

# ROLL REVE



**Development work aimed at preventing rollovers continues at various research houses around the world. But, asks Dave Young, are we much closer to solutions?**

**A**ccidents resulting from truck rollovers remain an expensive, occasionally catastrophic, issue – an extreme contemporary example being the loaded car transporter on its side across all three lanes of the M25. Even if a vehicle doesn't roll, instability can cause serious accidents.

ABS braking (largely succeeding earlier anti-jackknife devices) has assisted in ameliorating the problem, but engineering innovation has presented new difficulties. Traditionally, the most vulnerable semi-trailers were tankers with liquid loads and fridges carrying hanging meat – the first subject to surge, the latter the pendulum effect. Latterly, however, double-deck box trailers, drawbar car transporters and container rigs have been added to the danger list. Whereas traditional drawbar trailers feature the very stable, wheel-at-each-corner, A-frame design, most modern combinations are centre axle, close-coupled types, sometimes larger than the prime mover.

Legislation has struggled to keep up. Until recently, official DSA advice to drivers recommended tying back the curtains on an empty vehicle during high winds to reduce the surface area. But manufacturers said that a constant quest for weight saving and pillarless designs has meant that curtains are now part of the body's structural integrity. Run with them open and the roof may blow off.

Examination of rollovers appears to reveal no clear single solution – rather a combination of driver

training, loading technique and technical specification.

Interestingly, when Michelin launched the X One MaxiTrailer tyre (455/45 R 22.5), anecdotal feedback from drivers implied that it made trailers more stable. Michelin then took a 44-tonne artic to Chobham's tilt-table and tested the vehicle rollover angle on both regular and MaxiTrailer tyres. It found a 6.5% improvement in stability, (for context: bus operators consider a 1% improvement significant) and Michelin subsequently won the Fleet Safety Product of the Year 2010.

## **What's on offer**

Several suppliers have been working on solutions for identifying and reducing the impact of rollover, with varying degrees of success. SDC Trailers claims to be the first manufacturer to secure type approval for semi-trailers fitted with roll stability systems (RSS). Type approval on Haldex, Wabco and Knorr-Bremse braking products was achieved through the Vehicle Certification Agency (VCA) and forms part of the Whole Vehicle Type Approval (WVTA) process.

During braking, RSS acts if it identifies a risk of rollover. SDC managing director Mark Cuskeran says: "With this optional extra, [customers] will receive better stability, integrated emergency relay function and improved brake response times."

Knorr-Bremse has also launched a truck ESP that automatically adjusts the direction of travel and speed, in order to stabilise a vehicle in critical conditions. A separate system has been developed for articulated trailers. The G2 EBS includes a roll stability function, actively monitoring vehicle behaviour; if instability is detected, based on lateral acceleration, vehicle speed and axle load, a test pulse is triggered.

## **Rollover guide**

For more information on this subject, consult the IRTE/SOE Rollover Guide. Contact [ian.chisholm@soe.org.uk](mailto:ian.chisholm@soe.org.uk) or call 0207 630 1111 for a copy



# RSA



This, along with data from systems sensors, can tell whether the vehicle is in a critical condition, with rollover likely. If it is, then lateral acceleration of the trailer is halted by braking to achieve maximum deceleration and reducing the tendency of the trailer to roll. In a collision avoidance manoeuvre, the system can force an immediate Rollover Stability Programme (RSP) brake intervention.

Another solution comes courtesy of Wabco's ABS system, which incorporates roll stability control and roll stability support to actively reduce the likelihood of vehicle rollover, automatically intervening when vehicle stability becomes critical.

US truck manufacturer Freightliner manufactures a roll stability advisor training aid, designed to warn the driver if he or she has made decisions likely to lead to rollover. Messages are communicated to the driver with increased urgency as the potential for rollover increases; depending on the urgency, this system then triggers the roll stability device, automatically slowing the vehicle.

And, again, Scania's Driver Support System (DSS) offers similar measures. It advises the driver and provides prompts on the best way to drive, given the environment, using information from a series of sensors around the vehicle to prevent vehicle rollover. Downloaded information from these telematic systems may be used to analyse when and how often the stability control program was triggered.

## Back to the future

Since July last year, it has been mandatory for all new trailers over 10 tonnes gross weight to be fitted with electronic stability control (ESC), in accordance with Economic Commission for Europe regulation 13. This will also be the case for trucks and buses, starting with two-axle tractive units registered from July of this year. 

## Why do rollovers occur?

In 2008, there were 9,040 reported UK accidents involving heavy goods vehicles (rigid and articulated) – a little under 5% related to rollovers.

Rollover typically occurs during cornering, with the centrifugal force acting through the centre of gravity, causing the lorry to lean. The level of centrifugal force increases with speed and turning angle. Rollover threshold (RT) is the indicator traditionally used to describe a truck's ability to resist rollover – a value derived by the lowest point of centrifugal acceleration that causes the truck to tip over when travelling consistently along a curved path.

RT can be directly affected by the way in which the vehicle is set up (loads, tyre pressure, suspension etc).

Principal contributory factors include:

- **Weather:** among the most obvious problems are high winds. The probability of rolling over is increased as the centre of gravity increases. Additionally, weather affecting the road surface (snow, rain, ice) can contribute to vehicle rollover as the contact between the tyres and road surface is inhibited and friction reduced.
- **Avoidance:** this type of incident occurs where the driver attempts to avoid a hazard in his or her path and turns too abruptly, resulting in oversteer.
- **Road design:** adverse cambers, roundabouts, slip road radius. These don't directly cause rollovers, but can contribute to instability, especially if a driver overestimates the safe speed on bends.
- **Training:** lack of training for drivers of high centre of gravity vehicles
- **Speed:** not always a causal factor – hence the notorious 'low speed rollover' when exiting a roundabout, typically caused by the 'pendulum effect', where the truck and trailer make three consecutive changes of direction within a short distance.
- **Loading:** an important stability factor is the location of the centre of mass, in relation to the position of the axles. Too much weight behind the wheels and insufficient weight on the coupling make a trailer inherently unstable. Centre axle drawbar trailers require a positive nose load for stability.

