Techniques for Paradigm Improvements Towards a Heavy Vehicle Safe System

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Abstract

Enhanced driver education, trip time insurance, log book revisions, low interest loans and accelerated depreciation allowance are paramount issues which could yield paradigm improvements towards a safer system for heavy vehicle (HV) operation. In addition a 24/7 independently funded driver contact centre should be created to receive and address driver problems and issues.

Enhanced driver education is necessary to inform heavy vehicle drivers of the near chaotic multiple scenario handling behaviour of unimproved air suspended vehicles. To this end a DVD based driver education resource is suggested.

Next a scheme for operators to insure against journey delays will be outlined. The essential aim of this scheme is to encourage heavy vehicle drivers operate at speeds commensurate with actual road conditions and avoid attempting to compensate, for delays, by speeding.

Next it is proposed that during extended traffic delays HV drivers should be encouraged and/or allowed to park on road shoulders or in nearside lanes to attract log book recordable rest periods.

Finally it is proposed that the cost incurred by HV operators installing genuine vehicle safety enhancements attract liberal accelerated depreciation allowance.

Opportunity is taken to present brief paramount details of each proposed strategy.

Keywords

Heavy vehicle safety improvements, safe road transport industry system

Introduction

On 30th May 2011 the Wollongong NSW resident author initiated a road trip, in a 1 tonne Ford Courier table top truck, to Brisbane to collect an eBay purchased goods in response to receiving a freight forwarders quotation of $650 for the task. The selected route essentially involved the National Route 1 between Sydney to Brisbane. Initially the intention was to effect a overnight stopover at or about Port Macquarie with the actual journey broken by brief rest breaks every 2 hours. The trip was commenced at about 14:00 simultaneous to the development of a major meteorological (low (or high)) pressure system or event off the north NSW coast. As a result driving conditions deteriorated with northward advancement. So bad were the overall road conditions that at least 80% of the journey distance was effected with

the windscreen wipers operating at the second highest setting. A further 5% of the trip distance was effected with the windscreen wipers operating at highest setting. Simply put the driving conditions along all journey legs were horrid. So much so that on approaching the F3 Moonie Moonie bridge progress completely ceased due to the occurrence of a northbound fatal multiple vehicle accident which closed all three north bound lanes. Once sufficient number of lanes at the accident site had been cleared northbound progress was reestablished after a 2.5 hour parking lot delay. Shortly after the traffic flow had been reestablished it was noted the northbound heavy vehicle traffic had been diverted from the F3 onto the Old Pacific Highway.

As a result of the major delay the remaining forward leg trip was completed as a single leg trip with very brief rest breaks taken at 3.5 - 4 hr intervals to satisfy the scheduled collection time. In comparison on the return trip an over night stopover was effected at Burringbar NSW. The remaining return leg was conducted as per the forward leg. During actual driving operations whenever heavy vehicles passed and overtook windscreen visibility was almost nonexistent. The majority of visibility losses occurred whilst being over taken by heavy vehicles operating in the overtaking lane. Frequent visibility losses occurred due to water jet blasts from the tyre / road interaction of passing heavy vehicles. Each loss of visibility was attune to directing a 5 litre bucket of water onto the vehicle's windscreen in response to each passing heavy vehicle axle group whilst travelling at speeds typically in excess of 80 km/h. This direct windscreen water load was simultaneous to continuous heavy rain.

So adverse were the driving conditions that on both the forward and return legs the author incurred very near misses with highway speed heavy vehicles. Both these high risk situations occurred in the merging lane zones at the termination of overtaking lanes.

The occurrence of these extremely close near misses subject to the stated extremely adverse driving conditions prompted the author to ask how the road transport industry could be made safer. Basically the problem was that the heavy vehicle traffic were operating at 100 km/h when, in fact, conditions demanded they operate at no greater than 80 km/h. Furthermore log book demands necessitated they operate at invariant speed independent of the actual road conditions.

The other obvious concern was the fact that the diverted heavy vehicle traffic resulting from the F3 fatal would need or attempt to make up for at least 3 hours of lost travel time subject to the prevailing horrendous driving conditions.

The following declares possible techniques for a safer road system subject to extremely adverse driving conditions. The trip therefore proved most informative towards contributing to a safer road system especially that involving significant heavy vehicle traffic.

