

**NATIONAL HEAVY VEHICLE
BRAKING BRAKING STRATEGY**

November 2008



National Transport Commission

**Prepared by
National Transport Commission**

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National Heavy Vehicle Braking Strategy

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REPORT OUTLINE

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Type of report: Information Paper

Objectives: To inform stakeholders of the finds of the national heavy vehicle braking strategy report, and the actions that the NTC will undertake in response to the findings of the report.

NTC Programs: Safety

Key Milestones: The national heavy vehicle braking strategy report due in November 2008 with NTC's response by the end of November 2008.

Abstract: In response to the national heavy vehicle braking strategy report, the NTC has identified three areas to focus action: an Advanced Heavy Vehicle Strategy to increase the uptake of advanced safety features; a series of Australian Design Rules amendments and potentially Australian Vehicle Standard Rules changes; and an industry led Brake Balance Code of Practice.

Purpose: For information

Key words: Brake system, antilock braking system (ABS), advance safety systems, electronically controlled braking systems (ECBS), Electronic stability control (ESC).

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FOREWORD

The National Transport Commission (NTC) is an independent body established under Commonwealth legislation and an inter-governmental agreement and funded jointly by the Commonwealth, states and territories. The NTC is responsible for developing, monitoring and maintaining uniform or nationally consistent regulatory and operational reforms relating to road, rail and intermodal transport in Australia.

Australia has a uniquely diverse range of heavy vehicles. It includes equipment manufactured in Australia, North America, Europe and Japan as well as multi-combination b-doubles, road trains and other innovative combinations. This diversity coupled with the need to mix and match trucks and trailers can lead to poor braking performance and a potential road safety risk.

NTC is committed to improved heavy vehicle braking. Not only is it a key safety reform but it is also a key factor in building community confidence in larger and more productive vehicles that can improve Australia's road freight efficiency.

This paper informs stakeholders of NTC's response to a comprehensive review of a complex safety issue. It outlines a practical way forward to improve brake safety; including short-term actions for industry and government and future work to harness the potential of advanced braking technology.

The braking strategy is broadly supported by industry. NTC will continue to work closely with industry and government stakeholders to get the right outcome for Australia.



Greg Martin
Chairman

SUMMARY

Improvements to Australian Design Rules (ADR) for heavy vehicle braking are constrained by the need to maintain interoperability of the wide and varied trailer fleet used in Australia. This limits the industry's ability to easily adopt new braking technologies.

NTC commissioned brake expert Dr Peter Hart to conduct an investigation into heavy vehicle braking. The national heavy vehicle braking strategy final report provides a comprehensive analysis of the issues relating to heavy vehicle braking. It also includes specific recommendations to improve the braking performance of the Australian heavy vehicle fleet.

In response to the national heavy vehicle braking strategy report, NTC identified three areas of action to address short and longer-term heavy vehicle brake safety.

In the short-term, NTC has recommended amendments to the relevant Australian Design Rules (for new vehicles) to ensure prime mover and trailer braking, when connected in combination, will work better. A future review of relevant Australian Vehicle Standards Rules (AVSR) will improve in-service vehicle braking standards for existing vehicles.

A proposed Braking Balance Code of Practice, led by industry, will help brake suppliers, dealers and engineers identify poor performing combinations and provide guidelines and tools to improve brake performance.

Finally, in recognition of the potential safety benefits of braking technology now available in the marketplace, it is recommended that an *Advanced Heavy Vehicles Braking Strategy* should be developed in consultation with industry and government stakeholders.

These actions are consistent with the national heavy vehicle braking strategy major recommendations and will have the greatest impact on road safety.

CONTENTS

1. INTRODUCTION	1
1.1 National Transport Policy Framework.....	2
1.2 National Heavy Vehicle Braking Strategy	2
2. REPORT ON HEAVY VEHICLE BRAKING	4
3. NATIONAL HEAVY VEHICLE BRAKING STRATEGY.....	6
3.1 Australian design rules amendments.....	6
3.2 Australian Vehicle Standard Rules amendments.....	10
3.3 Industry Developed Brake Code of Practice	11
3.4 Strategies to increase the uptake of advanced safety features	12
3.5 Consultation with stakeholders	15
3.6 CONCLUSION.....	15
4. GLOSSARY.....	17
5. REFERENCES	18
APPENDIX A: NATIONAL TRANSPORT POLICY FRAMEWORK'S VISION, POLICY OBJECTIVES AND POLICY PRINCIPLES	19

LIST OF TABLES

Table 1. Benefits of breaking systems	4
Table 2. Recommended Australian design rules from the national heavy vehicle braking strategy	6
Table 3. Australian design rules proposed amendments	9
Table 4. Proposed future Australian design rules reviews	10
Table 5. Advanced braking technologies	14
Table 6. NTC's response to the national heavy vehicle braking strategy report.....	15

LIST OF FIGURES

Figure 1. Brake system technology hierarchy.....	12
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1. INTRODUCTION

Australia is failing to meet its own 40% road safety reduction target. Each year there are still 1600 road deaths and 30,000 hospital admissions while the economic cost of road crashes has been conservatively estimated at \$18 billion.

