Smart braking systems

Bob Woodward - ATA / RFT, Session Chair
Thomas Belcher – Federal Department of Infrastructure & Regional Development, Standards Division
Ian Thomson - BPW Transpec, Engineering
Peter Verde - SAF Holland
Chris Blanchard - Herb Blanchard Haulage
David McCormick - Rivet Energy
Bob Woodward
Australian Trucking Association
& Ron Finemore Transport
Session Chair
Thomas Belcher
Standards Development & International Vehicle Safety Standards Branch
Mandating Electronic Stability Control (ESC) for heavy vehicles is an agreed priority under the National Road Safety Strategy (NRSS) and 2015-2017 Action Plan, as endorsed by transport Ministers in November 2014.

Implementation:

- Development of a regulatory package in accordance with the NRSS.
- Adoption of Australian Design Rule (ADR) requirements (subject to Regulation Impact Statement outcomes).
ADR 35 AND 38 DEVELOPMENT

• Working with industry reference group on development of draft ADRs

• ADR 35/06 being developed to require stability control for prime movers and heavy buses
  ▪ Functional requirements (directional and rollover)
  ▪ Demonstration of ESC performance through United Nations UN ECE R13/11 Approval or a J-turn test based on that in US

• ADR 38/05 being developed to require stability control for heavy trailers.
  • Functional requirements (rollover only)
  • Excludes converter dollies and certain low-loaders
a) Vehicle oversteering,
b) Vehicle understeering.

- Braking force
- Yaw-moment adjustment
- Direction of motion
- of the (part) vehicle

ESP intervention
• Stability function needs to incorporate at least rollover control (RSC).

  - Rollover control automatically brakes at least two wheels of each Axle or Axle Group when the system detects, from values of the vertical force on the tyre(s) or lateral acceleration and wheel speeds, that the trailer is at risk of rollover.
- Stability function needs to incorporate at least rollover control (RSC).
  - Rollover control automatically brakes at least two wheels of each Axle or Axle Group when the system detects, from values of the vertical force on the tyre(s) or lateral acceleration and wheel speeds, that the trailer is at risk of rollover.
ELECTRICAL CONNECTORS FOR TRAILER ABS/RSC

• A 24 V connector required for trucks designed to be used in ‘Road Train’ combinations, to power trailer ABS/RSC systems
  
  Additional 12 V connector permitted

• A 24 V connector required at front and rear of ‘Road Train’ trailers designed to tow another trailer (>4.5 tonnes ‘ATM’)
  
  Additional 12 V connector permitted
OTHER KEY ELEMENTS OF THE DRAFT ADRs 35 AND 38

- Auto slack adjusters for all trucks/trailers
- Operation of the parking brake control must result in application of trailer spring brakes (no parking on air)
- Switch allowed for operator to disable truck and trailer stability control system for low speed manoeuvring
  - Truck systems must also automatically reset on each ignition cycle
- Trailers (excluding converter dollies and certain low-loaders) to be equipped on each Axle Group with an Antilock Brake System (ABS)
PUBLIC CONSULTATION PROCESS

• Regulation Impact Statement (RIS) released around late October 2017 for a minimum of 4 weeks

• DRAFT ADRs released with RIS

• FINAL ADRs determined following RIS consultation

• Usually at least 18-24 months lead time once published (therefore from approx. 2019-20 onwards)

• Shorter lead time needed for trailers than for trucks and buses
Smart Braking:

- Hope you are all familiar with the guide by now
- If not please download or request a hard copy
- If you need any interpretations or assistance please ask.
- The aim of the guide is to help
Smart Braking

Use the guide to:

• Determine best braking combinations from your fleet
• Assist with purchase decisions for your fleet
• Achieve safer braking and stability outcomes for a given combination
• Give confidence/assurance of how a combination is put together

Table 3: performance rating for truck and trailer
### Compatibility development truck & semi trailer

#### Brake System: Semi Trailer/ Dog Trailer / Lead Trailer/Dolly

<table>
<thead>
<tr>
<th>Brake System: Truck</th>
<th>Trailer Brake System Power Yes/No</th>
<th>Basic</th>
<th>LSV</th>
<th>ABS</th>
<th>T-EBs (No Roll Stability)</th>
<th>T-EBs with Roll Stability</th>
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<tr>
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<td>Heavy Braking</td>
<td>Roll Stability</td>
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**Legend:***
- ✓: Compatibility
- ×: Incompatibility
Compatibility development truck & semi trailer

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<td>Basic</td>
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<tr>
<td>LSV</td>
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<td>ABS</td>
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<td>ABS with ESC</td>
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<tr>
<td>EBS - Truck (No ESC)</td>
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<tr>
<td>EBS with ESC</td>
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TMC Technical & Maintenance Conference

