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PROGRAM**

## **Q&A: Bulk Tanker Rollovers**

### **The Question:**

How do I minimise the risk of Bulk Tanker Rollover?

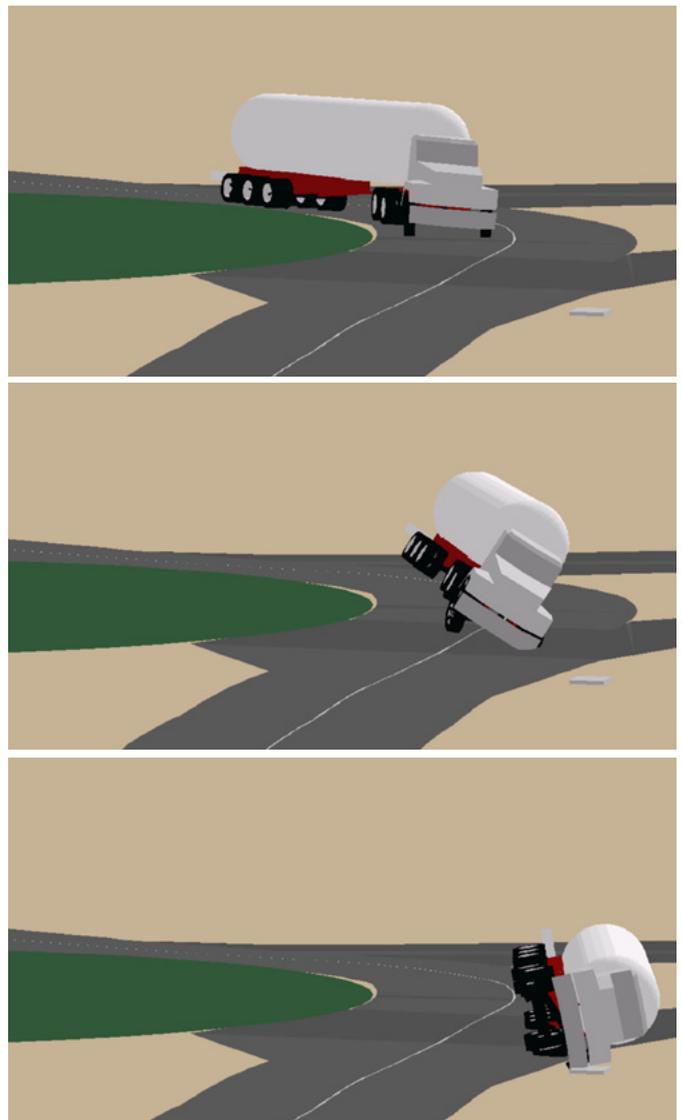
This Q&A has been produced to assist Bulk Tanker Drivers and their wider organisations in reducing the risk of rollovers.

### **Scope of the problem:**

Research has shown that fatalities and significant injuries are more likely in rollovers rather than other crashes involving bulk tankers.

This Q&A explores the background of heavy vehicle rollovers, and more specifically bulk tanker rollovers. It also provides an insight into how a bulk tanker operator ensures safety by:

- pre-emptive steps that can be undertaken to minimise risk,
- things to avoid that are high-risk,
- avoiding rookie mistakes, and
- ensuring journey management and planning.



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### **Heavy Vehicle Rollovers**

Drivers of cars, SUVs and vans typically feel when the vehicle's wheels lift off the ground as a rollover starts and have an opportunity to correct it. This isn't the case for heavy vehicles. Contrary to popular belief, a heavy vehicle's trailer will usually start rolling before the prime mover does. The driver is usually not aware that their trailer has started rolling over and by the time that they become aware and start trying to correct and brake, it is too late. Different centres of gravity between the prime mover and trailers can explain this phenomenon. The centre of gravity of a prime mover is typically low, whereas the centre of gravity of trailers is usually higher. It is easier to roll over objects with higher centres of gravity.

When heavy vehicles are involved in rollovers, the outcomes are usually more severe. This is down to the heavier mass of the vehicle which increases the strength of crash forces involved. In summary, there are broadly three things that work against a heavy vehicle driver:

1. The centre of gravity of trailers is higher than that of the prime mover (in which the driver is located) and will be the first part of a heavy vehicle to roll
2. Drivers will usually not feel when their trailer first starts to roll and by the time that they are aware of the problem, it can be too late to correct
3. When heavy vehicles are involved in rollovers, the outcomes are usually more severe than other vehicle rollovers.

It is estimated that about one-third of heavy vehicle major crashes can be attributed to rollovers.

