Editorial

Nearly everyone—young or old—seems to have commented on the speed with which 2007 seemed to vanish into past tense. Already we are into the New Year 2008 and the holiday season is almost over, schools are about to re-open and tertiary institutions are preparing for an influx of new students. Numerous unexpected conditions have combined to delay this edition of Ergonomics Australia and with the Easter holiday occurring in early March this year, the next issue may well arrive a little late as well. However the good news is that any delays are no longer associated with a limited choice of material on offer. The reality is that an increased volume of submissions makes greater demands on referees and requires more time for consistent copy editing. As we become more sophisticated in our editorial processes—and confident about a reliable stream of material—it also will be possible to provide more reliable deadlines for the commercial layout, printing and mail houses. We are very fortunate to have such adaptable support in these evolutionary stages of a professional refereed journal. One project this year is intended to generate a ‘house style’ document for potential authors and thus avoid some individual word processing styles that must be reformatted for a consistent manuscript … something which would add considerably to publishing costs if not addressed voluntarily.

It is interesting to note that there seems to be a growing awareness in almost every field of human endeavour that there is a need to change existing patterns of behaviour. In some instances it is clear that recent concerns have focused on isolated issues rather than the broader patterns of operational sustainability. There is a growing appreciation of the need to address systems rather than discrete processes. This is being reflected in education, health, industry and politics although the pace of change varies considerably in different workplaces and cultures.

In this edition of EA there are two valuable articles which give thoughtful consideration to safety issues in road and rail transport. Other papers on related topics are already in the pipeline but not ready in time for this edition. The line-up of papers being offered / considered for 2008 promises to challenge our thinking as ergonomists and the opportunities for future intervention in an ever widening sphere of influence. The creation of a national Professional Development committee under the direction of Stroma Lawson at the HFESA 2007 AGM should act as a catalyst for growth.

Following the findings of the Productivity Commission of Inquiry into Standards Australia, there has been a flurry of activity in that organization. The main offices have been moved from the Sussex Street, Sydney building to several floors of the ASX building in Bridge Street where security is much stricter. There have been tremendous staff changes within the organization to both positions and structural hierarchies. Standards committees and their projects are being assessed and evaluated in terms of profitability; no new projects are expected to be approved until the current backlog has been finalized. There has been considerable delay in arranging committee meetings while the deck chairs have been shifted, but a bustle of activity recommenced towards the end of 2007. Significantly, the voluntary committee delegates are still expected to provide their intellectual property for the benefit of the community ... but effective financially for the directors and shareholders of SAI Global, the independent publishing company once wholly owned by Standards Australia. This issue remains a sleeping tiger. It is important to have regular updates for a Standards Section in this journal from HFESA delegates to the relevant committees.

Health management has become a controversial issue worldwide. A senior medical consultant recently stated that a Sydney hospital, which has been attracting media attention recently, has major systemic issues that go far beyond the individual misadventures gaining such attention. A decade ago the hospital catered for nearly1000 patients. Today the bed allocation is 500 and five floors of former wards are now filled by administrators. This is not an isolated example. Interestingly, the problems are mirrored in articles appearing in the UK media about similar health logjams. How many people remember the UK Yes, Minister TV episode when a new hospital was opened and was functioning superbly ... no patients yet admitted to test the operational as opposed to designed spaces and human factors interaction? It is all very well laughing. How should ergonomists influence the powers-that-be about necessary systems changes to remedy discrete workplace inadequacies?

A recent article in the UK Daily Telegraph quoted a management consultant, Gerry Robinson, who was commissioned to resolve problems in a particular NHS hospital and was delighted with improvements monitored twelve months later. There was still room for further improvement but the article gave a detailed summary of the human factors that were addressed and underpinned the changes. The ideas could be adopted across the spectrum but this was thought to be unlikely.

There were still some restrictive regulations ... at least one outstanding medical specialist had gone into private practice ... where he still treated NHS patients but the NHS now paid the private hospital’s fees for his services. Meanwhile the NHS was building a new drop-in centre duplicating the hospital’s facilities at a cost to the taxpayer of £12million.
This long article commented on the fact that when policies failed, the reasons were not examined ... merely new policies introduced. Gerry Robinson concluded that:

Solving the problems of the NHS is not about throwing money at it. It is about organizing it in a coherent, cohesive way. The staff are up for it. But I am not optimistic that the politicians will listen and take action.

Does that sound familiar?

Talking Point in this issue reprints an article from the Building Services Journal (UK) about some questionable paperwork in the construction industry. It presents a cogent argument for rethinking a range of current well-intended but ineffectual bureaucratic requirements. It is similar in many ways to a disturbing tendency that some industries question, or ignore where possible, the implementation of many well-intentioned but perceived to be ineffectual OHS directives. It was interesting to read an article in the December issue of Engineers Australia which discussed revisions to AS/NZS 4360 Risk Management Standard, and the 2007 Victorian OHS regulations. The article entitled Safety cases move towards due diligence states that it is no longer sufficient to assume a hazard-based approach but rather a determination of not intolerable risk. This assumes a common law principle of a balance between effort and results. After discussing each of the revisions it notes a move to focus on controls rather than risk assessment and concludes by stating that generating a safety case will depend on the hazards and available technology as well as the business and legal situation. It is clear that ergonomists should be in the front line of understanding and implementing the necessary attitudinal changes.

It is time to consider offering a paper for the next CybErg Conference to be held later this year. This triennial cyberspace ergonomics conference was started by Leon Straker at Curtin University in Western Australia in 1996. Andrew Thatcher at Witwatersrand University, South Africa then took over in 2002 and the baton has now passed to Alvin Yeo at University of Malaysia, Sarawak. Further details are available on Noticeboard in this edition. This conference, which is online for a month, allows plenty of time for considered and thoughtful discussion of the widest possible range of issues confronting ergonomists in this time of rapid change. Being able to access the papers at any time of the day from ones’ own computer during this month long conference offers considerable advantages over international travel and accommodation for land based conferences.

Australia is seen as a hub of professional activity in the region and so it is important that Australian ergonomists maintain a high profile via contributions in support of this effort by a former developing country in the southern hemisphere. In previous cyberspace discussions there has been considerable attention paid to ergonomics implications for an ageing workforce and wider community design considerations. While this is important, it would be heartening to have some attention paid to the non-frail and non-nursing home aged who comprise an increasingly significant sector ... and whose needs for good and safe design are no different from the rest of the community. Good ergonomics are good for all, not just specific ages ... whether young, middle or old. Details may need tweaking but the systems thinking should be constant.

Best wishes for active participation in local and global ergonomics development in 2008.

Shann Gibbs PhD
Editor

From the Internet

Don’t Mess With Grandma

An elderly Florida lady did her shopping and, upon returning to her car, found four males in the act of leaving with her vehicle. She dropped her shopping bags and drew her handgun, proceeding to scream at the top of her voice:

I have a gun, and I know how to use it!
Get out of the car...!

The four men didn’t wait for a second invitation. They got out and ran like mad. The lady, somewhat shaken, then proceeded to load her bags into the back of the car and got into the driver’s seat. She was so shaken that she could not get her key into the ignition. She tried and tried, and then it dawned on her why.

A few minutes later, she found her own car parked four or five spaces farther down. She loaded her bags into the car and drove to the police station. The sergeant to whom she told the story couldn’t stop laughing. He pointed to the other end of the counter, where four pale men were reporting a car jacking by a mad, elderly woman described as white, less than five feet tall, glasses, curly white hair, and carrying a large handgun.

If you’re going to have a Senior Moment, make it a memorable one!

Shann Gibbs
The first public railway line in Victoria using steam locomotives opened in Victoria on the Melbourne to Port Melbourne line on 12 September 1854, and lines to Williamstown, Geelong, St Kilda and Newport began in the next few years. Following the discovery of gold, lines from Melbourne to Ballarat Bendigo and Echuca were built between 1859 and 1864 and the Geelong-Ballarat line was completed in 1862. Lines radiating from Ballarat and Bendigo to the West and North-West were commenced in 1872, whilst 23 new lines were authorised by the Victorian Parliament in 1880 and a further 62 in 1884. Hence, by the end of the 19th century, Victoria had almost 16,000 kilometres of railway track on which were carried some 3 million tonnes of freight and on which were made almost 50 million passenger journeys.

