ROAD SAFETY COMMITTEE

Inquiry into safety at level crossings

Melbourne—14 April 2008

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Mr G. Lawson-Smith, Chief Executive Officer, Safety Institute of Australia;

Dr G. Dell, CFSIA, Safety Institute of Australia, National President and Dean, College of Fellows; and

Dr G. Rechnitzer, Fellow, Safety Institute of Australia..

Mr KOCH—I would like to welcome you all to the public hearings of the Road Safety Committee inquiry into safety at level crossings. All evidence taken at this hearing is protected by parliamentary privilege as provided by the Constitution Act 1975, and further subject to provisions of the Parliamentary Committees Act 2003, the Defamation Act 2005 and, where applicable, the provisions of reciprocal legislation in the other Australian states and territories. Any comments you make outside the hearing may not be afforded such privilege. Have you received and read the guide for a witness presenting evidence to the Parliamentary Committees? Thank you so much. We are recording the evidence and we will provide a proof version of the *Hansard* transcript at the earliest opportunity so that you can correct it as you see appropriate.

Before inviting you to make your verbal submission and the asking of questions I would like to introduce the committee members who are with us here today: Shaun Leane on my right; Paul Weller; myself as deputy chair—and I apologise for John Eren, our chairman, who has had to attend to some other business and cannot join us—Terry Mulder and Craig Langdon; our executive officer Alex Douglas and our research officer Laurie Groom. Gentlemen, if you could introduce yourselves and where you sit within your organisation and, if you are comfortable, we will have questions on the run as you make your verbal submission. Thank you very much.

Mr LAWSON-SMITH—Thank you very much, Mr Deputy Chairman and committee, it is great to be here. We appreciate the invitation to present from the Safety Institute's point of view. It is a pleasure to assist you, of course, in improving level crossing safety.

Mr KOCH—Gary, just prior to moving too far in, if you would all like to introduce yourself for Hansard, would be the better way to go and then we will go on with the presentation.

Mr LAWSON-SMITH—Our delegation is Dr Geoff Dell, the national president of the Safety Institute of Australia and principal for protocol safety management; Dr George Rechnitzer on my left who is a fellow of the institute and chairs our Transport Safety Committee and also a principal forensic engineer and director of DVExperts International; and my background, I am the CEO for the Safety Institute and a former CEO of the Aviation Safety Foundation Australasia.

Mr KOCH—Thank you so much.

Overheads shown.

Mr LAWSON-SMITH—Again we appreciate the opportunity. The institute has been around for nearly 60 years. It celebrates 60 years next year, very much promoting nationally the highest possible standards of health and safety at work, on the roads, at play and at home. Our submission that we put in last year strongly advocates the adoption of a strategic top-down approach. In our research we looked at the UK rail safety plan. I have come from a long aviation background, working on global standards and Australian standards in both the air traffic control world and the airline world. Again transport, and certainly aviation, has gained a lot in terms of safety operation, environment or benefits by adopting a strategic approach over what used to be called a fly crash fix approach.

Aviation learnt many years ago that the reactive approach to crashes and putting bandaids on problems was not sustainable and hence there was a need for a different approach to be adopted which was more proactive, more reflecting data on day-to-day operations but certainly taking a top-down strategic approach. Looking at the whole system holistically, not just individual components of navigation aids or other things, it was looking at the whole system. We in Australia were successful in influencing where global developments in that direction went. Now there is a global safety plan that has been implemented for aviation purposes and Australia plans to supplement that.

There are more crossing points in the upper air route structure over Australia than there are in level crossing numbers on the ground. We control in this country about 10 per cent of the world surface in airspace, and up there is a fairly complex airspace structure and air route structure where aircraft will cross—747s, A380s—at eight miles a minute in through a crossing point. To handle that there is air traffic control, there is vertical separation, but there are also enablers—proven technology enablers—based on satellite based technology, like collision avoidance systems. There are systems on the flight deck that are used day in day out to again prevent

accidents occurring.

I think if we just compared really level crossing accidents in what we have seen since the tragedy of Kerang and since then, and looking at what would happen in upper air space if, in the same time frame, we saw accidents happening at crossing points with major airline aircraft, what would the public reaction be. I am sure it would be quite profound. We are looking at various transport modes. One thing always puzzles me, it used to happen when I was involved in search and rescue, is we seem to plan on different elements of what we do, but if we look at public safety and we look at six people in a mini-bus going through Melbourne through level crossings on our Melbourne roads and so on, going out to Melbourne Airport, hopping on a Qantas aircraft, going to Sydney and then going out on Sydney Harbour, do we offer those people different levels of safety in what they are looking at? Do we look at the whole thing as a transport holistic system problem or do we accept the fact that in aviation today, sure, things go wrong in aviation but are there different levels of safety that we offer the same people? I will now hand to Dr Geoff Dell.

