

Cutting out jackknifing

Once upon a time, jackknifing was seen as a major issue. Nowadays it's unusual enough that, when it is reported, our ears prick up with surprise.

Anti-lock braking took care of the majority of cases, finds Lucy Radley

We've not done anything about jackknife prevention for 20 years," states Andrew Lumley, account manager (trailer sales) at Knorr-Bremse reflects. "I'm not saying jackknifing doesn't exist, but the vehicles we currently build are significantly better than a long time ago, and the prevalence is less."

Jim Crawley, homologation engineer at Haldex, agrees. "You've got vehicles today with ABS, which activates when the wheels are over-braked to maintain vehicle stability and mitigate locking of its rear axle. Hopefully that prevents the jackknife."

There are three elements to this: ABS (anti-lock brakes)/EBS (electronic braking systems), ESP (electronic stability program, a term that is a Bosch trademark but is still widely used) and load-sensing improvements. Air suspension has also been key, from a trailer perspective. "With steel suspension and load-sensing valves, the braking effort applied to the trailer would be a little bit hit-and-miss, to be polite," Lumley recalls. "Now, we can tell what the load is on the trailer via the airbag pressures, then work out how much pressure to put down to the brakes to make it stop in a reasonable manner."

This helped solve trailer swing as well. This is the opposite to jackknifing. In simple terms, jackknifing is when the truck over-brakes and/or the trailer under-brakes, whereas trailer swing is where the trailer locks up too quickly. "With electronic control, hopefully we can match the braking forces on the truck and trailer and pull up nice and smoothly," Lumley says.

From a truck perspective, ABS was a revolutionary step. The first system for commercial vehicles was launched by WABCO (now part of ZF) in 1981, and by 2000 ABS was a legal requirement for all categories of vehicles. "ABS doesn't kick in until you over-brake," Jim Crawley explains. "It's passive, just monitoring the wheel speed signals, then when the brake is applied too much for the adhesion available, the wheels decelerate at a high rate relative to vehicle speed."

The ABS will then take hold of whichever wheel is the problem and release the brakes, allowing the wheel to recover. "If you're on a high-friction surface, the wheel will spin back up and recover quickly, but on a low-friction surface it's going to take a longer time," Crawley continues. "So that's how ABS knows it's on different surfaces. As long as you have wheels rolling, you've got some lateral stability, which is what you need to prevent jackknifing."



ABS can work on the truck alone, or on the trailer as well if it is ABS-equipped. Most trailers nowadays, however, have EBS, which take ABS to another level - you can't have EBS without ABS there as its foundation.

HOW EBS WORKS

A pressure sensor on the yellow service airline and a solenoid inside the brake valve assembly collaborate. "Now the ECU can brake for itself," Crawley tells us. "It responds to the driver's input on the pneumatic brake demand, but it will also have an electronic brake command as well." This means that, instead of having to wait for the air pressure signal to get all the way down the trailer before the brakes are applied, the solenoid is activated, applying them more quickly.

While this doesn't remove the delay between truck and trailer braking, it does try to improve it, going one step further again if the truck is also EBS-equipped. "In that case, in theory, the driver has plugged in a seven-pin ISO 7638 suzie, and pins 6 and 7 bring the electronic brake demand from the driver's cab down to the trailer," Crawley says. "There are electronic sensors on the foot brake of the truck, so the trailer can respond almost instantaneously - within 20-30 milliseconds, as opposed to waiting 400 milliseconds for the pneumatic signal to build at the back of the trailer."



DRAWBARS

Jackknife prevention is still an area of concern for traditional A-framed drawbar outfits. These rigs have an extra 'hinge' to worry about, and can come round if the trailer's steer axle locks up, as well as the rear axle of the truck.

One solution to this is Volvo's 'stretch braking' system, which is popular in Scandinavia. This aims to hold the trailer back - to stretch the combination out - to increase stability. When switched on, it works by pulsing the trailer brakes when the accelerator pedal is released, and avoids situations where, for example, the engine brake is in use on a long decline, and the trailer would otherwise not be braked. This, in turn, helps the front wheels of the truck maintain full steerability, keeping the vehicle under control.

In addition, specialist coupling manufacturer VBG is in the final phase of developing a Jackknife Warning System for drawbar outfits, based on a combination of radar sensors and reflectors. This measures the angle between truck and trailer, warning drivers if a jackknife is beginning to develop, so they can react and take action in good time. [TE](#)

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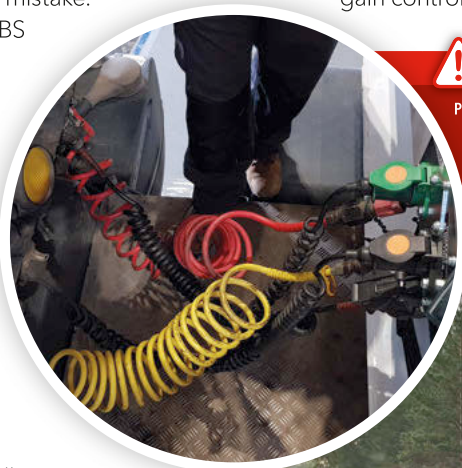
Note the words 'in theory' used there. "Electronic control is the thing that has improved over the last 20 years, magnificently," Lumley confirms. "And electronic control is great until people don't plug it in, because it all stops working at that point! The dummy socket on the truck is often the problem - they pick the wrong one out of the parking socket," he says.

This is a common mistake.

If both ends of the EBS lead are stowed for solo tractor running, they look almost identical, making it all too easy for the wrong end to be pulled out and attached to the trailer if drivers are in a hurry, or can't see what they're doing. "Most truck manufacturers will tell you if it's not plugged in now, which is good, but not all - it's not actually in the standard."

The third and final element is electronic stability, which has been mandatory for trucks in the EU since the introduction of EC661/2009, the General Safety Regulation. There are two parts to this: roll-over control and directional

control, and while trailers only need to be fitted with the former, trucks must have both. "Directional control is what they used to call yaw-rate control, and it mitigates jackknifing or spinning out on corners," Jim Crawley explains. "It corrects the over-steer or under-steer by applying the correct individual wheel brake to help steer and stabilise the vehicle. It can also slow the engine to gain control more quickly."



WARNING

Picture (courtesy Don-Bur) shows how NOT to hook up suzies; EBS connection mistakes such as this could cause a jackknife accident.

