SPEED Fact Sheet

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ITS and Speed: accelerating the deployment of Intelligent Transport Systems for Speed Management

Introduction

The European Commission has proposed an action plan and European Directive for Intelligent Transport Systems (ITS). The time is therefore ripe for an update on the advancement of ITS and Speed Management within ETSC's Speed programme. This Fact Sheet will present a brief overview of:

-The content of the EU Action Plan and Directive proposal for ITS, with a special focus on matters related to speed.

-An overview of the existing ITS for speed management, and Intelligent Speed Assistance (ISA) in particular.

-The progress made towards the deployment of ISA, including an ISA "Barometer" for different EU countries recapitulating the ISA projects and trials that have been conducted; the state of play regarding digital mapping; and the initial deployment of ISA.

1 An EU Action Plan and Directive proposal for ITS

On 16 December 2008, the European Commission took a major step towards the deployment and use of Intelligent Transport Systems (ITS) in road transport: an Action Plan suggests a number of targeted measures, and a proposal for a Directive lays down the framework for their implementation. The purpose is to ensure better use of the newest active safety systems and advanced driver assistance systems with proven benefits in terms of in-vehicle safety for the vehicle occupants and other road users (including vulnerable road users).

ETSC supports the European Commission's proposal for the adoption of both an Action Plan and an accompanying Directive. In particular the Directive would set forth a formalised structure for ITS with the creation of a European "ITS Committee" and an "ITS Advisory Group" (Articles 8 and 9 in the Directive). The Action Plan covers the period 2009 – 2014 and a mid-term review will take place in 2012/13.

Regarding speed, a number of elements in the legislative package would have positive implications for the deployment of ITS related to speed management. The action plan has six priority areas, and three of them might have implications for ITS related to speed management. The first one is the "optimised use of road, traffic and travel data", which would notably include the improvement and regular updates of digital maps through cooperation between Member States, road concessionaires and digital maps providers. As such, provisions for the development and standardisation of digital speed limits mapping throughout the EU might be taken, which would in turn facilitate the deployment of ISA (more on that below). The second, "better traffic management", would for example favour the deployment of tools such as dynamic speed limits. The third area, "road safety" lists the most promising systems in terms of saving lives and includes collision warning and avoidance systems such as ISA (its informative version, referred to as "speed alert", is the one inserted in the Action Plan).

ITS listed in the Action plan that are related to speed management include: ISA; Adaptive Cruise Control (ACC); Collision Warning; and Emergency Braking Systems. This fact sheet will therefore provide a short introduction to these systems as well as their potential for safety.

2 Existing ITS for Speed Management

Intelligent Speed Assistance

ISA refers to a collection of technologies which assist the driver in the task of speed control. At its core is the principle that the vehicle is aware of the prevailing speed limit and gives the driver feedback, and in some cases restrict engine throttle

control, to keep the vehicle at or under the speed limit. The most commonly chosen method to make the vehicle aware of its location and the prevailing speed limit is the use of GPS devices and an on-board digital map.

What is then done with the information varies from informing the driver of the limit (advisory ISA), warning them when they are driving faster than the limit (supporting ISA) or actively aiding the driver to abide by the limit (intervening ISA).

ISA has clearly been identified as a technology that has one of the biggest life-saving potential, and regularly comes up at the top of impact assessment studies on ITS and safety. ISA is therefore a technology that ETSC is actively promoting.

Adaptive Cruise Control

ACC is a more advanced cruise control that can automatically adjust a car's speed to maintain a safe following distance. This new technology uses a forward-looking radar, installed behind the grill of a vehicle, to detect the speed and distance of the vehicle ahead of it. Adaptive cruise control is similar to conventional cruise control in that it maintains the vehicle's pre-set speed. However, unlike conventional cruise control, this new system can automatically adjust speed in order to maintain a proper distance between vehicles in the same lane. This is achieved through a radar headway sensor, digital signal processor and longitudinal controller. If the lead vehicle slows down, or if another object is detected, the system sends a signal to the engine or braking system to decelerate. Then, when the road is clear, the system will re-accelerate the vehicle back to the set speed. The Dutch institute SWOV (2008), carried an investigation of the safety of the system, with mixed outcomes.