By contrast, commercial development of the motor car started in 1901 with the first 400 three-horsepower Oldsmobile cars appearing in the United States in that year. The Ford Motor Company came into existence in June 1903 and sold its first car in July 1904, almost exactly 50 years after the first trains ran in Victoria. In those 50 years, the alternative methods of land transport were either on horseback for short distances or by horse-drawn carriage for longer journeys. At those points where the railway line crossed the rutted, pot-holed carriage tracks, the railway engineers saw no need for any form of active protection since horses were unlikely to challenge locomotives. Moreover, the engineers had absolutely no conception of the volume of road traffic that would later ensue (nor could they have). Hence Australia now has a tragic legacy of some 9,000 railway crossings.

About 3,000 crossings have “active” protection in that they have some form of device that is activated by train approach. This generally takes the form of twin alternating flashing lights, with or without supplementary audible warnings.

These systems were the basis of our protective systems until 1976 when the then Victorian Liberal Party Transport Minister Joe Rafferty became concerned about the growing number of car collisions at railway crossings in Victoria, and funded an investigation into the reasons and to propose solutions. That report (Wigglesworth, 1976) pointed out that, in Melbourne and the major urban areas, the stimulus from twin alternating flashing lights was not strong enough to overcome the other factors competing for driver attention.
attention (other road traffic approaching on intersecting roads: turning traffic, pedestrians—especially children and the infirm—animals, bicycles and so forth). The report recommended that boom barriers be installed at these crossings.

That report was received by the incoming Victorian Labor Party Transport Minister, Steve Crabbe whose constituency of Knox contained three level crossings with high crash rates. He came to office with a pledge to tackle the level crossing problem. He accepted the recommendations and implemented them. Between 1971 and 1989, 91 metropolitan and major urban road-rail crossings were upgraded from "flashing light" status to "boom barrier" status. At these crossings, the number of deaths from motor vehicle/train collisions was reduced from 61 before boom barrier installation to 2 thereafter, whilst the mortality rate (deaths per 100 crossing-years) was similarly reduced from 5.71 to 0.33. (Wigglesworth and Uber, 1991). The strategy of installing boom barriers at metropolitan and major urban road-rail crossings previously protected by flashing lights alone is highly effective. This is a particularly significant finding since mortality rates at these crossings had previously been shown to be unusually high.

The remaining 6,000 crossings have no such device. They are passive and give the road vehicle driver no warning of an approaching train. This is the legacy that we have inherited from our forebears.

**HUMAN FACTORS CONSIDERATIONS**

One of the basic tenets of ergonomics can be expressed in three words. Humans are fallible. Put more precisely, humans have a limited range of capabilities, and outside that range, their ability to perform will suffer. In order to prevent injury, the task of the ergonomist is to identify those points at which the demands of the system outstrip the capability of the human.

The classical representation of the man-machine system is given in Figure 1 below. Starting at the 9 o'clock position, the system presents information to the operator. On receiving that information, the operator decides (at the 12 o'clock position) what action to take and acts (at the 3 o'clock position) to change the mode of operation of the system. After that change the cycle repeats.

Figure 1: the man-machine system

Applied to the level crossing scenario, the fundamental limitation of the present Australian system is immediately apparent. In one of the classical papers that still underpin our present road safety strategies, Cumming (1964) defined information as “the resolution of uncertainty”. Passive crossings do not resolve uncertainty about the presence or absence of a train. They warn the driver of the presence of a railway crossing. This is not the information required by the road vehicle driver, who needs to be told if a train is approaching.

Instead, the present warning requires the driver to disobey one of the tenets of safe driving by taking his/her eyes off the road in order to search in both directions for train approach at a reduced speed that would enable him/her to stop if a train be sighted. This basic ergonomics failure to provide adequate warning of train approach has been criticised by the State Coroners in both Victoria and Western Australia.

It is sometimes suggested that road vehicle drivers should respond to the “Level crossing ahead” warning sign, but that suggestion ignores another aspect of human fallibility – that of expectancy. Simply stated, if motorists regularly traverse a particular crossing but never see a train, they build up a negative expectancy of train arrival. This expectancy is reinforced every time they traverse that crossing without seeing a train.

Given that most of these 6,000 crossings have few train movements (and sometimes only on a seasonal basis), the need to provide a warning of train arrival at these crossings is quite crucial. That there are so
few crashes at these crossings is, in the opinion of this author, simply a function of exposure. The fewer the train movements, the lower the exposure and hence, the lower the risk of collision. With increasing volumes of both rail and road movements, it now behoves our society to discard the protection provided by the mathematical laws of probability, and to substitute evidence-based control measures identified by appropriate research.

SAFETY CONSIDERATIONS

Historically, the emphasis on injury prevention has been entrenched in tort law with its remorseless emphasis on faulty human behaviour. When one or more persons was being careless or negligent, the case was complete since allocation of culpability was deemed to be synonymous with identification of cause. Hence the desirable technique of identifying those points in the causal chain where countermeasures could be introduced was neglected in favour of the hunt for a scapegoat who could then be required to accept the financial and legal consequences of the event.

Protagonists of tort law were quick to point out that the objective was not to punish the offender, but rather to deter others from offending similarly. The success of the tort law system is questionable since there were 5267 accidental deaths in Australia in 2005. This represents 5267 failures of that system to achieve its objective.

Happily an alternative scenario is now available. Following the authoritative advocacy of the epidemiological approach to injury prevention (Haddon 1966) our understanding has been brought into a more rational framework. Haddon pointed out that injuries occur when energy is transferred in such ways and amounts and at such rapid rates that persons are damaged. He went on to list (Haddon, 1973) ten strategies for reducing the human and economic consequences. The first two are:

The first strategy is to prevent the marshalling of the form of energy in the first place. The second strategy is to reduce the amount of energy marshalled.

Applied to the level crossing scenario, the first strategy is clear. Quite the most effective safety measure to improve safety at a particular level crossing is to close it, thus removing all chances of collision. Only a minority of crossings can be closed, but the first recommendation of the 2002 International Conference at Monash was sent to every State/Territory Government. It suggested the development of a Level Crossing Closure program, modelled on the US Department of Transport Federal Railroad guidelines of not more than one crossing per mile in rural areas and four per mile in urban areas. Progress seems not to have been reported.

The second strategy, though desirable, is negated by current trends. Fifty years ago, a train might haul 200 tonnes at (say) 40 km/h. Now, trains hauling 4000 tonnes might travel at 110 km/h. – with a potential energy (1/2 mv^2) that is more than two orders of magnitude above the previous figure, a level that far far exceeds the original design expectations.

It is therefore relevant to consider the consequences of this increase by comparing the types of road vehicles involved in fatal accidents at road-rail crossings in Victoria between 1973 and 1977 (Wigglesworth, 1979) on the one hand, with those of the most recent fatalities in Victoria between 1999-2006. (Department of Infrastructure, 2007)

Table 1: % involvement of trucks in fatal accidents at road-rail crossings in Victoria 1973/77 to 1999/06

<table>
<thead>
<tr>
<th>Study Period</th>
<th>Total no of vehicles</th>
<th>Total no of trucks</th>
<th>Percentage involvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1973-1977</td>
<td>85</td>
<td>3</td>
<td>3.5</td>
</tr>
<tr>
<td>1999-2006</td>
<td>21</td>
<td>6</td>
<td>28.5</td>
</tr>
</tbody>
</table>

Two features of Table 1 stand out. First the overall number of fatal accidents has been drastically reduced during this quarter-century. This pays tribute to the success of the railway engineers. The second is the extent of the involvement of trucks in these fatal accidents. Thus has grown from 3.5% to 28.5% in that period.

What makes the position even more ominous are the data of table 2 which show that, whilst the number of motor cars increased by 10.8% between 2002 and 2006, the truck fleet increased by the larger figure of 12.3% (Australian Bureau of Statistics, 2007). In both table 1 and table 2, the numbers are small but the trend is unmistakably clear.

Table 2: Growth in vehicle types: Australia 2002 and 2006

<table>
<thead>
<tr>
<th>Year</th>
<th>No cars ('000)</th>
<th>No Trucks ('000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>10 101.4</td>
<td>405.4</td>
</tr>
<tr>
<td>2006</td>
<td>11 188.9</td>
<td>455.2</td>
</tr>
</tbody>
</table>

% Increase 10.8 12.3

Note (1) Rigid trucks and articulated trucks
Users can find the desk height that works best for them
- Added flexibility for different occupational tasks
- Sit or stand while working
- Improves employee retention, health, morale and satisfaction
- Dynamic, productive and healthier way to work
- Quick, effortless and easy adjustment regardless of the weight on the work surface
- Reduced absenteeism and employee turnover
- Increased productivity (employees can take “micro-breaks” without leaving their workstations)
- Reduced costs: Ergonomic programs can reduce workers compensation claims

Alternating between sitting and standing positions is the most effective way to maintain productive workflow
SUMMARY OF THESE CONSIDERATIONS

These basic considerations show that our current methods of protection at railway level crossings are flawed both in terms of human factors analysis and in terms of injury prevention analysis.

