Engineering Solutions

Crocodile Tears for Heavy Vehicle Safety

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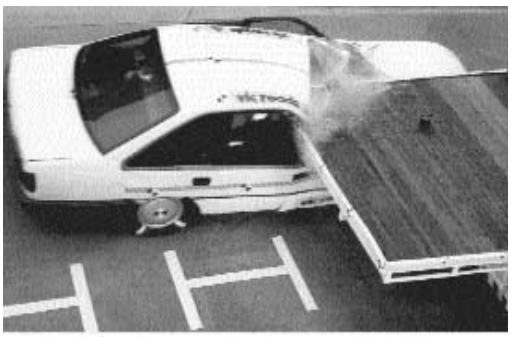
The Sunday Age dated the 4th January 2004, front page feature caught my attention regarding: "community outrage" following Australia's well known crocodile man Steve Irwin holding his one-month old baby in one hand and feeding a large crocodile with the other. His response at such apparent community outrage and concern over the safety of his infant was that he was more worried about the safety of the baby travelling in a car on the roads than being eaten by a croc. I thought he had a point.

Thinking of crocodiles, it also reminded me, once again, in this new year, of "crocodile tears" being shed in some quarters over road safety, but little being done about conspicuous and well known causes of hundreds of fatalities and serious injuries on Australia's roads every year – that is, crashes involving heavy vehicles and other road users. We know very well what can be done about reducing this toll – but every year those who have the authority and capability to act, both in Canberra and at a State Level, seem to have forgotten what their responsibilities and roles should be.

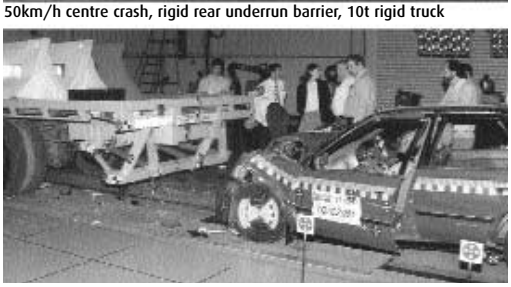
Before the relevant bureaucrats, the trucking industry, safety researchers and all other vested interests get into their defensive bunkers and knee-jerk reaction mode, may I quickly add two key points: what I have to say has nothing to do with who is at fault in terms of the crash (this is irrelevant) and that the mass of the heavy vehicle, contrary to popular opinion, is not the main obstacle to improved heavy vehicle safety! The biggest obstacle to improved heavy vehicle safety is a system that encourages and enables bureaucrats, regulators, and safety exponents, to hide behind mindless cost-benefit calculations to avoid requiring known and effective design improvements to heavy vehicles. Yes, cost-benefit analysis indeed is the main culprit.

In this regard, it is my opinion that Sweden has got it right, with their Vision Zero philosophy [13], which states that *"Life and health can never be exchanged for other benefits within the society"*. You can think of it this way: if we require each new heavy vehicle to add a package of safety related design requirements, including, well designed front, side and rear underrun protection which, let's say, adds an average $2,000 per vehicle, what will this mean to transport economics? Simply not much except that perhaps, for example, a packet of breakfast cereal may go up by one or two cents due to slightly increased freight costs. And that's our cost! And the benefits? Many members of our community and families saved from fatal and serious injuries. So what cost-benefit analyses really means, is that when no action is taken to improve the design of heavy vehicles, people's lives are being traded for reduced transport costs. Will the trucking industry object to these requirements? No – provided it is a level playing field – that is, it is a regulatory requirement.



50km/h Offset crash, no rear underrun barrier, 10t rigid truck

50km/h centre crash, rigid rear underrun barrier, 10t rigid truck



75km/h centre crash, energy absorbing rear underrun barrier, 9.1t rigid truck

Figure 1. Examples of crash test development work on rear underrun barriers carried out by the author at Monash University for VicRoads and DOTARS (then FORS).[4]

What is required? Simply the addition of well-known design requirements [1-12] making the front, side and rear of heavy vehicles compatible (in crashworthy terms) with the rest of the road travelling public, be they vehicles, cyclists or pedestrians [see Figures 1, 2 & 3]. Europe has had regulations for many years requiring rear, side and front protection. The USA back in 1997 introduced rear underrun standards.

