

# Comparing heavy vehicle safety management in Australia and the United States

Mooren, L.<sup>1</sup>, Grzebieta, R.<sup>1</sup>, Williamson, A.<sup>1</sup>, Olivier, J.<sup>2</sup>

<sup>1</sup> Transport and Road Safety Research, University of New South Wales

<sup>2</sup> Prince of Wales Clinical School, University of New South Wales

## Abstract

Heavy vehicle transport safety regulation has been evolving to align with a “duty of care” legislative framework. Conventional transport regulation enforcement (of driver compliance with road rules and vehicle compliance with standards) is still necessarily in place, but “rules compliance” regulators and the transport industry alike are grappling with the need to monitor whether transport operators are meeting their duty of care by putting in place effective safety management practices and systems.

Recently Trucksafe, the Australian Trucking Association’s (ATA) alternative compliance scheme and the Australian Logistics Council’s (ALC) National Logistics Safety Code, were recognised as codes of practice that could be used in a “reasonable steps” defence under the Victorian Road Act. But as Hopkins [1] points out, it is relatively easy to determine after an incident whether a “reasonable” effort was made to manage safety. The challenge is to measure the sufficiency of safety management practices when crashes have not occurred and to codify the evidence of this in a way that enables consistent enforcement practices, the latter being particularly more difficult.

This paper aims to identify the ways that transport safety regulation is evolving and compares the approaches in transport safety monitoring and measurement in Australia and the United States of America. The differences in these approaches and the evidence of the effectiveness and challenges in each approach may be instructive for policy makers considering reviewing and changing regulatory frameworks.

**Key words:** Safety management, transport safety regulation, alternative compliance, enforcement, truck safety, heavy vehicle, motor carrier

## Introduction

A Truck Safety Benchmarking Study commissioned by the National Transport Commission in 2002, found that the United States of America (USA) had the lowest rate of persons killed in crashes involving heavy trucks per 100 million kilometres travelled. In fact the rate for Australian truck involved fatalities (2.5) was considerably more than the United States rate (1.7) [2]. And a more recent OECD report indicates that this disparity continued. Table 1 shows the comparative rates using the exposure denominator, 100 million vehicle kilometres travelled (VKT).

**Table 1 – Australian and US fatal truck crash rates per 100 million VKT**

Year	2003	2004	2005	2006	2007
Australia	2.43	2.28	2.09	2.36	2.08
United States	1.44	1.45	1.46	1.4	1.33

Reproduced from Moving Freight with Better Trucks: Improving Safety, Productivity and Sustainability, OECD/ITF 2011

The data using the measure per 10,000 trucks also indicates that heavy vehicle crash rates still tend to be lower in the USA. See Table 2 for recent comparative data.

**Table 2 – Australian and US fatal truck crash rates per 10,000 registered trucks 2007, 2008, 2009**

Year	Fatal crashes per 10,000 trucks in Australia	Fatal crashes per 10,000 trucks in the United States
2007	4.63	4.31
2008	4.24	3.76
2009	3.85	2.93

Data sources: ABS Census Reports and BITRE Heavy Vehicle Crashes Australia FMCSA Commercial Motor Vehicle Facts – November 2011

According to the Australian Bureau of Infrastructure Transport and Regional Economics (BITRE) the latest figures (available) on heavy vehicle fatalities and fatal crashes indicate that heavy truck crashes are decreasing in recent years. In fact, fatal crashes involving articulated trucks decreased by an average of 3.5 per cent per year over the three years to June 2011 while during the same period fatal crashes involving heavy rigid trucks decreased by an average of 14.7 per cent per year [3].

The trend seems to be going in the right direction, but far too many people are dying from heavy vehicle crashes in Australia. To put things into a different perspective, by comparison transport related fatalities are the biggest work-related death category of all industry types. According to a recent Safe Work Australia report, “in 2009–10, 24% (51 deaths) of the workers who died were employed in the transport, postal & warehousing industry.” Three industries, including transport, agriculture and construction accounted for 61% of all worker fatalities in that year with transport at the top of the list[4].

