

Cardan Shaft Brakes in Heavy Vehicles

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Purpose

To seek the Board's endorsement of the approach being undertaken to address risks with Cardan Shaft park brakes in heavy vehicles.

Recommendations

It is recommended that the Board:

- **Notes** the actions already underway to investigate and implement improved in-service testing for vehicles with Cardan Shaft Brakes (CSB); and, conduct an education and awareness campaign aimed at all vehicle owners, operators and the service industry;
- **Notes** that depending on outcomes of monitoring, further action may be required in the future;
- **Notes** the risks associated with this issue including the likelihood of public statements about whether the response goes 'far enough'; and,
- **Endorses** the long-term approach to measure the success of actions being taken and to continue monitoring the issue using intelligence from overseas, information from Waka Kotahi technical staff, NZ Police and industry.

Strategic relevance

Decisive regulatory action that is risk-focussed and evidence-based is in keeping with the approach outlined in Tū ake Tū māia (our regulatory strategy). Such action should be based on the best available evidence; and be proportionate to the risk it is seeking to address.

Acronyms and Technical Terms used in this paper

Acronym	Stands for	Explanation
CoF	Certificate of Fitness	Evidence of in-service periodic inspection and certification. The heavy vehicle and passenger service vehicle version of the Warrant of Fitness (WoF).
CSB	Cardan Shaft Brake(s)	Parking brake system that works by holding the vehicle's driveshaft stationary rather than the rear wheels.
RBM	Roller Brake Machine	Equipment used to measure the effectiveness of vehicle brakes. These are what the large vehicle inspecting organisations like VTNZ and VINZ use to check brakes. Mandatory requirement for inspections on heavy vehicles.
Term		Explanation
Enforceable Undertaking		An agreement between WorkSafe and a duty holder made under the Health and Safety at Work Act 2015 (HSWA). It is entered into voluntarily by the duty holder following a breach (including an alleged breach) of HSWA and, once in place, is legally binding. It is generally used as an alternative to prosecution. <i>(source: Worksafe website)</i>
Roll-away		When an unattended vehicle's brakes fail and the vehicle rolls away until something stops its progress. This is the cause of the deaths associated with CSBs in New Zealand.

Background

Cardan Shaft Parking Brakes (CSB), also known as driveshaft parking brakes or transmission parking brakes, differ from 'normal' parking brake systems in that they act by preventing the driveshaft from turning rather than directly preventing the rear wheels turning.

CSB are commonly fitted to many classes of vehicle, most commonly in the medium heavy (NB) class here in New Zealand where there are 55,000 vehicles with CSB. 1,500 vehicles with CSB are imported annually, adding to the fleet, or replacing retired units.

To give a sense of the global prevalence of CSB, Isuzu Japan is the largest producer of vehicles in this class selling 179,000 units domestically in Japan and exporting a further 51,000 (2020 numbers).

CSB have been implicated in several deaths here in New Zealand over the past decade; either fitted to road vehicles or off-road equipment.

In 2019 Waka Kotahi presented evidence at a coroner's inquest related to one of these deaths and several recommendations were made including the desirability of a review of maintenance and testing practices.

Around this time, s9(2)(a) of a CSB failure in off road equipment made representations to Waka Kotahi urging further work to be done urgently by Waka Kotahi. This was discussed internally and as a result in April 2020 a working group to progress this issue was established under the joint sponsorship of GMs of Regulatory Services and Health Safety and Environment.

A series of collaborative workshops were held including internal and external subject matter experts and other stakeholders. From this, research programmes were initiated, field testing of in-service

vehicles was undertaken and a programme to test equipment used to certify vehicles during CoF checks was commenced.

Progress has been made as we sought to address issues that were obviously in need of addressing and could be progressed immediately; while continuing to gather evidence to determine whether further, potentially more drastic action was required.

As a final note of background, following vehicle roll away at one of their sites, Ryman Healthcare entered into an enforceable undertaking with WorkSafe NZ to provide \$450,000 to Waka Kotahi towards a comprehensive education campaign to raise awareness about issues associated with CSBs.

