

# **CARAVANS AND TRUCKS SHARING ROADS IN AUSTRALIA**

Have you heard the truckies on the UHF radio, exchanging abusive language about old farts in caravans?

Have you read in caravan forums and letters to editors of Caravan Magazines about the inconsiderate, rude and aggressive behaviour of truckies on our roads?

Truckies communicate with each other on UHF Channel 40 (except on the Pacific Highway between Sydney and Brisbane, where Channel 29 is used). They also communicate with each other at truck stops and rest areas.

Caravanners communicate with each other at Caravan Parks, on internet forums, and some communicate on UHF Channel 18 when they are on the road.

Most caravanners don't communicate with truckies and most truckies don't communicate with caravanners.

Truckies are working in a high pressure transport industry, trying to maximize their efficiency by traveling at near the speed limit, right on the speed limit, or creeping just over the speed limit. Their workplace is on the road, and a major part of their profession is to tolerate traffic situations and share the road with others. Truckies have regulated work hours and can work up to 12 hours a day, with 7 hours of stationary rest.

Caravanners are on holidays, either touring or heading to a long stay vacation at their favourite caravan park. They are generally not in a hurry, and tend to travel considerably under the speed limit, and therefore, at a considerably slower speed than the trucks. They usually travel for 4 to 6 hours in a day and have 16 to 18 hours of stationary rest.

It is a pretty big conflict of interest on our roads, and this conflict is probably a major contributing factor in caravan crashes.

Every caravan tow vehicle (tug) driver has a responsibility to share the road with others, particularly in the area of co-operation with the truckies and helping them to share the road.

## **HOW CARAVANNERS CAN HELP.**

The first recommendation to caravan tug drivers is to acquire a UHF radio and use it to communicate with the truckies (ie Channel 40 and 29...not 18). If this can be achieved nationally and quickly, the traditional bad language could diminish considerably, and may even disappear if the women in caravans can make their presence heard. The truckies will quickly learn of the benefits of communication with caravanners if the actions set out in this document are adopted by the caravanning road users.

## **MEETING TRUCKS ON THE ROAD**

A truck can have a maximum width of 2.5 metres (8 ft 3 inches.) Caravans can also be up to 2.5 metres, and tow vehicles are usually less than 2.0metres wide.

A truck passing a caravan, with a metre (about 3 ft 3 inches) between them will require a 6 metre (20 ft) wide road surface. Most rural two lane highways built in Australia up to the 1960's had a maximum width of bitumen of 6.1metres, or 20 feet. Most rural main roads had a width of only 5.5m (18ft). Many shire roads that were sealed in the 50's and 60's had a bitumen seal width of only 4.9m (16ft). Many outback roads, when they were first sealed had a seal width of only 3.66m (12 feet).

Many of these roads in Australia have not been widened, even though the maximum allowable width of vehicles increased from 2.4 metres to 2.5 metres in the mid 1970's.. So, we must learn how to drive on these roads and share them with others, including the monster trucks.

Of course some major roads have been widened to 7 or 8 metres, and some of them now have sealed shoulders.

## **THE WIND THAT THE TRUCKS PUSH IS A HIDDEN FORCE.**

All caravanners will have experienced the buffeting wind that comes from a passing truck, either in the opposite direction, or when the truck is overtaking your caravan. Cab-over or flat fronted trucks produce a stronger "bow wave" of wind than trucks with long bonnets over the engine and some trucks may have more than one "bow wave", depending on their configuration and load. For example, a low loader with rear ramps in their upright position and no load, can produce a "bow wave" from the ramps, and likewise, a road train with a high load on the rear trailer.

The force of wind can be so strong that it affects the line of travel of your rig. Over-correcting in these situations can lead to loss of control, a collision with the truck, or jack-knifing, possibly ending in vehicle roll-over, on or off the road.

Understanding the dynamics of these instances, and knowing how to apply remedial action can avoid a disastrous event.

