Motorcycling and the safe system – an international perspective

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Abstract

Motorcycling represents a significant and growing proportion of road trauma across the world. While Safe System approaches have the potential to produce significant reductions in trauma across the road system, the challenges of applying these to motorcycling are likely to be greater. If these challenges are not met, motorcycling will become an increasing obstacle to the achievement of a safe system for all road users and widespread reduction in road trauma. While some of these challenges are technical and the result of the physical limitations of the mode, the community's acceptance of risk is also fundamental to the progress that can be made.

This paper examines how different jurisdictions set strategic direction for motorcycles within their road safety strategies or, conversely, address safety within their broader motorcycle plans. The paper also discusses whether the relative contributions of individual safe system components may need to be altered for different road user types, such as motorcyclists.

Examination of the application of the Safe System to motorcycling can provide guidance in the broader issue of the role of community acceptance of risk and its impact on how quickly transition to the Safe System can be achieved.

Keywords

Safe system, motorcycles, strategy, road safety

Introduction

The Safe System is described in the National Road Safety Strategy (ATC, 2011) as:

- 1. **People make mistakes**. Humans will continue to make mistakes, and the transport system must accommodate these. The transport system should not result in death or serious injury as a consequence of errors on the roads.

- 2. **Human physical frailty**. There are known physical limits to the amount of force our bodies can take before we are injured.

- 3. **A 'forgiving' road transport system**. A Safe System ensures that the forces in collisions do not exceed the limits of human tolerance. Speeds must be managed so that humans are not exposed to impact forces beyond their physical tolerance. System designers and operators need to take into account the limits of the human body in designing and maintaining roads, vehicles and speeds.

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However, the first of these principles contains two quite different and independent concepts:

- An implicit recognition that serious trauma and death are unacceptable, and
- Acceptance that road users will make mistakes and that the road system needs to be designed and operated to accommodate those mistakes.

In implementing these (the "what"), the third principle provides the "how" for the safe system:

- Recognition that it operates as a system and that the three components of speed, infrastructure and vehicles can work together to create a safe system whereby all impacts are within the limits of the human body's tolerance to physical force.

An additional element in the development of road safety strategy is the suite of measures that need to be put in place as we work towards a safe system. In other words, how we manage risk until we achieve the risk-free system.

In the case of motorcycles, a safe system could be achieved in three ways:

- limiting travel to roads where there is segregation from heavier vehicles or where the travel speeds of these vehicles, and motorcyclists is below a survivable limit – probably or the order of 40-50 km/h with current protective technologies
- improving vehicle, protective equipment and roadside performance to increase the speed at which collisions are survivable
- improving technology so that rider errors do not result in a crash occurring.

For all three of these, the gaps between current performance (constrained by technology and community acceptance) are significant; such that for many years, motorcycle safety will need to be focused on risk reduction. The Safe System model provides a means to understand the problem and derive tools to facilitate this risk reduction.

Trends in motorcycle road trauma, partly driven by increases in usage, indicate that this challenge is becoming an increasingly difficult one to tackle if jurisdictions are to achieve their overall targets to improve road safety and, ultimately achieve a safe system.