In terms of human factors, the system depends quite fundamentally on fallible human behaviour and, in the case of the 6,000 passive crossings in Australia it presents incomplete information since it does not tell the road vehicle driver whether or not a train is approaching.

In terms of injury prevention analysis where the fundamental requirement is to reduce the amount of energy available, the system cannot comply, and indeed the imperative is towards just the opposite. All future developments are likely to involve faster and heavier trains and faster and heavier road vehicles, with vastly increased amounts of energy involved in any crash.

The prognosis seems grim. The absence of needed information and the presence of faster, heavier and longer trucks will combine to place a strain on our present protective system that it was not designed to withstand.

Accordingly, there is a need to examine new technologies that will help to upgrade our protective systems in order to keep pace with present and future developments in surface transport.

WHAT ARE THE OPTIONS FOR IMPROVED PROTECTION?

Three strategies are considered under the headings of:

(a) educational "awareness" programs;
(b) installation of STOP signs at all crossings; and
(c) application of new technology.

The first two strategies are not recommended.

Educational programs

The second half of the last century saw a consensus (Haddon, 1966, 1973, 1974; Baker, 1972; Barry, 1975; Klein and Waller, 1970; Wigglesworth, 1976, 1978) that passive countermeasures (those that are independent of human behaviour) are more likely to be successful than those that are active (i.e. those that require some human involvement for their success).

This principle has many parallels in the management of other public health problems. Thus fluoridation of water has been shown to be more effective in the reduction of dental caries than reliance on the brushing of teeth by children; automatic sprinklers constitute a more effective fire protection system than reliance on hand held fire extinguishers; and the provision of a clean water supply has been more successful than the request to boil water in the prevention of most infectious and parasitic diseases.

By contrast, attempts to control accidental injury by ‘creating awareness’ or by similar educational or propaganda measures have been shown to be almost completely ineffective (Robertson, et al., 1974; Anderson, 1978). Two examples follow.

The first was the President Eisenhower Safety Driving Campaign of 1955. An enormously expensive multi-media nation-wide appeal was spread over a two-month period to promote the idea that every American should avoid an accident on one specific day. The campaign was totally ineffective. There was one more road death on the specified date than on the same day in the previous year, whilst the days before and after showed no change.

However, over the two-month period of the campaign, there was a change. Road accident deaths showed a 10% increase in many areas of America over the number of deaths in the same months of the previous year.

The reasons are not known, but a comment by the British Medical Research Council may well be appropriate. “Fear of having an accident is just the frame of mind to induce it”.

Twenty-three years later, the Victorian Parliament repeated the exercise. With substantial government, police and media support, members of Parliament urged all Victorians to attempt to achieve a “death-free weekend” during the weekend of Saturday April 15th 1978. The results are shown in Table 3 below.

Table 3: Road deaths Victoria: Weekend including April 15th, 1976–78

<table>
<thead>
<tr>
<th>Day</th>
<th>1976</th>
<th>1977</th>
<th>1978</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friday</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Saturday</td>
<td>2</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Sunday</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL</td>
<td>6</td>
<td>5</td>
<td>9</td>
</tr>
</tbody>
</table>
In similar fashion to the Eisenhower campaign, Table 3 shows that the number of deaths actually increased instead of reduced on the selected weekend. The numbers are of course far too small to permit any statistical conclusions, but one inescapable fact remains. The campaign did not work.

**Installation of STOP signs**

The use of STOP signs as a traffic control device at railroad crossings has been the subject of extensive debate for at least seventy-eight years and can legitimately be deemed controversial. A recent report by the United States National Transportation Safety Board (NTSB) “Safety at passive grade crossings” (1998) cites a 1929 report by the National Association of Railroad and Utilities Commissioners which suggests that, in general, “the enforcement of this (Stop) requirement is not practicable”.

More recently, but as long ago as 1966, the STOP sign strategy was criticised by Bezkorovainy and Holsinger, and their work has been followed by a series of other critiques (see, for example, Sanders et al, 1978; Heathington, 1993; Burnham, 1995; Russell and Burnham, 1999; with one of the most comprehensive overviews being also the most recent (Lerner et al, 2001). Three of the concerns most frequently raised are reiterated here.

First, there are high rates of non-compliance with the STOP sign. For example, two studies some thirty years apart (Bezkorovainy and Holsinger, 1966 and Burnham, 1995) both reported that more than 80% of drivers observed at STOP signed crossings violated the legal requirement to stop, thus clearly demonstrating the ineffectiveness of this countermeasure. In both studies, the authors were concerned that this flouting of the STOP sign at railway crossings could induce similar patterns of behaviour at STOP signs in the general road system - with tragic consequences.

Secondly Heathington (1993) suggested that the use of STOP signs unambiguously placed legal liability on road vehicle drivers even at crossings where the geometric and other characteristics make it intrinsically high-risk. In other words, the emphasis was on liability issues and not on prevention and he commented that “This approach seems to be addressing the wrong issues”.

Thirdly, the use of STOP signs increases the danger to large road vehicles since it takes longer to clear a crossing from rest than if the road vehicle merely slows but does not stop. If the total time to clear a crossing from rest exceeds the time for a train to approach from the available sight distance, then the addition of a STOP sign increases rather than reduces the risk of collision.

It is relevant at this point to examine the papers presented at the Seventh International Symposium on Railroad-Highway Grade Crossing Research and Safety. This was held at Monash University in February 2002 and was sub-titled “Getting active at passive crossings”. The co-conveners decided that, since in both America and Australia, the majority of crossings were passive, that theme should be the focus of this conference. This resulted in twenty-one papers on methods of reducing injuries at passive crossings. None of the 21 papers presented to this scientific meeting suggested the use of STOP signs as an appropriate strategy.

Nor was there any paper at the Eighth Symposium held in Sheffield, England in April 2004 that advocated the use of STOP signs as an appropriate strategy.

The indiscriminate use of STOP signs seems therefore to be not widely supported. Indeed the RTA Traffic Manual states “Care should be exercised in the use of stop signs at level crossings. Indiscriminate use will lead to a lack of credibility of stop signs at level crossings.”

The whole philosophy of the use of STOP signs was examined in a recent study by Raub (2006). Table 4 is based on his data.

**Table 4: Relative annual crash rates for four types of crossing protection [from Raub 2006]**

<table>
<thead>
<tr>
<th>Type</th>
<th>Number of Crossings</th>
<th>Number of crashes</th>
<th>Number of fatal crashes</th>
<th>Crash rates per 1000 crossings</th>
<th>Fatal crashes per 1000 crossings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crossbucks</td>
<td>31960</td>
<td>3197</td>
<td>289</td>
<td>10.0</td>
<td>0.9</td>
</tr>
<tr>
<td>STOP signs</td>
<td>4523</td>
<td>1146</td>
<td>116</td>
<td>25.3</td>
<td>2.6</td>
</tr>
<tr>
<td>Flashing lights</td>
<td>11983</td>
<td>2445</td>
<td>234</td>
<td>20.4</td>
<td>2.0</td>
</tr>
<tr>
<td>Gates (Note 1)</td>
<td>7327</td>
<td>2068</td>
<td>298</td>
<td>28.2</td>
<td>4.1</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>55792</strong></td>
<td><strong>8856</strong></td>
<td><strong>937</strong></td>
<td><strong>15.9</strong></td>
<td><strong>1.7</strong></td>
</tr>
</tbody>
</table>
Table 4 shows that, in three of the four types of crossing protection:
(a) crossbucks alone;
(b) STOP signs; and
(c) flashing lights;
the category with the highest rate of collisions between motor vehicles and trains is (b) STOP signed crossings. Moreover, the highest rate of fatal collisions also occurs at STOP signed crossings.

Commenting on the fact that gates (ie boom barriers) seem to have unexpectedly large rates, Raub emphasises that the rates of Table 4 do not take into account the number of motor vehicle and train movements at these crossings. When these exposure factors are taken into account (million motor vehicles and thousands of train movements), the annual crash rates change, as shown in Table 5 below.

Table 5: Relative annual crash rates for four types of crossing protection, adjusted for exposure (million motor vehicle movements and thousand train movements): [from Raub 2006].

