Making Pilots of Us All:
Adapting and Adopting Aviation Human Factors Lessons to Make Australian Roads Safer

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Abstract

Over the last forty years, safety on Australian roads has significantly improved in part because of the adoption of aviation safety technologies. The best known of these adaptations are: safety belts; anti-skid braking; dashboard/control layout improvement and the use of computers to aid stability and performance. The improvement in safety on the road as reflected by reductions in road trauma has plateaued since 2005. Perhaps it's time to revisit aviation for ideas - but this time in the discipline of human factors. The safety culture that permeates aviation is the single most significant factor in keeping the skies safe. The driver culture relating to licensing, skills, updated knowledge, risk, driver limitations and situational awareness must change. The research and experientially acquired knowledge is all there....all we have to do is look up.

Keywords

Safety culture, licence renewal, hazardous attitudes, aviation and road safety.

Introduction

In the year 2000 a three-point national road safety strategy was formulated: Fix the driver - using advertising targeting illegal and dangerous behaviour; Introduce affordable motor vehicle safety measures - Traction Control, ABS (an anti-skid braking system) and Electronic Stability Control; Safer Roads - Target black spots and improve the roads (this it claimed, could save 330 lives nationally each year).

There are two statistics fundamental to an understanding of road trauma and they are: more than 1600 people are killed on Australian roads every year and the estimated annual cost of road trauma (injuries and death) in Australia is $17 billion.

These figures; especially the road fatalities feature prominently in national and State advertising campaigns and public statements by the government. However in a survey of more than 1500 drivers undertaken by ANOP Research Services on behalf of Australia's' Auto Clubs in 2007 it was revealed that Australian drivers significantly underestimate the road toll. The average estimate by those polled, was that the national annual road toll was 500. This is less than a third of the actual figure.

Upon the basis of this sample alone, it might reasonably be concluded that quoting statistics in government statements and advertising are less then effective in entering the public consciousness. Whilst the poll did not ask drivers if they knew the annual cost of road trauma it is reasonable to assume the results would be similar.

This $17 billion imperative must be found before a single dollar can be spent on road improvement, driver education research and other critical safety initiatives.

Whilst the advertising methodology has been controversial the strategy of fixing the driver remains the key to long term reduction of road trauma.

In 1980, 3272 Australians were killed and a further 32,054 were seriously injured on our roads. Twenty-five years later, these figures were down to 1627 and 30,574 respectively. This improvement is attributed to a number of causal factors - chief among them being the introduction of vehicle safety measures, along with seat belts and anti drink drive strategies.
In 2000 the annual road toll was 9.3 fatalities per 100,000 population and the goal was to reduce it to 5.6 per 100,000 by the end of the decade. Between 2000 and 2004 the trend downwards was encouraging and the goal was clearly attainable, but by the end of 2006 the rate of reduction had reduced and this trend has continued to the end of 2008 and beyond. Up until 2008 an average reduction in fatalities of 3.8% was attained. To reach the end of decade target, there must be a 10.5% reduction in 2009 and again in 2010. This will not happen without a significant interdiction.

Better roads are safer roads; but it is noted that traffic crashes at ‘black spots’ are as much a function of the human factor as they are of the road itself. It may seem obvious that one cannot continue to drive at the same speed on a windy slippery hill road as one can on a straight sweeping four-lane freeway. The fact is that lapses in situational awareness mean that many drivers do just that with predictable consequences.

If the trend downwards is to be improved it is contended that the first of the Year 2000 strategies: ‘Fix the Driver’ needs to be re-visited but this time by adopting and applying the lessons learnt in commercial aviation.

If it is accepted that travelling at just under the speed of sound, 6 or 7 km above the earth in a long thin pressurized aluminium tube is the most precarious form of transport designed by humans; then looking at its record, it is only a short step to accepting that it is also one of the safest forms of transport.

More people die on US roads every 6 months than have died on scheduled airliner accidents worldwide, since the dawn of passenger jet aviation over fifty years ago.

It is significant to note that seat belts, traction control, ABS braking and stability control have their genesis in aviation and it is therefore both reasonable and appropriate to again look skywards for safety solutions. This time at the discipline of aviation human factors as practiced in modern airlines.

Methodology

A simple comparative study of the relative safety cultures, attitudes and licensing and competence requirements across the two disciplines provides the opportunity to design a suitable model to ‘Fix the Driver’ of the future.

In this study the emphasis was on the great advances made in airline crew training and pilot altitudes rather than just the advances in technology. Re-enforcement of the already strong safety culture extant throughout the airline industry, in the developed world at least; is achieved through a continuing education and training discipline termed Crew Resource Management (CRM).