Image: TMC logo on metallic background.
Euro vs US type settings

• We have a mixture of European and US style truck brake settings in our market
• European settings have typically used load sensing in their truck EBS settings for some time and US typically don’t account for load sensing but rely more on the ABS function to prevent lock up
• The difference in these settings can add to the complexity of brake compatibility and wear issues
• For best compatibility each part of the combination should look after the brake load of that part.
Onset of Braking

- With ABS you can't modify braking onset
- With EBS you can modify the braking onset

![Graph showing Established Retardation Characteristic (ERC) vs. Control Signal 'E' with application pressures and ADR boundaries.](image)

- 80-90% of braking in this zone *

- ADR upper boundary
- ADR lower boundary

- Equivalents:
  - 130
  - 260
  - 325
  - 520
  - 650kPa
  - application pressures
Contact Pressure and Onset points

EBS enables greater flexibility for brake settings:

• The Brake booster size and slack adj. length effect brake onset
• Disc and drum brake start to operate at different pressures
• Through the EBS programming we can set some of the brake pressures
• The changes we make to pressure settings help better match overall brake performance across the whole vehicle
• Always start with a correctly adjusted mechanical/pneumatic brake set up
Trailer EBS (TEBS) Brake outputs

TEBS logs data to help with assessing what adjustments are required to improve the braking, it can also provide feedback to help reduce maintenance costs and encourage safer driving practices.
Trailer EBS (TEBS) Brake outputs

With TEBS:

• Varying systems will give a log of Brake Performance or harsh brake application counts
• These logs also help with assessing how the vehicle braking and or driver is performing
Additional things to consider

• Simple ongoing checks/maintenance of wiring and connectors will limit problems
• Take care to check the basics: brake adjustment, booster condition, EBS power, air supply cleanliness and valve air filter...
• ABS/EBS and Roller Brake testing?
Chris Blanchard
Herb Blanchard Haulage
TEBS by accident
TEBS by accident!

‘06 Trailers with smart brake systems & retro’ing older units
’07 PBS compliant units with TEBS equipped trailers
  • Tyre flat spotting
  • Brake by wire and balance with improved performance
  • Reduced maintenance costs through improved brake wear, up to 150% life improvement
  • Safer empty braking and excellent loaded performance
  • Driver reluctance and acceptance
  • ODR/OBD => reporting
    (ABS/jackknife/heavy braking & rollover interventions)

Backup –
System supplier diagnostic software/training FoC for owner
TEBS by accident!

Design issues
- TEBS over ABS
- ‘06 - 24volt Vs 12volt / CAN comm’s
- ADR's did not assist ABS/TEBS on some new vehicles

Maintenance issues
Very few running highway and regional roads with bit of dirt
- Dirty poll rings ≈ wheel seal failure, sensors moving, excessive bearing play
TEBS by accident!

Moving forward with TEBS
• Onboard in Dash Scales => Smart Board (if fitted)
• ETASC (Electronic Trailer Air Suspension Control)
• Optiturn - improved turning / reduced tyre wear at low speeds
• Tailguard - Improved safety and damage reversing
Many other untapped functions
• AEB (Autonomous Emergency Braking) may need TEBS

Not 1 flat spotted tyre on a smart trailer since 2006!
$$$$$$$$ saved
Safety! How many unknown accidents has it saved us?
David McCormick
Rivet Energy
Learnings and Maintenance to Ensure EBS works correctly
Rivet Maintenance Long and Short Haul

To ensure our fleet is compliant and all braking systems are working correctly Rivet has put in to place a stringent service and maintenance schedule.

<table>
<thead>
<tr>
<th>Asset Code</th>
<th>REGO</th>
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Maintenance Trailing Equipment

• 45 days as a minimum
• Tyre pressures checked
• Brake test / shaker completed
• Wheel bearings checked
• Autoslacks checked
• Brake stroke checked to ensure no over stroking
• EBS leads and wiring checked
• 6 Monthly: quality audits on all equipment
• All tow operators must comply to our maintenance standards
• Annually: wheel bearings complete strip/inspect and replacement if required
Month of Sep
Company and Tow Haulier:
• 953193 kms travelled
• Average of 12709 kms per vehicle
• CPK average .373 (Company Fleet)

Road Authority Inspections for Sep 17: 5
Defects Issued 1 (Brake Imbalance/Adjustment)

Inspections Jan 17 to Sep 17 Total: 91
Defects issued (Brake imbalance/Adjustment) 3
Smart braking systems and getting the best out of them
Panel Q &A

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