Intelligent Speed Adaptation: the safety potential

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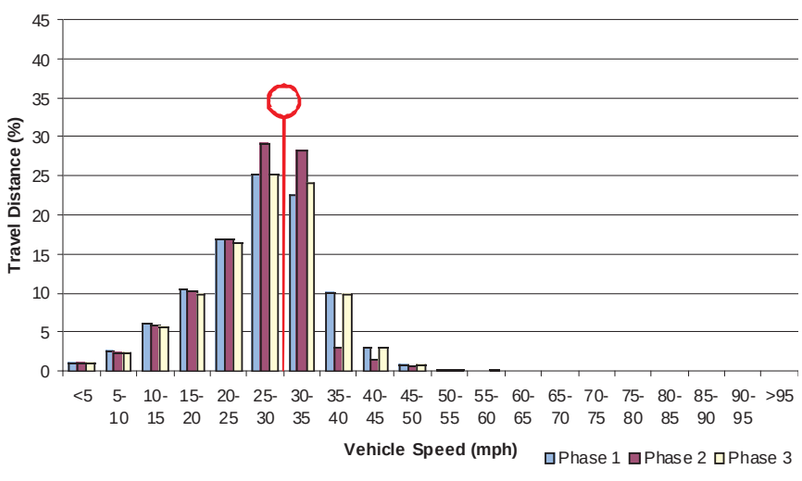
Oliver Carsten, Professor of Transport Safety at the Institute for Transport Studies (ITS) at the University of Leeds, UK, discusses Intelligent Speed Adaptation, looking at its safety potential

Intelligent Speed Adaptation (ISA) is the system that brings the speed limit inside the vehicle. Usually based around the same technologies as Satnav (GPS-based positioning and an on-board digital road map), it can take the form of advisory ISA (a device that warns the driver about speeding), voluntary ISA (a device that deters speeding by requiring the driver to deliberately override the system in order to speed), and mandatory ISA (no speeding possible).

Few systems have been investigated as intensively as ISA. There have been real-world trials in Sweden, the Netherlands, Denmark, Belgium, Australia, Spain, Hungary, France and the UK. The large interest in the system's safety potential is not all that surprising. In our recent project on behalf of the UK Commission for Integrated Transport and the Motorists' Forum, looking at the potential benefits of ISA, we calculated that full compliance with the speed limits on British roads would result in a reduction of 29% in injury accidents. The reductions in serious and fatal accidents would be substantially greater: approximately 50% for fatal crashes. Countries with greater problems of speeding than Great Britain would save even more.

The trials that we conducted in 2004 to 2006 on behalf of the UK Department for Transport revealed that a voluntary ISA system had a considerable effect on speeding behaviour as well as a high degree of acceptance among the drivers. The drivers were selected across a range of characteristics including gender, age, private or fleet and general intention to speed or not to speed. Driving with ISA produced virtually no change in speed choice below the limit, but had a marked impact on top-end speeds. In spite of the possibility to override the ISA at will, driving with ISA available reduced 85th percentile speed on 30mph (approximately 48km/hr) urban roads by approximately 2.5mph (4km/hr) and the proportion of distance travelled when driving over the speed limit declined from 40% to 35%. On 70mph roads (112km/hr), 85th percentile speed fell by over 4 mph and the proportion of

Figure 1: Speed distribution by trial phase on 30mph roads



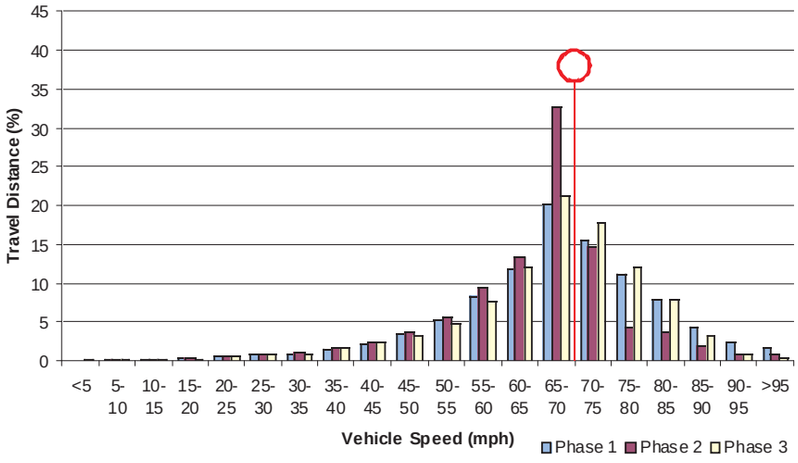


Figure 2 shows the same analysis for 70mph roads. Again there was no real change at the low end, and again ISA curtailed very fast driving

distance travelled when driving over the speed limit declined from 31% to 25%. These numbers may not appear to be very dramatic, but with ISA very large excess speeds became a rarity. It should also be noted that our ISA system allowed some limited speed excursion before it cut in.

