SAFETY GAINS IN LOG TRANSPORT IN NEW ZEALAND

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Log transport in New Zealand involves transporting relatively heavy loads with a relatively high centre of gravity on roads that are often narrow, winding hilly and of poor quality. Not surprisingly they had a high rollover rate and a 1998 study showed that there were more than 60 on-highway rollovers per year involving log trucks when the total log truck fleet consisted of about 650 combination vehicles. The industry recognised the urgency of this problem and, in 1997, established the Log Transport Safety Council (LTSC) to develop initiatives to improve the safety of log transport. Membership of the LTSC is voluntary but it includes most of the log transport operators, the major forestry companies, vehicle manufacturers and equipment suppliers, researchers and the regulatory agencies.

Since its inception the LTSC has funded a number of research and education initiatives aimed at improving safety and has also promoted regulatory changes. Details of these initiatives are presented in the paper. Although it is not possible to quantify the effect of any one initiative the combined effect of the safety initiatives has been that the rollover crash rate of log trucks is now less than one quarter of what it was in the late 1990s.

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1 INTRODUCTION

A parliamentary inquiry into truck crashes (Anderson and Sinclair, 1996) initiated by the New Zealand Government identified the poor stability of logging trucks as an area of particular concern. A subsequent analysis of crash statistics (Baas and Latto, 1997) showed that logging trucks were involved in a disproportionately high number of crashes and in particular rollovers. It was conservatively estimated that more than 60 logging truck rollover crashes were occurring each year. As there were about 650 combination vehicles in the national log truck fleet, this implied that about one in eleven log trucks was rolling over every year. To address this problem the industry established the Log Transport Safety Council (LTSC).

LTSC has as its members, most log transport operators, the Road Transport Forum NZ, which is an industry association that represents most of the hire-and-reward transport fleet, the Forest Owners Association representing forest owners, nearly all of the trailer manufacturers that specialise in logging equipment, a research provider, and several government agencies with an interest in log transport. The broad spectrum of stakeholders involved is a major contributor to the success of LTSC.

This paper describes:

- The safety improvements that have been achieved by the log transport sector
- The steps that were taken to achieve that improvement in safety
- Future initiatives the Log Transport Safety Council would like to see implemented to further improve heavy vehicle safety.

2 IMPROVEMENTS IN LOG TRUCK SAFETY

The incidence of on-highway rollover crashes per 100million km of travel involving logging trucks has reduced dramatically over the last 6 years and is now less than ¼ of what it was in 1999 as shown in Figure 1. The lower of these curves is based on an analysis of the crash data collected by the NZ Police Commercial Vehicle Investigation Unit (CVIU) who report only the crashes that they attend. The upper curve is derived from the more extensive LTSC database for the period 2001 to 2004. The LTSC database contains all known crashes and includes a number not attended by the Police. Forest owners have a strict requirement that all crashes must be reported and LTSC committee members follow up on any crashes that are heard of through other

means. A review of the data has confirmed that all of the CVIU reported crashes are included in the LTSC database while the converse is clearly not the case.