## **THE ON-COMING TRUCK.**

If the road is linemarked with only a centre line, (ie, no edge lines), the road may not be wide enough for the truck and car to pass without one vehicle or the other having to drive with left wheels on the shoulder. The caravan should slow down and very gradually move to the left so that the left wheels are off the bitumen, then, after the truck has passed, wait until there is a smooth path back on to the bitumen, and very gradually move back on. Any sharp change in direction or speed whilst the left wheels are off the bitumen can lead to instant loss of control. Do not brake hard in this situation because your right wheels will have more effective braking ability, resulting in the vehicle veering sharply back onto the road and into the path of the truck.

If there is no centre line, the bitumen road width is likely to be only 16 ft. (4.9m), or even 12 ft.(3.7m). Call the truckie on your UHF40 and tell him to “STAY ON” as you are going to slow down and pull off the road. That way you will not only gain appreciation from the truckie, but you will avoid being showered with rocks and gravel which would happen if the truck had to leave the bitumen.

If the road is linemarked (in accordance with Australian Standard AS1742) with a centre line and, edgelines on both sides, it will be wide enough for the truck and the caravan to pass without any wheels leaving the bitumen.

Apart from driving as far to the left as possible, the caravan towing driver must be prepared for the wind forces that will be exerted by the truck. It is a good idea, if, when you are travelling on an empty road (no other vehicles behind, in front or coming towards you) to practice, using your left side mirror, to drive so that the caravan wheels are just touching the edgeline. You can then establish a relationship between the left front of your vehicle, and the edgeline so that you can drive as close as possible to the edge of the road, without having the caravan wheels drop off the bitumen.

A bit of practice and you will be in the best position without having to glance across to the mirror.

So, when the front of the approaching semi-trailer is passing the tow vehicle, you will feel the buffeting of the bow wave of air that the truck is pushing at 100km/h. Your vehicle has wheels on each corner and the force of the wind should not affect the stability or direction of travel. When the bow wave hits the front of the caravan, as shown in Diagram 1 on the following page, the force will have a severe effect on the stability of the caravan, The van is connected to your vehicle at the towball, which is a single pivot point, or fulcrum. The caravan's wheels are in the middle of the van and therefore the centre of the axle(s) is another pivot point.

The force of the bow wave will push the front of the van towards the left side of the road, pivoting at the towball and the centre of the van's axles. This subsequently creates a force at the front of the tow vehicle towards the truck. Added to this is the suction of air, back in towards the prime mover's driving wheels, the “eddy”, or “vortex” behind the bow wave.

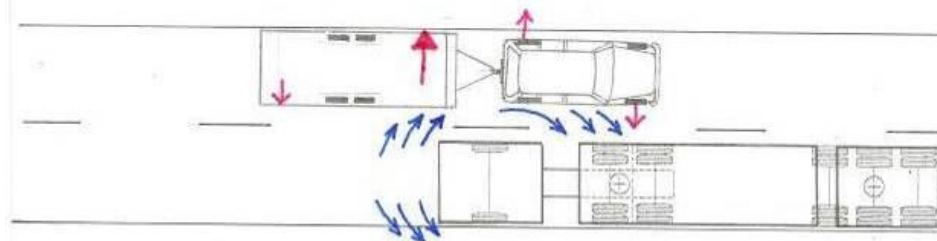


Diagram 1

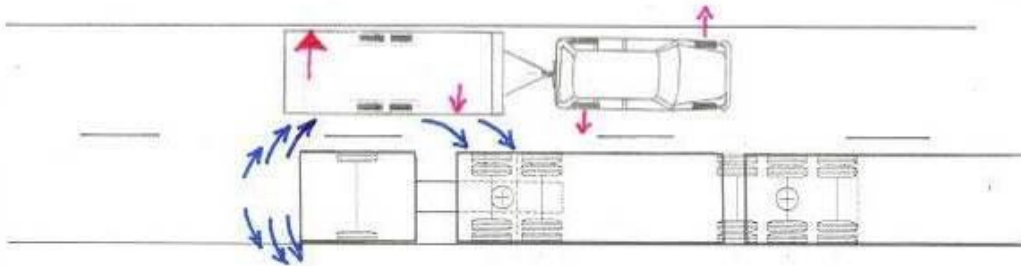


Diagram 2.