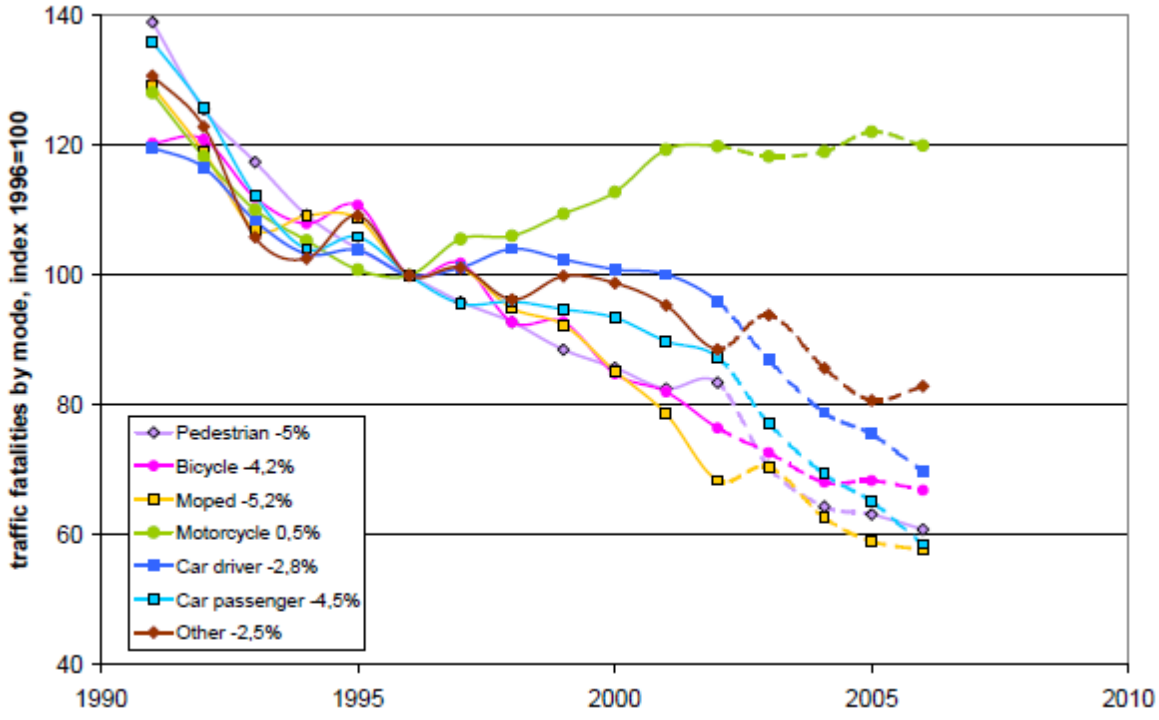

Figure 1 Road safety Improvements by Mode of Transport (Wegman, 2008)

This paper examines the appetite for trauma reduction and how the elements of the safe system can work to reduce trauma.

Trauma reduction targets and the appetite for risk

While a number of jurisdictions have established ambitious visions for road safety supported by aggressive targets, the level of ambition directed towards motorcycle safety is less common.

The Lillehammer Conference concluded with recommendations across a range of safety issues. However, on the matter of a vision, or target, it is less explicit:

> It is a fundamental motorcycle safety requirement that motorcycles should have a place in overall transport policy and infrastructure policy/management (OECD 2008)

This perhaps implies that motorcycle safety ambition should be the equal as for other modes but this is left unstated.

The Swedish strategy for motorcycles is more explicit:

> The objective of this strategy is to demonstrate how the number of motorcycle and moped fatalities could be halved and the number of seriously injured riders reduced by 25 per cent by the year 2020, thus contributing its share to the 2020 interim goal. (Trafikverket, 2010)

The European Commission acknowledges the need for ambitious targets. “Targets provide the focus for the national road safety strategy and the level of their ambition drive decisions about coordination needs, legislative needs, funding and resource allocation, promotion

needs, monitoring and evaluation, as well as research, development and knowledge transfer. (EC 2011)

It includes ambitious overall reduction targets within its Strategic Plan to 2020 but the specific goals for motorcycling recognise the challenges in achieving targets:

> This ever-growing group of users is the one where it is the most difficult to attain a significant reduction in accidents and fatalities. In particular, the reduction rate of fatalities amongst motorcycle riders is lower than for other road users…The problem of motorcyclists' safety should be addressed through a range of actions...(EC, 2010)

Similar to the Lillehammer statement, the Victorian PTW Strategic Action Plan recognises the need for improvement without defining any degree of ambition:

> With such significant increases in the numbers of PTWs on Victorian roads, there is a need for greater consideration of PTWs in road use and transport policy development and planning. Those working in these fields need to become more aware of the needs of PTWs and the role they can play in the transport network.
>
> In an environment where PTWs are an increasing component in Victoria's transport mix, the plan seeks to identify initiatives and actions that will:
> - significantly reduce the number of riders and pillion passengers killed or seriously injured
> - ensure that PTWs are given appropriate recognition in transport and road use policy and planning. (Victoria, 2008)

The UK followed a similar approach in its strategic plan for motorcycling:

> The principal aim of our strategy is to 'mainstream' motorcycling
>
> The theme of this strategy therefore is to facilitate motorcycling as a choice of travel within a safe and sustainable transport framework.
>
> Our aim is to make motorcycling a safe, enjoyable experience for those who choose this mode. This means taking account of the needs of motorcyclists, promoting safety measures and mainstreaming motorcycling, so that its needs are considered as fully as any other transport mode, in the development of transport policy. (DfT, 2005)