Whilst the level of road trauma caused by heavy vehicles is less than passenger cars, and should be considered in the context of a growing transport task, it is still significant. During the 12 months to the end of March 2008, 294 people died from 251 crashes involving heavy trucks or buses¹.

These included:

- 183 deaths from 148 crashes involving articulated trucks;
- 92 deaths from 85 crashes involving heavy rigid trucks; and
- 27 deaths from 26 crashes involving buses.

Heavy vehicle safety is influenced by a number of factors, including speed and fatigue. Brake performance and dynamic stability of heavy vehicles are known to contribute to heavy vehicle crashes because of the challenges that load variation and mixing different technologies on combinations pose for good brake performance on heavy vehicles.

We also know that Australia's major trading partners (Europe, America, Japan and China) have justified mandatory antilock braking systems (ABS) on heavy vehicles including trailers (Hart 2008). Furthermore the European Commission (EC) is planning to mandate advanced safety systems like electronic stability control (ESC), and advanced emergency braking systems (AEBS) in the near future².

The National Heavy Vehicle Braking Strategy recommends the development of Australia's brake regulations to capitalise on the significant safety improvements achievable with new technologies. The strategy covers all motor vehicles with a gross vehicle mass of greater than 3.5 tonnes and all trailers with an aggregate trailer mass of greater than 3.5 tonnes.

This strategy aligns with the safety policy objective under the Australian Transport Council's (ATC) National Transport Policy (ATC May 2008) to provide a safe transport system that meets Australia's mobility, social and economic objectives with maximum safety for its users.

The strategy also aligns with ATC's National Road Safety Action Plan 2007 and 2008 which is underpinned by 'safe system' principles. In managing road safety the safe system approach requires (ATC 2008b) to regulating or encouraging high quality active and passive safety systems in vehicles to reduce impact forces on occupants and on struck pedestrians and cyclists.

The National Road Safety Action Plan calls for vigorous action to achieve a major step-down in road deaths. Concurrent short and longer term actions include accelerating the introduction of vehicles with improved safety systems.

¹ Fatal Heavy Vehicle Crashers Australia Quarterly Bulletin. Jan-Mar 2008.

² European Commission Document No: WP.29-145-08, 145th session, 24-27 June 2008, agenda Item 6.

1.1 National Transport Policy Framework

The Australian Transport Council (ATC) consists of transport ministers from Australian state and territory governments. It is the ministerial forum for the coordination and integration of transport policy issues at a national level. At ATC's meeting in February 2008, ministers agreed that there is a need for a national approach to transport policy.

The vision, policy objective and policy principles were agreed at ATC's meeting in May 2008. These are reproduced in Appendix A.

1.2 National Heavy Vehicle Braking Strategy

NTC is committed to making progress on heavy vehicle braking. Not only is it a key safety reform but it is also a key factor in building community confidence in larger and more productive vehicles that can improve Australia's road freight efficiency.

There are three elements supported by the NTC from the findings of national heavy vehicle braking strategy report:

1. An Advanced Heavy Vehicle Strategy should be developed to increase the uptake of advanced brake safety features. Policy development should include extensive consultation with all stakeholders. Strategies may include but should not be limited to mandatory regulations.
2. The adoption of the national heavy vehicle braking strategy's proposed Australian design rules amendments and relevant Australian vehicle standard rules (AVSR). This includes mandatory anti lock braking and, in time, fitment of electronically controlled braking systems (ECBS) or Electronic braking systems for motor vehicles on new motor vehicles (motor vehicles other than road train prime movers with a gross vehicle mass greater than 3.5t) fitted with air brakes.

Electronically controlled braking systems would not be mandated in the immediate future on new trailers (trailers with an Aggregate Trailer Mass (ATM) greater than 3.5t). New trailers would, however, be required to have load-proportioning brakes if they do not have an antilock brake feature.

This approach is consistent with current policies of harmonising with the United Nations Economic Commission for Europe. The proposals will be subject to the development of a regulatory impact statement by the Australian Government Department of Infrastructure, Transport, Regional Development and Local Government.

The NTC acknowledges Australia's policy of harmonising vehicle standards rules, subject to a regulatory impact statement, with those of the United Nations Economic Commission for Europe. In this domain Australian design rules should be consistent with United Nations Economic Commission for Europe Regulation 13³, Consequently Australia should, in-time mandate electronic stability control systems (ESC), which are required under Regulation.

³ Regulation 13 is the pre-eminent world braking rule for heavy vehicles. It has been adopted into, or has significantly influenced the braking rules in Europe (EEC), Japan, New Zealand and recently in China and Thailand. Furthermore, the brake compatibility limits in the Australian Design Rules 35 and 38 have been influenced by those in United Nations Economic Commission for Europe Regulation 13.