The main conclusion is that ACC can have a favourable effect on road safety when used on motorways with non-congested traffic and can also have a positive effect on fuel consumption and road capacity. But it can also have negative safety effects if it is used in busy traffic and on roads that are not main roads. Nevertheless ACC is expected to have a large road safety effect in the future: it has been estimated that if all vehicles were fitted with ACC accidents would fall by 13% on 'provincial' roads and 3.4% on main roads, but only when used in non-congested traffic.

Forward Collision Warning

A warning system warns drivers both visually and with a sound when they are too close to a preceding vehicle. The warning depends on the time gap or time to collision between the vehicle and the vehicle ahead. The level of warning will switch from "safe" to "critical" as time decreases. Systems with auditory warnings have been proven to be effective warning mechanisms (ETSC, 2005). Driver inattention, or failure to pay adequate attention to the driving task, is one of the most common causes of front-to-rear end collision crashes and could successfully be addressed by this technology.

Emergency Braking Systems

Emergency Braking will be introduced into the markets after 2010 but deserves prioritisation due to its extremely efficient safety benefits (eIMPACT, 2008). The aim of Emergency Braking is to avoid crashes. The system reacts if a vehicle approaches another leading vehicle. Systems can react in one of three steps:

1) Optical and acoustical warning, if the approaching could lead to an accident.

2) Autonomous partial braking, if the distance is reduced further.

3) Autonomous full braking, if an accident appears inevitable. Input is the distance and the relative speed to a leading vehicle.

Emergency Braking Systems can reduce impact speed in case of immediate danger, which increases passive safety and reduces accident consequences.

- Reduced risk of injuries / collision mitigation through decreased impact velocity

- Reduction of braking distance through immediate braking action and adapted, improved brake assist function

- Support for collision avoidance and collision mitigation

With the total penetration of the full Emergency Braking system it has an estimated fatality reduction of 7% in the EU25 scale, and one of the highest benefit-cost ratios there is for driver support systems. The eSafety Forum included it as one of the priority systems in 2008.

3 Progresses towards ISA, and the "ISA Barometer"

ISA is advancing fast, some automotive manufacturers such as Daimler AG (in its Mercedes Benz cars) and General Motors (in its Opel cars) have started offering informative ISA in their vehicles, and nomadic device providers such as Blaupunkt are doing the same.

In 2006 ETSC published a position on ISA called "ISA Myths and Realities", exposing the fact that there has been extensive research into ISA and trials carried out over more than two decades, showing that:

-ISA can bring substantial safety benefits.

-ISA can reduce fuel consumption and other pollution from cars including noise.

-ISA is cost-effective.

-Test drivers show a high acceptance after testing the technology.

-The technology is robust, reliable and ready to use.

This publication was intended also to refute a number of myths about ISA, including for example the idea that ISA is too costly, or digital speed mapping is too complex. While speed mapping is indeed complex, it is not too complex or demanding that it cannot be undertaken.

Many initiatives are taken at the European and national level to develop ISA and speed limit databases. The PROSPER and the Speed Alert projects, were concerned with standardising the approach to ISA deployment in Europe. Particular European projects are also looking to develop systems and solutions for digital mapping and their use for road safety. The ROSATTE project launched in 2008 is one of the latest projects: ROSATTE aims at facilitating access to accurate and up-to-date information about safety attributes of the road infrastructure that can be exploited for the establishment of digital road databases. The aim is to stimulate the uptake of different applications such as ISA (http://www.ertico.com/en/subprojects/rosatte/).

The provision of speed limit data in a consistent way will require the commitment of different public and private actors (road authorities, road operators, content providers, service providers, map providers) which means that they will all need to collaborate in an organised manner. Important issues involve how to gain and store speed limit information, who is responsible for getting the information, the maintenance and rapid update of the data (for example see also the European project ActMAP), but also how to standardise digital mapping throughout Europe.

The European ITS Action Plan and Directive should help make this come to life in particular thanks to the proposed actions under the first area of the Action Plan (but also in the Article 4 and Annex I and II in the Directive) on the "optimal use of road, traffic and travel data", and should use the information and tools generated by European projects.