However, it is noted that the UK's more recent Strategic Framework for Road Safety provides no targets for any aspects of road safety performance and its vision is notably silent in relation to motorcycling:

> Our long-term vision is to ensure that Britain remains a world leader on road safety. There have been impressive improvements over previous decades and in recent years. We are committed to ensuring this trend is maintained. Alongside this our aim is to reduce the relatively high risk of some groups more quickly, such as for cyclists and children in deprived areas. (DfT, 2011)

The key issue to address in this matter is described in the Netherlands' Sustainable Road Safety:

> Do motorized two-wheelers actually fit into Sustainable Safety? The brief answer to this question is no, because Sustainable Safety speaks of achieving a considerable reduction of risks and of numbers of casualties. ... It is difficult even to conceive of Sustainable Safety measures that could lead to a substantial reduction in the number of victims of crashes involving motorized two-wheeled vehicles.
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> Furthermore, the relatively high risk of motorized two-wheelers calls for a discussion concerning the acceptance of risk in a risk society ('How safe is safe enough?'); what should reasonably and responsibly be done to reduce risks ('As low as is reasonably achievable') (SWOV, 2006);

While this document was drafted by road safety practitioners within the Government, the result of this consideration is reflected in the Dutch strategic action plan for motorcycling, which was prepared to reflect the consensus views of stakeholders:

> The aim of this action plan is to reduce the per kilometre risk of accidents faced by motorcyclists with a view to reducing the number of motorcycle casualties. ...
> This action plan is part of the Strategic Plan for Road Safety 2008-2010 … the guiding principle of which is that all measures must be proportional, i.e. increasing motorcycle road safety must not come at the expense of the freedom of motorcyclists to use the road in a responsible manner." (Rijksoverheid, 2011)

In summary, the current approach to defining a vision for motorcycle safety is, with the exception of Sweden and perhaps a few other jurisdictions, "to improve".

Recreational Road Use

Comments made by a number of strategies that motorcycling safety ambition may need to be tempered is perhaps a reflection of the fact that, for many, motorcycling is a recreation. Recreational road use is not, of course, limited to motorcyclists. Although, for motorcycling, recreation would represent a larger proportion of the overall mix of purposes compared to general traffic. An interesting question that arises is how recreational road use fits within the safe system. The conventional trade-off is between mobility and safety and results in close attention to speed. A trade-off between recreation and safety might also focus on speed but may call into question developments such as vehicle ITS, that may reduce operator control and hence the possible aesthetic pleasure of driving or riding.

It could be argued that the road system is not there to facilitate recreational use. However, the distinction between use for access to recreation (as a valid trip purpose) and use as recreation is probably too small to make such an argument sustainable. So, just as the conventional view examines the trade-off between safety and travel time (and its economic worth), a broader approach may need to consider the trade-off between safety and pleasure.

An area to consider is whether recreational road user is inherently more risky that other trip purposes. Hence, one of the factors in determining the acceptable level of risk, or rate of risk reduction, may be the proportion of traffic represented by recreational riding. While this will vary across developed economies, the domination of PTW in emerging economies may

provide different opportunities for interventions that may be unacceptable amongst the more recreationally-focused users in developed countries

Targets

Decisions regarding resource allocation to road safety, the level of regulatory controls imposed on road users and other community costs will depend on agreement regarding the level of risk, or the reduction in trauma, that is being sought over the life of a strategy. While the Swedish strategy spells this out, very few others do. This can lead to debate between stakeholder groups regarding the acceptability of proposals as there is seldom any objective target to provide guidance in the assessment of competing options and competing outcomes.

Not all stakeholders share the Safe System view as the ultimate aim of a road safety strategy and this is reflected in a number of strategies referring to the need for proportionality. The contrary view to the Safe System is that continued progress to reduce motorcycling risks is sufficient even if these reductions do not lead to reductions in overall levels of trauma, as the growth in motorcycle use outweighs the reduction in risk.

So, in the development of a road safety strategy for motorcycling, while many jurisdictions recognise the need to broad stakeholder agreement to the content of the strategy, a shared commitment to a specific target will assist in subsequent determination of specific actions required to implement the strategy.

Motorcycles and the Safe System model

The Safe System approach assumes that road users will enter the system competent and will take measures to ensure that they remain compliant and alert. The system then ensures their safety by providing vehicles, road and roadside infrastructure and travel speeds that combine to ensure that any crashes that do eventuate result in crash forces that are below the level of human tolerance to physical harm.