Figure 1 shows the speed distribution of the drivers when driving on 30mph roads. The Phase 1 bars show driving in the first month without ISA. Phase 2 covers the four months with ISA and Phase 3 represents the last month when ISA was switched off again. The effect of driving with ISA was to substantially curtail high speeds and there was no discernible effect of the system on the distribution of speed at the lower end. This shows that drivers were not on "autopilot". Because the drivers were able to override the system, there was still some driving above the speed limit. In Phase 3, when the ISA was withdrawn, behaviour reverted to that observed in Phase 1.

We also investigated acceptance of ISA. We used a scale that measures both "usefulness" (how good is it for the traffic system?) and "satisfaction" (how much does it fulfil my goals?). Usefulness was positive throughout. Satisfaction was mildly negative during early acquaintance with ISA, but after that became positive and was most positive after ISA was withdrawn. This indicates that the participants regretted losing ISA.

Figure 3 shows intention to speed over time. ISA reduced not only the actual propensity to speed as discussed earlier but also intention to speed. In other words use of ISA acted as a kind of vaccination against wanting to speed, and the effect persisted into the after period.

We also examined the long term accident reduction penalty of ISA and carried out a cost-benefit analysis that, on the benefit side, considered both the accidents saved with ISA and reduction in fuel consumption and CO2. We looked at two scenarios of the future. The first was a Market Driven scenario with relatively slow adoption of ISA and the ISA systems chosen generally tending to be the less effective advisory ones. The other scenario was an Authority Driven one, in which fitment of

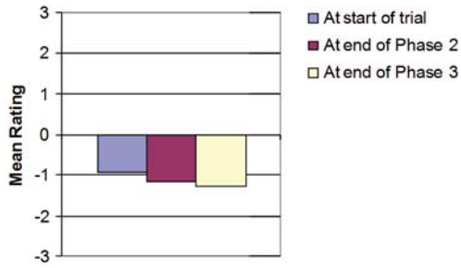


Figure 3: Mean intention to speed

Voluntary ISA on new vehicles became required and in which, once virtually every vehicle had ISA, it became compulsory to use it. Table 1 compares the numbers of crashes saved under the two scenarios over the period 2010 to 2070. It can be seen that the Authority Driven scenario is far more effective.

The overall benefit to cost ratios (BCRs) calculated are 3.4 for the Market Driven scenario and 7.4 for the Authority Driven scenario. In both cases almost all the costs are attributable to the in-vehicle equipment. These BCRs mean that both of the alternative futures are fully justifiable in terms of social investment, but the more forceful scenario clearly has greater pay-off.

Thus it can be seen that both scenarios are "winners" but benefits are tied very closely to the form of ISA and the rate of adoption. Indeed, the harder the push for ISA, and the "stronger" the system, the greater the benefits. It should be noted that ISA can potentially deliver far more than was considered in this analysis. For example, it was assumed that, apart from the introduction of ISA, there would be no fundamental changes in the speed management regime. But ISA could deliver 20mph zones for virtually no cost, since all that would be required would be an alteration in the speed limit map. There would be no need for all the costly infrastructure changes normally associated with 20mph zones. ISA could also be employed dynamically, with the addition of a communications interface. This would enable dynamic speed management to be extended to the whole road network. In the long run, we might get away completely from having fixed speed limits.

The conclusion is that here is a system with very large safety potential. Whether that potential is fully exploited will be determined by the political process. ■

Table 1: Crashes saved 2010 to 2070

Scenario	Slight Crashes	Serious Crashes	Fatal Crashes
Market Driven	4%	8%	13%
Authority Driven	15%	25%	30%

Reputation for excellence

The Institute for Transport Studies (ITS) at the University of Leeds, UK, is Europe's largest single academic department for transport teaching and research, enjoying a worldwide reputation for excellence.

For almost 40 years it has provided policy-makers with the evidence to underpin sound decision-making, keeping a watchful eye on the impacts of new developments to see how technology can help create safer, cleaner, more efficient and sustainable transport.