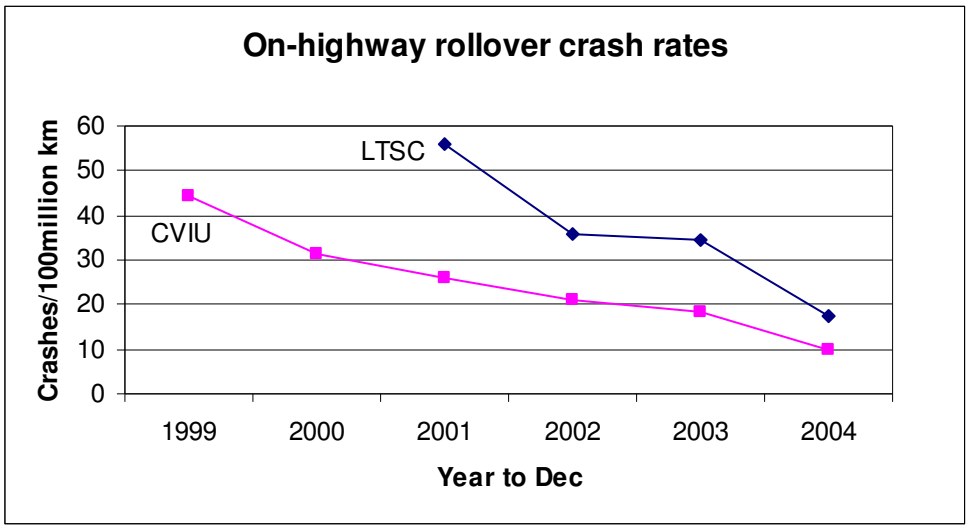

Figure 1. On-highway log truck rollovers per 100million km .

For both datasets the vehicle-kms used to calculate the crash rates were derived from data supplied by the Transport Registry Centre of Land Transport New Zealand. Log haulage vehicles were identified from vehicle registration information. The vehicle registration numbers were then used to extract the distance they traveled from the Road User Charges (RUC) database. Unfortunately a significant proportion of vehicles in the registration database had no industry code recorded against them. A survey of log trucks undertaken in 1997 found that there were 650 in use at that time although the registration database recorded only 315. It was assumed that the shortfall in log haulage vehicles in the registration database compared to the LTSC survey was due to vehicles where no code had been recorded and that this number has remained proportional to the total number of "no code" vehicles in subsequent years. Applying this assumption results in an estimate of 1378 log trucks in 2003, which is very close to the 1400 estimated by the industry at that time.

Figure 2 shows the trend in the number of crashes reported in the CVIU and LTSC databases. The number of CVIU recorded crashes reduced by 61% from 1999 to 2004. The reduction shown by the LTSC data is greater for the period from 2001 to 2004 (64% LTSC versus 56% reported by CVIU). This may be a reflection of the increased resources available to CVIU for log truck crash investigations during that time (i.e. they may have attended a larger proportion of crashes).

Figure 3 shows the 12-month rolling total number of log truck on-highway rollover crashes recorded in the LTSC database. The trend line shows an on-going reduction in crashes.

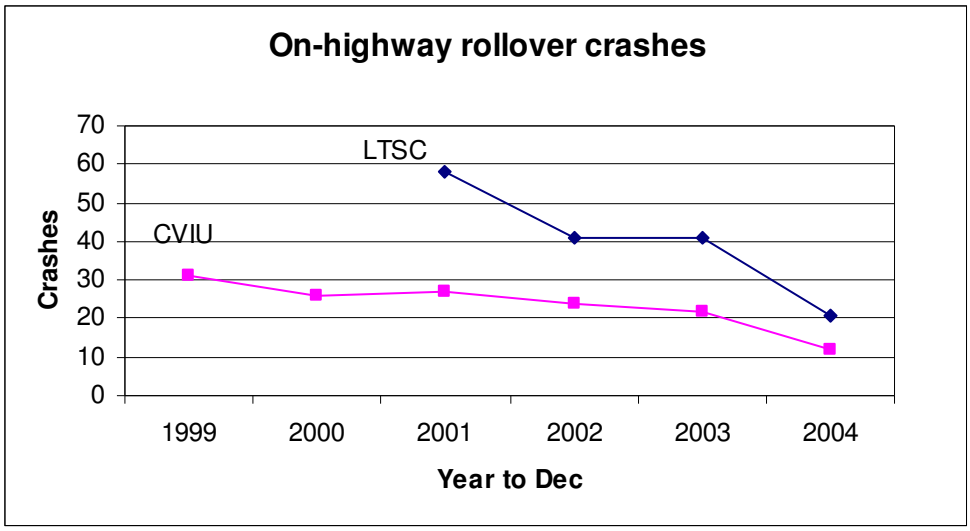

Figure 2. Number of on-highway log truck rollover crashes.