Dr DELL—The principle behind the institute's approach to safety management, regardless of whether we are talking about road safety or any other safety scenario, is the notion of—in contrast to other bodies—hazard management as against risk management. We find that in quite a few walks of life the current approaches to risk management provide a mechanism or justification for not taking action; in other words, people apply in all the modes of transport and in fact all the applications of safety management, an approach a la out of the risk management standard, 4360, which everybody uses to differing degrees of effectiveness. By and large, a large percentage of the hazards that are involved in the operations are not managed because there is a perception that it is a low risk, and low risks tend to become high risks while nobody is watching. The level crossing scenario is probably a good example of just that.

As Gary said, we need to apply these principles across not only this problem but others and if the mindset takes place early then you have an obligation to control whatever the situation is. It shifts from considering risk to ensuring positive control of the hazard. In a level crossing circumstance that means—similarly to the OH and S analogy—there is a finite obligation to prevent vehicles and trains coming together by whatever means are necessary. In the past—and it is not only unique to this environment as well but aviation, as Gary said, has come along the same journey—there has been, and still is, a 'blame the victim' mentality; that is, we set up a set of rules and then we benchmark people's behaviour against those things and if they fall short then the system kicks into gear. Indeed, these accidents have been good examples of exactly that philosophy taking place. It took a long while to beat it out of the aviation industry by a lot of hard work by a lot of people over the years, but certainly a no blame scenario which again supports the notion of positive hazard management has been proven in those other domains to be more effective.

Holistically, if we are going to beat the problem in this scenario, then significantly increased funding is going to be necessary, but that is putting the cart before the horse. Certainly this is going to be an evolution, given the number of level crossings that are problematic, and not a revolution; something that we could not fix tomorrow if we tried, but we need to have a plan for the future that is going to have us looking back in 10 or 15 years and have the problem solved. One of the underpinning safety science philosophies these days is the notion of a hierarchy of hazard control that is buried in all our safety legislation in Australia. By and large it is not used. It is used as a justification for not doing things or being perceived to be doing things. Really, if we are going to be serious about prevention of these types of accident then the hierarchy of hazard control needs to be the fundamental premise upon which we make decisions; in other words, we should not default to administrative controls, road rules and personal behaviour and the like until we have exhausted the possibilities of engineering redesign and in the case of grade separation, eliminating the problem entirely.

I think the realism that we all have to confront is that unless we intervene the current frequency rate is just going to continue. As the road usage and rail usage increases, accidents will be as a result of the increased frequency and exposure, the number of opportunities for trains and vehicles to come together. We have come to the view that the risk assessment models that have been used are inadequate. They certainly do not take into account some of the more, let's say, latent human factors issues, such as increasing train speeds, restricted visibility, the geometry and design of level crossings and indeed the design of the vehicles. While we have a model of reliance on the behaviour of the individual, the systems to support that model are not consistent and in some cases are counter-productive.

Also we still tend to be in the mode that Gary suggested before with the fly crash test old model of aviation in this area where there is a lot of discussion about what interventions we should be using, but we do not see a lot of research backing up some of those things. Certainly in other aspects of road safety particularly, there is a lot of work going into crash testing and surveying to make sure that the interventions are going to be reliable and effective before they are even considered. A warning would be to not have knee-jerk reactions to this problem that do not deliver the solutions we are looking for. At this point I will hand over to George.

Dr RECHNITZER—We did a literature review some months back which is part of our submissions included in your files and the literature review looked at holistically what was happening overseas with level crossing safety. Our assessment was we are not really up with the best methods that could be employed. That was our finding. They are certainly not uniform across the country and they are certainly not mandatory; in other words, there is not a list of things that you should be using and putting in, back to Geoff's point, the risk assessment type model, and then people can choose whether they do something or not which in our view is totally inadequate.