<table>
<thead>
<tr>
<th>Type of Crossing Protection</th>
<th>Relative Crash Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crossbucks</td>
<td>129</td>
</tr>
<tr>
<td>STOP signs</td>
<td>1216</td>
</tr>
<tr>
<td>Flashing lights</td>
<td>66</td>
</tr>
<tr>
<td>Gates</td>
<td>39</td>
</tr>
</tbody>
</table>

Raub comments that, after allowing for exposure, gated crossings had the lowest rate of 39.26. Flashing lights had a rate of 66, ie some 1.5 times higher. The rate of 129 where only crossbucks were in place was more than three times the rate for gated crossings. STOP signs had a rate of 1216, approximately 31 times where gates were in place.

He also compares the rates at those 1,939 crossings which were changed from crossbucks to STOP signs during the period. The crash rate when STOP signs were in place was 2.64 per 100 crossings, as compared with the lower rate of 2.1 with crossbucks alone.

Raub emphasises that, as there were only 175 crashes at these crossings, these results may not be statistically significant. What he fails to say is that, if the STOP sign strategy were successful in reducing the number of crashes at these crossings, there should be a statistically significant change. Moreover this should result in a lower number of crashes with the use of STOP signs rather than the increase that his data show.

**INTRODUCTION OF NEW TECHNOLOGY**

From this analysis, two conclusions may be drawn. First, when the railway lines were first laid down in Australia, the alternative form of land transport was the horse. As horses would not challenge trains, there was no need for any form of active device to announce train arrival. When, fifty years later, the motor car burst on to the scene and ultimately revolutionised land transport, the railway engineers responded by developing protective systems that were appropriate for the motor car. Figure 2 is but one piece of evidence that demonstrates their success.
Whilst some part of that success can legitimately be attributed to the Victorian boom barrier program, it is relevant to stress that this achievement compares more favourably with the reduction in the overall road toll that has been achieved in Australia. For example, in the decade between 1970 and 1979 an average of 3,766 persons died on the roads each year: Twenty years later, between 1990 and 1999, the road trauma toll had been reduced to an average of 2,020, a reduction of 46%.

By contrast, the number of persons killed in collisions between motor vehicles and trains at railway level crossings in Australia has been reduced from an average of 54 in 1970-1979 to 17 in 1990-1999. This is the much higher reduction of 68%.

Since then, however, there has been virtual technical stagnation, with no enhancements to cope with the increasing numbers of rigid trucks, semi-trailers and B-Doubles that now carpet our roads. That trend will continue with the expected introduction of the new and even longer B-Triples.

Secondly, the underlying prevention philosophy, seemingly based on emotive pleas to “increase awareness”—long since abandoned in other areas of road safety, and never considered for one moment in the occupational health and safety field—seems still to hold sway.

In simple terms, the existing technology to provide protection at road-rail crossings in Australia and the existing protective philosophy in use in the first decade of the twenty-first century both need to be updated.

OPTIONS FOR THE FUTURE

An earlier report (Wigglesworth, 1976) contained 56 recommendations, some of which are still relevant thirty years later. Since then a large number of recommendations and suggestions have appeared both in the scientific literature and in the media. Some of these are listed below under the three headings of (a) methods of improving communication with the road vehicle driver; (b) strategies that may slow the road vehicle on approach to the crossing, and (c) methods of preventing injury.

As a preliminary to that listing, the first Haddon strategy should be addressed. Does Australia really need 9,000 railway crossings? The US criterion for closure includes locations where there are more than four crossings per mile in urban areas and one per mile in rural areas. An examination of Australia’s 9,000 crossings to ascertain how many crossings meet that criterion, and how many could be closed with no loss of amenity to the local community, would be a useful starting point.

There is now a further concern, arising from the Victorian response to the Kerang tragedy. One item of that response suggests that “trying to beat the train” will now become an offence. However, if the total time to clear a crossing from rest exceeds the time for a train to approach from the available sight distance, then a crash is inevitable. For example, a B-Double, starting from rest, requires 18.6 seconds to clear the crossing (AS 1742.7 – 2007. From this starting point, the driver needs a sight distance of 646 metres if the permitted train speed is 125 km/h—rising to 775 and 827 metres respectively—for maximum train speeds of 150 km/h and 160 km/h. An early, urgent administrative task is to determine how many crossings in Victoria do not meet this criterion.

It would also be helpful to assess some new countermeasures. Some suggestions are offered in Tables 6, 7 and 8 below. The list is not claimed to be comprehensive, but it may help to prompt new, innovative thinking.

Table 6: Suggested methods of alerting the road vehicle driver.

Examine ways of using the train’s kinetic energy to power the warning system
Further develop the Victorian Low-Cost warning system
Examine the safety of transponders
Examine the use of high-intensity acoustic beams
Provide advance warning lights in advance of each crossing
Fit two aircraft type beacons to locomotives
Erect strobe light gantries at passive crossings
Replace flashing lights with conventional red, amber green traffic signals
Install vandal-proof reflectors to redirect the train locomotive headlight along the road
Paint locomotives in fluorescent colours
Table 7: Suggested strategies to slow the road vehicle.

- Install speed humps
- Reconfigure the approach road by building roundabouts or by providing a sealed, divided highway for (say) 200 metres before each passive crossing
- Install active rumble strips that will rumble only when a train is coming.
- Investigate the potential of deceleration stripes and/or narrowed edge lining
- Install decreasing speed limits on approach to crossings (suggestions range from a terminal 40 km/h to 20 km/h)
- Require all road vehicles to stop at all crossings (not recommended)

Table 8: Other suggested methods of preventing injury

As a major principle, find methods of using solar power or train generated kinetic energy to power injury prevention strategies such as:

- Deployment of aircraft-carrier type arrester wires
- Closing of cantilever gates
- Deployment of airbags (or other energy attenuating devices) on locomotives.
- Actuation of satellite surveillance and, where necessary, intervention.
- Investigate the Leibowitz phenomenon

One of these topics - the Leibowitz phenomenon— is selected for special mention. In brief, Leibowitz suggested that, the larger the object, the slower it seems to be moving. If accurate, this has enormous repercussions for safety at railway level crossings. It is frequently alleged that (the road vehicle driver) “tried to beat the train”. If Leibowitz is correct, then the normal human ability to judge speeds, based on the driver’s experience of other road vehicles, is flawed for judging the speed of trains at level crossings. Unfortunately, although the Leibowitz paper was published in 1985, and there is—to the best of this author’s knowledge and belief—no Australian research on this topic. The reason is simple. There are no funds to support research in this area.

Answers are needed to three questions:

a) was Leibowitz correct?

b) if so, what human information processing mechanisms are involved? and

c) what countermeasures emerge?

Without answers to those questions, the recent package of measures announced in Victoria will result in a situation where persons adjudged to have attempted to ‘beat the train’ will be charged with an offence (if they survive). Quite apart from the unscientific context of this new regulation, it will not apply universally. Those who are killed in the subsequent crash will presumably not be charged posthumously, whilst those who successfully traverse the crossing before train arrival will be almost impossible to trace. This leaves those who are severely injured who will find, on their recovery, that they will be charged for an offence relating to their (unsuccessful) attempt to ‘beat the train’.

There has to be a better solution.

CONCLUSION

Traditionally level crossing safety has been a matter for the States and not the Federal Government. No change is proposed here. Similarly health has traditionally been a matter for the States and not the Federal Government. But research into Australia’s health has been carried out by the NATIONAL Health and Medical Research Council, with hugely successful results.

What is needed now is a parallel structure with research being funded at Federal level with a tiny grant of (say) $10 million over 5 years to examine ways and means of updating our present protective strategies. With this miniscule help, Australian scientists will be able to develop and test new and more effective methods of preventing further tragedies at railway level crossings.

Without that input, the toll will continue.
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ABSTRACT

The purpose of the present paper is to summarise human factors (HF) issues relevant to Australian rail and to consequently outline proposed areas of research for an HF ARC Linkage group project investigating rail safety and reliability. External partners RailCorp, the NSW Independent Safety Transport and Reliability Regulator (ITSRR) and the Victorian Department of Infrastructure (DOI) identified the main HF issues to be driver safety systems, train protection systems, Signals Passed at Danger (SPAD), and passenger movement. A review of Australian incident/accident reports and SPAD data also revealed that SPADs remain a significant problem in NSW and Victoria. A literature review of rail HF research confirmed a need for work investigating the effectiveness of the driver safety systems currently in place in Australia, a need for work investigating the impact of system change (e.g. Automatic Train Protection; ATP) on driver performance, and also identified a need for research examining the contributing factors associated with SPADs/incidents/accidents in Australia. The project priorities, based on partner input and previous research, are safety systems, system change, human error, and as a minor component, passenger movement.