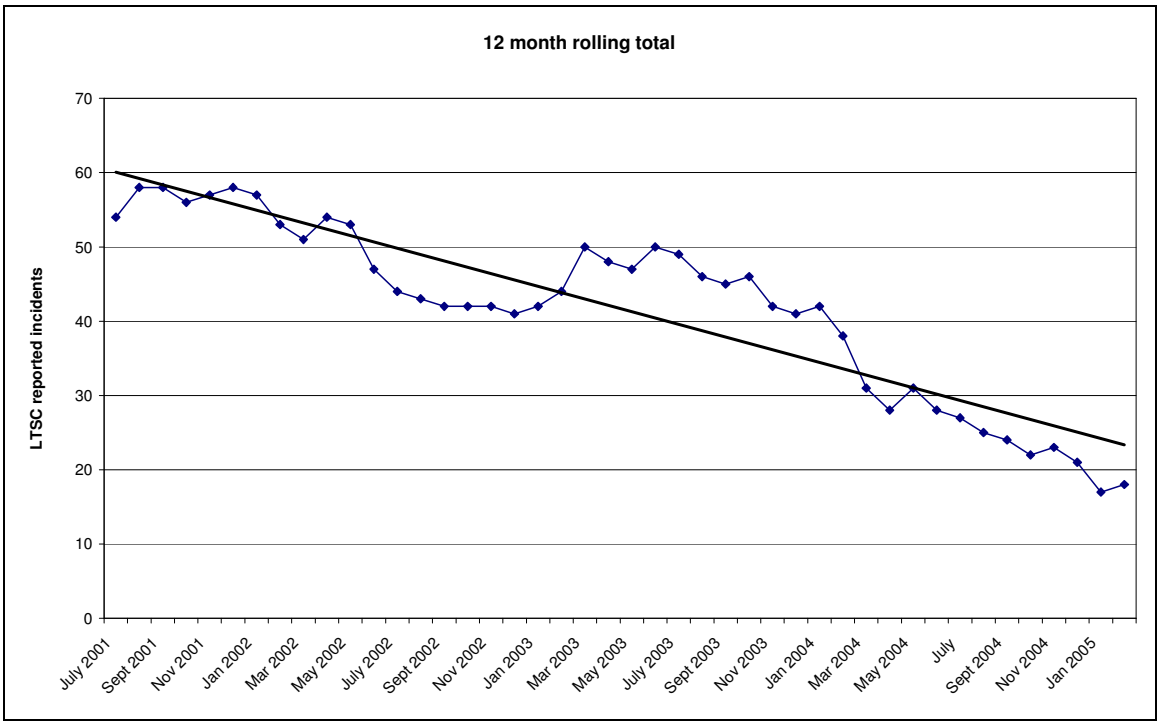

Figure 3. 12-month rolling total of log truck rollover crashes in the LTSC database .

Table 1 shows the total number of rollover crashes attended by CVIU and the number of log truck rollover crashes. In 1999 over 22% of the rollover crashes CVIU attended were log trucks. By 2004 this had reduced to 7%.

Figure 4 and Table 2 show the rollover crash rate of log trucks and all heavy vehicles. While the risk of a log truck rolling over was more than 4 times that of the average heavy vehicle back in

1999, the risk of a logging truck rolling over is now very similar to that of an average heavy vehicle. This is a remarkable result, especially as log trucks often operate on secondary roads that are less safe than the roads used by many of the other heavy vehicles.

Table 1. Number of rollover crashes in CVIU database per annum.

Year to Dec	Total number of heavy vehicle rollover crashes attended by CVIU	Number of log truck rollover crashes attended by CVIU	% of log trucks as a proportion of all rollover crashes attended by CVIU	Number of heavy vehicles on the road (powered units)	Distance travelled by all heavy vehicles (powered units) km
1999	136	31	22%	72,489	1,938,993,610
2000	133	26	20%	73,475	1,995,519,439
2001	155	27	17%	74,657	2,072,579,366
2002	145	24	17%	76,894	2,174,137,887
2003	173	22	13%	79,567	2,233,969,785
2004	162	12	7%	84,770	2,376,960,741

