It’s been a long road, but we are on the cusp of a vehicle and safety revolution

For as long as we have had transport, governments have taken action to increase safety and reduce accidents. The Auckland City Traffic Department employed its first traffic officer in 1894 to manage the traffic of horse-drawn carriages in the city. The work of traffic officers soon extended to the horseless carriage – the car. Nicholas Oates, the first person to import a car into the South Island, received a fine in Christchurch in 1901 for driving at the excessive speed of 6.5km/h and frightening horses.

As the reliability of early automobiles increased and their cost went down, they quickly became a safer and more popular alternative than the horse-drawn carriage. However, increased affordability and use of motor vehicles (post World War II) saw annual road deaths in New Zealand rise until they reached a peak of 843 in 1973.

In response to the unacceptably high number of deaths, the government has invested in education campaigns, better-quality roads, improving the regulation of vehicle safety features, and regulating driver behaviour. Warrants of fitness, road policing, speeding tickets, campaigns to stop drink driving, and a focus on actions to avoid deaths and serious injuries are all things that we associate with road safety today.

Safety innovations have played a huge part in improving vehicle safety and saving lives. Manufacturers have developed technologies, and governments play a role in accelerating their uptake. For example, since 1965 all new vehicles in New Zealand have had to be fitted with seatbelts. Since 1972, wearing them has been compulsory. Buckling up is almost second nature today. Vehicle safety has become such an integral part of our society nowadays that new vehicles are marketed on the basis of safety features that come ‘as standard’.

Since the late 1980s, road deaths have decreased, even as the number of cars on the road has increased. In 2011, there were 284 road deaths – the first time the road toll had fallen below 300 since 1952. Improving road safety further will continue to be a key objective for governments.
In the future, we envisage that developments in vehicle and other technologies will bring a step change in road safety. We are on the cusp of a revolution that will bring far greater road safety benefits than seatbelts and airbags combined. Autonomous (or driverless) vehicles will take the driver – the single most significant risk factor for the last century – out of the safety equation. We envisage that annual road deaths will drop from 300 to 30 as a consequence. There will still be transport safety issues, but they will be very different from those that occupy the headlines and halls of Parliament today.

**Is road safety still an issue when driverless cars are the new norm?**

In the future, New Zealanders will readily adopt new technology and the passenger fleet will almost entirely be composed of autonomous vehicles. These vehicles will be ‘connected’ to all other vehicles on the road and the number of collisions will plummet dramatically, even while technology enables them to drive closer together. We won’t need traffic signals or lights in the future! Vehicles will manage intersections directly and will determine the optimum speed to keep traffic moving in all directions. They will follow the rules of the road and have real-time information on road conditions. They won’t get tired or distracted. The human factor in accidents will be reduced to nearly zero and there will be far fewer accidents as a result.

There will still be some risk on our roads from vehicles that are not autonomous, such as bicycles. While it is impossible to completely eliminate this risk, autonomous vehicles will anticipate and quickly react to the unexpected behaviour of such vehicles and their human riders.

Many of the mechanical features in cars that are designed to mitigate harm in crashes will drop away because crashes will be so rare that the benefits won’t warrant the burden. On the other hand, the computing power vehicles rely on to analyse and react to vast quantities of data will increase. The ‘brain power’ of vehicles will go from that of hamsters to humans as they become increasingly computerised and automated (see the Future of Data and Intelligence in Transport).

**Letting the vehicle do the work**

After a period of transition where autonomous, semi-autonomous and ‘self-drive’ cars will share the road, driving yourself will be completely banned from all public roads. There will be very few exceptions to the rule.

Most people will be happy to hand over the wheel, especially as access and mobility increases. For example, autonomous technology will provide greater access to people with disabilities, youth, the elderly, and the vision-impaired. New Zealand will also be able to accommodate increasing numbers of international tourists without any increase in safety risk.
For everyday trips, people will enjoy having extra time to relax and let their vehicle do the work. Transport won't just be a means to an end (the destination), instead it will be a leisure activity in its own right.

The concept of driving yourself will be a foreign one to young people. They will listen in awe as their grandparents talk about getting their driver's licence or buying their first car.

On the outskirts of some cities and in rural areas, driving tracks will offer the 'self-drive' experience for people desperate for a taste of 20th century life. To drive, participants have to wear a crash helmet and sign a waiver. For novice drivers, the vehicles will be programmed to detect and respond to human error. Those who pass a rigorous driving test will be allowed the ultimate thrill experience of driving cars without any assisting technology.

