



# A tragic lack of restraint

## All seatbelts are not created equal

**T**here are two collisions in every accident. The first is when the car collides with something or rolls over. The second is when the vehicle stops but the people keep flying, then often collide with the vehicle itself, or with the road outside.

You can soften the collision with an airbag or you can restrict the collision with a seatbelt. Those are your two main options when it comes to surviving accidents.

Most cars don't have airbags; the best way we can lessen the second collision is by wearing a good quality seatbelt.

The government has been saying this for years. The idea is sound; the accident survival rates of people who wear seatbelts are much better than those who don't.

Yet the seatbelts themselves vary alarmingly in quality. There are fabulous safety features available on modern cars. The problem is simple and obvious; most Kiwis and Australians never buy new cars. Most new cars are bought as company vehicles and few are fitted with the safety features so glowingly described in the glossy brochures, for the simple reason that it's cheaper to leave them out.

Australasia's vehicle fleet is old by world standards, and the cars in the fleet are awash with poor qual-



At just 56km/h, the seatbelts on this 1994-97 Ford Festiva stretched enough to allow the dummy's head to smash the steering wheel. Scientists concluded that a real human would have had an 82% chance of receiving life-threatening injuries.

ity seatbelts that could be easily and cheaply replaced with something much better.\*

Open the door of an older Volkswagen Kombi and you'll likely see twenty-year-old diagonal-only seatbelts which are close to useless. Open up the door of a late model car, – including some recent models – and you may be looking at seatbelts which have been proven to be largely ineffective in a serious accident.

Take the crashtests on the 1993 Holden VP Commodore, for example. Largely due to seatbelt failure,

crash scientists concluded that one occupant faced near certain death in an accident at 56 km/h into a solid object.

We spoke to Chris Coxon, the scientist who supervised the Commodore tests. Coxon confirmed that the safety of the VP could be dramatically improved by simply retrofitting it with the seatbelts from Holden's replacement Commodore model, the VR.

The incredible thing is, this retrofitting of the improved belts rarely happened. Despite our efforts to

\* They were not necessarily substandard when they were first produced – they met the regulations and standards of the time. It's just that the technology for testing seatbelts has improved dramatically over the last decade, and, therefore, so have the seatbelts. Also, as we have outlined elsewhere, seatbelts don't last forever. Many are simply worn out.



## Seatbelts

publicise crashtest results, there are still thousands of VP Commodore owners driving around ignorant of the fact that their vehicle is a death trap in certain situations. Those who are aware of the crashtest results are largely unaware that the car can be made much safer simply by upgrading the seatbelts.

The obvious thing for Holden to do would be to urgently recall the vehicles and retrofit them with the improved seatbelts. Holden has never done so and has no intention of doing so.

It wasn't just the Holden. The 1993 Ford Laser was the same, as is the 1997 Kia Sportage. All are vehicles with a shocking crashtest record, yet they, along with many other makes and models of cars, could be made substantially safer simply by changing the seatbelts.

A vehicle should not have to fail a crashtest in order to get decent seatbelts. The same type of belts that failed in the Commodore are fitted to thousands of Australasian cars. Yours may be one of them.\*

In the past, it was assumed that seatbelts worked if fitted. However, tests over the last five years have shown beyond reasonable doubt that the seatbelts of several popular cars would stretch enough to cause almost certain death in certain types of accidents.



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**Crashtests showed that the seatbelts of several popular cars would stretch enough to cause almost certain death in certain types of accidents**

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Even more scary: the seatbelts used in those crash-tested cars were some of the better belts around. The older-style belts on some cars are almost as bad as no seatbelt at all.

Till recently, at least, Australasians have always tended to own older cars. That's a fact of life. These vehicles can't all be retrofitted with crumple zones or side airbags but they *can* be retrofitted with very good quality seatbelts. The screwy thing is, good seatbelts aren't even that expensive.

Lets summarise the types of seatbelts you'll find in Australasian cars, and the belts that do & don't work as they should.

1) **Diagonal only.** This sort of seatbelt dates from the 1960s. It straps across the wearer, and has a simple adjustment, which by now will be difficult or impossible to use. Even if adjusted properly, this type of seatbelt is almost useless in an accident, because the wearer will simply slide out from underneath it. As with any belt over ten years old, it is also possibly seriously weakened by sun damage & aging (see below).