The European Road Safety observatory (2007) also stresses that awareness of ISA has to be created. Authorities and organisations (e.g. fleet owners) can act as forerunners by implementing ISA in their vehicle fleets, as is already happening in some nordic countries.

To provide an update and illustrate the progress made on ISA throughout the years, an "ISA Barometer" was prepared for this Fact Sheet, providing a brief overview of ISA trials and projects; the state of play regarding digital speed mapping; and the initial deployment of ISA in EU countries. For convenience only EU countries are included, however note that Norway is also very active on ISA. The Norwegian road administration has made plans to implement SpeedAlert in their own vehicles, and cross-border testing of ISA with Sweden has been carried out, notably within the European TeleFOT-project.

Every trial has demonstrated that ISA has positive effects on driving speed and speed violations. The effects and acceptance tend to depend on how intervening the systems are. Given the extent of research and initiatives on ISA, preparing an exhaustive list is almost impossible, so this table might very well have missed out some of the past or ongoing initiatives.

ISA Barometer:

	ISA Projects / Trials	Digital Speed Map	Initial Deployment
Austria	A project called RONCALLI on diverse "Traffic telematic applications" was conducted, which included ISA.		
Belgium	In 2002, the first ISA trial in Belgium started in Ghent, in association with the Belgium Institute for Road Safety (IBSR), the City of Ghent, an insurance company, the provincial administration, Volvo-cars Ghent and the regional public transport company. Thirty-four cars and three buses were equipped with an ''active accelerator pedal''. The project ended in December 2003.	In Flanders an inventory was commissioned in 2006 to determine which digital speed information was available in Flanders. It was noted that already a certain basis was available and growing. The Flemish Government then planned to make an inventory of all traffic signs (including speed limit signs) along the remaining 55,000 km of municipal roads. The Flemish Government will take the lead in carrying out the zero measurement (i.e.: first measurements) on all municipal roads. The purpose is to have the database by 2010. It will then be essential that all road authorities co-operate to keep the established database up to date.	In the Belgian Federal Parliament, two resolutions on ISA were voted and approved: - One stating that ministers and members of the parliament should take their responsibility as role-models in society and equip their vehicles with ISA (presented in 2003) - Another one about the general implementation of ISA as a solution for road-safety (presented in 2004). According to the resolutions, preparations were made for a subsequent trial in Brussels with ministers as role-models. However, following political office changes this trial was never conducted despite being announced.
Denmark	In 2001 a project on ISA called INFATI was carried by the University of Aalborg. A project called "sparpaafarten" (pay as you speed) is carried out by the Traffic Research Group at Aalborg University in cooperation with the Danish insurance company Topdanmark, the computing services companies M-tec and Webhouse and Copenhagen University. The aim is to assess whether ISA combined with insurance discounts can motivate drivers to reduce speed.	There is a digital speed map based on the registration of all speed signposts in the county of North Jutland including approximately 22,000 km of roads. The local road authorities update the speed map via a web application developed for that purpose. Road Authorities can insert new speed signs, delete existing ones and they can change speed limits or change the position of signposts. The detailed digital speed map covers the North Jutland County including all roads - even minor ones. In other parts of Denmark the map covers all speed limits above 90 km/h. This information is available from: http://www.sparpaafarten.dk/en/speedmap.php	
France	France was actually one of the first countries to run an ISA trial: as early as 1982 drivers tested a system related to a cruise control, which did not automatically set the correct speed (the drivers had to set the speed manually). A large project called LAVIA was conducted since (2001-2006); this was a public/private partnership involving the Renault and PSA Peugeot Citroën manufacturers.	A digital map was prepared for the LAVIA project in the municipalities including Saint Quentin en Yvelines, Versailles, Vélizy, Villacoublay, and Le Chesnay, and the main roads connecting them with one another and with Paris. However this map was not upated since 2003. The French BALI project was launched to prove the feasibility and interest of a speed limit data collection and delivery device on the scale of a French test region: Yvelines. This means creating a technical data collection infrastructure, but above all including data holders, with local authorities at the forefront.	