In the United States, a total of 3,413 people died in large truck crashes in 2010. This is an 8% increase on 2009 fatalities involving large trucks (3,147). However, it is noted that fewer people died in large truck crashes in 2009 than in any year since data on fatal crashes began to be collected by US authorities in 1975 [5].

Traditionally in Australia, regulation of safety relating to the operation of heavy vehicles has been managed almost solely by road and transport authorities and has focused on regulation of the types and features of heavy vehicles and road user regulations applying to truck drivers. But increasingly since the early 1990s, regulators and Australian transport industry bodies alike have been turning their attentions to systemic safety management issues across the whole transport and logistics chain. Moreover, the occupational safety regulators are recognising that the transport industry is a big contributor to occupational injury and death.

The regulatory system in the USA is somewhat different in that transport companies are registered and regulated as well as trucks and truck operators.

While, in this paper, some comparisons will be made between the USA’s and Australian regulatory and industry frameworks, the focus is the question of how the Australian regulatory system and other incentives can best support a duty of care for the safety of those affected by heavy vehicle transport operations and whether certain features from the US framework could assist in further reducing Australian fatalities.

## Methods

The research methods are the investigation of the methods of transport regulation in Australia and the USA and the recent developments in regulatory change to address heavy vehicle transport safety improvements.

In addition to the question of best regulatory methods to improve heavy vehicle transport safety, industry commercial incentives and other motivations are also addressed. The incentives for good practice safety management can be either government regulatory or incentives offered by financial risk organisations like insurance companies. Other motivations may include industry and company reputations as well as compliance with social and legal obligations.

## Findings

The heavy vehicle transport regulation frameworks are similar in Australia and the USA in some respects, but there are some key differences. Australian regulatory bodies pose restrictions relating to the types, conditions and features of vehicles that are permitted to travel on Australian public roads. There are also specific licensing restrictions applying to drivers of heavy vehicles, such as hours of service, speed regulations, and other road rules. Similar restrictions are also in place in the USA. The main difference is that in the USA, companies that operate heavy vehicle transport are separately registered to do so. This is not the case in Australia.

Some of the regulatory and non-regulatory compliance features are summarised in Table 3. These are further discussed in this section of the paper.

**Table 3 - Comparisons of Heavy Vehicle Compliance in the USA [6] and Australia [7]**

	USA	Australia
Commercial driver licence	Yes	Yes
Pre-employment screening information for companies	Yes	No
Registration of HV	Yes	Yes
Registration of Companies	Yes	No
Compulsory Regulatory Audit	Yes	No, except for WAHVAS <sup>1</sup>
Safety performance reporting	Yes – CSA <sup>2</sup>	No
Compulsory monitoring (telematics)	No	Under consideration
Chain of Responsibility	No	Yes
Logistics industry safety code	No	Yes, but low uptake
Alternative compliance scheme	ISO 9000 only	NHVAS & TruckSafe
Regulatory concessions	No	NHVAS Yes, TruckSafe No
Insurance incentives	Some for on-board safety systems	Some for TruckSafe
Hours of service limits	Yes	Yes
Speed limiter requirements	Under consideration	Yes
Roadside vehicle inspections	Yes	Yes
Drug and alcohol testing	Companies are required to test drivers	Companies are not specifically required to test drivers

1. The Western Australia Heavy vehicle Accreditation Scheme (WAHVAS) is a compulsory accreditation scheme for restricted access vehicles, including B-Doubles, over-dimensional vehicles and road trains

2. Compliance, Safety, Accountability (CSA) publicises violation and crash histories for all interstate trucking companies

As noted in Table 1, there are some similarities and some differences in the regulatory and safety management compliance landscapes of the USA and Australia. The USA system is more prescriptive and up front in what they require of heavy truck operators than their Australian counterparts. In Australia, companies can be held accountable for deficiencies in safety management practices, but for the most part, enforcement of their responsibilities is usually after some serious vehicle or driver regulatory breach is detected. Moreover, the safety performance of companies is not made known to the public as it is in the USA.