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As the bow wave passes the van's axles, ( Diagram 2.), the pressure on the side of the van will push the back of the van towards the edge of the road, with subsequent forces pushing the front of the van towards the truck, (aided again by the suction of the eddy) and the front of the tow vehicle towards the left.

If not counteracted by the driver, this could develop into an harmonic motion of opposite direction swaying, which can increase to a point of total loss of control, jack-knifing and then roll-over. End of holiday!

Holding the steering wheel firmly with both hands tightly, the left hand at "10 o'clock", and the right hand at "2 o'clock". Compensation for the changes in force contributable to the bow wave of the truck are by pressure only.....do not attempt to steer in the opposite direction to that of the force.

Remember a truck travelling towards you can be doing 100km/h and if you are doing 90km, the closing speed is 190km/hr. The truck will take only 0.2 seconds to pass you and you won't have time to compensate for the change in forces anyway.

If your rig does start an harmonic motion, take your foot off the accelerator and slowly apply the brakes of the caravan. If you don't have an electric brake controller with a manual over-ride, gently apply your footbrake, keep the tow vehicle pointing straight ahead and keep slowing until the rig is stable. Don't try to accelerate away from the sway and don't hit the brakes hard.

## THE OVERTAKING TRUCK

This can be a much more dangerous situation for the caravanner and I believe it may be a major contributory factor in the occurrence of jack-knifing and rollovers involving caravans. If you are travelling at 90km/h, and a 25m long B-Double is travelling at 100km/h, you will be subjected to the forces of truck generated winds for some 21 seconds, until the back end of the truck has passed the front of your vehicle. (Note: the times are measured from when the front of the 25m B-Double is 10 metres behind your 13m long rig, until the rear of the B-Double is 10m clear of the front of your tug.). If the truck is a 55m long, 4 trailer road train, as you would encounter on the Great Northern Highway (WA) or the Stuart Highway (SA & NT), it will take 32 seconds to pass.

If you are on a two way road and you see the truck approaching from behind, call him up on Channel 40 and tell him that "As soon as you've pulled out, I'll back off". Do not back off until the whole of the truck is "out" in an overtaking position. When the rear of the truck has cleared the front of your vehicle, flash your lights or call "You're clear" on the radio. This will gain a lot of appreciation from the truckie as, if you can slow to 80km/h it will reduce the overtaking time by half, to 10.5 seconds. The truckie will thank you, either by calling on the radio, or by flashing his right turn indicator light, and then the left turn indicator light. At 80km/h, you will be in a better position to handle the forces of the truck's bow wave, eddy and following turbulence.

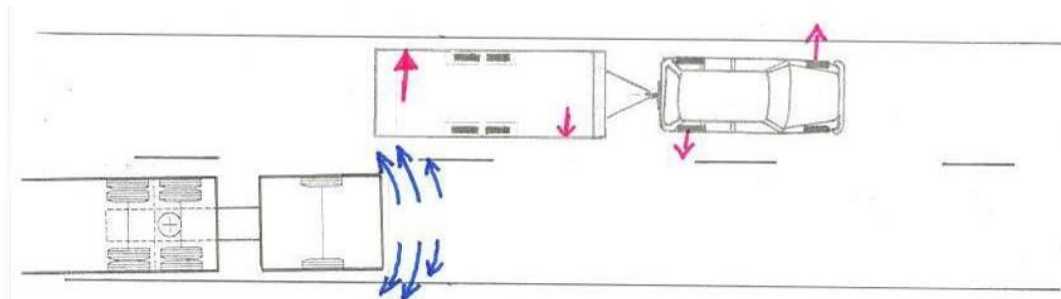


Diagram 3.