### **Bulk Tanker Rollovers**

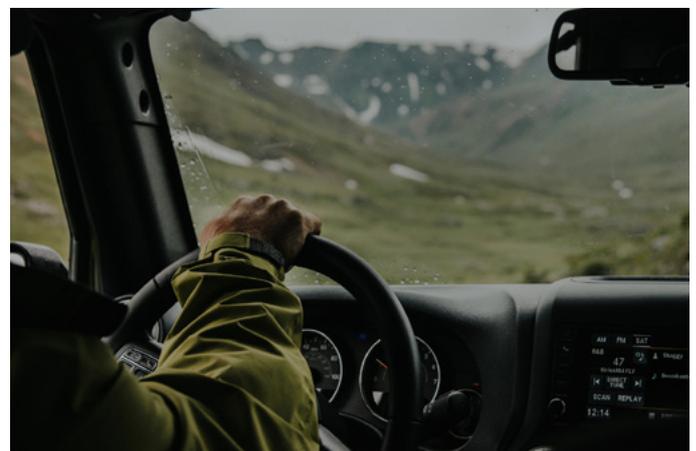
One type of heavy vehicle that creates unique challenges is the bulk tanker. Bulk tankers transport liquids, dry bulk cargo or pressurised gases.

In addition to the challenge of rollovers faced by heavy vehicles, bulk tankers also face additional rollover related issues:

1. By its very nature, the bulk tanker transport task is variable, by initial load and differential loading during delivery resulting in a changing trailer centre of gravity
2. Liquids can shift more readily and faster than steadier or solid loads, altering the centre of gravity of the trailer (the tanker in this case) during the actual driving task
3. Bulk tankers transport amongst other things dangerous goods, meaning the consequences of a rollover may be far more significant than the crash itself.

### **Tips for Avoiding a Bulk Tanker Rollover**

This section provides an overview of risk management strategies which can be used to minimise the risk of Bulk Tanker Rollover. It is divided into tasks to be undertaken before driving, tasks to be undertaken on the road and tasks to be undertaken during journey management and planning.



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### Before Driving Off

Filling the tanker so that it is full; that is, filling all of its compartments to their safe fill level, can greatly reduce the risk of rollover. By doing this, the effect of fluid slosh is greatly reduced, so that the distribution of the liquid remains largely unchanged when driving. In fluid dynamics, slosh refers to the movement of liquid inside another object (which is typically also moving).

In a tanker with several compartments, try to fill or empty each compartment completely before filling or emptying another. If possible, leave only one compartment with a partial load.

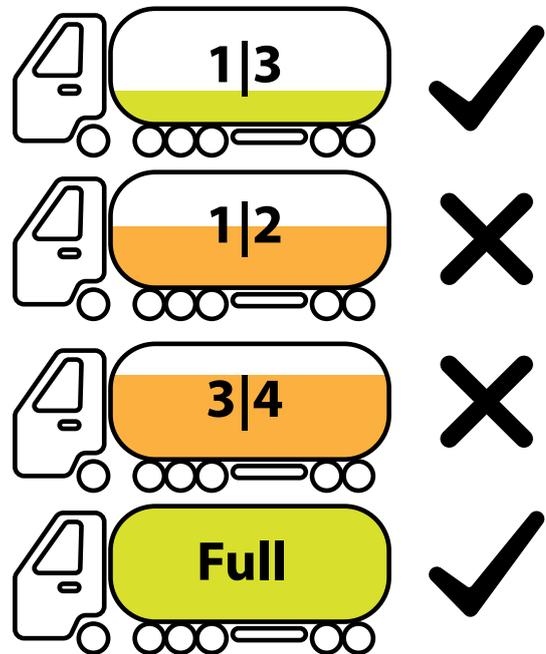
### On the Road

Care is needed when cornering as a tanker's centre of gravity is affected by sloshing. The faster that a vehicle travels as it drives around a corner, the more its centre of gravity changes due to the movement of the liquid inside the tank, making the vehicle unstable. Curves should be approached with less speed.

***"Speed is the leading cause of rollovers. It is a very fine line between being in full control and being out of control" — Justin Fleming of TruckSafe***

Compartments within a tanker that aren't consistently filled can pose a hazard when a driver needs to undertake a manoeuvre to avoid a hazard or possible collision. It should be ensured that as many compartments as possible are either filled or empty, by planning how much each will be filled before filling begins. If sloshing is isolated to one compartment of the tanker, it will have less of an effect on stability than if sloshing was occurring in all compartments.

Having compensating turntables or oscillating fifth wheels installed can make a journey more comfortable for a driver. However, drivers have to be cognisant of the changed stability control at the front of the tanker over the turntable especially during cornering and manoeuvring.



### Journey Management and Planning

The quickest way isn't always the best way when it comes to travelling in a heavy vehicle, let alone a bulk tanker. This includes avoiding roads with sharp curves, poor alignment or that are rough, even if they are shorter routes.

It is appropriate to consider the wear factors of the heavy vehicle that may impact its ability to continue performing well. Under inflated or worn-out tyres are more likely to slide around corners, rather than grip the road correctly. Tyres should be inflated correctly based on the load being carried and the user manual.