Since the early 1990s it has been recognised that heavy vehicle drivers themselves sometimes operate under considerable commercial and financial pressure to break laws – especially speed and hours of service regulations. This is true for both American and Australian drivers. Indeed, Belman and Monaco examined the effects of industry deregulation and de-unionisation of truck drivers between 1973 and 1997 and found that as a result of driver wages dropping by 21% in this period, combined with an increase in wage and employment condition inequalities such that non-unionised drivers were particularly encouraged to compensate by working longer hours and drowsy driving [8]. Moreover, Corsi et al. found that companies with satisfactory Compliance Review outcomes devote a higher percentage of their operating expenses to wages [9]. This situation is echoed in the Australian research, where Hensher and Battellino for example, found that underlying economic conditions accounting for unsafe on-road behaviours of Australian truck drivers highlighted the need to consider how remuneration affects safety outcomes [10].

While there is a new Remunerations Bill that has passed one house of the Australian Parliament to require that safe rates and conditions are established and enforced in the trucking industry, the Australian Governments have not acted to regulate trucking companies directly thus far. However, the Compliance and Enforcement Bill prepared by the National Transport Commission in 2003 [11], introduced a legal instrument to prosecute any of those involved in the transport and logistics chain who influence breaches of the transport laws. This is termed the “chain of responsibility” principle. This instrument has now been adopted in Australian State legislation, giving authorities the ability to investigate company practices and individuals’ behaviours and prosecute any entity in the transport and logistics chain for safety breaches.

In the USA, companies with heavy vehicle operations must be licensed under Federal Regulations. To meet the requirements of licensing, the companies must conform to the Federal Motor Carrier Safety Administration's (FMCSA) safety fitness policy and be able to demonstrate adequate financial responsibility. Further, prior to approval, the FMCSA posts a summary of the application to enable members of the public to raise any objections. Further, more USA heavy vehicle operators are subject to regular safety analysis. A safety measurement system monitors the safety levels of operators across Behavioral Analysis and Safety Improvement Categories (BASICS) including:

- Unsafe Driving.

- Fatigued Driving (Hours-of-Service)
- Driver Fitness
- Controlled Substances/Alcohol
- Vehicle Maintenance
- Cargo-Related safety
- Safety/crash Records

A review of this model found that crash rates for carriers exceeding the thresholds defined for the categories above, were higher than for carriers exceeding none of the BASICs. Unsafe Driving, Vehicle Maintenance and Fatigued Driving were found to be the most important predictors of crashes. It also concluded that in 61.7% of cases, simply issuing a warning letter to those exceeding the thresholds was the most effective way to bring a company back under the thresholds. The remaining cases needed follow up interventions such as an offsite or onsite investigation. In other words, no additional intervention was needed in the majority of cases [12].

New entrants to the motor carrier industry must undergo a safety audit within the first 18 months of their operation. If a registered motor carrier company is found to fail a safety audit conducted by the Department of Transportation, the company's registration can be revoked, and in some cases criminal charges laid [13]. An analysis of the cost to the government agencies carrying out these audits is estimated to be \$775 per audit. During the financial year 2006, some 38,680 audits were performed at a total cost of \$21.6 million[14]. Moreover, a full compliance review costs on average \$1,133, with reviews of large carriers (with 100-300 trucks) cost \$2,880 per review plus the costs to the motor carrier. Again, in 2006 enforcement agencies conducted compliance review of 14,884 companies at a total cost of \$16.9 million[15].

Unfortunately, the USA safety compliance system (including compliance reviews, safety audits and roadside inspections) is not necessarily achieving improvements in terms of fatality reductions in the most cost effective way. Chen reviewed crash reductions of companies that had undergone compliance reviews and found that there were some reductions, especially in smaller companies, but that this mode of enforcement is resource intensive [16]. The American Transportation Research Institute (ATRI) found in a review of crash rates between 2004 and 2008, it appeared that only carriers with small fleets benefited from crash reductions following compliance reviews, whereas the larger carriers either found no change or higher crash rates following compliance reviews [17].