In any collision, particularly between objects of significantly different masses (such as a car and heavy vehicle; or pedestrian and car), the issue is not one of absorbing the kinetic energy of the heavy vehicle, but of

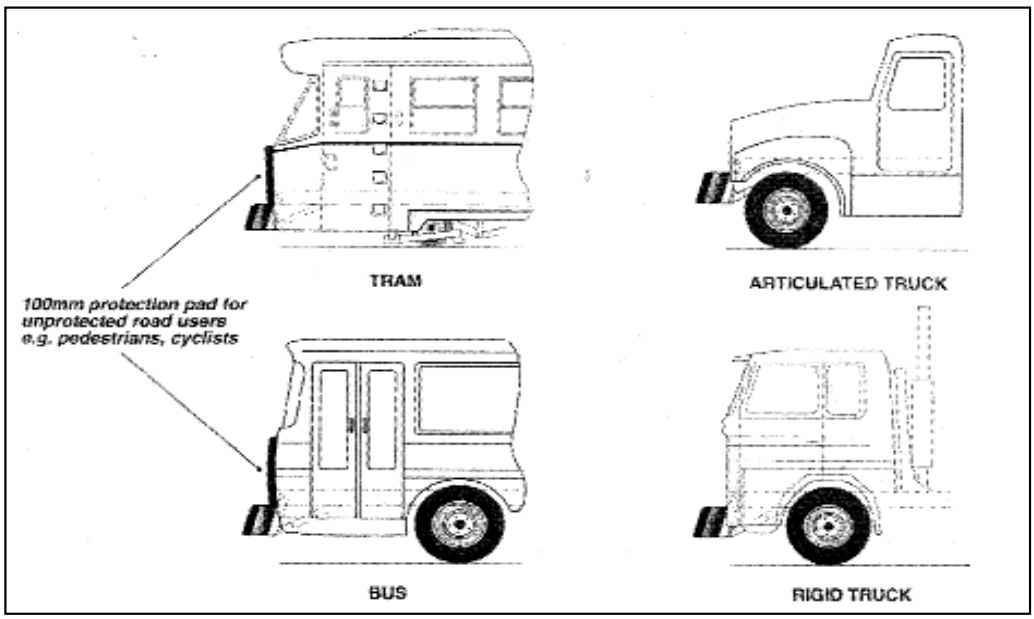


Figure 2. Diagram showing proposed modifications to the front of heavy vehicles, trams and buses incorporating an energy absorbing front underrun barrier (and pedestrian protection pad) (from Rechnitzer, 1993).[11]

control of the exchange of energy between the two objects [7]. This is clearly a simpler problem to deal with than that of absorbing the energy of a heavy vehicle. The latter "problem" is often considered, mistakenly, to be the issue, and has thus prevented the realistic consideration of countermeasures aimed at reducing heavy vehicle aggressiveness in crashes. The key issue in these cases is not the very high mass (momentum) and energy of the heavy vehicles but the ***appropriate management of the interface*** between the two impacting objects. This requires both geometric/stiffness compatibility as well as energy absorption.

Scania Trucks[1] have recently announced that the introduction of energy absorbing front underrun structures on trucks would have major safety benefits.

"The front underrun protection on modern trucks is estimated to save 900 lives every year in the European Union.

Scania believes redesigning the front of cabs can double the number of saved lives. Vehicle length is limited by law in most countries. Permitting an extra 600 mm for a crash-zone and some additional weight could thus save many lives."

The inclusion of a 600mm crush zone is similar in concept to that suggested by this author in his 1993 report to VicRoads [11].

So in 2004, let's hope that Australia finally catches up with the rest of the world and those responsible for road safety get bouquets of appreciation from the community by, at least, introducing the safer European requirements for the design of the front, side and rear of heavy vehicles.

I hope that 2004 will see the end of "crocodile tears" in relation to heavy vehicle safety.

Figure 3. Exampled of different styls of side underrun protection on various heavy vehicles.[2,3]

1. http://www.scandia.com/products/trucks/Safety/the_future/crash_zone.asp

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