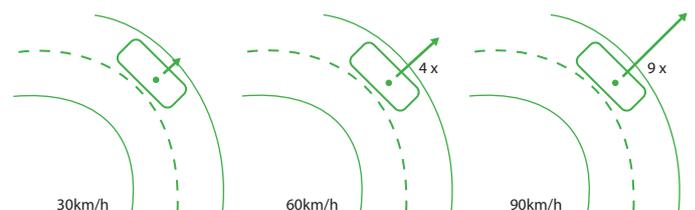
In the event of a crash, HOV's have a high propensity to result in a rollover, however, this rate triples as the number of occupants in the vehicle increase.

Speed

- Excessive speeds have a dramatic effect on the stability and controllability of a HOV (Main Roads Western Australia, 2014).
- HOVs roll at speeds as low as 50 km/hr, and the risk of rollover doubles by the time the vehicle has reached 80 km/hr (Subramarine, 2004)

Speed and Corners

The higher the speed of the HOV, and the tighter the turn it is trying to make, the more likely the driver is to lose control of the vehicle and for a vehicle rollover to occur. As can be seen in the diagram, the overturning force of the HOV increases as speed increase.



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Improper Loading or Overloading

- Improper loading, or overloading, of HOVs causes the centre of gravity to shift rearward and upward increasing the likelihood of 'fishtailing' and roll over.

Tips for Preventing Roll Over Crashes in HOV's

The driver of a HOV has a difficult task of coping with varying sizes of loads (in both weight and dimensions), causing changes in the centre of gravity of the vehicle. Therefore, drivers need to be aware of exactly where passengers are seated in a HOV in the vehicle, to ensure it is balanced.

According to Main Roads Western Australia to reduce the risk of rollover a driver should:

- Understanding the dynamics of the HOV and what the causes of a rollover are;
- Use the correct driving techniques to manage the forces at work;
- Ensure the vehicle speed is appropriate for driving conditions (e.g. wet roads);
- Consider the effects of road condition (e.g. unsealed roads);
- Become familiar with the effects of speed, weight, and cornering dynamics through driver train

Safety Technologies

Lack of Occupant Safety Features

All HOV should be fitted with a seatbelt for each occupant. Occupants of a HOV should wear their seatbelts at all times (OGP, 2014).



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Emerging Technologies

Antilock Braking Systems	Antilock Braking Systems (ABS) prevent the wheels of a vehicle locking as brake pedal pressure is applied - often suddenly in an emergency or short stopping distance.
Curtain Airbags –Rollover occupant protection system	Rollover occupant protection systems detect a rollover and deploy systems such as curtain airbags, which are designed to stay inflated longer than frontal airbags.
Retractable 3-point seatbelts & seatbelt interlock systems	Three point seat belts incorporate both a lap and sash belt in a unitised configuration. Three-point seat belts provide superior protection compared to two-point lap seat belts, spreading the load over the chest, pelvis and shoulders. Seat belt interlocks require the driver to put on their seat belt before the vehicle can be driven.
Lane Support Systems	LSS recognise lane markings and alert the driver through either an audible or visual warning or vibration of the steering wheel if the vehicle is leaving the lane without indicating. Active systems may automatically steer the vehicle back within the lane if the driver fails to do so.
Fatigue Detection & Reminders	Attention assist systems use sensors to monitor driver attention and detect drowsiness, alerting the driver and prompting a break. A fatigue reminder system monitors the length of continuous driving (trip timer) and encourages the driver to take a rest through visual alert messages which are displayed for the driver.
Roll Stability System	Roll stability systems are an advanced form of electronic stability control that are capable of detecting a potential rollover and initiating corrective action to stabilise the vehicle.
Rollover Warning System	Rollover warning systems monitor vehicle dynamics and detect, then alert the driver, of an increased risk of rollover.
Alcohol / Drug Ignition Interlock	Alcohol/drug ignition interlock systems require the driver to 'pass' a breath (alcohol) test in order for the vehicle to be driven.
Trailer Stability Control	Trailer stability control systems recognise the early stages of dangerous trailer sway and apply the vehicle's brakes to stabilise the trailer.
Smart Key	A smart key can be programmed to place operating restrictions on a vehicle, such as time of day, or maximum speed.
Tyre Pressure Monitoring System	TPM systems use sensors and alarms to alert the driver when tyre pressure drops below a designated pressure (25% under-inflated).
Top Speed Limiter	A top speed limiter results in a vehicle not being able to travel above a set speed for an extended time. A speed alarm alerts the driver when the vehicle exceeds a (pre-set) speed.
Pre-Crash Systems	Pre-crash systems detect that a collision will occur and take action preparing the vehicle and the occupants for the impact. Some examples are reducing slack in seat belts, adjusting seating positions, and shutting windows.
Autonomous Emergency Braking	AEB systems use ESC and sensor technology to detect the speed and distance of objects in the vehicle's path and automatically brake if the driver does not respond in order to avoid or minimise the severity of an accident.

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Tips for HOV Crash Risk Management

The ROSPA (2015) outline that operators should do the following to ensure their drivers are operating HOV safely.

Understanding the dynamics of the HOV and what the causes of a rollover are;

- o Ensure drivers have the appropriate driver's licence to drive the minibus
- o Ensure drivers undergo initial and periodic assessments of ability to drive a HOV
- o Ensure drivers undergo a re-assessment if they are involved in an at fault collision, if they receive a fixed penalty or if a concern about their driving is raised
- o Ensure all drivers receive practical driver training under the conditions in which they are likely to drive
- o Ensure all drivers understand their responsibilities
- o Ensure drivers have a clean driving record (at the discretion of the Operator)
- o Ensure all drivers are medically fit to drive
- o Ensure drivers are well rested before they drive and ensure they take rest breaks (about every two hours) on long journeys

- o Ensure drivers are accompanied by a second driver, who is also fully qualified and meets the same conditions as the first driver, where necessary
- o Ensure drivers are accompanied by a passenger assistant where passenger's needs require it
- o Ensure drivers always carry a suitable form of identification (e.g. driving licence)

References

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