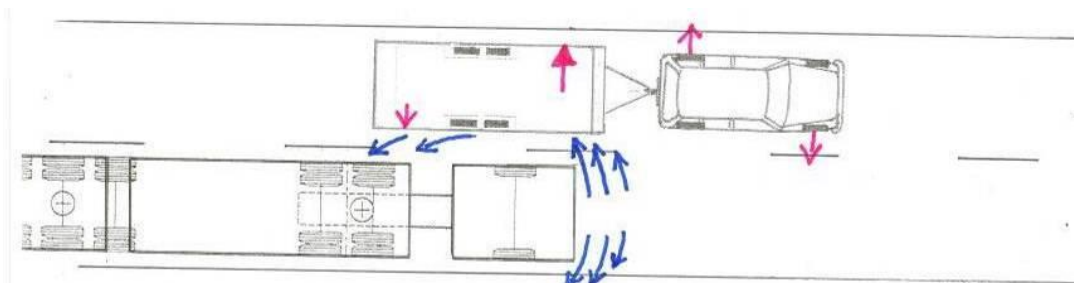


Diagram 4.

As the front of the truck reaches the rear side of your van, the bow wave will push the back of the van towards the edge of the road (Diagram 3), and the front of the van will be pushed towards the truck, pivoting at the van's axles. (This will be more pronounced with a single axle caravan).

The front of your tug will feel as though it is veering to the left. Do not try to turn the steering wheel to the right to compensate.

As with the approaching truck, keep your hands firmly at “ten and two” and concentrate on keeping a straight course. You will feel the pressure of the “force to the left” but your firm grip will compensate for the pressure. Next you will feel pressure to the right as the bow wave hits the front side of the van, pushing the A frame towards the left. (Diagram 4) The eddy, (or vortex) behind the bow wave, will tend to “suck” the rear of the van towards the truck, and this will exacerbate the forces. The front of your tug will feel as if it is veering to the right, towards the front of the truck.

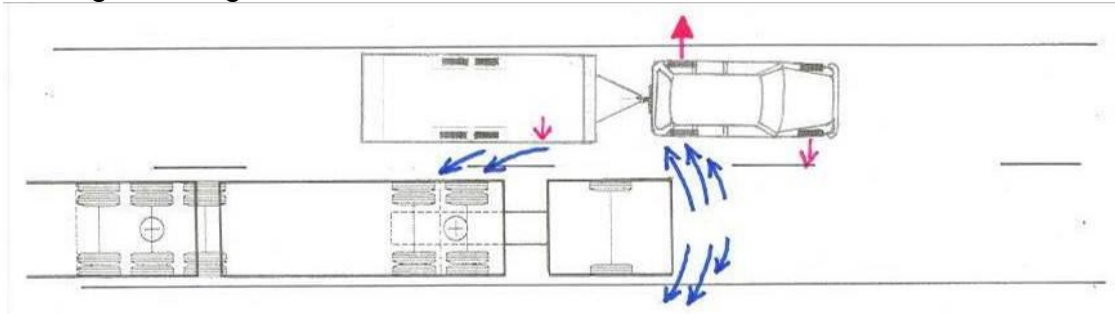


Diagram 5

You will next feel the bow wave hit the rear side of your tug (Diagram 5) and the eddy will draw the front side of the van towards the truck.