Following an analysis system used to understand the functions and interactions of the identified parts of the flying system, CRM specialists broke the system down and began to study the interface between each of these constituent parts:

Concomitantly, using a contemporary jargon and modelling CRM, the three parts of the 'motor vehicle system' could be described as:

*Hardware* - The vehicle itself. Its design, power and safety systems along with its state of repair;

*Liveware* - The driver and passengers in the vehicle including experience, recency, skills, familiarity with the *hardware*, and the *environment*, along with attitudes, behaviour, alertness, physiological issues including the effects of drugs and alcohol;

*Software* - The systems, including common practice, road rules, courtesy and other driving norms;

*Environment* - The inside of the vehicle including such issues as comfort, ergonomics, noise and distraction. It also relates to the situation beyond the vehicle, including weather, road conditions and speed;
It is these same interfaces that CRM and pilot safety training have been focused on for more than twenty years and chief among them is the liveware.

The four particular areas where there is potential to exploit transferable attitudes and values evident among aviators and then to transplant and grow them in the culture of the road can be broadly classified under the following headings: Licensing and the privilege of flying; Attitudes to safety and understanding hazardous behaviours; Human Factors, ongoing skill acquisition; Situational awareness.

**Results**

Current driver behaviour patterns are linked to existing attitudes, acquired by observational learning or modelling; the tendency to reproduce actions, responses and attitudes that have been observed and experienced in real-life situations.

Children sit in cars and listen to, mimic in play; and later adopt the driving conduct and behaviours they have observed. This exposure has often been experienced on a daily basis for more than a decade. They have made sense of their world by watching observing and listening and have learnt the ways of the road using these same techniques. In consequence, when they begin driving they model what 'they know'.

There is no such influence on the pilot - though the pilot is the ‘same person’ as the driver the attitude displayed in each environment is quite different. The exposure to ‘piloting’ begins abruptly on the first trial flight or lesson and the inculcation of the safety culture of the aviator begins that day and continues throughout their aviation career.

A pilot's attitude to the pilot license is markedly different to the attitude of the driver to the driver’s license. Pilots see their license as that formal imprimatur that permits them to 'dance among the clouds'. It is valued based upon the relative difficulty in attaining the licence and importantly, maintaining it.

The pilot is instilled with a safety culture that is practiced and tested on every flight. Moreover, the pilot knows that maintenance of the license or ancillary qualification such as an instrument rating is based upon demonstrated skills linked to the two constants of experience and recency. The ability to demonstrate and practice a skill is as much a function of current experience as it is of flying hours alone. The aviator’s individual health and fitness is yet another factor; creating a further element of fragility and thus perceived value. It is for these reasons that the pervading attitude among pilots both amateur and professional is that holding a pilots license is not a right, it is a privilege - and a fragile one at that.

No such attitude pervades the drivers of Australia. After the initial written and oral test followed by a skills based on road test, a driver need never again look at a 'road rules' or consider for a moment upgrading or even maintaining their skills. The most ominous aspect of license renewal is having to wait in a queue to have their photograph taken. Some renewals are now routinely done on line.

The driver licence is viewed by many as much a form of identification as a permit to drive.

Whilst it cannot be claimed that most Australian drivers view it as their right to drive on the road rather than a privilege, it is no accident that police regularly run operations near court houses. Drivers are disqualified by a magistrate, walk straight from the court to their cars and drive off.

As a serving police officer it is asserted, if anecdotally that the one of the most common explanations given by a disqualified driver caught randomly driving is; 'If I don't drive, I can't get to work, I'd lose my job!' This explanation is delivered in a tone that suggests the belief that the excuse is righteous and overrides any court ruling. 'No magistrate can take away my right to drive.'

One of the most significant aspects of aviation training for airline pilots is LOFT - Line Oriented Flight Training (simulator training). LOFT is a regular component of recurrent training for professional pilots.
On 15 January 2009 US Airways Captain Chesley Sullenberger and First Officer Jeffrey Skiles took off in their Airbus A320 from La Guardia Airport. Several minutes later, the engines failed and their airliner became a 70 tonne glider. The crew landed the aircraft in the Hudson River - all 155 occupants survived.

Apart from superb airmanship under extra-ordinary pressure, one of the main reasons why the crew did such a good job was they had done it so many time before!

LOFT allows pilots to simulate crisis management, workload tolerance, auditory overload, visual overload as well as standard flight conditions. If Captain Sullenberger and First Officer Skiles hadn't 'landed' in the Hudson before - it would have been in Lake Michigan, The Gulf or San Francisco Bay.