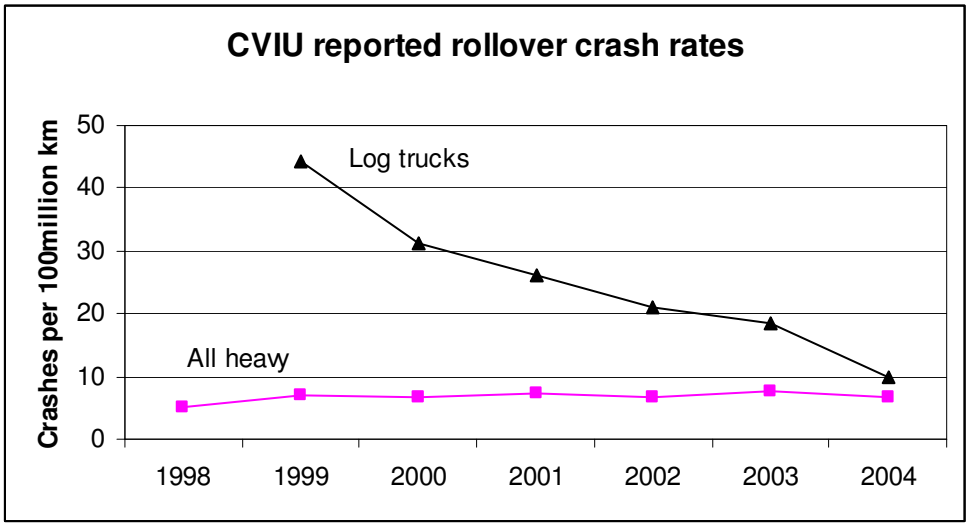

Figure 4. Rollover crash rates of log trucks and all heavy vehicles based on CVIU data.

Table 2. Rollover crash rates of log trucks and all heavy vehicles.

Year to Dec	All heavy vehicles rollover crashes per 100million km	Log haulage rollover crashes per 100million km
1998	4.9	
1999	7.0	44.4
2000	6.7	31.2
2001	7.5	26.1
2002	6.7	21.0
2003	7.7	18.4
2004	6.8	9.9

3 INITIATIVES INTRODUCED TO IMPROVE LOG TRUCK SAFETY

The reduction in crashes has been achieved through a range of measures that include improvements in:

- Vehicle design
- Vehicle operation
- Driver behaviour and
- Company management.

Underlying this has been the commitment of all parts of the industry to safety. Of note is that LTSC is one of the few organizations in the transport sector that includes all of the key stakeholders including forest owners as transport users, transport operators, contractors, researchers, equipment suppliers and government. A significant step in achieving this level of commitment was the signing of the Log Transport Safety Accord by the New Zealand Forest Owners Association, Road Transport Forum, Log Transport Safety Council and the New Zealand Farm Forestry Association.

3.1 Vehicle design

The fundamental weights and dimensions limits for combination vehicles in New Zealand are 20m overall length and 44 tonnes gross combination weight. Almost all of New Zealand's on-highway log transport fleet are truck and full trailer combinations. Although this has not changed there have been major improvements in vehicle design with:

- bolster bed heights now typically up to 300mm lower than previously, significantly improving rollover stability
- longer trailer wheelbases further improving vehicle performance
- greater use of multi-bunk trailers. Almost all new trailers are now multi-bunk
- improved component design, including bolster design
- the use of more roll-stiff suspensions improving rollover stability and handling.

Modern log trailers now typically have an SRT of around 0.42g compared to less than 0.35g before LTSC was formed. This is a significant improvement in stability. Steps taken to achieve this include:

- a comprehensive study into log truck crashes and the stability of log trucks (Baas and Latto, 1997)

- the lowering of maximum load heights as a temporary measure (de Pont et al, 2002b)
- stability analysis of new vehicles at the design stage
- the development of a paper-based method of assessing the stability of log trucks for use by operators, drivers and manufacturers (de Pont et al, 2002a)
- assistance with the development of the LTSA SRT calculator (de Pont et al, 2002a)
- industry meetings, articles, newsletters and other means of technology transfer to encourage the move more stable vehicles.

A significant turning point occurred when a major log transport operator invested in a new trailer-building operation in competition with the existing manufacturers and demonstrated the vehicle performance improvements possible by designing and constructing a low, long-wheelbase trailer based on the research undertaken by TERNZ as illustrated in Figure 5. The new generation trailer on the left is actually carrying a greater payload than the trailer on the right.

Figure 5. New generation log trailer compared to existing standard trailer.