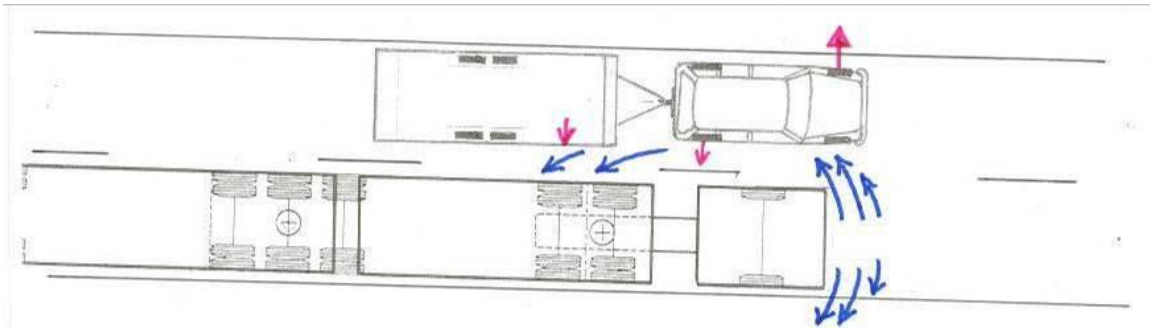


Diagram 6.

The bow wave will then force the front of your tug to the left (Diagram 6) and the van will tend to be sucked towards the truck by the eddy. As the front of the truck passes the front of your tug, you will feel as though you are being sucked towards the bogey wheels of the truck. (Diagram 7.) This again is the force of the eddy behind the bow wave.

Finally, as the rear of the truck's trailer passes, (Diagram 8), you will feel the buffeting of the “wake” and turbulence. This again will tend to pull the van towards the truck, but the forces will not be as great as they were in Diagrams 3 and 4.

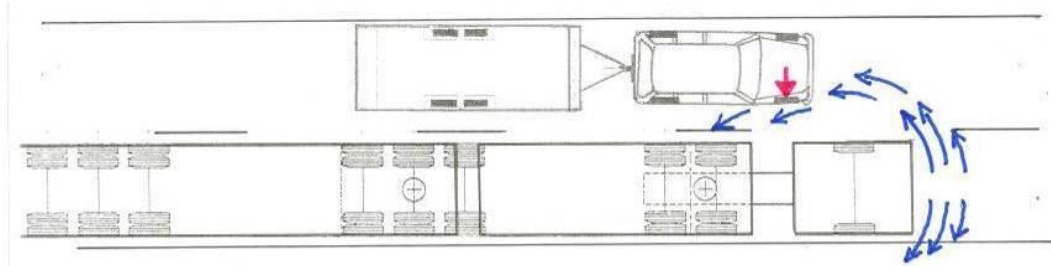


Diagram 7

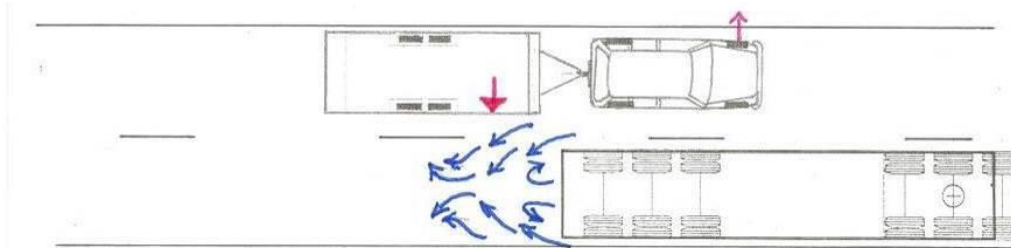


Diagram 8.

The forces exerted by the winds of an overtaking truck can set up an harmonic motion which could end up in a situation as shown in the following photograph.



This scene was on the Pacific Highway near Coolongolook.

In this instance the momentum that could have contributed to the disaster would be exacerbated by the weight of the large outboard motor, spare wheel, and generator attached to the rear of the van and, the distance between this weight and the centre of the van's axles.