Our assessment is that in many cases level crossing safety is reduced to the lowest level. When you think about it, it comes down to the individual decision-making of drivers. That means that you are put into the hands—you have sophisticated rail stock, high-speed trains and so on, and yet we in many ways have abrogated that responsibility down to what that particular driver can do there on the spot. We will exemplify that a bit later. To put it in clear terms, from our perspective, we regard as a complete abrogation of responsibility by the government, regulators and relevant agencies and operators, to acknowledge that passive crossings are in dire need of safety upgrades, yet then we see a resorting to blaming the driver when collisions occur at such crossings, that includes charging with culpable driving and so on. I will come back to that point.

Overheads shown.

Dr RECHNITZER—We looked at the Trawalla train crash in detail; Lismore, another one in New South Wales. But the Trawalla crash is fruitful to exemplify some of these points. We will go through those. I mention Kerang. We were not involved in that investigation but that too, when we look at the damage to the train, exemplifies a whole crashworthiness issue which we are not discussing in detail here, other than the one about frontal treatment. But Kerang certainly exemplified some serious problems with crashworthiness design there.

Looking at the Trawalla crossing, looking from a crossing with the fast train approaching and the damage from hitting—this is a reconstruction where the rock that was on that truck, running into that trailer, and then looking at a truck on that crossing at the stop sign, and when you look at it with a trailer on, it takes—as you would have heard throughout—about 13 seconds or so to go through it, and then you look at the geometry of that crossing which is on quite a severe angle to the road, and then you look at what view the truck driver has—when we saw that we were rather horrified—an extremely restricted view, and it is clear that in any of these risk assessments they do not get down to, as far as we are aware, the detail. Sometimes sitting in a cab, for example, and saying, 'What the hell can you see? Can you actually see it?' This is the untested assumption that Geoff was talking about earlier. There are untested assumptions that you can get onto that crossing and see something. Then you have the fact that you have a train travelling at about 40 metres per second which means to cross that crossing takes you, with a semitrailer, about—the train is about 600 metres plus away.

There are a whole lot of issues from a human factors side of things. That is a view from the cabin. The police thought it was appropriate for the driver to take his seat belt out, get out of the steering wheel and look down the track. There is a whole lot of nonsense that is associated with these crossing designs that from a safety point of view are just untenable.

Mr KOCH—George, the timber on the side of the road was removed by the time you did these photos.

Dr RECHNITZER—That is correct.

Mr KOCH—That was another obstacle, when the train comes out of the slight ravine.

Dr RECHNITZER—Yes, you are right. They took down the hill, yes. There were a number of things, yes. That is a view when you are actually on the crossing. When you are on the crossing you can see down the damned thing. With that crossing you can see—and of course you can multiply that across the environment. Human factors issues, the whole situation of awareness, we are relying on perception. That is getting down into the lowest common denominator, unless you provide these additional supports, as Gary was talking about, and Geoff, that we see in the aerospace industry. Negative training is an interesting idea. Geoff, do you want to talk about that?

Mr LANGDON—Can I go back a little bit?

Dr RECHNITZER—Sure.

Mr LANGDON—Having seen the crossing I know exactly where it is, he was on the crossing—that is the best view of the crossing you can get, the truck driver can get, with such a large truck, it has to be on the crossing. A small truck that actually turns into it could see that from a different point. Correct?

Dr RECHNITZER—If you turn into it, yes.

Mr LANGDON—That is a large vehicle and if you get to that point it had to be there.

Dr RECHNITZER—In effect, yes.

Mr LANGDON—Thank you.

Dr RECHNITZER—You have mentioned that whole point of turning in; in other words, the driver has to figure out, 'I've got to sort of come around,' yes.

Mr LANGDON—When they were put there they didn't have the same size trucks.

Mr KOCH—Presumably had a horse and cart.

Mr LANGDON—Exactly. That angle again is a defining factor.

Dr RECHNITZER—Yes. Geoff.

Dr DELL—The notion of negative training is one that again comes out of aviation. There were problems when high-speed jet aeroplanes were introduced in the 60s with the early versions of collision avoidance and certainly terrain avoidance systems where they were pretty well unreliable and activating spuriously at high frequency. It happened so much, of course, that crews became completely immune to the warnings. It was not unusual if you were involved in an investigation of a controlled flight into terrain investigation to find the last thing that was recorded on the cockpit voice recorder was the pilot screaming at the system, derision at the system, as in 'Pull the circuit-breaker,' or, 'Cancel the alarm,' seconds before the aeroplane ploughed into the ground; in other words, the thing had been going off so often, telling him that there was a problem, so he was trained that the thing goes off and there is not a problem. We believe the same thing applies here. If the mindset is going to be to warn people that there is a level crossing coming—and to my mind, the things like ripple strips and those sort of warnings are going to be telling people that there is a railway line coming, and a commercial driver will probably cross 50 level crossings a day or something, so they will get 50 warnings that there is a level crossing coming and 90 per cent of those will have no trains. What we have to avoid is to get them to the mindset that these things just warn that there are railway lines coming and it is not connected to the fact that there is a train coming.