Under present circumstances the first time a driver experiences a critical situation it will not be in a simulator but moments before what often turns out to be a fatal crash.

Young drivers in particular model risky behaviour on what they have observed with little appreciation of the link between risky conduct and consequences. Young males up to about the age of twenty five in particular, have difficulty intellectually drawing links between risk taking and consequences.

The flight deck of a large airliner is a busy and dynamic place and the technical crew and cabin crew visiting the flight deck, engage in normal social conversation as well the necessary operational talk. In certain phases of flight there is also the involvement of Air Traffic Control to be considered. It is normal practice for the flight deck to be 'sterile' below ten thousand feet. That means that the social chit-chat stops and the only permissible conversations are operational. This Standard Operating Procedure (SOP) coincides with the increased work load of the climb-out or descent for landing.

No such situation exists or can exist in a car, however in simulation; drivers are able to practice skills whilst being subjected to noise overload (the loud music) or distraction (conversations or the behaviour of children in the car). If practiced in the simulator, drivers are able to experience and understand the resultant performance degradation.

Research into hazardous attitudes on the flight deck has identified the following risky behaviours: Anti-authority; Impulsivity; Invulnerability; Macho and Resignation.

The anti-authority emotive response affects those who tend to regard 'rules', like speed limits as arbitrary restrictions on their freedoms and rights. Using the airline pilot correlation; anti authority affected drivers may over estimate their own ability, and the vehicle capabilities and underestimate or not understand the environment including road conditions, whether conditions or a changing situation.

Acting on impulse is not exclusively the domain of the young but it can be more dangerous in the young because of peer pressure exacerbated by inexperience. Pilots flying in VFR/VMC conditions (i.e. by visual reference to the ground rather than exclusively by instruments) know that if they encounter bad weather, the pressure on them to push on often comes from passengers unqualified to advise and from their own inner messages. 'It's worth giving it a go' (impulsivity). 'I can do this' (macho).

Often seeking advice from other pilots results in a 'group-think' situation. In this situation the 'group' elect to push on however had any of them been flying solo in that situation - they would have turned back. As a group they feel emboldened and impulsively decide to push-on. This behaviour is a strong component in peer pressure.

'I've never been killed in a plane (or a car) crash before, only other people are killed'. Whilst this statement appears trite it is in fact in it's simplest from, the embodiment of the issue of feelings of invulnerability. Added to that, younger people tend to view the prospect of death as an issue to be dealt with later in life.

In the ANOP research the number one concern of Queensland motorists (nominated by 43% of respondents) was 'other drivers'. It might be argued that this mirrors the view that people now choose to blame others (other drivers) and external issues (the condition of the roads) as the major cause of traffic crashes - few are willing to take responsibility for their role. Can it be said therefore that not only do 'other' people die in car crashes but it is 'also' other people who cause them?
Situational awareness has long been a major subject for study in aviation. It is something of a 'minefield' however the way people drive on wet roads, on 'bad' roads, at high speed or low speed might be seen as stupid or reckless. Such a view is often simple attribution error and if there is no specific explanation for the manner of driving, it is likely to be the result of lapses in situational awareness. The reasons are many but include, fatigue, distraction, intoxication and even emotional state.

There is an old saying among pilots 'Never let the aeroplane take you anywhere - you weren't 10 seconds before'. Drivers distracted by their passengers, their phone and their emotional state often arrive mentally at the crash, after it has happened.

**Discussion**

Drivers licence renewals should require knowledge testing (i.e. resitting the written road rules test). Skill demonstration - a practical test particularly focused in the use of new technology (e.g. manoeuvring under ABS braking). Such renewals might be done every five or eight years. Motor vehicle simulator training is not new but there is scope for extending its use for driver license renewals and upgrades. Compulsory simulator, training can be given to beginners, allowing them to learn driving technique in a safe environment. With the addition of the behavioural context they can experience simulation accompanied by risk and consequences training; allowing them to develop predictive skills.

The police provide visible reminders of the law and facilitate sanctions for those who break that law. Their role is one of encouraging 'situational awareness'. The solution to road trauma does not lie in enforcement - but enforcement is a worthwhile way of funding the initiatives that will.

It is no accident that human factors research in aviation has been carried out and replicated in medical operating theatres. It is an example of how two apparently disparate environments share characteristics that can be 'exploited' to make each safer.

It is time we exploited the aviation safety discipline; because the roads and the skies are just not that different. We need to get our feet planted firmly in midair.

**References**