3. NTC is supporting industry in developing a Brake Balance Code of Practice. The code will provide guidelines and tools that will assist in the achievement of good brake performance for all heavy vehicle combinations.

2. REPORT ON HEAVY VEHICLE BRAKING

In 2002 the NTC was asked by SCOT/TACE to review the case for mandating antilock braking systems on heavy vehicles. Following initial stakeholder consultation, it was determined that broader investigation was required.

Heavy vehicle braking expert Dr Peter Hart was commissioned to report on the full range of issues related to heavy vehicle braking. The national heavy vehicle braking strategy report is a comprehensive resource and is available on the NTC website (www.ntc.gov.au). It is anticipated that the report will provide the impetus for numerous reform actions in the future.

With regard to mandatory anti-lock braking the report's recommendation was that antilock brakes should be mandated in the short-term on heavy vehicle types to provide protection against wheel lock-up (in particular skidding on drive axles) Road trains to include a antilock braking systems disabling switch for when travelling on dirt roads.

Other key recommendations in the report are:

The brake balance of combination vehicles can and should be improved.

Higher national stopping and directional control performance standards should be specified.

Electronic brake control systems should be encouraged subject to revised technical performance requirements.

Replacement brake parts should meet standards to ensure that performance comparable with the relevant new, certified vehicle be achieved.

Guidelines about brake adjustments and modifications should be developed for brake mechanics and technicians to support improved road safety.

The following table describes the main benefits of some of the different braking systems:

Table 1. Benefits of breaking systems

SAFETY FEATURE	BENEFITS
Electronically Controlled Braking Systems (ECBS/EBS)	A faster system response and reduced stopping distance; Provide interaction with retarders and exhaust brakes; Automatically balance the braking on truck and trailer; and More even brake pad wear and preventative maintenance with brake pad monitoring.
Electronic Stability Control (ESC)	Provides protection against skidding and rollover and prevents loss of control and allows to some degree, drivers to regain some control in emergency situations
Anti Lock Brakes (ABS)	Provides protection against skidding. It can be particularly effective at preventing jack-knife events on combination vehicles.

Recent international and Australian developments have strengthened the case to go beyond antilock protection and consider a move over time to advanced braking technology, which adds intelligent control and distribution.

Electronically controlled braking systems are maturing technologies, including significant experience in Australia. Furthermore, the United Nations Economic Commission for Europe has decided to amend Regulation 13 to require both electronic braking systems and electronic stability control on heavy vehicles in a staged introduction between 2010 and 2016.

Australia currently has a policy of harmonising vehicle design rules with the Economic Commission for Europe.

The NTC has identified three areas to focus action for immediate action and longer-term development:

1. The inclusion of the national heavy vehicle braking proposed Australian design rules amendments in the development of a regulatory impact statement by the Department of Infrastructure, Transport, Regional Development and Local Government; particularly the mandatory fitment of antilock braking systems on new vehicles, and future review on electronically controlled braking systems.

In addition, modifications to the relevant Australian vehicle standard rules will be required to improve the braking performance requirements of in-service vehicles (heavy vehicle combinations).

2. The transport industry, including supplier and manufacturers are developing a Brake Balance Code of Practice. The intent is for the code to help brake suppliers, dealer and engineers identify poor performing combinations and provide guidelines and tools to improve brake performance.
3. An Advanced Heavy Vehicle Braking Strategy should be developed to improve the uptake of advanced brake safety features on heavy vehicles.

The NTC's considers that these actions will have the greatest impact on road safety and are consistent with the national heavy vehicle braking strategy major recommendations.

3. NATIONAL HEAVY VEHICLE BRAKING STRATEGY

A three-pronged approach will improve heavy vehicle braking over the short-term and long-term. Heavy vehicle braking is a key road safety reform and also an important factor in building confidence in larger and more productive vehicles that can improve Australia's road freight efficiency.

The proposed approaches are explained in more detail in the following sections:

3.1 Australian design rules amendments

The national heavy vehicle braking strategy report proposes a number of amendments to the brake regulations that apply to new trucks and trailers, which are - Australian design rules 35 and 38. The report does not recommend that heavy vehicle braking becomes fully harmonised with UNECE Regulation 13, but does recommend that UNECE Regulation 13 requirements are adopted as much as possible.

The changes recommended by national heavy vehicle braking strategy fall into nine categories and are listed in Table 2.