Underpinning our strategy where we would perceive you need to go forward is to look at using the new technology systems that Gary is talking about to not only warn that the level crossing is coming but the hazard there. It is the train that is the hazard, that if the train is not there, it is not a problem. What we have to do is break into the psyche of George's last common denominator, people, at the time that it is necessary. When they get an alarm or the system goes off to say that there is something coming—I do not know that you can do it with ripple strips—when it activates they know that the hazard is there. They do not get that monotonous,

frequent alert that there is a problem when in fact there really is not. It took a long time again for aviation to understand that. Since they have, the number of controlled flight into terrain accidents have dropped off significantly. Certainly you do not hear any more of pilots cancelling the alarm just prior to impact.

Dr RECHNITZER—Did you want to talk about the last one, I think that is related.

Dr DELL—Indeed. The thrust—as you will see as we progress to the end of our presentation—is that we need to start introducing some of these new technologies into this environment. While the situations are similar, as Gary has pointed out, there is certainly going to be a need to finetune some of these. I know you have already done some work in this area but the level of sophistication of the solution has to be ramped up, compared to where we have perceived it to be in the past. We will talk more about that as we go.

Dr RECHNITZER—Talking about rumble strips, we are going to give a couple of examples to exemplify some of our ideas. This is something that Dr Eric Wigglesworth and I were talking about—I see Dr Wigglesworth is here—in 2002 at the Rail Conference we had at Monash, and that is to have an active rumble strip, one that—to exemplify what Geoff is saying—is active only when a train is there. It is not warning of the crossing, it is warning of a train which is really the hazard. The crossing itself, as such, is not a hazard. That is a particularly interesting idea. The whole idea of it is that you have it only rumbling, if you like, when there is a train coming. That ties in with an active warning for the motorist.

The other idea that we also put forward back then was again looking at where trains collide with cars or other vehicles—or indeed pedestrians but let's just look at cars—on a level crossing. Again we will briefly touch on the whole issue of there has been really nothing in terms of crashworthiness for the front or sides of trains to ameliorate the impact. We have learnt so much that you can change the whole interface. It does not matter whether a train weighs 200 or 300 tonnes or whatever it is, it is the interface that dictates what is the outcome. You can have an airbag that can go off and totally change the interface with the car to make it a much more gentle impact, and there are circumstances where people can walk out of that collision.

Mr LEANE—Has that been tested?

Dr RECHNITZER—It has not, yet, but that is something we would like to put, as a slide, to you right at the end, but that is a good question. We have been seeking funding for quite some time.

Mr LEANE—Can I ask, on the previous technology, I understand—it is a good idea—that half of the battery has solar panels. You do not need a power supply and that is what costs usually a lot of money to get there. What triggers that?

Dr RECHNITZER—It is a sensor—

Mr LEANE—Yes, but what—sorry, go on.

Dr RECHNITZER—It is a sensor related to the rail track and the train.

Mr LEANE—There needs to be a closed circuit that is caused by the train?

Dr RECHNITZER—Well, you have a transponder of some sort on the train.

Mr LEANE—It is a transponder.

Dr RECHNITZER—Yes.

Mr LEANE—The evidence we have had is that the signalling system that does get sorted out by the train across the two tracks is quite expensive, as far as the detection.

Dr RECHNITZER—With our modern GPS and everything—and that is something we can talk about more. But I think the technology is here where you can have quite simple systems that work.

Mr MULDER—Is that the failsafe, the back-up, that you describe as being a failsafe system?

Dr RECHNITZER—Yes, it is described in the paper we did which is attached to the submission. Yes, it is a failsafe system.

Mr LEANE—How does it do that? If the battery runs out of grunt do the rumble strips come up—

Dr DELL—There are many ways you could design it. That would be one. There are other ways you could design it with redundant systems. If battery is the limiting factor then design it with multiple electrical systems, that if one goes down—the same as you do in any other safety system—it defaults to a safe mode, whatever that is, and alarms to let somebody know that they need to interrupt—go and repair whatever has failed. That is basic engineering machine safety.

