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«Speed»

Summary
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Talk

What are the technical measures that reduce speed?

Introduction

Excessive speed, inappropriate speed, high speed variability: when it comes to road safety there is barely an issue of more importance – and there is no other area in which research and practice has, over the decades, led to the development of more measures for dealing with the problem. Here, an outline will be provided of the most effective tools for dealing with the problem of speed. It will cover the areas of infrastructure, vehicles, legal measures and information, as well as surveillance.

Infrastructure

The goal of all infrastructure measures to reduce speed or ensure appropriate speed is the 'self explanatory street' which should make signposted speed limits and police presence on the edge of roads mostly redundant. The basis of this is an integrated, functional categorisation of streets whereby every driver can choose the appropriate speed simply by the appearance of the street; in the same way they will know what types of intersections and other vehicles to expect (WHO, 2008).

For **urban** streets, various traffic calming measures have been implemented in most parts of Europe since the 1960s, beginning with the 'Woonervs' (living yards) in the Netherlands. Proven speed reduction measures include speed **humps**, **raised** zebra crossings and whole intersection plateaux, as well as **horizontal diverters** and **narrowings** (County Surveyors Society, 1994). Such measures should be placed at regular intervals along a stretch of road in order to ensure a constant speed level.

Roundabouts are a European success story for safer intersections, and the implementation of the so-called '**gate-effect'** ensures appropriate speed levels at the transition area between rural and urban roads. Austria has had particularly positive experience with the reconstruction or redesign of **main through roads,** and the incorporation of structural crossing aids for pedestrians (Zibuschka, 1996).

Recently, a new concept being discussed in many countries is that of '**Shared Space**' whereby - again based on the experience of the Netherlands - road signs and separation of different types of vehicles are largely dispensed with. The concept is based on the unconditional *shared* use of road space by all road users. Additionally, the Swiss model of the **Meeting Zone** is being discussed by traffic engineers and decision-makers in many countries as a complement to the widespread living- and playing- streets.

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Most traffic fatalities occur on **rural roads**[1]; again, excessive or inappropriate speed is the main cause of accidents. As opposed to urban roads, the repertoire of the traffic engineer in rural areas is limited. Unfortunately there are starkly different views in the EU at present about what constitutes an appropriate speed limit – varying from 70 km/h (Sweden[2]) to 100 km/h (Austria, Germany).

By reducing lane widths through the use of suitable road markings, speed levels can, to a certain degree, be reduced. Zig-zag markings or rumble strips placed before intersections, railway crossings etc. have the effect of reducing speed through tactile means.

An essential determinant of the choice of speed on a particular stretch of road is the routing. As early as the 1960s, traffic engineers realised that routes should not be built in the form of long straights joined here and there with a curve when necessary: this results in the all-too-easy prediction of accident spots. Today, wherever such stretches are still to be found in the road network, and generally wherever drivers are required to use lower speeds 'unassisted', attention should be given to the use of unmistakable **optical leads**. Here, electronic means will provide a valuable service in future (see below, Legal Measures, Information).

Vehicle

One of the classic areas of driver information deficit is prevailing speed limits. The principle of **Intelligent Speed Assistance** (ISA) addresses this problem by permanently displaying the prevailing speed limit in the vehicle, any overstepping of the limit results in either a warning signal or, additionally, depending on the system, some concrete means of intervention (eg. increased resistance on the gas pedal). ISA has been tested in pilot studies in many European countries, particularly in Sweden where, between 1999 and 2002 in four cities, approximately 5,000 vehicles (10,000 test-drivers) were fitted with ISA (www.vv.se/isa). It was found that, depending on the system, the potential for reduction of fatal accidents is between 18 % and 59 % (OECD, 2006). Some navigation devices already offer ISA functionality today, yet the inherent problem remains ensuring that speed limit data is current.

In many types of vehicles today there is already the possibility that driver-installed **speed limiters** or speed warning systems are activated. That speed limiters from the manufacturers' side only react at speeds over 250 km/h (when even installed) yet, although in the whole of Europe, with the exception of one country, nowhere are speeds higher than 130 km/h allowed, is a point that will not be further commented on here.