Table 2. Recommended Australian design rules from the national heavy vehicle braking strategy

CATEGORY	RECOMMENDED AUSTRALIAN DESIGN RULES CHANGE (subject to RIS)
Mandate antilock braking systems on new motor vehicles (with gross vehicle mass > 3.5t)	<ul style="list-style-type: none"> • mandate antilock braking systems on motor vehicles with a gross vehicle mass over 3.5t; • in time mandate electronically controlled braking systems and electronic brake distribution on motor vehicles (other than road train¹ components) with a gross vehicle mass greater than 3.5t; • require new road train¹ components to meet the Australian design rules unladen brake compatibility limits (either trailers fitted with antilock braking systems or load proportioning systems)²; • vehicles fitted with an antilock braking feature should be exempt from the Australian design rules unladen brake compatibility limits³; • allow a means to disengage the antilock braking function when operating on gravel roads, including reset with each start-up; • an antilock braking function to have split-mu capability (i.e. independent control to each side of an axle); • vehicles that are fitted with a tow coupling must provide an electrical antilock braking systems (or electronically control braking systems)² connector for use by a trailer; • the antilock braking systems (or electronically control braking systems) electrical connector to be keyed for 12 volt or 24 volt operation, as appropriate; • mandate automatic brake adjustment on vehicles fitted with

CATEGORY	RECOMMENDED AUSTRALIAN DESIGN RULES CHANGE (subject to RIS)
	<p>an antilock braking function;</p> <ul style="list-style-type: none"> • drop release time limits for an air path that passes through an antilock modulation valve; • Achieve Australian design rules 35 and 38 stopping distance requirements with antilock braking function inactive; and • In time require heavy motor vehicles to have electronic stability control. <p>Notes:</p> <ol style="list-style-type: none"> 1. A road train component is a motor vehicle declared by the manufacturer to be a road train on the Australian design rules 61 heavy vehicle identification plate. 2. An electronically controlled braking system must include an antilock braking function. 3. Compliance with the Australian design rules unladen compatibility limits will require that load-proportioning brakes be fitted.
<p>Mandate either antilock braking systems or unladen compatibility limits on trailers (with aggregate trailer mass > 3.5t)</p>	<ul style="list-style-type: none"> • new trailers (with an ATM > 3.5t) to have either antilock braking systems or to comply with the unladen brake compatibility limits (variable load proportioning systems). • in time, require all new trailers (with an aggregate trailer mass > 3.5t) to have an electronically controlled braking system. • steerable trailer axles with antilock braking systems are not required to have split-mu capability
	<p>sub-assembly registration number (SARN) reports to show:</p> <ul style="list-style-type: none"> - actuator size - lever length (if applicable) - brake dimensions - disc or drum brakes used. - average torque values - manufacturers nominal lining friction rating <p>historical SARN data to be publically available;</p> <p>SARN number information for foundation brakes to be available for each vehicle⁴;</p> <p>where a manufacturer does not certify the foundation brakes via a SARN, the brake performance and set-up information is to be made publicly available.</p> <p>inertia dynamometer tests to be an acceptable method of certifying foundation brakes, and that federal motor vehicle safety standards 121, Economic Commission For Europe Regulation 13 and European Union 86/12/EC test reports to be acceptable in Australia.</p> <p>Australian design rules 35 and Australian design rules 38 to</p>

CATEGORY	RECOMMENDED AUSTRALIAN DESIGN RULES CHANGE (subject to RIS)
	specify a burnishing procedure prior to brake testing Note: 4. It should not be necessary to recertify the vehicle's foundation brake performance when Electronic braking systems /Trailer Electronic Braking System is mandated
Economic Commission For Europe Regulation 13 as an alternative standard	<ul style="list-style-type: none"> • upgrade the acceptable version level of Economic Commission for Europe Regulation 13 in line with Australian design rules requirements for electronic controlled braking systems. • require manufacturers who certify brakes via the Economic Commission for Europe regulation 13 approval path to declare test weights at which compatibility testing was conducted. • develop Summary of Evidence forms that are tailored to Economic Commission for Europe regulation 13 as an alternative to the usual SE35 and SE38 forms.
Antilock braking systems and electronically controlled braking systems equipment standards	<ul style="list-style-type: none"> • Antilock brake systems to be proven against the United Nations European Commission for Europe regulation 13 Annex 13 test requirements in at least one instance. This requirement will also apply to the antilock brake feature of electronically controlled braking systems.
Trailer brake controls – 'spring to off'	<ul style="list-style-type: none"> • Australian design rules 35 to require that when trailer brake controls are fitted they are 'spring to off', that is, they are cannot be used as "hand brake" when parked.
Auxiliary braking systems	<ul style="list-style-type: none"> • antilock braking systems to have veto control over the auxiliary brakes (retarder); • powerful auxiliary brakes must only apply with a specific driver control action; • stop lamps to illuminate when an auxiliary brake is active that could cause a 0.1g deceleration.
Intelligent braking systems	<ul style="list-style-type: none"> • New section in Australian design rules 35 that concerns the control, warning features and fault performance of electronically controlled brakes. This section to be based on Economic Commission for Europe regulation 13.
Road train pneumatic systems	<ul style="list-style-type: none"> • Australian design rules 63 and 64 to specify an upper limit of pneumatic resistance in the air supply paths on any vehicle that is road train capable and has a rear tow coupling.