Mr LANGDON—How do they compare with, say, boom gates coming down, even if—

Dr DELL—Pardon?

Mr LANGDON—How does the price of that compare to the boom gate—the standard boom gate and, say, more the exit side of boom gates?

Dr RECHNITZER—That is a good question. The whole idea of this was—the common thinking was—that boom gates were too expensive and hence we needed a simpler system. This was intended to be a lower cost than boom gates.

Dr DELL—Sorry for intervening, George. The other advantage is that this system can intervene earlier. We have seen from overseas experience that there has been some level crossing accidents where the gates get taken out just before the train. In other words, the driver for whatever reason is not on the same page and does not take any intervening action and the gate—

Mr LANGDON—How far away would you put the rumble strips then?

Dr DELL—That is the reason why we are suggesting we need some research, instead of just taking a wild guess you would need to—it will be a function of how fast the trains are, the issues we talked about before about visibility down the track et cetera. It depends, if you are on a 60 kilometre an hour suburban street, it will be closer than if we are on a high-speed rail highway scenario.

Mr LANGDON—Yes.

Dr RECHNITZER—They are parameters that can be worked out but we have not nailed it down to say whether it is 200 metres or 100.

Mr LANGDON—How would that compare with the crash you have just shown which is off a main road? There was not that much lead-in from the main road to the railway crossing.

Dr RECHNITZER—Are you talking about Trawalla?

Mr LANGDON—Yes.

Dr RECHNITZER—That problem was entirely different. You would have to come to a stop, the driver did that and you had visibility that was—

Mr LANGDON—I understand all that but this system would not work there either. You could not put it on the main road.

Dr DELL—You could alarm the main road, yes.

Dr RECHNITZER—We do not say that one glove fits all, one hat fits all. Safety has to be layered.

You do not rely on the one intervention.

Mr WELLER—This would have alerted the truck driver at Kerang, yes. The airbag, rumble strips, would have alerted the truck driver at Kerang before he come up to—

Dr RECHNITZER—Yes. There was the other one we had, the one in the fog, at Lismore. There are a number of circumstances but I think it has to be layered. There has to be more than one. The airbags, yes, we know they work. They work in lots of environments. We just have not tested them on trains.

Mr KOCH—Do you have the resources to do that testing as an institute?

Dr DELL—We are going to suggest in one of the later overheads, we normally team up with Monash University Accident Research Centre. We have a long history with them. George is a former senior research fellow; so am I. We do quite a lot of aviation work with them still.

Mr KOCH—So those avenues are there if you call on them.

Dr DELL—Absolutely, yes.

Dr RECHNITZER—Where to from here? We have a list of things we think are relevant: review current administrative controls to benefit appropriateness and effectiveness of any educational program. Again it is back to not assuming something works, let's strip it down and say, 'What is really fair dinkum. What actually does work.' Review the effect of stop and give way signs at uncontrolled level crossings. Again strip away the assumptions and let's see what really happens and works and does not. Implement enhanced train engine and rolling stock conspicuity. We think conspicuity is an important issue and there are lots of gains to be made there, we feel, despite some of the research that claims there is not. We do not agree with that. Review current methods of level crossings—

Mr KOCH—I assume that is colour visibility?

Dr RECHNITZER—Yes, and light. We have talked about the whole issue of risk assessment. Geoff has talked about that, and the inadequacy that currently exists. Investigate engineering interventions, grade separation; evaluate modern technology based on methods to assist drivers. This is all the advanced technology that is really at our fingertips now with GPS and transponders and so on. Active and passive rumble strips. We talked about the active rumble strips. Evaluate energy attenuating systems, such as the airbags and so on. I will hand over to Geoff.

Dr DELL—I think the silver bullet that everybody looks for in these sorts of problems does not exist. Like all of it, it is a complex issue, it requires complex solutions and probably a suite of complex solutions. That is certainly the aviation experience eliminating similar problems with aircraft. The point George made is one of the other key points we would like to make about the notion of crashworthiness. Very little effort in the past has gone into interrogation of design for ability to design any kind of impact, certainly in the interface between heavy vehicles and trains. We see there is a need to improve the design standards, certainly of the rail equipment, and there may be a need to redefine the design standards for heavy road vehicles in light of the outcomes.

As a society we need to shift our focus away from risk management, as I said earlier, to understanding the hazards and then making sure we have the effective controls to mitigate those hazards. As I said in the introduction, that is going to mean, sadly, in the long run a much greater need for funding. We have some proposals for further research which we think needs doing and I will let Gary take you through those.