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GINA lends a hand with GNSS

IRF BPC bringing GNSS-based road pricing a step closer to maturity

Today, road transport faces major challenges such as the ever-increasing need for safety, as well as for reduced congestion and pollution. These problems are particularly critical in highly populated zones, notably big cities and their surrounding areas.

Different schemes are being proposed to improve the situation, including road pricing systems to automatically charge drivers for their use of road infrastructures.

The booming use of Personal Navigation Devices (PND) opens new and challenging opportunities for the implementation of innovative satellite-based applications beyond basic navigational functions. Apart from road pricing systems, these include other promising applications such as Pay-As-You-Drive (PAYD) schemes for the insurance sector and leasing companies and the like, as well as Value Added Services (VAS) such as local mobility information.

Nevertheless, there are still several obstacles to larger scale uptake of such extended services based on Global Navigation Satellite System (GNSS) technologies. For example, the technical and economical feasibility of large scale road pricing based on GNSS only is not yet proven. Likewise, the practicalities of using the same on-board equipment for different applications have to be established.

Given the high potential of key applications, the GINA (GNSS for INnovative road Applications) project, co-funded by the European Commission and the European GNSS Supervisory Authority (GSA), was recently launched to address current obstacles with a view to bringing road pricing and road VAS a step closer to reality.

> “FOLLOWING AN IN-DEPTH ANALYSIS OF REAL END USER REQUIREMENTS, GINA WILL INITIATE THE IMPLEMENTATION OF A NATION-WIDE DEMONSTRATION IN THE NETHERLANDS”

Over the next 24 months, the 12 project partners, coordinated by the Spanish company GMV, will conduct analysis to demonstrate that the adoption of the European GNSS (currently EGNOS, and Galileo from 2013) for road pricing and VAS is both technically and commercially feasible.

Following an in-depth analysis of real end user requirements, GINA will initiate the implementation of a nation-wide demonstration in the Netherlands. In the second stage of this project, 100 cars equipped with dedicated equipment will circulate on the Dutch road network for a period of six months. By the end of the project, new business opportunities should be clearly defined for the road sector.

The future looks very promising for the installation of GNSS applications in both urban areas and at national level. Hopefully, GINA will trigger wider interest in adopting the GNSS approach from EU cities and countries. ■

Further information at info@irfnet.e

Promoting long-term pavement performance

Carlos M. Chang Albitres talks about affordable, safer, and environmentally friendly pavement preservation practices

One of the major components of public infrastructure is the transportation group. This group mainly includes the road network, airports, railroads, and ports. The road network is perhaps the most important component of this group for providing ground links between businesses, industries, and consumers. Because of these links, there is a strong relationship between funds allocated in road infrastructure and economic growth.

The maintenance and rehabilitation of road infrastructure demands a great investment of time and money. The deterioration of pavement condition over time due to environmental factors and increasing traffic loads combined with the limitation of funds available for maintenance and rehabilitation creates a complex challenge.

A multidisciplinary coordinated effort is needed for addressing this challenge. This

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involves the use of new materials and innovative pavement preservation techniques. Without any doubt, the availability of new materials, new pavement preservation techniques, and alternative funding strategies for a better return on investments will be reflected on network condition and future funding needs.

A long-term vision to foster a sustainable and affordable programme to preserve road infrastructure starts with setting goals and delimiting expectations for building long-term lasting pavements. This involves a comprehensive understanding of the complex factors that influence pavement performance. Pavement performance includes consideration of functional performance, structural performance, and safety. In addition to this, the concept of green roads for better living should be encouraged by governmental policies to ensure high quality of life for all while protecting our natural system. Warm asphalt mixes, rubberised asphalt pavements, new environmentally friendly bitumen products for slurry seals, microsurfaces, and cape seals are just some examples of the evolution of new materials and technologies for pavement preservation.

As advocates of a proactive vision for affordable, safer, and environmentally friendly pavements, the International Road Federation (IRF) is supporting an international task force to coordinate efforts and foster collaboration among experts.

The first meeting of this nature will be held in Orlando, Florida from 4-7 August, 2009. ■

Carlos M. Chang-Albitres, Ph.D., P.E. is an Assistant Professor at the University of Texas at El Paso. Dr. Chang is recognised as an international expert on roadway materials and pavements, pavement evaluation, pavement management, knowledge management, decision making techniques and asset management. He has published many technical papers and books. Dr. Chang also serves as board member at the International Road Educational Foundation and as the Regional Coordinator for the IRF Fellowship Program in Latin America.