Key issues and mitigations

Issue	Mitigation
<p>Poor maintenance practices</p> <p>The principal responsibility rests with the vehicle owner/operator to keep it in safe working order. Our field testing clearly identified poor maintenance as a key issue in the failure of CSBs to perform as required.</p>	<p>Primary mitigation</p> <ul style="list-style-type: none">significantly improved testing regimes will identify poorly maintained CSBs and very quickly signal to the maintenance sector that a significant improvement is required. <p>Secondary mitigation</p> <ul style="list-style-type: none">Ultimately, we need a knowledgeable sector that keeps the fleet in safe working order at all times. Education will assist with this.
<p>Poor knowledge of CSBs</p> <p>Whilst common in certain classes of vehicle, CSBs are nevertheless not well known to many. Our surveys of operators during our field testing proved this to be the case for heavy vehicle drivers. Knowledge of the limitations of the vehicle in service will help drivers do what is required. Knowledge of the way to properly maintain CSBs will mean technicians keep the fleet safer.</p>	<p>Primary mitigation</p> <ul style="list-style-type: none">ongoing education including through the enforceable undertaking. In the longer term driving improved practice through maintenance technicians will be key. <p>Secondary Mitigation</p> <ul style="list-style-type: none">improved testing regime will better identify poorly maintained CSBs and fail them at CoF time. This will in turn drive change through the maintenance sector.

Issue	Mitigation
<p>Outdated testing regime</p> <p>The test procedures vehicle inspectors currently use requires review to provide proper assurance that the CSB meets the requirements of the Heavy Vehicle Brake Rule. There was a widespread assumption that the testing equipment used for service brakes and other types of park brake could not be used for CSB. Whilst still not conclusive, our recent research and testing programme indicates this is probably not the case.</p>	<p>Primary mitigation</p> <ul style="list-style-type: none"> The immediate mitigation (completed) was to update the brake testing protocol to reflect latest findings and improve, as best we could in the short term, the current testing regime. Further mitigation is to complete our research and testing to confirm the ability to use existing testing equipment known as roller brake machines (RBMs) on CSBs and, if confirmed, mandate this through the requirements for vehicle inspectors.
<p>Inherent Risk</p> <p>The design of the CSB system means that if a vehicle with CSB is parked with one rear wheel on solid ground and the other on very loose or slippery ground, there is a theoretical risk the parking brake will not hold the vehicle in some circumstances. We are not aware of any actual occurrences where this was the reason for failure or roll-away for on-road vehicles.</p>	<p>Primary mitigation</p> <ul style="list-style-type: none"> operators must be knowledgeable about the limitations of the vehicle they are using. Education campaign will assist with this. It will need to be ongoing and may need to be supported by in-vehicle notifications like warning labels. <p>Secondary mitigation</p> <ul style="list-style-type: none"> better maintenance and testing regimes. Possible research to better understand the likelihood of occurrence.

The risks that arise because of these issues are inter-related and as such the mitigations for each are expected to support reduction in risk across the system, as shown below:

Issue	Mitigations			
	Education Campaigns	Improved Testing	Further Research	Ongoing Monitoring
Poor maintenance practices				
Lack of knowledge				
Outdated testing regime				
Inherent design risk				

Key:

Primary mitigation

Issue	Mitigations			
	Education Campaigns	Improved Testing	Further Research	Ongoing Monitoring

Secondary mitigation

Summary of initiatives

Initiative	Status
Update the brake testing protocol with a more detailed and improved method for conducting the current in service stall test, relayed to Inspecting Organisations and Vehicle Inspectors via the VIRM.	Completed
Investigate using the Roller Brake Machine for in service testing in New Zealand. Note this is the current method used for in service testing of CSB in the UK and Japan.	Underway
Issue an information sheet to vehicle owners and operators outlining the operational and maintenance requirements of CSB.	Completed (ready for publication)
Set up a website for additional content and reference material on CSB which can be used to keep all vehicle owners, operators and the service industry up to date.	Completed (ready for publication)
Begin a comprehensive education and awareness campaign on CSB utilising funds from the Enforceable Undertaking. This will target vehicle owners/operators and the service industry.	Under development
Initiate a programme which measures the efficacy of all actions. This will include capturing data and information from overseas jurisdictions. Regular reviews of this data and information will be required to consider if additional actions are required.	Under development

Risks

There is a risk that further harm may be experienced while we roll out the improvement initiatives. The mitigation for this is simply to work as urgently as we can amongst all other priorities, and this is being done. Project governance structures are in place. Collaboration is occurring with the sector and with those subject to the enforceable undertaking to develop the education programme. Ongoing information to the vehicle inspecting sector will assist with identifying poorly maintained CSBs.

One of the things the working group was tasked with testing was whether there should be a ban on further imports and/or removal of existing CSBs from the fleet. We do not believe that the evidence supports this currently. There is much we can do to address the current failings in the regulatory system – particularly continuing the review of the testing regime. However, this view is not shared by all, and it is likely that we can expect public commentary calling for 'more to be done'. An external review of the programme has been undertaken that supports the initiatives we have underway.

Health & safety, customer/stakeholder & environmental impact

The impact of this decision is positive in terms of public health and safety because we are addressing risks in the regulatory system through the initiatives described in this paper. There is no significant effect on, nor benefit to, the natural environment.

Out of Scope



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