2) **Lap belts.** Most of these belts are fitted in the back seats of cars, particularly in the middle. They are better than nothing, but by no means as safe as an adjustable lap and diagonal. Although a lap belt stops a person flying through the car, the wearer's body tends to swing around without restraint in an accident, and

\* Although the attitudes are changing, traditionally, Australasian transport departments appear to have been fixated with standards rather than safety, and seatbelts are a good example of this. All new seatbelts have to be made to an Australian & New Zealand safety standard, which includes testing several samples of each type of belt. However, there is no requirement that the belts be properly crashtested. Unbelievably, none of the belts which failed independent crashtests have been recalled or banned for use in those vehicles. The worst example is the previous model Kia Sportage. The seat belts in that vehicle comply with all relevant Australian & New Zealand standards - they just don't work properly, that's all. And as the agents for Kia were quick to point out, it's all perfectly legal.



## Seatbelts

lap-only belts have been linked to serious abdominal injuries, because all the wearer's weight gets concentrated onto a relatively small area of belt. Another common injury with lap belts occurs when the wearer pivots forward and hits the centre arm rest or junk stored there. Further, any belt over ten years old is possibly seriously weakened by sun damage (see below).

3) **Adjustable lap & diagonal** (also called *lap & sash*). These belts date from the 1960s & '70s, although they are still common in the back seats of much newer vehicles. Unlike modern belts which automatically adjust around you, these belts have to be adjusted by hand. They are moderately difficult to adjust even when new, and very difficult when old. Many people simply don't adjust them at all, meaning that the wearer is likely to fly forward or slip under or around the belt in an accident. Adjustable lap & diagonals are often the only choice for the back seat passengers of older cars, and they are usually safe for this. This is because the back seat passengers are usually safer in an accident anyway, and because there are fewer hard things to hit in the back even if the person flies forward quite a long way in an accident. However, unless such belts are less than ten years old, are easily adjustable and are correctly adjusted around the wearer, they offer poor protection in an accident. Any belt over ten years old is possibly seriously weakened by sun damage (see below).

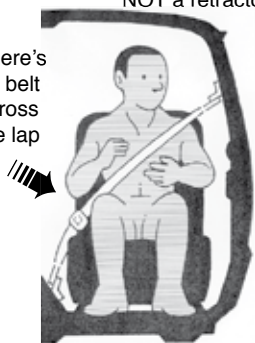
4) **Inertia-reel**. These are the most common form of belt. They stretch around you when you strap them on. They are loose until the car stops suddenly, then they lock up and restrain the wearer. The very latest inertia-reels offer reasonable protection in an ac

### DIAGONAL ONLY

NOT a retractor belt - it hangs down when not in use



There's no belt across the lap



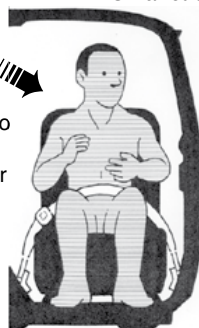
In an accident the wearer is likely to slip past the belt and be seriously injured or killed.

### LAP ONLY

NOT a retractor belt - it hangs down when not in use



There's nothing to restrain the upper body



In an accident the wearer's upper-body will fly forward and collide with anything in front. These belts are better than nothing, but are known to cause serious abdominal injuries. They are safest when fitted to the middle back seat

### LAP & DIAGONAL

NOT a retractor belt - it hangs down when not in use



The belt requires manual adjustment, which people won't usually do.



Unless the belt is correctly adjusted (which is rare), in an accident the wearer will fly forward and collide with anything in front. However, these belts are still better than nothing and are okay in the rear of a vehicle



## Seatbelts

cident, particularly when worn in the back of the vehicle. However, there have been a number of problems with this type of belt\*:

a) *Excessive stretching* – All seatbelts stretch a little bit. If they didn't they would probably cut you in half during a serious accident. However, the amount which a seatbelt stretches needs to be carefully controlled, or the wearer will simply fly forward and hit something in the car during an accident. We are sorry to say that many seatbelts of this type over five years old – and some current models – are highly suspect. This is because Australian crashtests showed that some belts stretched alarmingly in an accident. For example, a test on the 1997 model Kia Sportage showed an alarming 98% chance of causing life-threatening injury in a collision with a solid object at 56km/h.

Although the vehicle structure was partly to blame, the major culprit was the seatbelt. Video footage of the crashtest clearly shows the seatbelts stretching like rubber bands, allowing the crash dummy's head to smash into the steering wheel. A human would probably have died.