Adverse weather driving conditions

One notable wet weather driving condition observed was the formation of stratified visibility layers above the road surface due to tyre spray and splash emitted from heavy vehicles operating at highway speed. Notably in the 1.5 metre high zone in contact with the road surface visibility is severely eroded due to the high concentration of water in various forms. This near road surface low visibility conditions severely influences the driving consistency

and confidence of light vehicle drivers. In response to this reduced visibility light vehicle drivers typically slow down at least 10 - 15 km/h relative to the signposted advisory road speed. The need to effect slower travel speed is reinforced by the fact the light vehicle drivers are typically route unfamiliar.

In complete contrast heavy drivers remain largely uninfluenced by the adverse near road surface visibility condition. In fact the drivers appear completely oblivious to the adverse visibility conditions generated by their vehicle's contact with the wet road surface. Furthermore heavy vehicle drivers possess intimate route knowledge. Subsequently, heavy vehicle drivers operate at near invariant speed subject to conditions which light vehicle drivers describe as high risk. Unfortunately it is most disappointing to note the majority of heavy vehicle drivers appear completely unaware that their emergency situation safe stopping distance and evasive action controllability, under adverse conditions, are virtually meaningless to prevent a accident. Hence under these conditions suitable alternate accident avoidance strategies must be identified and disseminated.

Hence, under adverse weather conditions it is no surprise that light vehicle drivers report heavy vehicle drivers 'excessively speed'. Subject to the same adverse weather driving speed differential it is no surprise the heavy vehicles interchange lanes to command the overtaking lanes. Unfortunately this wet weather driving situation is completely unfamiliar to most light vehicle drivers. This unfamiliar highway speed driving situation compounds significantly to the already accentuated accident risk.

During adverse meteorological events governed road condition situation it is strongly recommended that low beam head light and tail light illumination be activated.

Possible safe road system improvements will now be outlined.

Maintenance of Familiar Driving Situation

In adverse weather the driving situation status quo should be maintained. Namely light vehicles should be allowed to occupy the offside or overtaking lane. Implying heavy vehicles should operate in the nearside lane and be allowed to overtake on the left of slower moving light vehicles operating in the offside lane. However, they must continue to obey the actual indicated governing lane merging priority. Furthermore heavy vehicle drivers will be merging with light traffic on their higher visibility side as against merging to their nearside or blind side. It must be noted under adverse driving conditions blind side revision mirror visibility is highly compromised due to the above mentioned high level of tyre levitated water mist.

Safe Rates & Driver Skill Payments

The Federal Government has recently introduced a Bill covering safe haulage rates for the road transport industry. It is expected this Bill will generate an incremental improvement in heavy vehicle road safety. However, much is still to be done. In particular safe rates of pay must be identified for partial loads. Furthermore, via chain of responsibility implications

freight forwarders must be required to specify a minimal delivery time (for each load fraction). A further enhancement would be to spilt cartage payments into a component involved with the actual goods cartage (paid in terms of $/tonne km) and a component relevant to the drivers skill, driving record and actual overall time commitment to each haulage task (paid in terms of $/hr).

Introduction of a weather dependent driving condition rating

Weather bureau responsibility should be both expanded and extended to 24/7 declaration of advisory maximum road speeds, in accord with predicted precipitation or weather conditions (e.g. fog, snow, hail, black ice, etc.) for all major highway and road segments. This declaration should attract legal standing commensurate with the issue of bush fire risk ratings. The specifics of the actual declarations should also be fully recorded for determination of actual trip driving times and possible future legal reference. The advisory speed recommendations should be regularly broadcast on free to air media and regularly spaced road side illuminated signage. This advise should be an extension to and complement the existing NSW Roads and Maritime Services (RMS) live traffic reporting service. This service should also regularly recommend minimum safe vehicle illumination levels.

In simple terms when road conditions are adverse heavy vehicles must operate subject to reduced maximum allowable speed restrictions. Failure to do otherwise will maintain current carnage rates.

Road congestion and motor vehicle accident trip time overruns

The relevant road authority should regularly declare expected trip time increments due to road congestion and motor vehicle accidents. The specifics of the actual declarations should also be fully recorded for determination of actual trip driving time and for possible future legal reference. Account must also be made for the longer trip times incurred effecting any specified or enforced detour/s. Furthermore to gain log book credit for traffic induced delays heavy vehicle drivers should be encouraged and/or allowed to park on road shoulders or in nearside lanes until road congestion clears. This advise should be broadcast as an extension to the existing RMS live traffic reporting service.