Now, the FMCSA's Compliance, Safety, Accountability (CSA) regulatory initiative, launched nationally on December 10, 2010 publicises the violation and crash histories for all interstate trucking companies, updating the most recent two years of data on a monthly basis. Similarly, a Pre-Employment Screening Program (PSP) was created to allow carriers to view the most recent three years of violation data and five years of crash involvement data for all prospective truck drivers who apply for work .

Most American insurers have already incorporated CSA data into their underwriting processes, evaluating risk exposure based on CSA performance over time and safety trends identified therein. As a result, insurers recommend that carriers regularly monitor their scores and address problem areas in a timely manner. Insurers have also

increasingly recommended that carriers incorporate PSP standards into their hiring criteria to ensure prospective drivers meet safety standards.

In addition to new recommended practices stemming from these recent developments in driver and carrier safety records, a 2011 ATRI survey of Commercial Motor Vehicle (CMV) insurers [17] revealed that many insurers also recommend formal Fatigue Management Programs (FMPs). This involves screening and treating drivers for sleep disorders and customising optimal schedules for each driver, among other practices

As an incentive for superior safety management, ATRI's survey discovered that the CMV insurance industry appears somewhat receptive to offering immediate front-end "incentives" (e.g., insurance premium discounts) to motor carriers that proactively manage safety through proven best practices. For instance, one insurer stated, "We support the use of management tools and technology that will control the risk exposures that commercial auto drivers face on the job." When discussing incentives, premium discounts were the most popular method for rewarding recommended safety practices, followed by reductions to deductibles and formally recognising or offering awards to exceptional carriers. These incentives are being offered by some American insurers, while others plan to implement them in the next 12-24 months.

There is also an implied commercial incentive for American truck operators. As safety records of all motor carriers can be obtained by potential customers online, there is an incentive for them to achieve CSA scores. The FMCSA provides free "snapshots" of companies, including a concise record of a company's identification, size, freight, vehicle inspection and out-of-service summary, crash data and safety rating (if any) [18]. For a fee, additional information can be provided by FMCSA, including more safety-related information about an individual company's operation, selected items from inspection and crash reports, and results of any reviews or enforcement actions involving the requested company.

Australian jurisdictions do not make this information about companies publically available. However, industry groups and companies who are members of the Australian Logistics Council (ALC), can request transport companies to provide safety data, and can request that a safety audit be carried out using the 113 criteria consistent with the National Logistics Safety Code [19]. Similarly, some companies give preference to transport providers who are accredited under government or industry accreditation programs. But currently there are only 70 companies that have engaged with the ALC to sign up to the Code. These companies are mostly in the steel and retail sectors and the larger transport companies.

In addressing the question of incentives to improve safety in the heavy vehicle transport sector, few incentives are offered in Australia or the USA by regulators. The Australian National Heavy Vehicle Accreditation Scheme (NHVAS), offers "concessions" to operators that comply with the criteria of the Scheme modules, but the primary benefits of this Scheme are industry efficiencies rather than safety improvement [20]. And there is no clear evidence that safety is improved through NHVAS accreditation. Indeed, a review of the data two years ago found that NHVAS accredited operators under the Maintenance Module had received more major defect notices than companies that were not accredited under any scheme [21].

The primary focus of the Australian industry managed accreditation program, Trucksafe, is improved safety management, but the only incentive offered is insurance premium discounts for Trucksafe accredited companies. But, the discount is offered by one insurer only. No concessions nor incentives are provided by Governments to encourage companies to seek Trucksafe accreditation.

While the National Transport Insurer (NTI) have found that their clients that are accredited under Trucksafe, submit 40-50% fewer claims than those not accredited, it is not entirely clear that being accredited under Trucksafe makes companies safer or that the safer companies tend to be the ones that seek to become accredited. Indeed, one of the key reasons for the Australian Trucking Association (ATA) to take up the Trucksafe initiative was to improve the image of the industry.