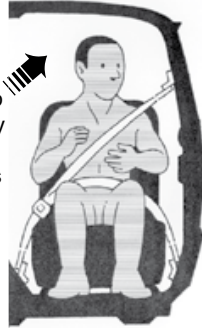
b) *Wear & tear*. Any tears or serious fraying can dramatically reduce the effectiveness of a seatbelt. It is estimated that a 5mm cut in the belt's webbing can reduce its effectiveness by half. Further, when a seatbelt gets old, it may work less reliably. It's as simple as that. One particular problem concerns belts which lock too easily when someone is trying to put them on. You've probably struck this – you sit in a car and attempt to pull the belt around you. Instead of pulling out easily, it locks up, even after several attempts. Often, people will simply give up and drive without a seatbelt (if the car is on a slope, this locking may occur even with a new belt, but if it happens regularly when

### INERTIA-REEL

A RETRACTOR BELT- it is pulled back when not in use



The belt automatically adjusts to your body shape and locks when the car is braked suddenly



Many belts of this type stretch badly in an accident. The wearer may fly forward and collide with anything in front. However, these belts are much better than nothing

NOTE: the inertia-reel belts fitted to some Japanese imports are less safe than the type fitted to locally-assembled models (see article for explanation)

**Video footage of the crashtest clearly shows the seatbelts stretching like rubber bands**



the car is on flat surfaces, the belt needs servicing or replacing).

c) *Sun damage* – seatbelts on modern cars come out with built-in sunscreens. Not so belts made a decade or more ago. Unless the car has been stored in a closed garage (not a carport) since new, many belts over ten years old will have been weakened by sun damage & general aging and should be replaced.

d) *Single-action seatbelts*. Most inertia-reel seatbelts have what is called dual-sensitivity. In other words, they have two separate mechanisms which lock the seatbelt in the event of an accident. This is because experiments have shown that single-action seatbelts will sometimes fail in certain situations. These are: low speed accidents, where the belt takes too long to lock up and may allow the wearer to slip out from underneath. The other problem is sudden random failure, which happens because there is only one locking mechanism. If this mechanism gets worn, old, or simply filled with dust, it can fail at a critical moment.





# Seatbelts

In many countries in the Western world, single-action seatbelts are banned.

## Webbing-grabber seatbelts

The front seatbelts of modern cars may appear to be the same, but there are three different types in operation, and they have vastly different safety potential. The safest seatbelts appear to be those with pretensioners fitted (see the diagrams opposite).

Of the two remaining 'retractor' types, webbing-grabber & inertia-reel, the webbing-grabber belts are far safer than the older inertia-reel belts fitted to many popular cars.

Don't let the technical terms put you off, both types are quite simple. In an inertia-reel belt, the belt is wrapped around a reel very much like a fishing reel. When you stop suddenly, the reel locks up and the belt can no longer unwind. This stops your body flying forward. However, the belt itself is made from stretchy material. It has to be or it could injure you in a serious prang.

When an inertia-reel belt locks up, the part of the belt which is wrapped around the reel keeps stretching for a long time, sometimes long enough to let you hit something like the steering wheel and do yourself a nasty injury or even kill yourself.

Webbing-grabber belts work in a similar way to inertia-reel, except that the belt (the actual belt of a seatbelt is called 'the webbing') is grabbed at the top of the reel. This means that the stretch of the belt is limited to the amount of belt outside the reel. It may not sound much different, but in practice, those crucial few centimetres may mean the difference between life and death.

Tests conducted by the New Car Assessment Programme in Australia indicated a dramatic improvement in

the safety rating of certain cars after they were changed from inertia-reel to webbing-grabber belts. NCAP scientists estimate that in an accident the worst inertia-reel belts can let you fly up to 30cm further forward than the equivalent webbing-grabber.

There is strong evidence that the safety of many older cars can be dramatically improved by changing from inertia-reel to webbing-grabber belts in the front seats. Certainly, anybody who is upgrading the seatbelts in their car should specify that they want

webbing-grabber belts, provided it is possible to comfortably fit them into that vehicle. The best thing is, webbing-grabber belts cost little more than the inertia-reel type.

If webbing-grabbers are so effective, why doesn't the government make them compulsory when older cars' seatbelts wear out? In New Zealand, that's exactly what has happened; webbing-grabber seatbelts are a compulsory upgrade for many vehicles when the existing belts fail the national Warrant of Fitness safety check.