Actual trip times

The existing RMS live traffic reporting service should be enhanced to predict actual segment trip times accounting for local weather conditions, road congestion and specified route deviations. These predictions should be updated at no more than 15 minute intervals. Each trip time histogram record should be retained for a period of seven years as per legal reference / records requirements.

Access to actual predicted trip times would also allow all fleet managers to pay drivers for actual trip times and so encourage their drivers not to speed. The same information could be

used to audit and collate vehicle log book / driver diary entries. Individual vehicle global positioning system (GPS) tracking resources would also consolidate fleet safety resources and efforts.

Trip time overruns

For each trip the difference between the actual and ideal road condition trip time should be evaluated. It is expected the actual trip time will always exceed the ideal road condition trip time. Obviously road transport operators only want to pay truck drivers for the ideal road condition trip time. Who should incur the cost of the additional driving time in excess of the ideal condition driving time? The latter is typically benchmarked to 'myNRMA' my trip predicted trip times (adjusted for heavy vehicle allowances).

Trip time overrun insurance

It is proposed that a trip time delay national insurance scheme be introduced, by the various States and Territories and the Federal Governments, road authorities, vehicle insurers and the transport operators proper. Claims to this insurance scheme should be made to cover the difference between the actual and ideal road condition trip times. This scheme should be funded by the various stake holders in accord with the motor vehicle accident saved cost disbursed to the various parties. Claims on the insurance policy should be directly related to the trip time increments for each operating vehicle incurring recorded journey delays.

At this stage an illustration of a typical insurance payout and benefit incurred during a meteorological event now follows.

For instance assume a meteorological event causes the maximum advised speed to decrease to 80 km/h inflicting a 2.5 hour increment to the inter capital city journey time within a single continuous 24 hour period. Assume some 5000 trucks driven by truck drivers attracting a hourly pay rate of $50 per hour (say, including on costs) experience trip time overruns. The resultant insurance claim pay out would be some $0.625 Million. Here no claim for increased vehicle operation costs will be entertained as the lower operation speed may, in fact, result in lower unit operation cost per hour (due to say improved fuel economy, reduced tyre wear and reduced overall vehicle wear and tear).

In comparison on assuming the heavy vehicle reduced driving speed saved at least one fatality (assumed to attract a social cost of some $6.5 million) the nett community saving would amount to at least $5.5 Million. To maintain sustainability of the insurance fund pool the Government should increment the insurance pool reserves by at least 30% of the community savings to insure against future events. Obviously scheme administration costs and overheads would need to be funded. On initiation suitable techniques must be put in place to eliminate fraudulent claims. To this end compulsory real time GPS logging of the nation's road transport fleet rolled out with the heavy vehicle intelligent access program (IAP) scheme

should be considered. At fault drivers generating accident congestion likewise must make an appropriate contribution to the insurance fund or be made fully responsible for the trip time overrun compensation payment. This compensation payment could be made payable to all drivers (i.e. light (including cars) and heavy vehicle) whom receive income for effecting driving functions.

Vehicle visibility

During times of high to very high tyre water spray loads every visibility asset or increment thereof could actually save a life. Hence the addition of self illuminating tap to vehicle extremities is strongly recommended.

Adverse weather merging lane peculiarities

Unbeknown to most light vehicle drivers when they operate in the slow vehicle lane it is necessary for them to give way to vehicles operating in the overtaking lane when merging. It is expected this oversight and the expected poor visibility conditions result in numerous accidents in these high risk zones. Frequent opportunity should be taken to remind light vehicle drivers of this oddity.

Heavy vehicle adverse weather operation enhancements

Every opportunity should be adopted to exploit the latest heavy vehicle tyre water spray suppression / minimisation technologies.

Heavy vehicle side under run protection

It is strongly recommended that all heavy vehicles be installed with side under run protection curtains. Such curtains will prevent light vehicles making contact with heavy vehicle towed axle groups post initial nearside guard rail impact reflection. The use of carbon fibre curtains or kevlar strapping is recommended to maximise the curtain's strength to weight ratio without significantly marring the vehicle's productivity. Installation of side under run protection will become increasingly paramount when the Nation's highways exhibit greater extent of dual lane standard.