1. INTRODUCTION

Any system designer requires information about the user population that establishes their physical, cognitive and perceptual capabilities and limitations under conditions that reflect the operational environment. This involves examination of the physical characteristics of the population, the effects of monotonous or repetitive task demands, high vigilance requirements, fatigue and other environmental or organisational factors on performance. At present the rail industry may not have sufficient, applicable data on human capabilities and limitations. Human factors considerations, while paramount for the successful functioning of technology, are often not incorporated in the design or evaluation process of new technology when it is introduced. Failures may lead to operational difficulties, safety deficiencies and injury. Operators may adapt to the technology, but this may increase the potential for occupational injury and decrease reliability. Human factors criteria need to be defined in the specification of work systems and in the development of new technology.

Unfortunately in Australia, the starting point for human factors (HF) research and development in rail is at a low level with very little HF research on the Australian railway system reported in widely available sources to date (Austin & Drummond, 1986; Edkins & Pollock, 1996, 1997; Glendon & Evans, 2005; Halcrow Pacific, 2006; McIntosh & Edkins, 2005). Therefore, in 2006 an ARC Linkage grant was awarded to UNSW in an attempt to change this. The overall aim of the project is to develop HF methods and data to benefit Australian railway safety and reliability. Our UNSW ARC Linkage project team will collaborate with external partners RailCorp, the NSW Independent Safety Transport and Reliability Regulator (ITSRR) and the Victorian Department of Infrastructure (DOI) to achieve this aim.

Objectives were initially put forward in 2005 as part of the original ARC Linkage project but have since been re-assessed and modified. As part of the initial planning stages of the project, meetings with Linkage partners were held from November 2006 to January 2007 to ascertain the key HF issues that partners viewed as still important for the project. All partners identified driver safety systems (with respect to driver fatigue) as an area of research requiring further investigation. This includes everything from simple systems like the deadman system and vigilance devices to more advanced alarm and alerting systems as part of rail traffic management and train control. Other issues identified included train protection systems, Signals Passed at Danger (SPAD), HF guidance material, and passenger movement/door closure. Following on from this, revised project objectives were defined. These included:

A. identify critical domains of driver performance and thresholds that represent the transition from safe task performance to unsafe performance, with a particular focus on task monotony and workload;
B. determine the impact of changes in level of automation on driver performance;

C. identify the contributing factors associated with rail accidents/incidents and SPADs in Australia and construct a rail error taxonomy for future error identification and prevention;

D. study passenger movement on and off trains to determine a model for automation of door closure protocols, improve train movement rates and prevent passenger injury; and

E. develop guidance material for the rail industry and regulators to translate the research findings into practice.

The purpose of the present document is to summarise the HF issues relevant to Australian rail and to consequently outline proposed directions of research for the current project.

2. LITERATURE REVIEW

The majority of human factors rail research has been conducted outside of Australia, particularly carried out and/or reported in the UK. The research team had, as a starting point, previous reviews carried out by a member of the team (Wilson, Farrington-Darby, Bye, & Hockey, 2007; Wilson & Norris, 2005) but a subsequent literature search identified over 75 articles not included in these earlier HF rail reviews. The following sections provide a brief summary of rail HF research relating to the four main areas that emerged as problems for rail safety.

2.1 Objective A: Task monotony, workload and driver vigilance

Inattentiveness has been identified as a precursor to a large proportion of rail incidents and accidents (Edkins & Pollock, 1997). Many attempts have been made to develop a reliable and user-friendly device for measuring and monitoring driver vigilance, some of which include eye movement/blink related devices, EEG, ECG, respiratory activity measurements, body, head or skin movement measurements, and electrodermal activity (EDA) measurements. The validity, reliability, and scientific feasibility of a number of these methods was investigated using a literature-based assessment (Whitlock, Pethick, & Mills, 2005). The best device capable of detecting a reduction in vigilance was determined to be the EDVTCS, a wrist sensor that measures EDA (Whitlock et al., 2005). Unfortunately, no subsequent experimental work has substantiated the claim that the EDVTCS is an effective device for monitoring driver vigilance and as a result the validity of such a system is questionable.

Until recently, the common device used in Australia for detecting reductions in driver vigilance was the deadman system. Although this system was previously the only device used on NSW and Victorian trains to reduce risk of collision following driver incapacitation (and is now used in conjunction with a task-linked vigilance system), very little research has been conducted to assess its efficacy in monitoring driver vigilance. In a recent report investigating the Waterfall accident it was determined that the deadman system failed to initiate braking following driver incapacitation in over 40% of the driver population (McIntosh & Edkins, 2005). A range of methods were identified to circumvent the system, including things like wedging objects between the pedal and console to keep the foot pedal depressed. A subsequent survey of Victorian train drivers confirmed these findings and revealed that 50% of drivers could hold the pedal in an activated position without applying any effort (McIntosh & Edkins, 2005). Most drivers also reported that the deadman rarely deactivated if they were drowsy or inattentive (McIntosh & Edkins, 2005). These results suggest that the deadman system’s protective function can be easily circumvented, either deliberately or unintentionally, making it an ineffective method of monitoring driver vigilance and/or bringing a train to a safe situation in case of driver incapacity.

In an experimental study that systematically tested the deadman system’s effectiveness as a measure of driver vigilance, the relationship between activation of the deadman pedal (as used in the French Railways) and vigilance (as measured by EEG and electro-occulogram) was investigated (Coblentz, Cabon, & Ignazi, 1989). It was found that during periods of low vigilance (increased theta and alpha ratios and decreased eye blinks) the drivers applied less pressure on the pedal, showed increased reaction times, and failed to respond to a greater number of signals (Coblentz et al., 1989).

A recent review issued by ITSRR evaluated the driver safety systems used in NSW and compared them to those currently used on a number of rail systems around the world (Halcrow Pacific, 2006). It was found that the combined use of a deadman system and vigilance device in NSW compares favourably with overseas railways. The main limitation of the system was identified to be the absence of more advanced levels of train protection (e.g. Automatic train protection; ATP), although more evidence for this may be needed (Halcrow Pacific, 2006).

Although some work on the deadman pedal has been carried out, no HF evaluation of the task-linked vigilance system used in Australia has been reported. More importantly, there is little fundamental work examining the relationship between task monotony, workload and driver vigilance. In fact, agreed upon
definitions of these constructs do not exist. In order to develop effective devices for monitoring driver vigilance, one must first clearly define monotony and workload and understand the link between these task demands and vigilance. This understanding will lead to the identification of critical domains of driver performance and thresholds that represent the transition from safe task performance to unsafe performance. Appropriate vigilance devices can then be developed or assessed based on the thresholds identified.

2.2 Objective B: Automation

Although it seems logical to assume that making train drivers’ tasks more automatic will lead to fewer errors, this may not be the case. Automated tasks cannot simply be forgotten, and they may become additional monitoring tasks, which may actually facilitate or hinder the performance of other tasks (Parasuraman, Mouloua, & Molloy, 1996).

The Automatic Train Protection (ATP) system used in the UK calculates the safe speed for a train based on the train’s distance from red signals, the braking characteristics of the train, gradient of the line etc. The system constantly monitors the train’s speed and if it exceeds the maximum safe speed by a specified amount, the brakes are applied (McCorquodale, 2002). ATP is thought to potentially prevent the vast majority of SPADs because it monitors the train’s speed on approach to a signal and it can’t be overridden by the driver (McCorquodale, 2002).

Although much research has been conducted, both pre and post ATP implementation, to determine driver attitudes towards ATP and the ease with which the system is used (Berman, 2004; Crick, 2004; e.g. Halliday, 1992a; Halliday, 1992b, 1994, 1996; Lucas, 1990), no work has been conducted in the UK examining its impact on driver tasks. Before ATP (or any system of train control) is implemented in Australia the effect of various levels of automation on driver performance (i.e. workload, situation awareness, stress, system knowledge etc) needs to be identified.

2.3 Objective C: Human error

Human error is thought to contribute to 80% of organisational accidents and incidents. As a result many tools have been developed in order to identify, quantify and reduce human error (e.g. Atkins, 2003; Kirwan, 1994; Rasmussen, 1982). Key areas found to contribute to driver error include system failures, task conditions, training, driver experience, environmental aspects, and the psychological condition of the driver (motivation, attitude etc) (Kecklund et al., 2000; Porter, 1992; Wright, Ross, & Davies, 2000).

Although much work has been carried out in error detection and reduction in other domains such as aviation and the chemical industry (e.g. Kirwan, 1997; Reason, 1999; Shorrock & Kirwan, 1999; Wiegmann & Shappell, 2003) and some international work has been carried out in the railway industry (e.g. Reinach & Viale, 2006), no studies have been reported that examine the error types and forms associated with accidents and incidents in the Australian railway system.