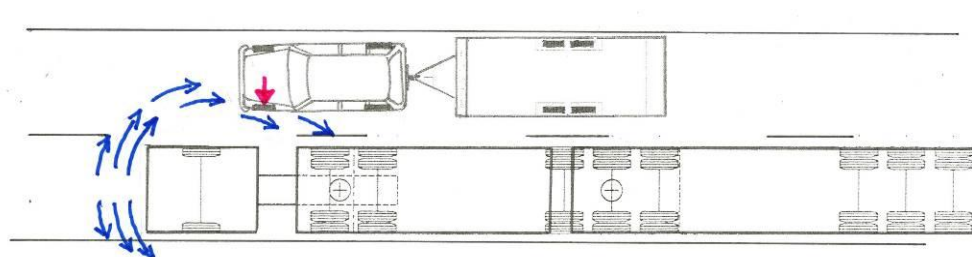


The swaying in harmonic motion produces an inertia about the centre of the van's axles. Inertia is measured by multiplying the weight (of the attachments) by the square of the distance between the attachments and the axles of the van. So, if the spare wheel was there when the caravan was purchased, and weighs 40kg and is mounted 3 metres to the rear of the centre of the axles, the inertia is  $360\text{kgm}^2$ . If the outboard motor weighs 50kg and the generator 25 kg and the mounting hardware 15kg., the combined weight is 130 kg. The centre of this mass has probably moved to 3.2 metres from the centre of the axles and the resulting inertia is a massive  $1331\text{kgm}^2$ .

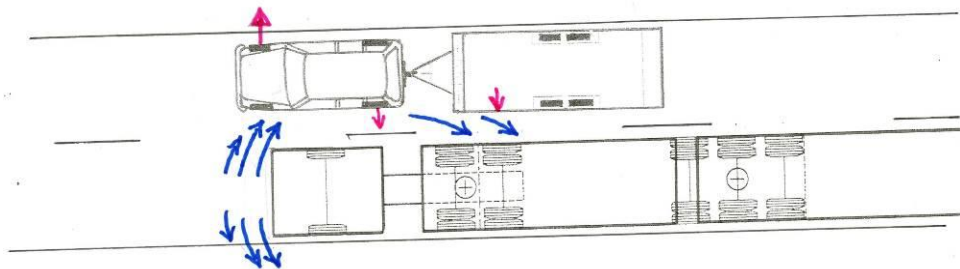
I have heard some say that they have added weight on the A frame to "balance" the rig and keep 10% of the GTM on the tow ball. For example, a folding boat trailer, jerry cans and boat fuel tanks. Well, this again is adding weight at some 3 to 4 metres away from the axle pivot point and this of course will add to the inertia when the van begins swaying.

## THE CARAVAN RIG OVERTAKING A TRUCK

Occasionally, there may be a need for vehicle towing a caravan, to overtake a truck. This manoeuvre has the potential for an even more disastrous result, simply because the caravan rig must travel faster than the truck. The wind forces are a mirror image of the overtaking truck situation described before.