Log book revision

In the case a recorded trip delay occurs drivers should be permitted to complete the 'standard' journey without incurring log book / driving hour penalties. In fact the existing log book

infringement inflexibility is killing drivers during times of adverse weather, post accident congestion delays or that due to completing specified road detours. Typically driver attempts to satisfy log book requirements associate with the need to operate the vehicle at excessive speed. Hence the current situation generates a deadly concoction.

Enhanced driver education

Hitherto heavy vehicle drivers possess minimal understanding of the dynamics of air suspended vehicles and the consequences of same on vehicle handling and controllability. Hence improved driver awareness to the characteristics of air suspensions including that during evasion action is paramount. In particular drivers should be informed as to how standard air suspensions behave in long sweeping curves, alternate lock curves, during and immediately post positive torque application and how the suspension's roll stiffness varies with operating speed and extent of torque or brake application. With heightened understanding of air suspension operation it would be opportune to disseminate the dominant air suspended heavy vehicle accident signatures (McLean (2009a), McLean (2009b) and McLean (2011b)). Further improved understanding of system behaviour provides opportunity to discuss the performance differences between turntable and hitch articulated heavy vehicle combinations. Equally the speed and system variable sensitive dynamic response behaviour of the strongly cascaded air suspended axles, cabins and seat system must be known. Furthermore safe emergency evasive strategies must be declared. Here it is paramount to inform drivers that standard air suspended vehicles demand vastly different evasive countermeasures than that used for mechanical sprung prime movers. This vital education should also extend to the handling behaviour of short wheel base prime movers, especially that hauling B doubles, subject to the complete ambit of road conditions.

This driver education resource must be effected via a professionally produced highly graphical DVD resource. It is expected that once drivers become aware that standard air suspensions exhibit gross adverse active suspension behaviour they will elect to operate their vehicles at speeds some 10 - 15 km/h lower than the status quo.

Enhanced light vehicle driver education

Light vehicle drivers should be educated as to what to do in the event of an imminent collision with an overtaking heavy vehicle. Notably to apply hard and sharp left lock to cause the vehicle to first impact and maintain in contact with the nearside guard rail. This contact normally only involves vehicle physical damage. In contrast should the light vehicle rebound from the guard rail the risk the accident will involve serious consequences will acutely elevate significantly.

Route selection

Road travel between Sydney and Brisbane involves either the coastal route (Pacific Highway)

or the inland route (New England Highway). Surprisingly the travel distance and time along each route is relatively invariant. In the author's case the Pacific Highway route was selected due to its greater familiarity despite the implication of the approaching / deepening meteorological event. Namely the mere presence of the meteorological event suggested adoption of the inland route.

Recommendation, whenever major meteorological events loom along the northern NSW coast the inland route (i.e. the New England Highway route) should be selected as the far safer option. A not so obvious implication of this recommendation is that Governments and road authorities must rigorously and continuously support funding and upgrading for a twin major highway system with namely a coastal route and an inland route. In contrast the funding of a unitary major road system without safe and convenient redundancy will attract political suicide status.

Heavy vehicle driver marital situation

Contact with a large number of deceased heavy vehicle driver next of kin, peripheral to the FORS 2000 investigation (Sweatman and McFarlane (2000)), strongly suggested heavy vehicle drivers with marital problems not be allowed behind the wheel. On the converse drivers in strong marital relations were identified to, in fact, keep vehicles with known major handling issues on the road. In simple terms it is essential drivers devote full vigilance to the driving task at hand and not have mind diversions to sorting out marital problems whilst they drive. Sadly, another casual observation from next of kin contact suggested young bachelor drivers also attracted a high fatal statistic. This casual observation suggested happy stress free (heavy vehicle) drivers are the safest drivers.

Informed drivers are safe drivers

Based on the author's experience a 24/7 call centre should be established to receive, discuss and recommendation solutions in regard driver complaints and problems. In addition the Centre should maintain statistical records of complaint type and sources. The Centre should be staffed by suitably qualified experts open to receive, hear and advise on the complete ambit of driver experiences and concerns. Obviously for brevity purposes it is impossible to list all such wide ranging and varied details.