However recent investigations have found that a Trucksafe accredited operator is currently under investigation for breaches including those relating to speed limiter tampering [22]. The company also carried NHVAS accreditation (until the investigation by authorities found serious breaches and accreditation was withdrawn). This does not mean that Trucksafe and NHVAS are not effective safety management systems, as individual operators can act contrary to their commitments at any stage, but it does raise questions about how the programs can be made more effective. In addition, it is estimated that less than 10% of the Australian transport industry is accredited under Trucksafe.

A review of Australian and North American truck safety accreditation schemes concluded that while there are promising indications that these schemes combined with government safety compliance efforts can improve safety performance, more research is needed to confirm that this is the case [23].

Moreover, while there are a number of general management characteristics and specific transport management characteristics that are associated with good or poor safety performance, there is still no complete safety management system that is solidly proven to achieve improved safety outcomes [24].

## **Discussion**

At a recent Forum of the Australian Logistics Council (ALC) it was made clear by a number of speakers and delegates that the effectiveness of safety codes and accreditation programs relies on embedding a safety culture within organisations to give real effect to improvements in safety performance. Specifically workers – employees and contractor staff - at all levels must be trained and managed to the standards embodied in the codes of practice. It is important also that top management commitment is demonstrated through actions that the principles of the safety codes are adopted in practice as well as through signing up to the code [25].

In a similar vein, regulatory compliance systems must be rigorously enforced to give effect to such legislation as Chain of Responsibility. The kinds of flagrant safety regulation breaches that have been uncovered in recent enforcement raids on transport companies suggest that some sections of the industry are systematically operating without due regard for their legal obligations for employee and public safety.

It is not clear whether the American legislative framework that requires companies to be audited and licensed to operate truck fleets is preferable to the Australian system that does not require this. Admittedly, the USA has a 47% lower rate of truck crashes per kilometres travelled [26]. It is difficult to know the reasons for this. It may be that there are environmental and economic reasons. For example, the USA road system is much better resourced and is intrinsically safer in terms of quality of roads and facilities such as service centres and rest areas. In addition, the distances travelled by American heavy vehicles are likely to be shorter than Australian counterparts.

Potentially, the systems administered by the FMCSA enable an easier – if more expensive – way for consignors to obtain important safety information about the transport companies they engage. This in itself means that companies needing transport services can more readily obtain safety information about transport companies. The introduction of a National Heavy Vehicle Regulator (NHVR) in Australia would make this easier to achieve. But in the short term, it is likely that the focus of the new NHVR, set to commence operations in January, 2013 will focus on priorities to do with harmonisation of the regulatory framework as well as compliance and enforcement processes.

Both the American and Australian regulatory systems lack recognition of the importance of organisational safety culture and design. While it might be acknowledged that this aspect of safety management is difficult to measure, let alone enforce, the Norwegians have taken steps towards this by requiring petroleum companies to “encourage and promote a sound health, environment and safety culture.” Hopkins believes that while rules compliance enforcement is necessary, taking steps to move beyond this to improving organisation design conducive to safety climate is needed to move organisations to the highest levels of safety performance possible [1].

It seems that the social discourse about trucking in Australia has moved towards placing a higher priority on safety by a number of industry leaders, especially in the retail, steel and transport sectors. The trucking and logistics industries have been placing safety high on their agendas for conferences and discussion forums. This visible commitment will hopefully influence others involved in the transport and logistics chain.

But the active interest in safety management is not mutually shared throughout the Australian transport and logistics industry. It may be that it is primarily those who are focusing on safety management improvements are the ones who seek accreditation to auditable safety management schemes. And others who want to “be seen to be” safe operators, but are not serious about safety management may not improve their safety performance in any measureable way through scheme participation.

The test will be to convert this safety agenda into measureable shifts in safety culture within and across organisations and the industry more generally.