Mr LAWSON-SMITH—Yes, we believe there is certainly a need to look at crash test research. It seems to be something that has been lagging. The airbag idea that George talked about we believe needs to be evaluated properly. I have come from the aviation world. I was involved in global standard developments in satellite based navigation, surveillance and communications for the aviation world. A lot of standards have been established and implemented throughout the world very safely and very efficiently. The maritime world has done similar things. It is quite amazing to me that the maritime world and the aviation world have got very

close together in these developments. I am not sure if the same is occurring on the rail-road side with the other modes, but I think there is a lot of work that can be done. We would recommend really a need for a cooperative research project involving ourselves and people like MUARC who, as Geoff said, we have a great relationship with and they are one of our strategic partners; but also government and industry partners who could work in that project.

From a government point of view, from an aviation point of view, Air Services Australia who provide the air traffic control system, they have a lot of people involved in technology infrastructure developments that I believe could help. They are proven technologies in surveillance. They would give a train driver and a truck driver oral alarms before they get to an intersection. They are very affordable, and again operationally proven technologies today. We will also seek from the SAA government support to conduct, during 2008-2009, an independent hazard management study of 20 level crossing sites. We believe the independence of the SAA would be very valuable to this committee and to this whole inquiry, and again to coordinate the cooperative research project is two separate activities we would be very happy to take on.

The adequacy of audible warnings consider hearing-impaired people cannot hear; use of ear-related equipment—mobile phones, iPods. Driving down the Burnley Tunnel, the fact that what comes through the radio these days is an interesting development of technology that helps everybody. Why that type of technology cannot be evaluated in close proximity to level crossings—but again technology, it is not always looking for the solution and solutioneering, but it is finding the problem. The aviation world learnt that you do not define the problem as an isolated issue, you look at the holistic system itself and develop a strategic framework and look at then these enablers that could help achieve those outcomes. That way a lot of good has happened.

Mr LANGDON—Your previous slide indicated you wanted more funding for level crossings, but wouldn't it be best to have these things researched first?

Mr LAWSON-SMITH—Absolutely. This is not the $300 million solution, this is simply asking for a grant or two to help us do some meaningful work that provides the independence but also has some very good stake-holders doing research. One thing I have learnt in my career is that you cannot determine safety outcomes and determine counter-measures without proper analysis. The use of people making operational judgments about quick fixes do not work. Bandaids do not do the job, it has to be a much more R and D type approach to look at those safety counter-measures. That is all we are saying. We would offer to conduct these sort of studies.

Mr KOCH—Gary, would you still have the capacity to conduct those investigations through 08 and 09 or has that pushed out, you are in April now?

Mr LAWSON-SMITH—Well, if we are looking at the financial year or in that two-year period, certainly I think the expertise that we would partner with, providing their availability to help and define the projects more precisely, then in that time frame some good things can happen in the phased approach. It is all about defining what the project is and also what the study might be and then identifying with the stake-holders in this committee and elsewhere what would be the top 20 sites or 10 sites.

Mr KOCH—Have you gone down the line of gaining that support for these pilots or is that yet to be undertaken?

Mr LAWSON-SMITH—No, we have not. We thought we would bring it to this table first, to this committee, and conceptually raise the offer from a Safety Institute point of view. We believe it is us being proactive to work with partners to help everybody understand better how we can look to the future and overcome these tragedies that are occurring. In aviation you can use vertical separation. Separating trucks and trains is the best solution of all, but certainly stepping down that path we need to look at what can be done. We need to do good R and D to make that happen and we are happy to operate in that independent mode.

Our strong view is that the global recognition of the hazardous nature of level crossings is best mitigated by the implementation of engineering controls. That I believe is a very strong statement that should be supported. This effectively leads to the conclusion that that is the ultimate responsibility of the governing bodies and not

of the general driving public to minimise level crossing accidents. A lot has to be down around, how do we mitigate this risk. There are responsibilities and accountabilities out there but we are happy to contribute where we can.

Mr LEANE—Can I ask you on the first point, evidence we have had is that well over 50 per cent of level crossing collisions have happened at actively protected crossings, as in people have somehow found their way in between the two booms on the track. What would you say to that because it is hard for me to reconcile exactly that without some sort of driver behavioural chain at the crossings?

Dr DELL—You are saying the vehicles are stationary between the two gates?

Dr RECHNITZER—They sort of sneak around, you mean?