Dusty roads are a hazard, as dust can get into suspension, components, electrics or plugs and damage them.

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### *Journey Management and Planning cont.*

Increased or less traffic, traffic lights, roundabouts and level crossings should also be considered in planning a journey. Stop-start environments can also have an impact.

Additionally, time of day can affect the safety of a journey. If on a journey there is a certain area where there is a high concentration of people at certain times, the drivers schedule should avoid these times (i.e. school zones and school pick-up times). A good example is, does anyone remember when a milk tanker driver lost control because he had a heart attack and drove through a coffee shop? No, because it happened at 5am, the company recognised the risk, they had no alternative route so chose to go through that area when there were few people.

To combat fatigue, nonprofessional drivers should take a rest break after every 2 hours of continuous driving. Driving professionals should take regular and appropriate rest breaks that comply with legislation. However, on heavy vehicles, finding a resting spot that can fit the entire vehicle may not always be easy. On journeys that are known to take over 2 hours, it is a good idea to identify appropriate rest areas as part of journey management. Scheduling journeys during daylight hours reduces the risk of fatigue and poor visibility.

### *Rookie Mistakes and Expert Tips*

Drivers who think that they may be taking a corner too fast usually glance in the side mirror at their rear trailer mudguards to see if the mudguards are lifting from the road.

Corners that drivers are very familiar with and have been traversed many times can be dangerous. A change in road conditions or the presence of other vehicles means that a driver who is complacent and doesn't adapt and drives through at the 'expected' speed puts the vehicle at risk of rolling over.

It is easy to come undone if the road is slippery, if there are obstacles ahead or an unexpected event occurs. This also includes a change in load. A tanker with one type of liquid can react differently to a tanker with another type.

"Unfortunately, some drivers take pride in how quick they can go around a corner without tipping them over — a foolhardy approach to safety" — Alan McKenzie of Aquatrans



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### ***Technologies which can assist***

#### ***Electronic Braking & Stability Systems***

Electronic Roll Stability Control is a technology that can reduce the likelihood of rollovers. When a vehicle is navigating a left-turning curve, more of the vehicle's weight shifts on its right wheels and vice versa. When that shift of weight becomes too great, then rollovers are likely to occur. In that instance, Electronic Roll Stability Control activates and engages the brakes, slowing the vehicle down and reducing that difference.

Evidence from around the world illustrates the benefits of these systems in reducing the risk of rollovers.

The benefits of these systems in reducing rollovers have been documented in the NRSPP case study of the Victorian logging industry. Even though they are a different type of heavy vehicle, these systems would work in a similar way. For more detail, please see NRSPP Case Study: VicRoads – Electronic braking and stability control system eliminates rollovers and NRSPP Case Study: Hornby Transport Services: Safe drivers, at safe speeds in safe vehicles: a simple recipe for success for a similar story.

It will be mandatory to have these systems in NSW by Jan 2019 for dangerous goods bulk tankers registered in or passing through NSW.

### ***Conclusion***

Bulk tankers face unique roll over challenges, due to the nature of their load and its behaviour.

Journey planning and management is critical to minimising risk. Drivers should know the route first and the quickest way isn't always the best way. On the road, drivers should take care especially when cornering and manoeuvring:

- making sure that they are not going too fast
- checking, by glancing in the side mirror, at their rear trailer mudguards to see if they are lifting
- to not assume road and environmental conditions remain the same due to their familiarity.

Drivers of tankers with EBS with Stability Control installed have found that they have had to modify their driving technique in driving slower, as it makes them drive more steadily around corners. Their help in reducing rollovers is evident.



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### For More Information

- NRSPP Quick Fact: Getting around Vehicle Rollovers.
- <http://trrjournalonline.trb.org/doi/abs/10.3141/1717-07>
- <http://casr.adelaide.edu.au/publications/researchreports/CASR026.pdf>
- <https://www.safercar.gov/Vehicle-Shoppers/Rollover/Fatalities>
- <http://roadsafety.transport.nsw.gov.au/downloads/heavy-truck-crash-data0114.pdf>
- Rollover Prevention: Heavy Goods Vehicles, TYA Guide 2015
- <https://youtu.be/B202yC90aw4>
- [http://www.artsa.com.au/assets/articles/2012\\_06.pdf](http://www.artsa.com.au/assets/articles/2012_06.pdf)
- [https://www.nti.com.au/files/files/20147\\_NTARC\\_Report/B524\\_NTI\\_2017\\_Accident\\_Investigation\\_Report\\_Web.PDF](https://www.nti.com.au/files/files/20147_NTARC_Report/B524_NTI_2017_Accident_Investigation_Report_Web.PDF)
- [https://www.vicroads.vic.gov.au/~/\\_media/files/documents/business-and-industry/](https://www.vicroads.vic.gov.au/~/_media/files/documents/business-and-industry/)

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