Despite dramatic improvements in suspension and braking, heavy truck rollovers are not getting any less frequent. Ian Norwell looks at the dynamics behind them, and gets a few surprises

Rollover lottery

The sultry tones of Radio 2's Sally Traffic routinely announce truck rollovers. Currently running at around 1,000 a year, they cost millions in damage and lost productivity. Any sizeable fleet will have experienced at least one, and workshops will have spent time counting the considerable cost. Why?

Engineers and drivers of yore will be familiar with the 'seat of the pants' concept of understanding how stable a vehicle is. But an undesirable side effect of increased levels of comfort, reduced decibels and sophisticated drivetrain technology in modern commercial vehicles is a detachment from that old trouser-based data stream. So, particularly with younger and less experienced drivers, some will be creating forces at the tyre and tarmac interface that they are not fully aware of.

Aside from the grip available, the most influential force at work in a rollover situation is that associated with a vehicle's centre of gravity (c of g). We all know that, if the c of g moves outside a vehicle's footprint, it will roll. But what is not so widely appreciated is the types of vehicle that are most vulnerable or the shockingly slim margin between stability and disaster.

Point of no return

There are many obvious high c of g candidates. Mixers with a full drum, car transporters when the load has been stripped from only the bottom deck and skeletal trailers with a 20ft box are all suspect. However, most drivers will be unaware that an artic combination with a steering rear trailer axle will roll before an un-steered one. Why? Because the straight line between the fifth wheel and the centre of the rear axle has effectively moved forward and shortened the critical length around which stability is calculated.

As part of DCPC training, I took a day out at the MIRA proving ground to attend a Mercedes-Benz rollover prevention and skid avoidance course. With expert tuition from Dean Jordan, of CRYdel, and under the aegis of the Mercedes-Benz driver training department, a loaded (water) Actros artic tanker had been fitted with substantial outrigger stabilisers, that would contain a rollover. On the steering pad tarmac, I was asked to start by driving in a fixed radius at what I felt was a comfortable and stable speed. Like most other drivers. I settled at around 18kph. The instructor then increased the speed with the radius maintained and a rollover was induced at just 23kph.

It was hard to believe that just 5kph was the difference between stable, controlled driving and losing the combination altogether. Even more worrying was the fact that there was no indication that the trailer wheels had left the ground and a rollover had started. The first I knew was when the stabiliser's wheel hit the tarmac with a bang.

But away from the c of g, there is also some elementary physics involved in grip that makes a difference. Assuming a vehicle and its tyres are in good condition, or even if they aren't, there is a 100% theoretical grip available. If you are using 35% of it steering the vehicle then you only have 65% left for braking. So, in a straight line, 100% is at the driver's command, but as a progressive steering radius is used, the grip available for braking diminishes – which, in turn, increases stopping distances. Aggravating this are seven coefficient of friction values provided by different road surfaces. Less obvious, but just as influential, is the fact that a mere 9% downhill gradient more than doubles stopping distances again.

Drivers of high consequence vehicles – fuel tankers in the main – are highly trained in rollover recognition, but regular tractor-trailer drivers could also benefit from knowing where the edge of that envelope is. All LGV drivers are less than a year away from needing to be DCPC-compliant. With training unavoidable, it may as well teach them something useful.

Mercedes-Benz's course is not cheap, but more than 90% of companies sending drivers on it have previously suffered a rollover. Surely a case of horse and stable door.