Applying the Safe System to reduce general levels of road trauma will result in developments in vehicle occupant protection, protection from roadside hazards and separation from oncoming traffic on high speed roads with limited access and lower speed limits (eg 50 km/h) and intersection treatments such as roundabouts where traffic conflicts are inevitable. Where pedestrian and cycling traffic is introduced into the mix, there is a growing use of even lower speed limits (eg 30 km/h) where segregation is not feasible or not desirable due to its impact on mobility and amenity.

Inclusion of motorcyclists into the Safe System yields two challenges. The first is the technical problem of providing protection from physical harm at the speeds at which collisions with other vehicles or fixed objects are likely. While this could be solved by ensuring travel speeds by, and in the vicinity of, motorcyclists are much lower, this then amplifies the second challenge. This is to ensure that any measures taken to improve motorcycle safety are supported both by the broader community and by motorcyclists in particular.

This leads to consideration of whether the conventional Safe System approach should be modified by recognising that, in the short to medium term, motorcycling will remain an

inherently risky activity and that measures should be taken to reduce risk wherever they will be most effective rather than following the pure safe system approach.

In other words, in considering Reason's model of reducing trauma outcomes, the "swiss cheese" model, the later slices of cheese in the model will, for many years, contain large holes that cannot be easily plugged. This leads to the conclusion that the most significant gains may derive from attention to the early parts – error and crash avoidance, rather than mitigating their effects.

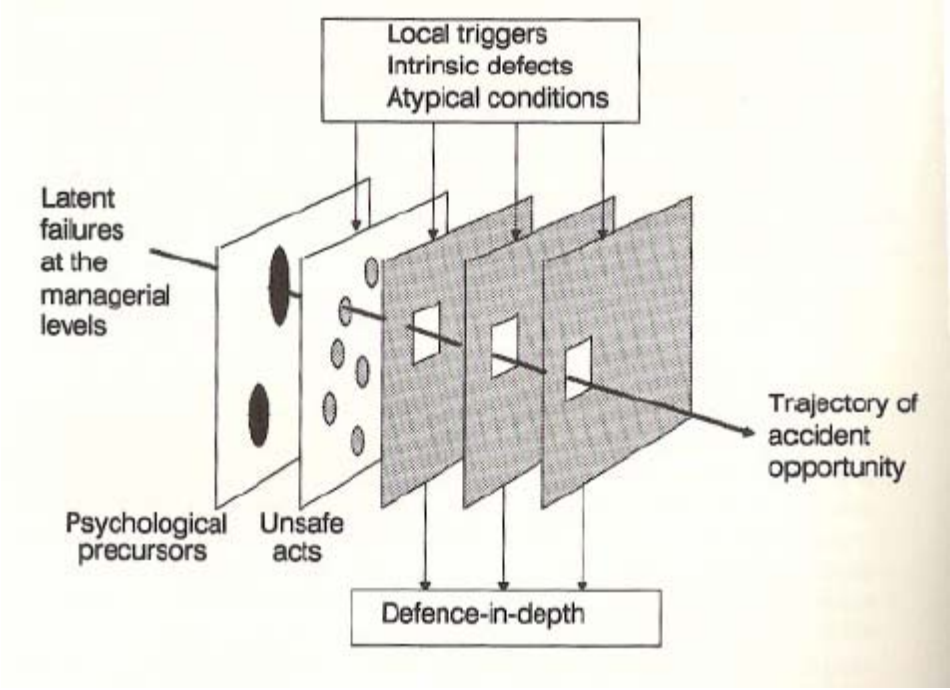

Figure 2:The "Swiss Cheese" model of accidents (Reason, 2006)

However, as guided by Safe System thinking, strategies should not ignore the opportunities that are available to address the later stages of the causal chain –such as the promotion of improved protective clothing and equipment.

Conclusion

While this paper has considered strategies for improving motorcycle safety as distinct from general road safety strategies and their overall targets, over time these two needs will merge. Growth in motorcycling, and improvements in safety for other road users is resulting in a general trend, across all countries, for motorcycling to represent a growing proportion of road trauma. Achievement of overall Safe System goals will be increasingly difficult without close attention to motorcycling.

So, while this paper discusses the strategies for the short and medium term, in the longer term, the distinctions described here will have to disappear if the Safe system is to be achieved.

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