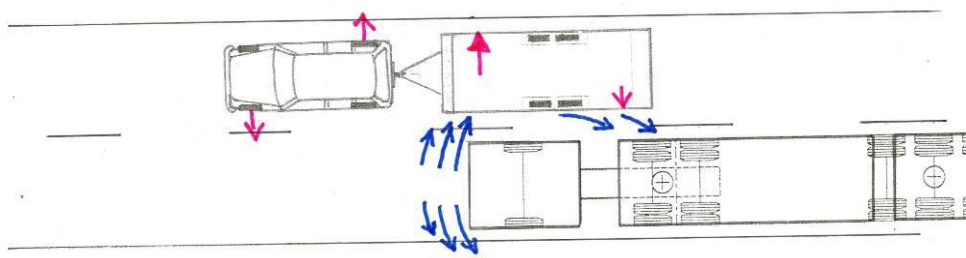


**Event No. 1. Tug enters vortex and is drawn towards the truck.**

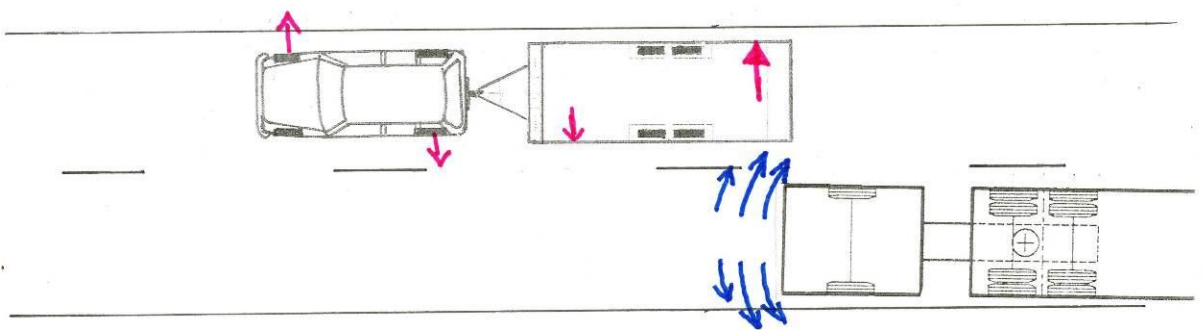


**Event No. 2. Tug hits bow wave with forces to the right, and front of caravan is in vortex, drawing towards the truck, setting up the harmonic motion.**





**Event No.3. Bow wave hits front of caravan and rear of caravan is drawn into vortex, exacerbating the harmonic motion.**



**Event No. 4. Rear of caravan hit by bow wave forcing it violently to the right.**



**Event No. 5. Caravan releases from bow wave, swinging back towards the front of the truck.**



**Event No. 6. Harmonic motion swings van from side to side. The black skidmarks are from the car braking hard. There are no caravan braking skidmarks, only yaw marks as the caravan swings back to the left. Driver has totally lost control.**



**Event No. 7. Tow vehicle braking skid marks turn to yaw marks. Left wheel of caravan starts yaw mark. Car broadsides off road, left wheels drop down embankment, digging in and causing vehicle to roll, caravan roll follows.**

On a flat, straight stretch of outback highway, (possibly with a speed limit of 110km/h), the truck is probably travelling at 100km/h. It is estimated that the caravan rig is about 10.5 metres in overall length. It took the rig 2 seconds to pass a reference point on the truck. (ie, 5.25 m/sec faster than the truck). The calculations show that the caravan rig was travelling at 119km/h. as it passed the front of the truck. If the truck was doing 95km/h, the caravan rig was doing 114km/h.

The photos above came from a video recording by the truck driver, via the following link, [http://www.caravancampingsales.com.au/news/caravans/caravan-roll-over-caught-on-video-42270?utm\\_content=buffer49e56&utm\\_medium=social&utm\\_source=facebook.com&utm\\_campaign=buffer](http://www.caravancampingsales.com.au/news/caravans/caravan-roll-over-caught-on-video-42270?utm_content=buffer49e56&utm_medium=social&utm_source=facebook.com&utm_campaign=buffer)

In the facebook page, there were several responses, some of which said that the driver should have accelerated to stop the sway. Such action in this case (the rig was already travelling at high speed), would have increased the pitch of the harmonic motion and the result would have been more catastrophic.

In reality there were two ways to avoid this crash:-

1. Don't try to overtake a truck at high speed....stop and have a cup of tea! and,
2. If you must attempt to overtake, make sure you have electric brakes fitted to the caravan, with a manual override – do not apply car brakes if swaying commences. Activate the caravan brakes manually, and steer your car straight ahead until the rig has stabilized. By this time the truck will have most likely continued on, and you will need to stop and have a cup of tea!

On multi lane roads, caravan rigs will often have to pass trucks and, of course, the same wind forces will be experienced. On these roads the lanes may be a little wider and the shoulders are usually sealed. This gives the caravanner the opportunity to pass with a larger gap between the truck and the caravan, thereby reducing the impact of the wind forces.