SPADs have been identified as the most significant events on the railway with potential for serious loss and injury (Wilson et al., 2001). SPADs are directly counted and continuously recorded by operators and regulators. Therefore, they may represent important indicators of potential problems with system safety. The majority of SPADs are not related to equipment shortcomings but to human error (Gilchrist, Bowen, & Moynihan, 1990). Much research has been conducted in an attempt to identify the risk factors associated with SPADs, most drawing conclusions from literature reviews, incident databases, interviews, surveys and the construction of task analyses (see Adcock & Sparkes, 1993; Downes & Robinson, 1999; Dray, Sutton, & Menter, 1999; Elliott, Garner, & Grimes, 2005; Flier & Schoonman, 1988; W. Gibson, 1999; W. H. Gibson, Shelton, & Mills, 2005; Li, 2004; Li & Lock, 2004; C. Lowe, Li, & Lock, 2004; May & Horberry, 1994; Wharf, 1993). Environmental (e.g. rail adhesion), temporal (e.g. time in shift) and driver factors (e.g. driver experience) have consistently been found to influence SPAD occurrence. An HF SPAD hazards checklist has also been constructed for the purpose of determining SPAD risk at a particular signal location (E. Lowe & Turner, 2005; Turner, 2002; Turner, Harrison, & Lowe, 2003).

Although a great deal of international research has investigated contributing factors associated with SPADs, no Australian work in this area has been reported. The following section provides a brief summary of recent Australian work for the purpose of determining whether SPADs remain a significant problem in NSW and Victoria.
2.3.1 Summary of railway statistics

Figure 1 shows the total number of SPADs recorded over a one year period in NSW. The average number of SPADs per month was 37, with a total number of 442 SPADs recorded over the entire year.

Figure 1. Number of SPADs for all NSW operators (passenger trains, freight trains, etc) as recorded by ITSRR from July 2005 – June 2006


This ITSRR information contains all SPADs from all types of train combined. Figure 2 shows the number of recorded incidents in NSW involving passenger trains only, as provided by RailCorp, over a nine month period overlapping with the ITSRR data. The total number of passenger train SPADs recorded over this time was 156. Comparison of Figure 1 and 2 shows that approximately half the SPADs recorded by ITSRR involved passenger trains (17 SPADs/month).

Figure 2. Number of SPADs for NSW passenger trains as recorded by RailCorp from Jan 2006 – Sept 2006

[Modified from http://www.railcorp.info/__data/assets/pdf_file/3906/ON-S1_webdata_16NOV06_-_verified.pdf]
The Australian Transport Safety Bureau (ATSB) and the Office of Transport Safety Investigations (OTSI) investigate safety occurrences affecting all rail operators in Australia and in NSW respectively. Of the 53 incident reports available on-line, 38 (72%) involved freight trains. Our review of all investigation reports involving passenger trains in NSW and VIC (1999-2006) revealed that SPADs were a contributing factor in 56% of the incidents investigated. It seems therefore that SPADs are a significant problem for passenger train incidents and accidents in Australia which need further action.

The bulk of research investigating the contributing factors associated with SPADs has been carried out in the UK. Although there has been a large reduction in the number of SPADs in the UK since the 1990’s, as shown in Figure 3, in 2004 there were still 360 SPAD related incidents. This reduction in SPADs over time may be attributed to a combination of factors including the introduction of driver protective devices (e.g. Train Protection Warning System (TPWS), ATP, and Driver Reminder Appliances (DRA)) and a greater understanding of (and consequently reduction in) the factors associated with both serious and minor SPAD cases.

Figure 3. UK SPAD data from 1990 - 2004
[Accessed from NWCLUSTER_SOSS_SERVER\SS\SS-ADMIN\Biomech\RMRC\ARC LP HF in Rail Safe-Reliability\Fatality & Injury Data\SPADs.xls]

2.4 Objective D: Passenger movement

No research was found investigating trends in passenger movement and how these affect train reliability or passenger safety.

The Rail Safety Standards Boards (RSSB) monthly SPAD report described a moving average trend in SPADs of 333/year for February 2006. The trend for SPAD incidents has remained fairly constant since November 2005.

These UK figures indicate that error detection and mitigation is possible following a thorough investigation of the contributing factors associated with SPADs. Although it is possible that organisational, environmental or system changes may have influenced the UK figures, these data suggest that understanding the underlying causes of SPADs in Australia may lead to the identification of effective methods or techniques for reducing SPADs.
3. What we need to know about rail safety and reliability

In addition to partners identifying the main HF issue to be driver safety systems, a review of Australian SPAD data and incident/accident reports revealed that SPADs remain a significant problem in the Australian railway system. A literature review of rail HF research highlighted the need for HF work investigating the driver safety systems currently in place in Australia and a need for work investigating the impact of system change (e.g. ATP) on driver performance. The following sections outline priorities for this project based on partner input and knowledge gaps identified in the literature. Although a driver-centred approach will be adopted here, the driver’s role will not be examined in isolation. That is, the associated effects on signaller, controller etc will also be examined within a systems approach.

3.1 Safety systems and driver performance

All partners originally identified driver safety systems as a major HF issue. There appears to be no work published evaluating the effectiveness of the vigilance system adopted in Australia and very little work on the Deadman system, except that which was conducted as part of the Waterfall enquiry and as part of the ITSSR review.

This project aims to determine the impact of the vigilance and deadman system on driver performance. Specifically, it aims to determine:

a. the influence of work tasks, or lack thereof (i.e. monotony and underload) on driver performance (vigilance/attention); and

b. critical thresholds of driver vigilance, which may in turn lead to the identification of appropriate timings for warnings and brake applications.

3.2 System change

Before any form of system change (e.g. variations on Automatic Train Protection or a system based on the proposed ERTMS) is implemented in Australia the impact of a change in balance of control on driver performance must be identified. Very little research has been reported investigating the impact of changes in automation on a driver’s tasks. This project aims to determine:

a. the risk factors (i.e. changes in load, situation awareness, vigilance etc) associated with various levels of automation;

b. the impact of these risk factors on driver performance; and

c. the impact of in-cab signalling on a driver’s task (i.e. workload, attention) and the balance of in-cab and trackside information.

3.3 Human error

Human error has been identified as a contributing factor to the majority of accidents/incidents reported in the literature. We recognise that much of what might be referred to as human error may be due to socio-technical system deficiencies and that the error may be of those higher in the organisational system than the driver, maintainer or signaller. This present project aims to construct a rail error taxonomy.

SPADs remain a significant problem in Australian rail and one in which human error is a major contributing factor. Although a large quantity of research has been conducted in the UK investigating SPADs, very little Australian research on SPADs has been reported. This project will therefore attempt to identify the risk factors associated with SPADs in Australia. As part of this project it may also be possible to validate the SPAD Hazard checklist (developed in the UK and thought to be appropriate for Australian use), ensuring its applicability to the Australian railway system.

3.4 Passenger Movement

Passenger movement and passenger behaviour were identified as major issues by partners and appear to be emerging as significant problems within Australian rail. Reductions in services lead to overcrowding and the subsequent delays in passenger boarding/alighting can lead to service unreliability and timetable disorder. Very little research has been reported on passenger movement. This present project aims to investigate:

1. Train boarding and alighting:

   a. determine passenger behaviour in response to doorbells/chimes/digital voice announcements;

   b. observe the behaviours and times taken by different groups of passengers at different designs of station and platforms; and

   c. identify ways to improve train movement rates.

2. Train doors / Door closure (minor component identified by ITSRR and RailCorp):

   a. assess current protocols of door closure; and

   b. determine appropriate sensitive/soft edges of train doors.
3.5 HF Guidance Material

A handbook will be developed based on the output of the projects.

4. Conclusion

This document identified HF issues relevant to Australian rail to be driver safety systems, train protection systems, SPADs, and passenger movement. In line with previous research, Australian incident/accident/SPAD reports, and partner recommendations, the present project ultimately aims to determine the impact of work tasks on driver performance, determine the impact of automation on driver performance and determine the types/forms of errors contributing to rail incidents and accidents in Australia.

5. References


Talking Point

The following item by Paddy Conaghan, a senior partner at Hoare Lea, a UK engineering consultancy firm, appeared in September 2007 issue of BSJ, and is reprinted here with kind permission of Andy Pearson, Editor of the BSJ [Building Services Journal—Chartered Institution of Building Services Engineering (CIBSE)]. The Institution is organized on a regional basis—with 16 regions in the UK and 3 overseas in the Republic of Ireland, Australia & New Zealand, and Hong Kong. It has members in 80 countries and has informal member groupings in Dubai, Malaysia and Mainland China. It works in partnership with other professional bodies worldwide and its involvement with sustainable and productive workplaces has much in common with the work of ergonomists. It is a possible professional link in the HFESA future network.