The mandatory fitment of antilock braking systems on some heavy vehicle types should be considered with the highest priority. Also, the requirements for antilock braking systems to assume veto power over the auxiliary braking should be required in the context of mandatory antilock braking systems.

Further details on the proposed amendments are available in the national heavy vehicle braking strategy report.

The Department of Infrastructure, Transport, Regional Development and Local Government has begun the process of working through national heavy vehicle braking strategy proposed Australian design rules amendments. There will be opportunity for public comment on major amendments during the required regulatory impact statement consultation process.

NTC has proposed the following timeline for the implementation of amendments and will endeavour to establish a shared position with Vehicle Safety Standards (VSS) of Department of Infrastructure, Transport, Regional Development and Local Government, as part of the existing Australian design rules development arrangements.

Table 3. Australian design rules proposed amendments

Date	AUSTRALIAN DESIGN RULES SERIES	PROPOSED AMENDMENT (subject to a RIS)
Jan 2009	35/02, 38/03	Require trucks and trailers to meet unloaded limits if variable load proportioning brakes are fitted. Certification can be proven by computation.
July 2011	35/03I, 38/04I	Require motive trucks to have antilock braking systems fitted. Require trailers to either comply with the unladen compatibility limits (i.e. Load proportioning brakes) or have an antilock braking systems fitted. Require safety enhancements in the Australian design rules (trailer handpick, auto adjusters, auxiliary brake controls).
July 2013	35/03II, 38/04II	Require United Nations Economic Commission for Europe regulation 13 equivalent stopping performance for basic braking tests (0.5g minimum from 60 km/h)

Table 4. Proposed future Australian design rules reviews

Date	AUSTRALIAN DESIGN RULES SERIES	FUTURE REVIEWS (subject to a RIS)
July 2012	63/01 and 64/01	Apply pneumatic supply performance standards for road train capable motive vehicles and trailers.
2015	35/04, 38/05	<p>Require electronic stability control Systems to be fitted to all new trucks and trailers with a GTM, ATM > 3.5t.</p> <p>Revise the alternative standards provisions in the Australian design rules 35 and 38 to specify Economic Commission for Europe regulation 13.11. (Consider full harmonization of the Australian design rules with Economic Commission For Europe Regulation 13.11 or higher).</p> <p>Require United Nations Economic Commission for Europe equivalent decelerations for basic braking tests. Align the Australian design rules compatibility limit curves with those in Economic Commission For Europe regulation 13.</p> <p>Note: A United Nations Global Technical Rule might exist for electronic stability control by 2015. Australia should adopt this rule.</p>

If these amendments were to be implemented in 2015 in line with the proposed introduction of electronic stability controls, this would represent a full five years lag behind implementation in Europe. The timeline does not include a schedule for the introduction for advanced braking/warning technologies (section 3.4) such as advanced emergency systems or lane departure warning systems.

3.2 Australian Vehicle Standard Rules amendments

The Australian vehicle standards rules require a vehicle that is subject to an Australian design rules when built or imported to continue to comply with the Australian design rules. The vehicle standards also apply other standards (adopted standards) intended to complement the Australian design rules.

A major objective of the braking strategy is to promote compatibility of brake systems; particularly their performance between vehicles connected in combination. One of national heavy vehicle braking strategy recommendations is to work towards aligning performance standards of the different bodies of legislation.

To account for factors such as the continued operation of older heavy vehicles, at present 128 sets a much lower stopping distance requirement than that applying to new vehicles/trailers in the Australian design rules. While it includes some provision for

limiting trailer swing/jack-knife (i.e. 3.7m lane width limit), it does not make any reference to wheel lock-up. The latter is particularly relevant to unladen trailer braking performance.

As the Australian vehicle standards rules requirements must account for the performance of older vehicle/trailer stock, it is not necessarily feasible to align the performance levels with those of the Australian design rules in the short term. However, Australian vehicle standards rule 128 is the national standard for combination vehicle braking, and a higher standard should be developed.

This standard should be reviewed, including a ‘grandfathering’ arrangement for older vehicles. The Brake Balance Code of Practice would be a useful compliance tool to meet future in-service standards.

3.3 Industry Developed Brake Code of Practice

NTC supports the Australian Road Transport Suppliers Association (ARTSA) initiative to develop an industry Brake Balance Code of Practice. ARTSA will develop the code in association with the Australian Trucking Association’s (ATA) Industry Technical Council (ITC) and the Truck Industry Council (TIC). This will build upon the existing Air Brake Code of Practice developed in 1997 with funding from the Australian Government and the then National Road Transport Commission (NRTC).