Finland	There was a first trial in 2000, three different ISA-types, informative, compulsory and recording were tested. A 'recording ISA' trial was also carried by the Technical Research Centre of Finland (VTT). In all, 153 taxi drivers, four drivers in a distribution company and six novice drivers participated in the trial. The objective of the feedback was to motivate drivers toward more moderate driving behaviour. Recording ISA can be used to record driving speed information and monitor the behaviour of user groups such as fleet vehicle drivers or novice drivers. This trial did result in a reduction of driving speeds.	There is a national digital database called Digiroad in Finland which contains precise and accurate data on the location of all roads and streets in Finland (covering a total of 430,000 km) as well as their most important features, including speed limits. The data is updated regularly, and it is the Finnish Road Administration that is responsible for the implementation of Digiroad, also working with various partners such as local municipalities (The Finnish parliament passed at the end of 2003 legislation requiring municipalities to provide data so that the digital map can be updated regularly) and other partners providing IT and technical support. http://www.digiroad.fi/en_GB/	The 2007 Finnish Government programme and strategy "Transport 2030 – Major Challenges, new directions" mentions ISA as one of the solutions that will be deployed in the future in the area of traffic safety. A 2006 government resolution on improving road safety also states that: Efforts will be made within the sphere of EU cooperation to have "intelligent speed adjustment" installed as standard equipment in all new vehicles to be imported to Finland. (Ministry of Transport and Communications). We can therefore expect future progress in the deployment of ISA, also thanks to Digiroad.
Germany	A number of studies investigating the feasibility and conditions for the implementation of ISA in Germany (for example a PhD thesis at the university of Kaiserslautern, 2004). The University of Kaiserslautern was also a partner in the PROSPER project. There is also a BMW Group research project called "Adaptive speed recommendation" (ASR). ASR is meant as a system that combines curve Information, Speed Limit Information and Crossing Information in one application. It will warn the user of the need to slow down before the vehicle reaches the point where speed must be reduced.	There is a partly European funded project called FeedMap run in Germany to which NAVTEQ, Teleatlas, Navigation AG, and the BMW Group are taking part. The aim is to improve digital mapping by developing a system that lets vehicles identify deviations between the reality and the information in digital maps. The basic idea of the FeedMAP project is to use the end customer's vehicle for the automatic detection of map "deviations". The detection of map deviations and a system for updating information should then provide a higher degree of map up-to-datedness for in-vehicle map databases.	Different current and futuer systems developped by German car manufacturers are available. They are all based on the principle only to inform the driver about the speed limit situation, e.g.: - Since 09/2008 BMW series produces the application "Speed Limit Info". A fusion of a windscreen mounted camera with electronic image processing and data from a digital map are used to determine the speed limit. - Mercedes Benz is offering a system called Speed Limit Assist which detects speed-limit signs through a windscreen mounted camera and electronic image processing (i.e.: not through GPS/digital speed map). In both cases the identified speed limit is displayed on the vehicle's instrument panel.
Hungary	One trial conducted in 2003-2005 involving 20 test cars. Within the framework of the European project PROSPER.		
Netherlands	1998: one trial within the MASTER European project. This trial involved Speed limit information transmitted by transponders on the speed limit signs. In 1999 - 2000, the Transport Research Centre (AVV) of the Dutch Ministry of Transport conducted a trial involving 20 cars and one bus. One main objective was to test public acceptance. Results showed that interest was considerable and the response was predominantly positive. There was also a trial called BELONITOR with 62 lease cars equipped with ITS equipment, giving feedback on driving speed and following distance. The trial involved rewards given for the preferred behaviour. The results did show a very strong influence of rewarding.	A speed limit database has been made available on the internet: www. maximumsnelheden.info/ This is the result of the voluntary cooperation between the various Dutch road managers, which include the Department of Waterways and Public Works, the provinces, and municipalities. In a White Paper produced in 2005 the Minister of Transport introduced the need to build a digital speed map for ISA.	The transport Ministry sees ISA as a promising tool for increasing traffic safety and has started discussions on introducing informative forms of ISA into all cars in the country. There were also talks about deploying ISA in 2,500 government fleet vehicles in 2008.

