# New brake rules bring new benefits and new risks

First, some basics. Antilock brakes (ABS) act to prevent sustained wheel lock-up. Australian trailers have a propensity for wheel lock-up when lightly laden because they generally have powerful brakes. The Antilock operation is triggered when the wheel-speed on a sensed wheel is decelerating too quickly and heading for wheel lock-up. Not all the axles in a group need be controlled and the number of wheel sensors and their location affects performance. Therefore, system design is important. During ABS operation, the brakes are temporarily released, so if the conditions that led to wheel lock-up persist, there will be an increase in stopping distance.

Load-Sensing brakes (LSB) reduce the brake capacity on an axle-group when this group is lightly laden. This is achieved using a pneumatic load-sensing relay valve that changes its maximum brake setting in proportion to a load signal; which is usually the air-suspension bag pressure. As a guide, the brake capacity on the rear group of a semi-trailer when it is unloaded, might be reduced to one third of its full-load level.

Both technologies have merit; if fact both are needed. Wheel lock-up is undesirable because a locked tyre loses most of its road following capability. Antilock brakes protect against this. Load-Sensing brakes can improve the brake balance of a combination and thereby reduce the likelihood that the wheels will lock-up during braking when the vehicle is lightly laden.

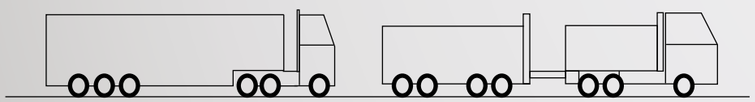

Table 1. Recommended mixtures of brake technologies for single-trailer vehicles.

| Semi-Trailer | Prime Mover | Dog Trailer | Truck |
|---|---|---|---|
| EBS* | EBS | EBS* | EBS |
| LSB | EBS | LSB | EBS |
| ABS | EBS | ABS | EBS |
| EBS* | EBD | EBS* | EBD |
| ABS | EBD | ABS | EBD |
| LSB | ABS | LSB | ABS |
| LSB | LSB | LSB | LSB |
| ABS | ABS | ABS | ABS |
| ABS | ESC | ABS | ESC |
| EBS* | ESC | EBS* | ESC |

* In Australia, trailer EBS is coupled with trailer Roll Stability System (RSS).

A downside to Load-Sensing brakes when used on a multi-combination vehicle is that it makes it more likely that the wheels will lock-up on the vehicle parts without Load Sensing brakes.

The reason for this is obvious. If the braking capability of only one vehicle in a combination is reduced, the other parts will do more of the braking work. The chances that the wheels will lock-up on these other parts is increased, assuming they are also lightly laden. However, using Load Sensing brakes on the trailer and not the truck of a single-combination is OK because the trailer experiences a greater proportional weight change when unladen than the truck does.

If Load Sensing brakes are used on only one trailer in a multi-combination, then the brake balance will be poor. The extreme consequence of very poor brake balance can be trailer swing or jack-knife by the trailer without the LSB, during moderate or heavy braking.

The new brake rule ADR 38/04 exempts converter dolly trailers from the requirement to have Load Sensing brakes or Antilock brakes. However, dog trailers are not exempted. There is no particular reason why the front axle group on a trailer should be treated differently. The danger is that wheel lock-up on a dolly trailer, which pulls a semi-trailer that has Load Sensing brakes, will be common. The extreme consequence of wheel lock-up on a converter dolly is jack-knife.

The technical requirements in ADR 38/04 for Antilock brakes on trailers have been changed to require wheel speed sensors on two axles in a tri-axle or a quad-axle group. Previously, wheel sensors were only required on one axle in a tri-axle or quad-axle group. This change will allow more sophisticated operation, as the Antilock has a better knowledge of pending wheel lock behaviour. It also provides some resiliance should one wheel sensor be out of adjustment.

The following tables are taken from ARTSA's Brake Code of Practice. They provide guidance about brake control technologies that can be successfully used together on combination vehicles. The tables include Electronic Brake Distribution (EBD) for trucks, which has both the Antilock function and Load-Sensing brake distribution, achieved by electronic control. Trailer EBS includes Antilock brakes, Electronic Brake Distribution and Roll Stability Program, again achieved by electronic control. Because of the additional safety benefits offered by current-generation electronic brake control for minimal additional cost, most trailers in the future will be spec'd with trailer EBS.

The take-away message from this article is that the mixing of different brake control technologies on a combination vehicle needs to be done with insight to minimise the risk of very poor brake balance occuring. ADRs 35/04 and 38/04 do not guarantee good brake balance because they apply to single-vehicles only. Get a brake supplier involved to provide guidance in your case.

Finally, the set-up of the brake control technologies should account for the actual characteristics of the towing vehicle. Therefore, an EBS truck should be set-up appropriately for the trailer(s). A Load Sensing brake system (LSB) should be set-up so that the compatibility characteristics of the towing and towed vehicles are about the same when unladen. ADR 38/04 requires that an LSB be set to meet a particular performance specification. However, it provides no guidance about the setting of Electronic Brake Distribution, which is the electronic version of the LSB.

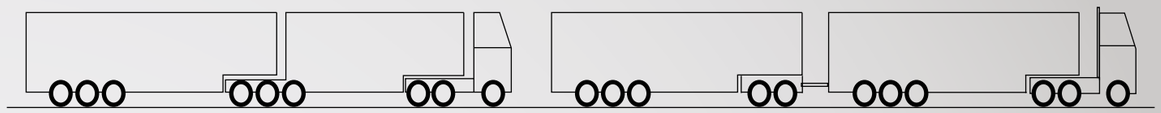

Table 2. Recommended mixtures of brake technologies for two-trailer vehicles.

| B-Trailer | A-Trailer | Prime Mover | Second Trailer | Dolly Trailer | Semi-Trailer | Prime- Mover |
|---|---|---|---|---|---|---|
| EBS* | EBS* | EBS | EBS* | LSB/ABS | EBS* | EBS |
| LSB | LSB | EBS | LSB | LSB/ABS | LSB | EBS |
| ABS | ABS | EBS | ABS | LSB/ABS | ABS | EBS |
| EBS* | EBS* | ESC | EBS* | LSB/ABS | EBS | ESC |
| EBS* | EBS* | EBD | EBS* | LSB/ABS | EBS | EBD |
| ABS | ABS | EBD | ABS | LSB/ABS | ABS | EBD |
| LSB | LSB | EBD | LSB | LSB/ABS | LSB | EBD |
| LSB | LSB | LSB + ABS # | LSB | LSB/ABS | LSB | LSB |
| ABS | ABS | ABS | ABS | LSB/ABS | ABS | ABS |

# ADR 64 requires that B-double prime movers have ABS. This is assumed to also apply to B-triple prime-movers.

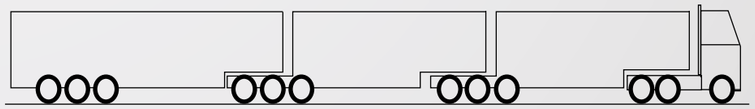

Table 3. Recommended mixtures of brake technologies for a B-Triple vehicle.

| C-Trailer | B-Trailer | A-trailer | Truck |
|---|---|---|---|
| EBS* | EBS* | EBS* | EBS |
| EBS* | EBS* | EBS* | ESC |
| ABS | ABS | ABS | EBS |
| LSB | LSB | LSB | LSB + ABS # |
| LSB | LSB | LSB | EBS |
| LSB | LSB | LSB | ABS |
| ABS | ABS | ABS | ABS |

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