Mr LEANE—Yes. There has been a bit of that, and there has been a bit of, you might maybe misjudge the time you have to get through with the lights going if there are no booms. Yes, that is the evidence we have been given.

Dr DELL—I would probably argue that one of the factors there is the time between the driver noticing that there is an issue; in other words, at the moment all of the warnings are at the level crossing. I will back up further. Possibly—and George hit on it before—maybe the investigations of these things are not going deep enough to try and get to the reasons why some of those things are happening because I would almost comfortably suggest that part of the equation is the warnings are happening too late. We see it in aviation where people fly into bad weather and do not make the decision to turn back until it is too late. When they are evaluating what they are going to do or not evaluating what they are going to do until it is too late and by the time they then get to that position the accident is almost inevitable. Part of our rationale would be—and I would like to see it as part of the research—to go back and re-analyse some of those events to see whether some of the issues were investigated correctly and to see what other factors resulted in either the driver ignoring the fact that the bells and whistles were going and then still tried to take on the train, or—

Mr LEANE—Or went around the barriers.

Dr DELL—Yes, was sitting there for 45 minutes and then decides, 'I'm going to take this on anyway.' They are two different scenarios but we tend to lump them into the one bracket. In fact from a causal factor's point of view it would be different, and from a remedial intervention point of view they would be different cases. I would be very surprised if 50 per cent of the accidents were due to someone—for the same single set of circumstances—being stuck between the two gates at the time the train arrives.

Mr LEANE—That is the evidence we have had is that the percentage of collisions have been at actively controlled crossings in some form. Going through the evidence you gave us you talk about, 'Don't blame the victim,' and I agree with you, but sometimes a victim can be the train driver that for some reason had to go through what he had to go through because someone was a victim of their own stupidity.

Dr DELL—But the other point of course we need to make is that even in the best systems you are never going to abrogate the responsibility of the individual entirely. There is no 100 per cent safety and there are no fully automatic systems, or very rarely are there. Some level of responsibility is still going to sit with the operator.

Mr LEANE—Absolutely.

Dr DELL—But at the moment we are arguing that if you put the whole risk spectrum on the table we are relying, about 70 per cent, on the behaviour of the people at the moment, and 30 per cent on technology. We would argue that it probably should be the other way around, that you make it so that almost regardless of the individual's behaviour, the intervention is going to work. As I said, you cannot get to 100 per cent of that but we can get it a long way closer than we are now, and that is what aviation has told us that effectively new technologies have eliminated pretty much in RPT operations people deliberately ignoring procedures and practices because basically it is 100 per cent probability that you are going to get found out, so it does not happen. Equivalency in road safety would be if you are trying to fix the behaviour of drivers at level

crossings, 100 per cent surveillance at level crossings would eliminate that problem. Drivers will not take the train on if they know that the camera is going to go off, that sort of approach. How much does that cost? Who knows.

But in terms of safety science, at the moment we are relying on the behaviour of people far more than we really should be relying on. The new technologies that I know everybody is probably suggesting to you is really going to shift the paradigm to less reliance on that. It is still going to have some reliance because whatever system you put in place, the driver who is going to ignore everything is going to take the system on. But you will find the percentage will drop from maybe—if you say now 50 per cent, we should be able to get it to 10 per cent or even less is my guess.

Mr LEANE—If you were monitored all the time, as far as your compliance to that part of the road rules, you would find that there would be a quick culture change.

Dr DELL—But then if you take that argument to the nth degree you go to positive vehicle control and you make the level crossing active with a transponder that talks to the vehicle, and the driver can do what he likes, the car will not go through.

Mr LEANE—That is the ultimate really.

Dr DELL—That is where the technology is heading for in 50 years time.

Mr LEANE—A bit less?

Dr DELL—Well, the only reason I say that is that we have 50 years to convince the public that that's what they have to do because it is really going to be a social shift.

Dr RECHNITZER—Can I just add to that briefly, because we had the same sort of issue, of course, in the whole road safety area. Now we have cars filled with eight or 10 airbags. We have gone a long way down the path. Certainly from a safety point of view you cannot get away from addressing behaviour, the environment and the vehicle. It has to be multifaceted. We do not say that there are not lots of idiot drivers around, we are just saying if you want to be effective you have to look beyond that and start looking into the engineering controls. What are you really raising is that the current systems are not well engineered. That is how I would read some of that.

Mr LEANE—But I would be saying with a boom gate down and lights and bells, we have not seen anything—other than grade separation—that would probably outdo that.