## **HARMONIC MOTION CAN AFFECT OTHER THINGS TOO.**

A most graphic display of wind force setting up increasing harmonic motion, or oscillations, was the spectacular destruction of the Tacoma Narrows bridge in Washington State, USA in 1940. There are many photos and films of this event and it is certainly worth a Google – Just type in “Tacoma” and have a look. The contributory factors were given as :-

1. Random Turbulance
2. Periodic vortex shedding and,
3. Aerodynamic instability.

Perhaps we have a correlation here, with the random turbulence being the bow wave, and eddy (or vortex behind the bow wave) and the periodic vortex shedding being the effect of the wind forces on the side of the van. The aerodynamic instability, or what I have referred to as harmonic motion, is probably related to the fact that the towing vehicle has 4 wheels, each near a corner of the vehicle, and the single pivot point connection to a van that has the wheels in the centre of the vehicle.

Perhaps caravan manufacturers should be looking at building a van that has a front and rear axle, like the dog trailers behind tip trucks.

To my knowledge, there has not been any scientific studies made to analyze the forces of deflected wind created by an overtaking truck, yet, the situation arises more frequently on our roads as old two-way highways are replaced by divided roads. How often do we hear that traffic on the freeway has come to a standstill because a car and caravan has jack-knifed?

Whilst truckies must have a special heavy vehicle driver’s licence and must undertake mandatory training in handling their rigs, car drivers who are towing caravans have not had any training in handling their rig, unless they have attended a towing course of their own choosing and expense. Most simply assume that as they are licenced to drive a car, they are capable of towing a caravan. To my knowledge, towing courses do not address the issue of wind forces from trucks and the subsequent potential of harmonic motion causing loss of control.

There are several towing guides, brochures and booklets published by road authorities, motoring organizations, insurance companies, and caravan magazines, very few of which address the issue of wind forces from trucks. An exception to this is the NRMA’s “Towing in Australia – Pain or Pleasure” (about 1983) booklet which contains the following advice on the last page:-

Caravan stability is also seriously affected when the combination is passed or being overtaken by large tankers or semi-trailers.

Wind forces from the front of large vehicles strike the side of the caravan and force it to the side of the road. Alternatively, when being overtaken, and the large vehicle passes the centre of the caravan, suction from the rear of the passing vehicle will tend to draw the caravan towards the centre of the road. This causes the caravan to oscillate about its centre of gravity and applies forces to the tow bar, making the car become unstable.

In really serious cases, this can cause the trailer combination to go completely out of control and jack-knife.

To reduce this dangerous tendency, try to increase the distance between the caravan combination and the passing vehicle.

Tests show that for two vehicles travelling at 80 km/h, suction force on the side of the caravan is reduced two-and-a-half times when the clearance between the vehicles was increased from half a metre to two metres.

On seeing in the rear vision mirror that you are likely to be overtaken, maintain the current line of direction on the trafficable portion of the carriageway until the approaching vehicle has commenced overtaking, then reduce speed and move as far as possible to the left.

Try to obtain the greatest possible clearance between the two vehicles: if the suction effects occur, accelerate to maintain control over your combination.

This section needs to be updated to reflect the higher speed (100km/h) of heavy vehicles, the size of the vehicles, especially the “Cab-over” flat fronted trucks, and the available lateral road space available. There is no mention of electric brakes, anti sway control and, the last line is certainly not appropriate when the speed is 100km/h.

The Caravan and Camping Industry Association of NSW, in their publication, “The National Caravan and Recreational Vehicle Towing Guide” does raise the issue, but only recommends that “if these forces are noticeable after fitting an appropriate weight distribution hitch, an added sway control unit should be fitted”

There is a clear need across all levels of Government, the media, and all organizations associated with caravanning, to provide education, training and re-training of drivers who are towing caravans and camper trailers. There has been many fatalities, serious injuries and family trauma resulting from ignorance and lack of knowledge in caravans and trucks sharing the road.

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August 2010 (Updated April, 2014)

**Footnote:** I do not know the persons who are responsible for the photos in this report, but I thank them, as it is hoped that this report will make a contribution to greater safety on Australian roads.