A number of codes of practice have been produced covering both vehicle design and operations. Those relating to vehicle design include codes covering the design of bolster attachments, a code on the safety of off-highway log trucks, and a code on the lifting and securing of trailers onto trucks.

A significant amount of work has also been undertaken on improving log load securing. This has included physical tests of different load securing systems and participation in the work the Australians are also doing on load securing. The tests included hard braking and tilt tests using the vehicles and facilities provided free of charge by a major operator. Improvements in log load securing are being introduced as part of the new Land Transport New Zealand Rule on Load Security.

3.2 Driver behaviour

A number of initiatives have been introduced aimed at improving driver behaviour. These include:

- An 0800 LOG TRUCK compliments and complaints scheme that has been in operation since the early 1990's. All calls are monitored by a commercial call centre and the details of the calls forwarded to the transport operator and to LTSC. All calls must be followed up by the operator. A new standardised 0800 sign was introduced in 2001 which improved both the legibility of the signs and increased the conspicuity of the rear of log trucks.
- Surveys of the speed log trucks when traveling around curves. Three surveys have been completed and have found that there has been no significant change in speeds from 2002 to 2005. All heavy vehicles travel around curves at speeds averaging 10% above the advisory speed. Log trucks travel slower but still 5% above the advisory speed. These results suggest that the benefits in improved vehicle stability have not been eroded by drivers driving faster.
- LTSC operates an extensive crash database that focuses primarily on rollover crashes. It is a Forest Owner requirement that operators report all log truck crashes to LTSC, ensuring that all crashes are reported, not just those attended by the Police.
- Driver training is seen as a top priority and 240 drivers have obtained their National Certificate in Log Truck Driving and a further 40 drivers have obtained their National Certificate in Commercial Road Transport with a logging strand. There are a further 330 drivers who are currently enrolled for these qualifications. This represents a high level of participation given that the log truck fleet is made up of approx 1,200 to 1,400 vehicles.
- Special training sessions were also undertaken throughout the country to make drivers aware of the stability of their vehicles and the need to slow down.
- a number of easy-to-read information pamphlets and articles have been produced for the drivers
- The forestry sector is a leader in alcohol and drug testing and has a zero tolerance to the use of drugs by its employees.
- The LTSC and Forest Owners Association contributed to half of the cost of the Driver Recruitment and Retention project and have been very active in implementing the recommendations. This has included establishing training programmes for the unemployed and school leavers.

3.3 Vehicle operation

One of the earliest operational measures introduced was to restrict log load heights to 3.8metres for 4 axle trailers and 3.5metres for 2 and 3 axle trailers. While this measure only eliminated the excessively high loads, it acted as a catalyst for many of the other changes.

A major improvement occurred when log trucks were permitted an increase in overall length from 20metres to 22metres when carrying 2 packets of logs on multi-bolster trailers as illustrated in Figure 6. This concession was subject to other constraints including a maximum overall height of 3.2metres but enabled longer log lengths to be carried in two packets with enhanced rollover stability. This concession was achieved through a concerted lobbying effort by the LTSC and one of its members in particular. The lobbying targeted Members of Parliament, regional councils, the New Zealand Automobile Association and the Director and Board of the

Land Transport Safety Authority (LTSA)[1]. Eventually all of these stakeholders were convinced that the adoption of these longer-lower log trucks would improve rollover stability and reduce crash risk. Thus the LTSA was able to issue permits allowing these vehicles to operate with the support of other road user groups and the public in general and without any significant opposition.

Figure 6. 22m multi-bolster log load compared to 20m single bolser load.

[1] There was a restructuring of the transport regulatory agencies in late 2004 and the LTSA is now part of Land Transport New Zealand.

Industry codes-of-practice relating to vehicle operations that have been prepared include those addressing the safety of personnel when loading log trucks and when the lifting of trailers onto log trucks for piggybacking purposes.

Further steps have been taken to increase the cartage of double packet loads although the proportion of logs that can be transported this way is limited by forest harvest considerations.

3.4 Company management

There have been major improvements in the safety awareness of transport operators and in the professionalism of the industry since the mid 1990s. The leading log transport operators are now amongst the leaders in the application of good safety management practice.