## WEBBING-GRABBER

A RETRACTOR BELT- it is pulled back when not in use



The belt automatically adjusts to your body shape and locks when the car is braked suddenly



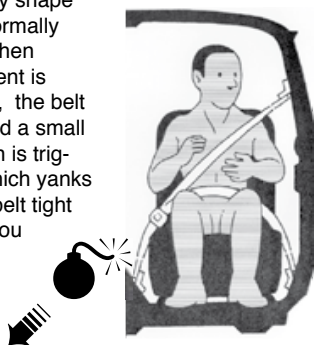
These belts stretch in an accident, but not nearly as much. The belt restrains the wearer and helps prevent injury. They can be retrofitted to most cars

## PRETENSIONING also known as PYROTECHNIC

A RETRACTOR BELT- it is pulled back when not in use



The belt automatically adjusts to your body shape and is normally loose. When an accident is detected, the belt locks, and a small explosion is triggered which yanks the seatbelt tight around you



These are the best belts in an accident, because they effectively restrain the wearer and help prevent injury. They can only be installed at the factory on new cars and cannot be retrofitted





Webbing-grabbers retrofitted to a VW Kombi

By contrast, webbing-grabber belts are almost unused in Australia, and not even recommended by the people who make them.

There are historical reasons for the differences between the two countries' approach: Australia is a more regulated environment, and no one, from the seatbelt company down, wants to take responsibility for a new initiative, even if the new initiative might save lives.

By comparison, most of New Zealand's vehicle fleet is made up of second hand Japanese imports, many of which already had their seatbelts changed when they first came into the country (many early Japanese seatbelts did not meet New Zealand standards). Thus, there was already a seatbelt upgrade culture in place. Although it took several years of campaigning by *The Dog & Lemon Guide*, together with a special government road safety conference, the only major change required to introduce webbing-grabbers was for the Minister of Transport to regulate the type of seatbelts that could be fitted when older seatbelts failed a safety check. There was no law change required.

Australia's motor industry and to some extent the road safety community are much more cautious: there's a prevailing attitude that says "look, modern cars have sophisticated occupant protection systems, designed by experts to provide optimum protec-

tion in a collision. You can't just throw another seatbelt in without extensive crashtesting."

It sounds really good in a car brochure, but it conveniently overlooks four key points: the first is that many of these "sophisticated occupant protection systems, designed by experts to provide optimum protection in a collision" have proved to be a bad joke in crashtests. In many serious cases, the primary cause of failure was the inertia reel seatbelts.

Second, cars with properly integrated safety systems (and which passed crashtests) did not enter the market till the mid to late 1990s. We agree that the seatbelts on these vehicles should not be interfered with in any way. However, in reality, such vehicles are a minority of the Australian vehicle fleet.

Third, even though integrated occupant protection systems are available for many vehicles, the sad reality is that they are often left out of the cheaper versions of many popular cars; that is, a significant percentage of new Australian vehicles are sold with key elements of this system missing. For example, the 2003 Kia Sportage has a driver airbag

– but no passenger airbag. The only thing between the passenger and the dashboard is the seatbelt. If you were in a collision in the passenger position in a Kia Sportage, would you rather have a seatbelt that restrained you more or less? Amazingly, six years after the Kia Sportage earned the dubious distinction of being the worst ever failure in an Australian crashtest, *the front passenger is still restrained solely by an inertia reel seatbelt.*

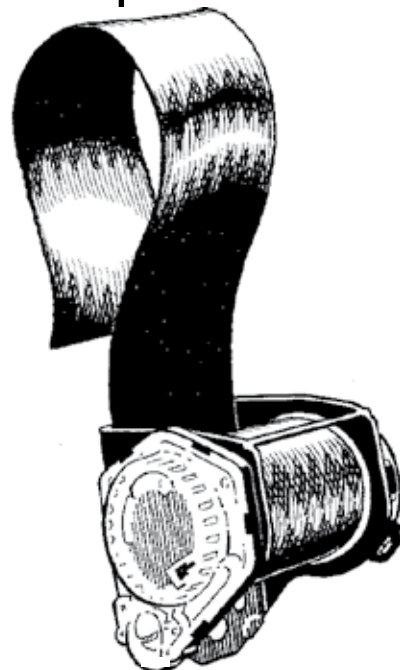
Fourth, many Australians already own older cars which never had integrated safety systems from new, and therefore webbing-grabber seatbelts are one of the precious few options available for the safety conscious owner of an older car.