Spain	1998: one trial within the MASTER European project. This trial involved Speed limit information transmitted by transponders on the speed limit signs. One trial conducted in 2003-2005 involving 20 test cars. Within the framework of the European project PROSPER		
Sweden	Many ISA trials conducted since the 1990s: 1997: In the town of Eslöv (25 passenger carsprovided with an active gas pedals for a period of 2 months) demonstrating: clear reductions in speed and in speed variation, improved behaviour in interactions with other road users, reduction of emissions, slight increases in travel time, an increased acceptance after subjects becoming accustomed to ISA. 1998: one trial within the MASTER project. This trial involved Speed limit information transmitted by transponders on the speed limit signs. 1999-2002: The world's largest trial ever conducted, coordinated by the Swedish Road Administration involved over ten thousand voluntary driver in four cities (Borlänge, Lidköping, Lund, and Umeå) over three years. The trial demonstrated clear reductions in driving speeds and speed violations, and good public acceptance of the technology. The system was also tested in a trial in Stockholm in 2004: 6 nomadic devices were tested, all of them offering the possibility of being installed in a passenger car, using GPS to give position and using the NVDB, the Swedish National Road Data Base.	The Swedish Government has issued a directive to build up a nationwide road database containing up-to-date and quality-assured data. This decision was taken as long ago as 1996. The database called NVDB is managed by the Swedish Road Administration in association with partners including the NLS, the Swedish Association of Local Authorities. The database is seen as a digital infrastructure to be of major importance within many different areas, including the deployment of ISA thanks to the mapping of speed limits. Speed data for the map is supplied both at local level and nationally. Local authorities are required by a traffic regulation to inform the NVDB whenever a speed limit changes. NVDB also relies on SRA employees, many of whom have ISA installed in their cars and report back in case of inconsistencies.	ISA systems have been installed in about 400 of the Swedish Road Administration (SRA) cars. A number of city municipalities have equipped their vehicles with informative ISA. The local buses in Lund for example are today equipped with an ISA system with auditory warning for the driver if he/she exceeds the speed limit. Freight transport companies are also contributing to the deployment of ISA in their fleet vehicles.
United Kingdom	Early projects demonstrated the viability of ISA technology. The first trial was run in 1997 by the University of Leeds, and a set of subsequent trials within the project ISA UK was subsequently commissioned to investigate how different types of drivers would behave when using ISA in everyday car driving, the acceptance of the technology, and the use in different vehicle types (cars, trucks, motorcycles). The trials indicate very good safety potential as well as a reduction in green house gas emissions, and high level of public acceptance for the technology. The results of ISA UK were published in September 2008 on the Department for Transport website: http://www.dft.gov.uk/pgr/roads/vehicles/intelligentspeedadaptation/ A report on the further work carried out for the Commission for Integrated Transport and the Motorists' Forum was released in December 2008: http://www.cfit.gov.uk/docs/2008/isa/index.htm	The Government has not yet announced a plan for the provision of a digital speed map for the United Kingdom. For the ISA UK trials a map developed by the company NAVTEQ was used, mostly based on data provided by the ISA UK researchers themselves. Transport For London (TFL) has developed a digital speed limits map for London to offer an "ISA Advisory Map" to Tom Tom navigation device users.	The ISA UK project has influenced discussions on ISA, notably through the commission of a further study expanding on its findings by the Commission for Integrated Transport (an independent body advising the Government on transport policy) and the Motorists Forum (a group of leaders in various fields: drivers, car manufacturers, motoring organisations, managers of the road network). The two bodies recommend voluntary (as opposed to mandatory) fitting and use of the device, suggests government vehicle fleets should be equipped first to encourage other drivers to join, and proposes to provide ISA for newly qualified drivers and those convicted of dangerous driving. PACTS, the Parliamentary Advisory Council for Transport Safety, has also recommended the fitting of ISA on public fleet vehicles. Any owner of a Tom Tom navigation device can download for free the "ISA Advisory Map" for London on the TFL website to have advisory ISA www.tfl.gov.uk/isa

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