4 THE WAY FORWARD

The improvements in log truck safety would not have been possible without the active participation of all of the parties involved, including transport operators, forest owners, government and researchers. This provides a model for achieving safety improvements across the whole transport industry. Major gains will not be achieved by simply creating more rules and enforcing them. The LTSC believes that the government should actively support industry initiatives to improve road safety. As part of its Safety Strategy 2010, the government undertook a consultation process to develop a heavy vehicle safety strategy. The following were LTSC's recommendations to the government based on the evidence in the LTSC crash database, comments made by the drivers and other sources.

1. Roads. In order to further improve log truck safety, priority needs to be given to improving the roads. Further gains in the safety of the vehicles themselves are limited and only so much can be done to improve driver behaviour though enforcement and training.
   - Improve the condition of road shoulders, especially on secondary roads. A number of rollovers have been caused by drivers having to pull over to the side of the road to avoid on-coming cars. Problems with shoulders include inadequate strength to support a truck and steep drop-offs.
   - Provide more passing opportunities. Of major concern to all truck drivers is the overtaking behaviour of car drivers. Insufficient passing opportunities increase the frustration of motorists and the prevalence of risky overtaking.
   - Increase lane widths on secondary roads. On many roads there is limited room for error.
   - Implement self explaining and self enforcing road measures. This involves the manipulation of road features that evoke the correct response from drivers. Such features can, for example, reduce the incidence of inadvertent speeding and the misjudging of the severity of curves.
   - Give urgency to upgrading the most dangerous sections of road.
   - Take greater cognisance of the requirements of heavy vehicles when designing, constructing and maintaining roads. Many traffic and road engineers have limited knowledge of the limitations of heavy vehicles and how to increase their safety through road improvements.

2. Enforcement is important, but insufficient on its own to achieve the safety targets set in the Safety Strategy to 2010. Enforcement needs to be seen as part of a package of measures. It is recommended that the CVIU's performance targets should be linked to the safety outcome the government is seeking as that would encourage the CVIU officers to be more innovative in how they contribute to improving safety. That would, for example, encourage Police to take a greater role in supporting industry initiatives and in providing advice to drivers on what is required. The Driver Recruitment and Retention Project found that many drivers only found out about law changes when ticketed by CVIU officers.

   Of considerable concern is the lack of consistency in enforcement, including vehicle inspection. The development of the categorization of defects is a step in the right direction and this approach needs to be extended to all areas of enforcement and mandatory inspection. Brake testing has been an issue of particular concern and any moves by the Police to introduce brake rollers at the road side should be delayed until the consistency and accuracy of those machines and their use is assured.

3. Vehicles. There is some scope to further improve safety through vehicle-based measures but, especially in the case of logging, the greatest gains may have been achieved through improvements in stability. Government needs to ensure the introduction of new technologies is not restricted through an inflexible Rules process and other barriers to their use. Safety gains will also be achieved through increased productivity that lead to a fewer, more efficient trucks on the road.

4. Transport operators. It is well proven that companies with good safety management systems in place run safer operations and transport is no exception to this. Support is required with the adoption of safety management within the transport sector.

5 REFERENCES

Anderson, R. and Sinclair, S. 1996. "Report of the Transport Committee on the Inquiry into Truck Crashes" By the Transport Committee for the New Zealand House of Representatives 1.13B 175.

Baas, P. H. and Latto, D. J. 1997. "Logging Truck Stability Analysis". TERNZ 2nd edition 59p.

de Pont, J. J., Baas, P. H., Mueller, T. H. and Hutchinson, D. N. 2002a.""Quick and Dirty" Methods for Estimating Heavy Vehicle Stability" In Proceedings of 2002 International Large Truck and Bus Safety Research and Policy Symposium (Ed, Zacharia, Z.) Knoxville, Tn.

de Pont, J. J., Baas, P. H., and Latto, D. J. 2002b."Improving the Safety of a Log Transport Fleet" In Proceedings of 2002 International Large Truck and Bus Safety Research and Policy Symposium (Ed, Zacharia, Z.) Knoxville, Tn.