The national heavy vehicle braking strategy report proposes that the existing Air Brake Code of Practice be extended to:

1. provide guidance on the procedures to be applied to correct poor brake balance on combination vehicles;
2. include the definition of a Figure of Merit for brake balance and proposed minimum values for the figure of merit; and
3. develop a computational tool to allow the Figure of Merit for vehicle configurations to be calculated.

A number of other recommendations offered in the national heavy vehicle braking strategy report may be undertaken by industry within the scope of a code of practice, these include:

- a replacement part code of practice;
- roller brake testing procedures;
- brake technician accreditation;
- guidance for modifications undertaken via vehicle safety board 6; and
- information for drivers on brake performance.

Industry is best placed to provide a practical perspective on how acceptable braking performance may be achieved and improved upon, and provide solutions to the myriad of challenges in getting the best brake performance in the Australian heavy vehicle fleet. It is expected that a code of practice will be developed by industry and partially funded by government.

The terms of reference for the Brake Balance Code of Practice will include an overriding public safety imperative that is a focus on delivering world’s best practice and promoting the specification of advanced safety features.

3.4 Strategies to increase the uptake of advanced safety features

An advanced heavy vehicle braking strategy should be developed, to increase the uptake of advanced brake safety systems. The decision to focus on advanced safety systems has been taken not only because it is consistent with safe system principles but because the brake system forms the foundation for many of these advanced technologies.

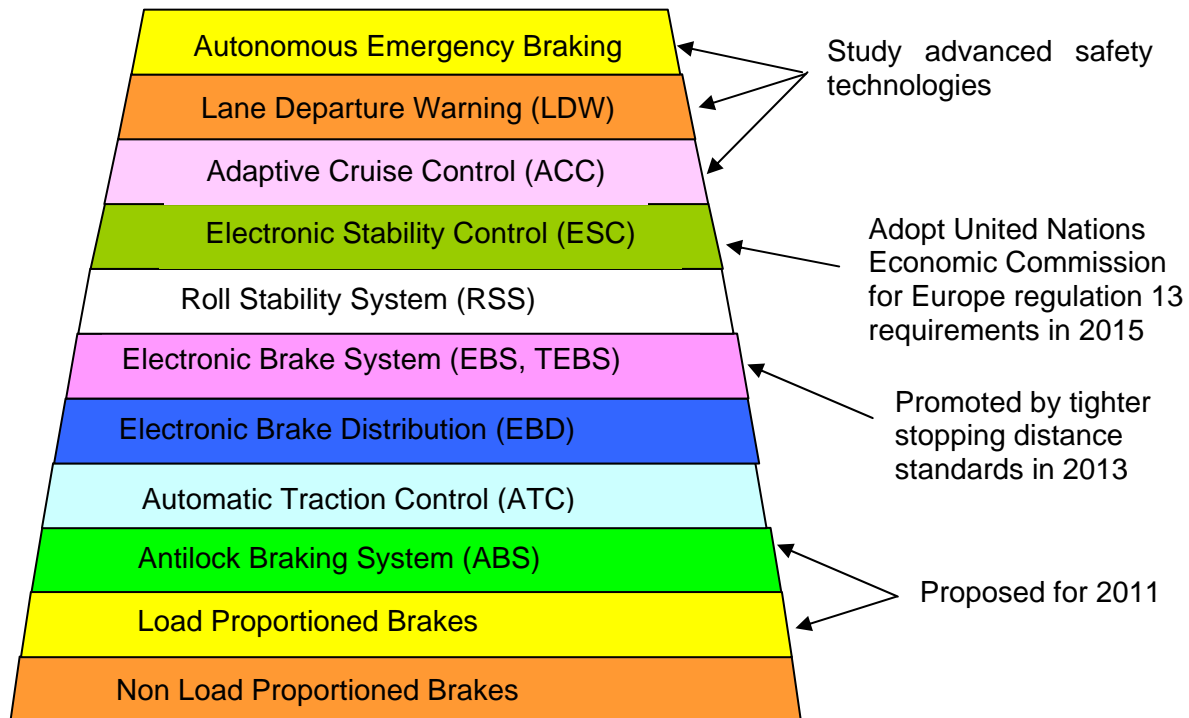


Figure 1. Brake system technology hierarchy

The strategy should focus on advanced safety systems that are directly related to the vehicle braking systems; however, it should consider the merit of other active vehicle technologies particularly if the cost/benefit ratio is improved by bundling of these technologies.

The executive European Commission recently found that there was a positive cost/benefit case for the mandatory fitment of advanced safety features. They have proposed that electronic stability control become mandatory on all new heavy vehicles from 2014 (later for some vehicles) and that potentially advanced emergency braking systems and lane departure warning systems become mandatory from 2015.

The European Union found that the economic benefit of electronic stability control systems was more beneficial on heavy vehicles and tourist coaches but that there is often not a market incentive to fit electronic stability systems voluntarily, since, unlike the case for cars, the purchasers are not normally the beneficiaries (CEC 2008).