Therefore it is important that industry bodies like the ALC and ATA and its affiliates continue to progress the safety culture agenda in any way they can. They can establish recognition programs for good practice in safety management as well as to



advocate and support Chain of Responsibility enforcement. Even though the safety outcome effectiveness of codes and accreditation is not proven, if nothing else it signifies a vocal commitment to a change in transport and logistics culture with regard to safety management.

Establishing more rigour in accreditation auditing and follow up is needed to ensure that government and industry schemes can reap sustainable safety benefits that are intended. This applies to industry and government schemes alike. Perhaps the schemes can be strengthened by audit-the-auditor mechanisms.

Similarly, government regulators may consider the possibility of requiring safety-conducive environments, beyond the current workplace safety requirements to consult employees about safety matters and conditions.

Recent consultations with the American Trucking Association about whether they would consider an industry safety accreditation scheme found that while the CSA criteria assessed by the Federal Motor Carrier Safety Administration is so detailed, it could be difficult to develop a scheme that added much to the safety assessment system that is managed by the Government.

More research is needed to confirm the most important elements of safety management in heavy vehicle transport operations. But safety culture and organisational design are increasingly gaining prominence in the literature and in industry discussions.

The advent of safety codes and safety accreditation schemes do not lessen the importance of road safety enforcement and compliance actions. Indeed, the findings from recent enforcement operations in New South Wales, indicate that there are some Australian transport operators that are systematically flouting safety regulations.

While some of the largest and prominent companies involved in transport logistics in Australia are becoming proactive in their attempts to raise the bar in road safety management, the numbers are too small and it seems that the critical mass of commitment to safety codes and safety accreditation is not evident.

Compliance and enforcement will remain the major mechanism for improving heavy transport safety in Australia in the foreseeable future. However, industry efforts should also be encouraged and improved.

There needs to be a variety of safety measures including regulatory and compliance instruments and those that aim to encourage companies to go beyond what is required by law. Industry groups have a role to play in promoting and managing safety codes and accreditation schemes. However, the auditing processes attached to these schemes must be comprehensive, rigorous and credible.

Also, monitoring and evaluation of both regulatory and alternative compliance programs in Australia would assist to ensure optimal results. Currently, there is no set of data that enables researchers to assess the benefits of these measures. Australian Governments with the cooperation of industry should work towards provision of the necessary data to evaluate safety benefits of government and industry efforts.

Moreover, more attention is needed toward creating and maintaining the optimal organisational and industry conditions for safety to be proactively and effectively managed.

### **Conclusions**

The conclusions that can be drawn from this analysis are:

- the USA and Australian regulations are similar but the USA system is more prescriptive and more transparent; and
- the USA has better safety results but it is not clear whether these can be attributed to performance management and compliance systems that differ from the Australian systems.

More research and analysis is needed to determine whether some of the American regulatory systems are worthy of consideration for the Australian context. Moreover, the efforts to enforce the Australian Chain of Responsibility provisions have not been fully tested. If more rigorously enforced, it may be that the Australian legislative framework can be as effective as the more prescriptive American system. However, improvements to data collection and analysis are needed.

### **Acknowledgements**

The authors acknowledge the financial and technical support provided by ARC Linkage Grant LP100100283 partners, the NSW Centre for Road Safety, Transport for NSW, Transport Certification Australia, National Transport Commission, Zurich Financial Services, and the Motor Accidents Authority of NSW to make this paper possible. Prof Williamson is supported by an NHMRC Senior Research Fellowship grant. Prof Grzebieta is supported by a grant from the NSW Centre for Road Safety at Transport for NSW. The authors also acknowledge the contributions of Dr Soames Job and Dr Charles Karl.