This independent Centre should be multi sourced funded with sources ranging from key stake holders. In the first instance, due to the relative centrality within NSW, it is suggested this Centre be strategically established at the Charles Sturt University Campus in Dubbo.

Safer heavy vehicles

A safe road system demands operation of safe heavy vehicles. The Federal Office of Road

Safety (FORS) 2000 report (Sweatman and McFarlane (2000)), despite every effort to blame post manufacturer vehicle modifications, identified systemic problems exist on standard air suspended heavy vehicles. Furthermore the extent of problem was strongly dependent on the suspension system details and the actual prime mover wheel base. (Notably in regard the latter the extremely adverse characteristics of standard air suspended short wheel base prime movers and particular air suspension makes and types were completely ignored.) With utmost concern adverse active suspension characteristics persist on almost all operating vehicles. Furthermore with heightened concern handling and stability deficiencies also exist on standard air suspended buses and coaches.

This situation can only be eliminated by retrofitting relatively low cost easy to install modifications (McLean 2011a). Obviously the greatest hindrance for operators against installing the improvement is the initial up front cost. Other hindrances slowing modification uptake are that operators consider the original vehicle manufacturer should cover the expense as a warranty issue. Another not so obvious hindrance is the income loss incurred whilst the truck and / or trailers are being retrofitted.

It is paramount these heavy vehicle safety paradigm systems be installed as rapidly as possible. To this end it is suggested a low interest loan system be instigated by the appropriate Federal Government Department to facilitate rapid retrofitting. Retrofit installation would also be promoted by the attraction of accelerated depreciation allowance.

A similar financing scheme could be adopted for all heavy vehicle genuine safety enhancement (and emission pollution reduction technology) retrofits. In particular this scheme should extend to updating drum brakes with disc brakes on all axles and the introduction of fully interchangeable and modular electric braking systems EBS brake control signalling to all axles, especially the towed axle groups. The same incentive based financing scheme should not extend to the installation of (anti lock up brakes) ABS and electronic stability control (ESC) as these systems are only suitable for operation on high quality sealed roads. Unfortunately for the local road transport industry such roads are relatively unknown.

Direct Line of Responsibility

Roads and Maritime Service or Transport NSW should appoint a single responsible executive appointment at a level directly below the CEO of the most appropriate organisation. This executive should be directly responsible for HV road safety and in particular reducing the road trauma component involving HV accidents. This executive should be extremely intimate with the industry, driver attitudes and have a particular fondness for HVs and be particularly aware of HV performance characteristics including handling, controllability, load centre of gravity, ride, noise and vibration. At present there is no readily identifiable direct chain of responsibility for this paramount role.

Dual Lane Upgrade

Surprisingly the complete upgrade of major east coast highways to dual lane dual carriageway status will not yield the expected universal panacea. In fact subject to the status quo dual

lanes will herald, simultaneous to adverse weather conditions, very high risk highway driving conditions. The expected carnage, subject to the stated conditions, will result, in turn, from the higher average vehicle operating speeds.

Conclusion

In times of adverse weather conditions associated with say a major east coast meteorological event it is paramount both the light and heavy vehicle traffic components reduce their operation speeds. Lower operation speeds incur longer travelling time. Heavy vehicle and professional drivers must be compensated for the longer trip time. Appropriate compensation could facilitated by claim to an adverse road driving condition insurance fund. Tentative analysis suggest considerable economic gain will result for each road accident fatality saved. Furthermore it is imperative heavy vehicles operate in the nearside lane to avoid highway speed heavy vehicle driver's blind side merging operations.

Safer road systems are essential during times of adverse weather such as that which regularly bestow the east coast Australian road network. With reported accelerating climate change more frequent and severe weather events are expected. Every marginal road safety improvement must be fully and seriously evaluated. Those attracting confident advance should be expediently introduced. To this end a small number of possible safety improvements are advanced for consideration. New road safety paradigms must be introduced. This paper's intention was to initiate paramount and necessary discussion towards attaining a sustainable long term safe road system. Hopefully the discussion technical merits and safe road system increments are blatantly apparent in stark contrast to the contents being viewed as the ramblings of a driver who had experienced acute heavy vehicle accident near miss situations.

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