PAPER WEIGHT

Paddy Conaghan
Dealing with the red tape on public sector projects can tie you in knots.

What real value does it bring?

by Paddy Conaghan

It shouldn’t have been so difficult. After all, we were the team that a top developer had appointed to do the job. So transferring us to his development partner, the local authority, because it wanted to take this first building forward faster, should have been painless. But it wasn’t.

The project wasn’t large – more of a jewel, giving real amenity to local taxpayers. It’s the sort of thing my partners keep saying we should do more of – before getting diverted by prospects of redevelopment and corporate relocation. But here we had been invited by a favourite developer to work with a great architect. This was absolutely right to do.

The first thing that happened on transfer was that the council emailed 36 pages of questions. The equal opportunities questionnaire was the largest. Apparently, our data would be used only for monitoring. Monitoring what? Our policies seem OK and we keep statistics on staff gender, age and ethnicity. But I was alarmed that, unable to answer the question on staff sexual orientations, our HR team was apparently committed to “monitor it over the next 12 months” – presumably to ensure we don’t discriminate. Surely neither knowing nor caring about a person’s sexuality is better proof against discrimination? Though undoubtedly well-intentioned, HR is so full of spooks and traps that simple humanity is the loser. It could one day finish off all businesses.

The HSE audit was something else! The borough’s external auditors advised that despite our full responses to their questionnaire, the abridged HSE pack we appended was inadequate and they needed the complete document. Our manual runs to three volumes. We hold a hard copy but, beyond this, it’s published only on our intranet. I explained that producing a copy for somebody to skim once would be inconsistent with our environmental policy, but they were welcome to inspect it at our office. Apparently, this was highly irregular – not surprising, perhaps, as a day visit by a skim-reader with a wetted thumb was charged at £750. I trust council taxpayers will feel the visit was good value.

My blood pressure was tested by the auditors when they rejected our environmental policy and sent a replacement text with the injunctive that we would get the necessary tick-in-the-box by signing and returning it. Our environment policy is a fibre of our belief system, mainly focused on climate change and recognising it’s where we can make the greatest difference. Their substitute was a list of anodyne blab that ranked “reducing business energy use and minimising CO2 emissions” only sixth, adding “minimising water consumption” as an afterthought.

Their policy set out that “current environmental regulations, laws and codes of practice will be regarded as setting the minimum standards of environmental performance”. So it seems that any suppliers that operate just about at the rim of lawfulness will be admitted, provided they sign up to a long checklist of environmental undertakings – often so vaguely drafted as to be worthless. Thankfully, one of my partners sorted it out for me; we are back with our own policy and I am returned to reasonable health.

We hold ISO 9001, 14001 and 18001. They are supposed to be differentiators that mean we and our services stand for something. But they seem to mean little to the public sector. Instead, each public client asks the same sort of questions – but, of course, differently. Why can’t the public sector at least standardise its questionnaire? Responding to detailed questions is expensive and, because some sectors seem none-the-wiser for the answers, often a waste of energy.

But, of course, probity in the public sector is vital. I was surprised, therefore, that the one question missing was whether we could demonstrate specific competence to do the project. It seems strange to take that on trust.
Noticeboard

1. HFESA Honours and Awards 2007

Fellow HFESA: Ian Gibson and David Brown
Society Medal: Andrea Shaw
Ron Cumming Award: Mark Dohrmann
Ken Provins Award: Sonia Ranelli, Leon Straker, Anne Smith
Alan Welford Award: Derek Smith, Ning Wei, Yi-Jie Zhang, Rui-Shing Wang

2. Call for 2008 HFESA Awards

Nominations are now being sought for 2008 Awards and further details may be found on the HFESA website www.ergonomics.org.au. Persons interested in nominating a candidate for any of the awards should contact the HFESA Secretariat.

The Human Factors and Ergonomics Society of Australia presents nine national Awards that reflect outstanding achievement by individuals or groups for service to the Society and the human factors and ergonomics profession as well as to the research and application of human factors and ergonomics in Australia. Five of the Awards are named after Founders of the Society who have been Presidents and Fellows of the Society.

The Executive of CHISIG, the Computer-Human Interaction Special Interest Group of the Society, nominate a recipient for the CHISIG Medal. CHISIG also has an Award for the best paper at their annual OZCHI conference that is named in honour of Gitte Lindgaard.

The HFESA Board and the Annual Conference Committee nominate the Society Medal and the Ron Cumming Memorial Lecturer, respectively. Members of the HFESA are invited to nominate eligible people for the remaining Awards. The David Ferguson Award requires the support and endorsement of the student’s supervisor.

The Honours and Awards Committee of the HFESA processes and endorses the Awards. All are based on merit and may not be bestowed every year.

Fellowship

- For outstanding contribution to the Society and the human factors and ergonomics profession over a period of at least ten years.
- Awarded to a member of the Society in good standing.

The Award is based on the assessment of the Honours and Awards Committee and ratified by the Society Board.

The Award is in the form of a membership certificate showing Fellow and confers honorary status.

The Society Medal

- For outstanding service to and promotion of the Society over at least seven years.
- Awarded to a member of the Society in good standing.
- The Award is based the collaborative assessment of the Society President and the Honors and Awards Committee.
- The Award is in the form of a medal suitably inscribed with the recipient’s name.

Cumming Memorial Medal and Lecture

- For highly esteemed human factors and ergonomics-related research or application in a relevant area of human factors and ergonomics.
- Awarded to an Australian resident, preferably a member of the Society.
- The Award is based on the assessment of the Honours and Awards Committee.
- The Award is in the form of a Medal suitably inscribed with the recipient’s name together with the presentation of the Cumming Memorial Lecture at the Society’s Annual Conference for the year of the Award.

Ken Provins Award

- For the best paper presented during the Society’s Annual Conference for the year of the Award.
- Awarded to individual or joint authorship, but not for a keynote speaker.
- The Award is based on both the written paper and the oral presentation at the conference.
- The Award is in the form of a Certificate for each author.
Alan Welford Award
- For the best paper on a human factors and ergonomics topic published in a peer reviewed journal within the calendar year prior to the Award.
- Awarded to individual or joint authorship, one of whom is a member of the Society.
- The Award is based on the intrinsic merit of the paper itself and its readability for the target audience.
- The Award is in the form of a Certificate for each author.

John Lane Award
- For a major systematic contribution to advancing the science of human factors and ergonomics and its application in Australia. This contribution may have been made at any time.
- Awarded to an individual, group or organisation having a relevant human factors and ergonomics connection with Australia.
- Covers work carried out over several years during the last five to ten years.
- The Award is in the form of a Certificate.

David Ferguson Award
- For the best postgraduate project report or undergraduate honours thesis produced in the 18 months prior to the Award.
- Awarded to an individual student enrolled in a relevant Australian University program of study.
- The Award is based on a paper summarising the report or thesis together with a supporting statement from the student’s supervisor.
- The Award is in the form of a Certificate plus one year’s appropriate membership of the Society. The paper will be published in Ergonomics Australia.

The CHISIG Medal
- For outstanding service to and promotion of the CHISIG over at least seven years.
- Awarded to a member of the CHISIG in good standing, or a retired member of CHISIG.
- Nominations can be submitted by any CHISIG member.
- The Award is based the collaborative assessment of the CHISIG Executive.
- The Award is in the form of a medal suitably inscribed with the recipient’s name.

Gitte Lindgaard Award
- For the best paper presented during OZCHI, CHISIG’s annual Conference for the year of the Award.
- Awarded to individual or joint authorship, but not for a keynote speaker.
- The Award is based on both the written paper and the oral presentation at the conference
- The Award is in the form of a Certificate for each author.

3. ASCC National Standard & Code of Practice for Prevention of MSDs
The Australian Safety and Compensation Council (ASCC) has issued a media release regarding the declaration of the National Standard for Manual Tasks (2007) and the National Code of Practice for the Prevention of Musculoskeletal Disorders Caused by Performing Manual Tasks at Work (2007). The aim of the revised standard and code or practice is to prevent injuries caused by performing manual tasks at work by identifying and managing risks. The National Standard and Code of practice can be viewed on the Australian Safety and Compensation Council (ASCC) website: www.ascc.gov.au

All correspondence should be directed to info@ascc.gov.au

4. Postgraduate Ergonomics at Queensland University
There have been some changes. 2007 was a transitional year in which the frequency of offering each course was reduced. From 2008 the GCErg, GDipErg and M Erg programs will be available in part-time remote mode only. While we intend to integrate opportunities for face to face contact each year via a “winter school”, attendance at these blocks will be optional. An information sheet can be obtained from www.ergonomics.uq.edu.au/pgradergo8.pdf or contact:

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Postgraduate Ergonomics Coordinator, School of Human Movement Studies
The University of Queensland 4072 Australia
robin@hms.uq.edu.au
T: +61 7 3365 4718
M: 0401 714 511
5. HFES Digital Library

The Human Factors and Ergonomics Society has just opened Phase I of the HFES Digital Library. The online collection of HFES periodicals is available for purchase/subscription to non-members. Members of the Human Factors and Ergonomics Society of Australia are entitled to a special discount from the regular non-member rates. To view the FAQ, go to http://www.hfes.org/web/PubPages/DigitalLibraryFAQ.html.