### **References**

1. Hopkins, A., *Beyond compliance monitoring: new strategies for safety regulators*. Law & Policy, 2007. **29**(2).
2. Haworth, N., Vulcan, P., Sweatman, P., *Truck safety benchmarking study*, 2002, National Transport Commission.
3. BITRE, *Fatal heavy vehicle crashes Australia quarterly bulletin Jan-Mar 2011*, 2011.
4. Safe\_Work\_Australia, *WORK-RELATED TRAUMATIC INJURY FATALITIES, AUSTRALIA 2009–10*, 2012.
5. *Fatality Facts 2010 - Large Trucks*. 2010 10 April, 2012]; Available from: <http://www.iihs.org/research/fatality.aspx?topicName=LargeTrucks&year=2010>.
6. Freund, D., *Motor carrier safety laws and regulations*, in *Transportation Research Circular*, T.a.B.S. Committee, Editor 2007.
7. NTC, *NATIONAL HEAVY VEHICLE ENFORCEMENT STRATEGY PROPOSAL*, 2007.
8. Belman, D., Monaco, KA., *The Effects of Deregulation, De-Unionisation, Technology, and Human Capital on the Work and the Work Lives of Truck*

- Drivers*. Industrial & Labor Relations Review, 2001. 54(2A, Extra Issue: Industry Studies of Wage Inequality): p. 502-524.
9. Corsi, T., Barnard, R., Gibney, J., *Motor Carrier Industry Profile: Linkages Between Financial and Safety Performance Among Carriers in Major Industry Segments*, T.P. Keane, Editor 2004, Federal Motor Carrier Safety Administration, Analysis Division U.S. Department of Transportation: Washington, D.C.
  10. Hensher, D., Battellino, H., *Long-distance trucking: why do truckies speed?*, in *Australasian Transport Research Forum* 1990. p. 537-554.
  11. NTC, *Information Bulletin: Road Transport Reform (compliance and enforcement) Bill*, National Transport Commission, Editor 2004: Melbourne.
  12. Green, P., Blower, D., *Evaluation of the CSA 2010 Operational Model Test*, 2011, Federal Motor Carrier Safety Administration: Washington DC.
  13. Federal Motor Carrier Safety Administration. *Frequently Asked Questions (FAQ) - New Entrants*. 2012 28 March, 2012]; Information on how companies can become registered to operate motor carrier fleets].
  14. Econometrica, *Safety audit cost estimation*, 2007, Federal Motor Carrier Safety Administration: Washington DC.
  15. Econometrica, *Compliance review cost estimation*, 2007, Federal Motor Carrier Safety Administration: Washington DC.
  16. Chen, G.X., *Impact of federal compliance reviews of trucking companies in reducing highway truck crashes*. Accident Analysis & Prevention, 2008. 40(1): p. 238-245.
  17. Murray, D., Keppler, S., Lueak, M., Fender, K., *Assessing the benefits of alternative compliance*, 2011, American Transportation Research Institute: Arlington.
  18. FMCSA. *Safety and Fitness Electronic Records (SAFER) System*. 3 April, 2012]; Available from: <http://safer.fmcsa.dot.gov/CompanySnapshot.aspx>.
  19. ALC, *National Logistics Safety Code (NLSC) Audit Framework*, 2009, Australian Logistics Council.
  20. NTC, *Accreditation policy review*, 2009, NTC: Melbourne.
  21. Jansen, C., Dikranian, G., *Heavy Vehicle Compliance Survey*, 2009, NSW Roads and Traffic Authority: Sydney.
  22. ATN. *COR investigation launched after police raid Lennox Transport*. 2012 29 March, 2012]; Available from: <http://www.fullyloaded.com.au/industry-news/articleid/78208.aspx>.
  23. Mooren, L., Grzebieta, R., *Review of Australian alternative compliance schemes*, in *TRB Annual Meetings* 2010, Transportation Research Board: Washington DC.
  24. Mooren, L., *Development of a safety management system for transport operations*, in *24th ARRB Conference - Building on 50 years of road and transport research* 2010: Melbourne.
  25. Silva, S., Lima, M.L., *Safety as an organisational value: Improving safety practices*, in *Advances in Safety and Reliability*, Kolowrocki., Editor 2005, Taylor & Francis Group: London.
  26. Haworth, N., Vulcan, Peter, Sweatman, Peter, *Benchmarking truck safety in Australia*. Road and Transport Research: a journal of Australian and New Zealand research and practice, 2003: p. 1037-5783.