**Safer vehicles are almost impossible to crash**

In the future, where autonomous vehicles are ubiquitous, accidents will only occur when a car has to swerve to avoid harming someone. If a vehicle has to swerve suddenly to avoid hitting a pedestrian or a cyclist, its occupants might sustain whiplash or some other minor injury but not crash. However, on a busy street this swerving vehicle could cause a chain reaction from one vehicle to the next. The laws of physics dictate that the swerving cars will have to go somewhere. In a constrained space, a crash will still occur.

Manufacturers will program autonomous vehicles so that they can respond to these situations. Society will have a say in what or who the vehicle should avoid first to minimise harm and increase the likelihood of the best possible safety outcome.

To lessen the impact of these rare crashes, we envision improvements to the materials and design of vehicles and roadsides. All vehicles will be equipped with an outer ring of material that will crumple on impact, absorbing the energy from the impact and minimising harm to the vehicles' occupants. We will replace all concrete and wooden streetlights with new materials that flex on impact. Where possible, we will move off-road infrastructure away from potential collision zones.

**Safer vehicles and safer cities**

In the future, there will be a huge expansion in walking and cycling. Large areas of city centres will be set aside for walking and cycling only. Underground public transport will service these areas, providing additional transport options.

In these areas, and where possible throughout cities, there will be dedicated, segregated paths to minimise crashes between pedestrians and cyclists. Cyclists, joggers and walkers will no longer need to worry about visibility because connected cars, trucks and buses will no longer have blind spots.
Where vehicles are allowed in urban environments, speeds will be lower. As a result, in the instances where pedestrians are hit, fatalities will be extremely rare. A swerving car will send an alert to the system. Depending on the severity of the crash, an ambulance will respond. Alerts will happen in real-time, and response times will fall as connected vehicle technologies clear the roads immediately.

**New skills to enforce safety and security**

In the future, enforcement will focus on regulating the programming of vehicles and ensuring the security of the transport system.

Government will increase its capability to regulate software developers and manufacturers to ensure the ‘drivers’ of the future – autonomous vehicles – are capable and law-abiding.

Road police will be far less visible as the need for a physical on-road presence declines. In fact, the term ‘front line’ won’t really be relevant as the skills required of road police will move from working with people to working with technology. They will rely on the speed of the processors they use, not the speed of their vehicles.

Today, vehicles have to pass a regular Warrant of Fitness to ensure the performance and safety of the fleet. The mechanics of the future will have skills in computer science and software engineering. Their primary role will be to assess and maintain increasingly computerised vehicle systems.

Connected and increasingly computerised vehicles and transport infrastructure will pose new security concerns. Current safety resources spent on education campaigns and road policing will shift to the development of software to monitor the transport system, and security systems and protocols in the event of system failures, hackers or attacks (see the Future of Data and Intelligence in Transport).

**‘Ride social’ has replaced ‘drive social’**

Car ownership today is incredibly inefficient. People pay for the upfront cost and maintenance of their car and then it sits in the garage or parked on the street for the majority of the day.

In the future, individual ownership of vehicles will be rare and ride-sharing will grow in popularity (see a Low-Carbon Transport Future). There will be a renewed focus on the safety of occupants in shared vehicles.

Similar to today’s ‘drive social’ campaign, the public safety agency will have a ‘ride social’ campaign to encourage friendly and safe behaviour in shared vehicles. We will put safety measures in place to protect the most vulnerable users. Because of the huge benefits of the system, ride-sharing will fast become a popular and safe way to get around.
All ride-share vehicles will have a direct line to 111 for emergencies. They will also be equipped with an emergency exit button so that passengers can easily stop the vehicle and remove themselves from a dangerous situation.

To protect vulnerable segments of the population, a portion of ride-sharing vehicles will not be open for public use – similar to school buses today. Some ride-sharing vehicles, like Kindercar for young children, will have attendants to provide their passengers with additional security.

**This story is one vision for the future**

From seatbelts to advertising to road policing, road safety is something that affects all of us. For the hundreds of people who die on our roads every year, we are compelled to find a way of making our roads safer in the future.

We want you to challenge these perceptions and ideas. This vision is not presented as the views of industry or government policy. It is the Ministry of Transport’s intention to stimulate wider debate and generate ideas on the possible future of New Zealand’s transport system.

So let us know your vision for the future of road safety. Challenge our assumptions and raise questions and opportunities for future work.

Find out more about transport futures at www.transport.govt.nz/futures

This vision is not presented as the views of industry or government policy. It is the Ministry of Transport’s intention to stimulate wider debate and generate ideas on the possible future of New Zealand’s transport system.