As New Zealand Minister for Transport Safety, Harry Duynhoven, put it:

"There's no particular mystery about webbing-grabber seatbelts – they simply restrain a person better than inertia reels. Any injury caused by restraining a person better will be peanuts compared to the injuries they would have sustained if their head had hit the dashboard or steering wheel."

## Inertia-reel

Inertia-reel belts lock at the centre, allowing the seatbelt to stretch in an accident



Webbing-grabber seatbelts are available in Australia, however, and you can contact a professional seatbelt installer to have them supplied and installed.

If your car is under ten years old you should contact the agents to find out what type of belts your car has. **You must never change the type of seatbelt fitted if that seating position in your car has either pretensioning seatbelts (see below) or an airbag.**

Please note that there may be problems retrofitting webbing-grabber belts on some cars because on modern vehicles the front seatbelt mechanisms live inside the bottom of the door pillar.

Because webbing-grabber belts are usually bigger, they may not fit in the available space. They can be fitted on the floor beside the door pillar (as they are on older cars), but some people may find this unsightly or intrusive.

Problems aside, we believe that fitting an approved webbing-grabber belt is possible on many cars and may significantly increase the safety of those vehicles.

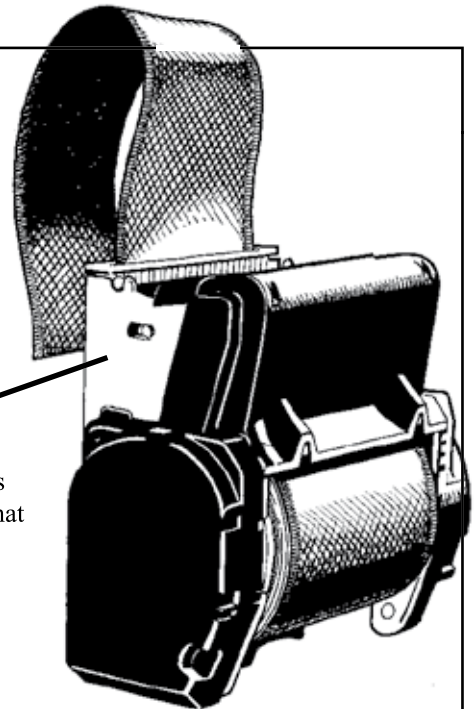
However, if you live in Australia you may have trouble finding someone to take you seriously: even seatbelt professionals often know little about the seatbelts they fit and are terrified of trying anything new. So they simply recommend that everybody fit a conventional inertia reel seatbelt, even though inertia reel seatbelts are proven to kill people.

**Pretensioning** (also known as pyrotechnic) seatbelts

Because all seatbelts stretch a bit, there are limits to how well you can restrain a person with a conventional seatbelt.

# Webbing-grabber

(also known as webbing clamp)



Webbing-grabber seatbelts lock at the top, meaning that there is less stretch in an accident

One thing which works well is to yank the seatbelt tight during an accident. This pulls the wearer closer to the seat and considerably improves his or her chances of survival. This type of belt is called a pretensioning seatbelt.

There are two types of pretensioning seatbelt – mechanical and pyrotechnic. Many mechanical ones work using a spring inside the spool out of which the seatbelt winds (in other systems this mechanism retracts the seatbelt buckles). The spring, which sits tense and waiting to work, is fired mechanically, that is, when it is jarred by impact.

Pyrotechnic ones work by firing a small explosive charge which spins the spool holding the seatbelt and therefore tightens it (in other systems this mechanism retracts the seatbelt buckles). These are fired electronically and often use the same circuitry that fires the airbags.

**Note:** Any seatbelt which has been in a serious accident should be replaced, as it may not work properly

*afterwards. This is absolutely critical with pretensioning belts, because the explosive mechanism will not work again once fired.*

**Load limiters** On some very modern cars the seatbelts have *load limiters*. Load limiters let the seatbelt loosen a little if the pressure on the wearer gets too great. This is done in order to minimise chest injury in a serious accident.

Load limiters generally work in one of three ways: the cheapest limiter is simply a loop sewn into the seatbelt which tears open under heavy load.

The second type uses a mechanism which lets the belt out a little under heavy load.

A third type simply uses an S-shaped piece of bent steel that straightens under heavy load, thereby reducing the load on the seatbelt wearer.

Of the three types, the second and third are by far the better systems •