If these technologies are to be mandated on new vehicles there must be a technical definition of the system and how it is to be approved.

Australian vehicle standards rules recommends that Australia should harmonise with the United Nations Economic Commission for Europe brake regulations as much as possible, but stops short of advocating full adoption of the standard. It argues that adoption of United Nations Economic Commission for Europe regulation 13 in full would (Hart 2008):

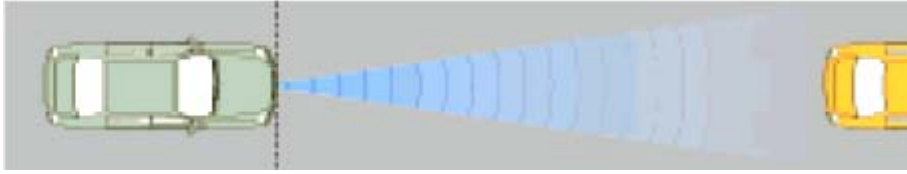

- cause substantial disruption to the new heavy vehicle industry, requiring design development in many instances;
- result in some confusion because the rule is very complicated;
- require a significantly more arduous test and certification process;
- require substantial investment in new testing facilities;
- disrupt the trailer-manufacturing industry because the certification by sub-assembly approach is not currently available; and
- result in less than satisfactory brake compatibility balance on B-doubles (and B-triples) because the rule does not have specific performance requirements for the leading trailer of a B-double configuration.

In undertaking the strategy the NTC will take these factors into account and ensure that technical specifications are appropriate for Australian conditions. It is anticipated that some research and testing may be required, the requirements for which should be investigated.

Whilst the national heavy vehicle braking strategy report is generally supportive of the application of electronic braking technologies, it made the point that the best outcomes occur when the fundamental brake balance on the vehicle (in particular combination vehicles) is good. Therefore relying on advanced braking technologies alone should not be the complete response.

Table 5 describes the major technologies used in advance braking. The line departure warning safety feature does not strictly fit as part of braking but should be reviewed as another means to improve road safety, especially on heavy vehicle combinations.

Table 5. Advanced braking technologies

ADVANCED SAFETY FEATURE	BENEFITS
<p>Electronically Controlled Braking Systems (EBS/ECBS)</p>	<p>A faster system response and reduced stopping distance; Provide interaction with retarders and exhaust brakes; Automatically balance the braking on truck and trailer; and More even brake pad wear and preventative maintenance with brake pad monitoring.</p>
<p>Electronic Stability Control (ESC)</p>	<p>Provides protection against skidding and rollover and prevents loss of control and allows to some degree, drivers to regain some control in emergency situations.</p>
<p>Anti Lock Brakes (ABS)</p>	<p>Provides protection against skidding. It can be particularly effective at preventing jack-knife events on combination vehicles.</p>
<p>Advance Emergency Braking (AEBS)</p>	<p>Sensors alert the driver when a vehicle is too close to the vehicle in front and, in certain situations, applies emergency braking to prevent or reduce the consequences of a collision.</p> 
<p>Lane Departure Warning (LDW)</p>	<p>Assist drivers by warning them when their vehicle is in danger of leaving the lane. This works by sensing if the driver is crossing road markings or when there is a vehicle in the adjoining lane.</p> 

3.5 Consultation with stakeholders

The development of an Advanced Heavy Vehicle Braking Strategy would require engagement with industry and government stakeholders to gain valuable feedback and information regarding Australian brake regulations. A strategic advisory group could also be appointed to assist policy development and provide feedback on the issues presented.

Formal consultation and public consultation should also be conducted at various stages throughout the development of an Advanced Heavy Vehicle Braking Strategy.

3.6 CONCLUSION

Good heavy vehicle braking performance is critical to the safe operation of the Australian heavy vehicle fleet. It is therefore imperative that action is taken to ensure that Australia is keeping pace with new braking technologies based on world's best practice.

The national heavy vehicle braking strategy report provides a strong technical base to proceed with improving the braking performance of the heavy vehicle fleet in the short, medium and longer term. Crucial to success is a cohesive and cooperative effort between: Brake supply industry, operators, the Australian Government, state road authorities and the NTC.