[1] Streets outside of city limits but not freeways.
[2] 70-90-110, as signposted.

Several studies (Samovar, Veronica) point to the beneficial effect of **Accident Data Recorders** on road safety. A moderating outcome on speed behaviour can be, at least in part, attributed to such recorders. The Austrian police have also found a resulting positive effect on accident rates.

With a simple psychological measure, a further contribution can be achieved: the **non-linear speedometer** shows the most used speed range (approximately 30 to 100 km/h) in optical detail, while higher speeds – particularly over 130 km/h – are displayed in a compressed format (OECD, 2006).

For the sake of completeness it is worth mentioning that numerous new **driver assistance systems** currently either being tested within framework (EU-)studies or already available, are still lacking studies on their effectiveness. Warning systems based on highly precise and continuously updated digital road maps (eg. project SafeMAP) have the potential to reduce speed and therefore help to avoid accidents. In the SASPENCE project (a sub-project of PReVENT), innovative systems to support drivers in the areas of speed and distance are being tested.

Legal Measures, Information

The effectiveness of classic speed limits with static sign-postage is limited. With a 20 km/h lowering of the limit on rural roads, a real lowering of the mean speed of 3 to 8 km/h can be anticipated (European Commission, 1999). Experience with **traffic influencing systems** on freeways shows that variable speed limits are well accepted, especially when the reason for the restriction (traffic jam, accident, weather hindrance) is also given, and thereby understandable to drivers (Machata, 2007). Here it is important that displays are regularly repeated at intervals of not significantly more than one kilometre (Harbord, 1998).

On rural roads, **dynamic warning systems** can be aimed at particular target groups. For example, electro-optical warning signs before high-risk curves are displayed only to those drivers approaching at too high a speed. Similarly, so-called **Speed Blinkers** display the local speed limit (blinking) only when an approaching vehicle is travelling at excessive speed.

Mobile speed displays are another method, commonly used internationally, of giving feedback to drivers about their speed. There are different types of these:

- Information about whether the local limit is being adhered to (Too Fast!)
- Speed displays without commentary
- Additional displays of an automatically read vehicle number-plate, with the use of a camera system

- Combinations with campaigns, e.g. at kindergartens or schools: in Austria, the popular 'Apple-Lemon' campaign uses a display to drivers which, depending on their speed, shows either an apple (speed limit adhered to) or a lemon (over the limit).

However, the temporal and geographical penetration of such speed display solutions is limited.

For intersections between same-level streets in residential areas, improvements have been demonstrated - particularly in the United States – by the use of stop signs at all approaches to the intersection ('**4-way-stop**', Elvik and Vaa, 2004).

Surveillance

The classic means of surveillance with radar boxes has a spatially very restricted effect on the choice of speed. To ensure homogenous speed behaviour the boxes would have to be placed at regular intervals, something that would attract considerable cost. With the '**section control'** the average speed of vehicles can be measured, not at a single point, but rather along a stretch typically from 2 to 10 km. This requires the deployment of modern video technology and automatic number-plate recognition. Currently applied measures on freeways in the Netherlands, Austria and the Czech Republic have shown excellent results in terms of speed ethics and also have high cost-efficiency (Stefan, 2005).

France has attracted much attention since 2003 with a totally **new system of speed surveillance** which over several years has brought about a significant reduction in the number of fatalities. The key features of the system are the installation of thousands of new radar boxes at accident black spots, the fully automated transmission of the radar pictures to a data centre, as well as the fully automated identification of vehicle number-plates and the rapid delivery of penalty notices to the persons in the first line responsible for the misdemeanours: the owners of the vehicles. The acceptance of the new system is not hurt by the fact that financial surpluses are invested back into road safety projects (ETSC, 2006).

Outlook

There is no shortage of possible solutions for this most central of all road safety issues; what is missing, however, is their widespread application. It is not only financial constraints that stand in the way of realising this, it is all too often a lack of willingness on behalf of decision-makers. Therefore, it is more important than ever to keep those at the political level informed about 'best practice' and to better communicate the impressive potential of the described measures for saving thousands of human lives.

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