Dr RECHNITZER—I can give you a couple of examples from some of research in America. There were gates with lights, a truck went right through the gates and lights—it was heavy fog but it was fully protected—and what was the assumption there, that those flashing lights you could see in the fog. The same with our systems, there is a certain underlying assumption that says, 'A boom gate is going to be effective under all circumstances.' Maybe there are some other issues, but you could argue, 'Have boom gates going the whole width of the road, don't let them come in and out.'

Mr LEANE—That is a problem with people getting trapped.

Dr RECHNITZER—I know. There are always issues.

Mr KOCH—The institute's position in relation to non-failsafe equipment—and taking into account where some of these railway lines or crossing are right across the breadth of Victoria, there is a number of them—collectively or individually, where does the institute sit in relation to non-failsafe? Is there a place for it? Do you support that or not?

Dr DELL—It gets back to the first comment that I made about perception of risk and hazard. If you subscribe to the notion that you have to protect the level crossing then ergo it needs to be failsafe. If we are going to have a risk assessment model where there is some arbitrary line drawn in the sand where we are

going to accept that risk but we are not going to accept that risk, then you would argue you have failsafe above the line and non-failsafe below the line. The difficulty with that—and it is no different in any other industrial application—we are really playing a game of Russian roulette. You are taking the risk assessment tool which is effectively a revolver with however many chambers in the thing that your risk assessment tool has, and you put one shell in there and every time you go to operate it, you pull the trigger and most times you get an empty chamber. Then on that 10 to the minus five—or 10 to the minus six, 10 to the minus eight—occasion, the ball is in the top chamber and you blow your brains out.

The same thing can happen here. We have trains going up and down the track and vehicles crossing over, and we have decided that at this frequency we are going to have a certain set of rules and at this frequency we are going to have another set. Sadly, you are still going to have accidents below the line but you might decide that one accident as a reasonable approach and it happens elsewhere—and certainly in aviation as well—that we are going to design for one accident every billion operations, let's say, and that's going to be the acceptable level. When you have billionth accident, well, almost you have to take it on the chin. You cannot turn around and go to the driver, 'You naughty boy,' because in fact you designed for that.

Mr LEANE—That is pretty good odds, one in a billion, but we would not be copping one in a thousand or something like that, would we?

Dr DELL—No. But the only reason I picked 10 to the minus nine is that Boeing in 1962, when they started designing a 747, picked 10 to the minus nine as the theoretical failure probability and it has been operating ever since and it has not had a 10 to the minus nine accident yet. There has never been an accident because of four simultaneous unrelated failures in a 747 system. In terms of my working life that is about as failsafe as you could possibly get.

Mr LEANE—Yes.

Mr KOCH—Any further questions, gentlemen?

Mr LAWSON-SMITH—Thank you very much indeed for the opportunity.

Mr KOCH—Thank you very much.

Mr LAWSON-SMITH—I think what we tried to present here today, we believe there is an opportunity for Australia to be a leader in the circumstances that have led up to this inquiry and we believe the approach that has been taken, the enablers and technology that are proven and affordable, and it is also looking at this whole thing from a clean sheet point of view. Aviation has learnt very well that you go back to taws, you develop the right approach, you look at technologies as enablers to achieve an outcome, not the reverse, not just the fact that, 'Here's a solution to a problem. We've solved the problem.' It needs a different look.

Mr KOCH—Gary, this committee of the Victorian parliament truly believes in what you have raised now and we will be doing whatever we can within our powers and recommendations to bring that safety forward on behalf of the nation, but certainly from Victoria's point of view. In saying that, thank you very much, we have appreciated your presentation and, Gary, if it's possible if we could have a copy of the presentation for our records that would be much appreciated.

Mr LAWSON-SMITH—Yes.

Mr KOCH—Thank you, gentlemen.

Dr RECHNITZER—I forgot to show a video.

Mr KOCH—We have 30 seconds for a video, George. How long is the video?

Dr RECHNITZER—Probably is less than that.

Mr KOCH—We have ample time.

Dr RECHNITZER—Thank you. It is the Trawalla one that we wanted to show you. This is a video that we put together. It is a compilation. I hope it plays after all that. No. Maybe when you download it to copy it you can have a look at it later. I do not know why it is not working. I am sorry about that. I will copy it over.

Mr KOCH—We look forward to it. Thank you, George.

Dr RECHNITZER—Thank you.

Witnesses withdrew.

Committee adjourned.