Table 6 Summary of NTC's response to the national heavy vehicle braking strategy

Table 6. NTC's response to the national heavy vehicle braking strategy report

NATIONAL HEAVY VEHICLE BRAKING STRATEGY REPORT STRATEGIC OBJECTIVES	NTC'S COMMENTS
Introduce consistent national minimum stopping distance and directional control performance standards applicable (in time) to all heavy vehicles.	Agree with objective. To be addressed by relevant Australian design rules and Australian vehicle standards rules review.
Require foundation brakes to be certified, requiring the disclosure of more detailed information and including braking systems fitted to towing motor vehicles. Introduce fade performance limits for foundation brakes.	Agree with objective Foundation brakes information could be available through the Road Vehicle Certification System website, as administered by Department of Infrastructure, Transport, Regional Development and Local Government.
Improve unladen brake compatibility on new and in-service combination vehicles.	Agree with objective. To be addressed by relevant Australian design rules, Australian vehicle standards rules and an industry Brake Balance Code of Practice (NTC is partially funding the development of this Code of Practice).
Require wheel lock-up protection (Antilock or antilock braking systems function) on new motor vehicles and improve antilock braking systems performance standards.	Agree with objective. The technology has now advanced to the next level which is Electronically Controlled Brake Systems. A staged introduction of antilock braking systems and electronic braking systems is proposed. To be addressed by relevant Australian design rules.

NATIONAL HEAVY VEHICLE BRAKING STRATEGY REPORT STRATEGIC OBJECTIVES	NTC'S COMMENTS
Update current Australian Design Rules to require modern brake features on new vehicles.	Agree with objective. To be addressed by relevant Australian design rules review.
Provide a certification path for replacement brake parts.	Agree with objective. Could be addressed by relevant Australian design rules and development of an industry code of practice for replacement parts
Develop national roller brake test procedures and standards.	Agree with objective. Could be addressed by reviewing current roller brake test procedures and standards. This is not on the NTC work program.
Develop a procedure for approval of brake modifications.	Agree with objective. Potentially addressed by modifying vehicle safety bulleting 6, Section G to include reference to the Brake Balance Code.
Improve training and knowledge of heavy vehicle braking issues.	Agree with objective. Industry to investigate development of a brake technician accreditation scheme.
Improve the quality of heavy vehicle crash reports.	Agree with objective. A more robust causal factor analysis in heavy vehicle crash reports and investigations conducted by enforcement and road agencies would be useful in future development of heavy vehicle regulations.

4. GLOSSARY

Antilock Braking System (ANTILOCK BRAKING SYSTEMS)	An additional service-brake feature that prevents (or minimises) wheel lock-up events by electronically monitoring selected wheel speeds and either holding or exhausting service brake application pressure on some controlled wheels.
Australian Design Rules (AUSTRALIAN DESIGN Rules)	The national design and performance rules for new vehicles applicable at first vehicle registration. A compliance plate is fitted by the manufacturer to identify that the vehicle complies.
Combination Vehicle.	A truck with trailers. A single combination vehicle has one trailer and a multiple combination vehicle has several trailers.
Electronically Controlled Braking System (ECBS or EBS)	An electronically controlled braking system that controls the brake application pressure at the foundation brakes to achieve near optimum brake balance and wear performance. EBS incorporates both the ANTILOCK BRAKING SYSTEMS function and load-proportioning brake function.
Electronic Stability System (ESS)	A development of EBS that can apply selected brakes to improve vehicle dynamic stability.
Load-Proportioned Brakes	A control system that alters the brake distribution between axles in response to weight distribution on the vehicle.
Unladen brake compatibility	A requirement of AUSTRALIAN DESIGN RULES 35 and 38 which specifies that combination vehicles should have good compatibility brake balance in all states of loading. In this case in the unladen state.
TEBS	Trailer Electronically Controlled Braking Systems.

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APPENDIX A: NATIONAL TRANSPORT POLICY FRAMEWORK'S VISION, POLICY OBJECTIVES AND POLICY PRINCIPLES

Source: ATC 2008.

Vision for Australia's Transport Future

Australia requires a safe, secure, efficient, reliable and integrated national transport system that supports and enhances our nation's economic development and social and environmental well-being.

Transport Policy Objectives

To achieve this vision, Australia's Transport Ministers commit to the following policy objectives:

- **Economic:** To promote the efficient movement of people and goods in order to support sustainable economic development and prosperity.
- **Safety:** To provide a safe transport system that meets Australia's mobility, social and economic objectives with maximum safety for its user.
- **Social:** To promote social inclusion by connecting remote and disadvantaged communities and increasing accessibility to the transport network for all Australians.
- **Environmental:** Protect our environment and improve health by building and investing transport systems that minimise emissions and consumption of resources and energy.
- **Integration:** Promote effective and efficient integration and linkage of Australia's transport system with urban and regional planning at every level of government and with international transport systems.
- **Transparency:** Transparency in funding and charging to provide equitable access to the transport system, through clearly identified means where full cost recovery is not applied.

Transport Policy Principles

Australia's transport policy framework is underpinned by the following guiding principles:

- **Infrastructure pricing:** sending the appropriate signals to influence supply and demand for infrastructure;
- **Competitive markets:** establishing competitive markets wherever possible to minimise the need for regulation;
- **Private sector:** involve the private sector, where it is efficient to do so, in delivering outcomes;
- **National regulation:** a national perspective should be adopted where regulation is required;
- **National markets:** encourage national markets where possible; and
- **Customer:** Customer – focused. Equitable access for all users.