The Digital Library now contains Human Factors, Ergonomics in Design, and HFES Annual Meeting Proceedings since 1993. By the end of 2008, content going back to 1980 will be available. When the third phase is complete (end of 2009), all the back volumes will be available, in addition to Reviews of Human Factors and Ergonomics. For those who hold a current subscription to the new journal from HFES, Journal of Cognitive Engineering and Decision Making, that content will also be accessible.

Two packages are available: Digital Library-Archive contains older volumes for a one-time purchase of US$638, and Digital Library-Current contains the three most recent years of all five titles for an annual subscription rate of US$611. Save another US$100 when you purchase both Archive and Current.

Please contact HFES at store@hfes.org, 310/394-1811, fax 310/394-2410 if you would like to purchase the Digital Library at the special HFESA rates. Do not order online.

6. CYBERG 2008

FIRST CALL FOR EXTENDED ABSTRACTS AND CALL FOR PROPOSALS

Fifth International Cyberspace Conference on Ergonomics (CybErg'08)

Local Knowledge, Global Applications


CybErg'08 is the fifth conference in the series, and is intended to cover issues on all aspects of ergonomics, highlighting the latest developments and current technologies in those areas. The theme of this upcoming CybErg’08 is “Local knowledge, Global Applications” which aims to deliberate and discuss ergonomic issues such as those applied in developing economies in Asia, Africa and Latin America.

However, one of the deterrents to greater participation from countries with developing economies has been the high international travel costs. As CybErg’08 is an online conference, it is easy to see how an international conference based on the World Wide Web can drastically reduce travel-related costs. In addition, with greater participation from the under-represented communities, it is anticipated that issues normally not discussed at major conferences would be covered. In addition, participation and responses received from the industries and organizations associated with previous CybErg Conferences have been very encouraging.

Last but not least, given the conference is on-going for a month, there is ample opportunity to discuss issues which may not normally get air-time given the limited amount of period available to conduct a lengthy discussion. With “bulletin boards” available, participants will have an opportunity to discuss with the authors and other attendees with similar interests.

Thus, we would like to invite you to submit an extended abstract to CybErg’08 (deadline 29 Feb 2008). Please note that awards for best paper and most active discussion groups, will be also be presented at this conference.

For more information, please visit http://www.cyberg2008.org. Should you have any queries, please contact Ms. D’oria Islamiah (CybErg’08 Secretary) (mailto:secretariat@cyberg2008.org) or me (mailto:alvin@fit.unimas.my).

Dr Alvin W. Yeo
Chairman
Fifth International Cyberspace Conference On Ergonomics 2008 (CybErg ’08)

A/P Alvin W. Yeo
Deputy Dean (Postgraduate and Research)
Faculty of Computer Science and Information Technology
Universiti Malaysia Sarawak (UNIMAS)
94300 Kota Samarahan
Sarawak MALAYSIA
Email: alvin AT fit.unimas.my, awy AT acm.org
Tel: + 6082-583 765/583784
Fax: + 6082-583 764
Conference Calendar

2008

19–23 February 2008 12th Annual BFE Meeting
Biofeedback Foundation of Europe
Holistic Approaches to Health
Salzburg, Austria
University of Salzburg, Faculty of Natural Science
Contact: BFE, PO Box 555, 3800 AN Amersfoort
The Netherlands
Daniel Matto / Senior Administrator
Email: d.matto@bfe.org
Fax: +31 84 83 84 696

19–21 March 2008 – Organizational Design and Management Symposium
IEA Technical Committee on Organizational Design and Management (ODAM)
Guarujá, São Paulo, Brazil (a top spot by the beach!)
The website for the symposium is:
http://www.pro.poli.usp.br/pro/odam2008/
Contact: Patricia Monteiro
Depto. de Engenharia de Produção - POLI/USP
Tel: (11) 3091-5363 - Ramal 434
Fax: (11) 3091-5399
Horário: 08h00 às 14h00
Email: patricia.monteiro@vanzolini.org.br

19–20 June 2008 – 8th ERGODESIGN Congress
8th International Congress of Ergonomics and Usability of Human-Technology Interfaces: Products, Information, Built Environment, Transportation
COMBINED WITH

17–18 June 2008
1st Maranhense Symposium of Ergonomics, Workplace Safety and Health
São Luís, Maranhão, Brazil.

This event is sponsored by Brazilian Ergonomics Association ABERGO.
The central theme will be Research and Development in Ergonomics and Design
The opening ceremony will take place on Monday, June 17, followed by a week of International and national plenary speeches, workshop sessions, oral technical sessions, posters session and Technical demonstration (cases) in ergonomics and workplace safety and health presented by Brazilian Industries.

São Luís, capital of Maranhão, is located in a transition area between northeast and northern regions of Brazil.
São Luís is a marvelous city with many attractive sightseeing places, has beautiful beaches and an ensemble of over 3,500 colonial buildings from the 17th and 18th centuries with uncountable architectural elements and details. We have exerted all our efforts to make this gathering a very rewarding and fruitful one socio-culturally as well as professionally and we sincerely hope that you will join us in making it success.

Papers are accepted until February 15th, 2008

Raimundo Lopes Diniz, DSc.
Congress Chair
Claudia Mont’Alvao, D.Sc.
Organizing Committee
Anamaria de Moraes, D.Sc.
Organizing Committee
Congress website:
http://www.nepp.ufma.br/congressos2008/
Maranhão website: http://www.turismo.ma.gov.br/

Jointly with 12th International Conference on Human Aspects of Advanced Manufacturing (HAAMAHA)
Caesars Palace • Las Vegas, Nevada USA
Under the auspices of 7 distinguished international boards of 167 members from 29 countries
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salvendy@purdue.edu
Program Chair: Waldemar Karwowski
karwowski@louisville.edu
Conference Administrator: Laura Abell
laurajere@peoplepc.com
Fax: + 1 502 852 7397
Communication & Exhibition Chair : Abbas Moallem
Abbas.Moallem@sjsu.edu
URL: www.AEI2008.org

15 September–15 October
Fifth International Cyberspace Conference on Ergonomics (CybErg’08)
Local Knowledge, Global Applications
Contact:
Ms. D’oria Islamiah (CybErg’08 Secretary)
E: secretariat@cyberg2008.org) or
A/P Alvin Yeo (Conference Chairman) E: alvin@fit.unimas.my ).
Information for Contributors

Articles published in Ergonomics Australia are subject to peer review.

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December edition November 1

Contributions
Any inquiries about contributions should be directed in the first instance to the Editor.

Information for Advertisers

Inquiries
All advertising inquiries should be directed to the National Secretariat of the Society.

Contact
The Human Factors and Ergonomics Society of Australia Inc
P0 Box 7848 Balkham Hills BC NSW 2153
Tel: +612 9680 9026  Fax: +612 9680 9027
Email: secretariat@ergonomics.org.au

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A professional advertising service is available for producing camera ready copy if required. For further inquiries regarding this service contact:

Mr Goro Jankulovski, Acute Concepts Pty Ltd
Tel: 03 9381 9696
Mobile: 0414 605 414
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Rates for enclosures

Enclosure not requiring folding  $ 412.50
Enclosure requiring folding  $ 462.00

These rates may increase if the enclosure weighs more than the equivalent of 2 standard weight A4 pages. These rates are inclusive of GST.

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Circulation

The Journal is published four times a year and is received by approximately 620 professional’s Australia wide working in the areas of ergonomics, occupational health and safety, and design.

Ergonomics Australia On-Line (EAOL)

Advertising and sponsorship opportunities also exist in the electronic version of this journal (EAOL) which is managed by Dr Robin Burgess-Limerick at Department of Human Movement at Queensland University. It is downloaded by more than 100 Australian and International readers each week.

To view EAOL: http://www.uq.edu.au or enter via the HFESA website.

Caveats

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Editor

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