Stakeholders meeting on the deployment of ITS and vehicle technologies to improve road safety

Brussels, 8 March 2013

Discussion document

Contents

1. SCOPE AND AIM OF THIS DOCUMENT

This document discusses the potential road safety improvements offered by Intelligent Transport Systems (ITS) technologies, with a focus on in-vehicle systems. It explains how some in-vehicle safety systems can contribute to the target of halving the number of road accident fatalities by 2020. Safety-enhancing potential is assessed on the basis of recent studies and research co-financed by the European Commission or carried out independently.

The aim is to provide a basis for discussion with stakeholders on the potential of these technologies to prevent accidents, or reduce their consequences, and on how best to promote the deployment of those seen to be most effective.

This discussion will help to inform and guide the industry and other stakeholders on this area of the Commission's work.

2. POLICY BACKGROUND

Road accidents and their consequences in the form of fatalities and serious injuries remain a serious problem in the European Union. Despite the encouraging improvements achieved during the decade 2001-10, much more needs to be done. Still in 2011, over 30 000 persons lost their lives and almost 1 500 000 were reported injured on EU roads in over 1 000 000 road traffic accidents.

In July 2010, the Commission adopted the Policy Orientations for Road Safety 2011-20, which provide a governance framework and strategic objectives for action aimed at improving road safety at all levels and include the ambitious target of halving the 2010 fatality figure by 2020.

One of the priority areas for action identified in the Policy Orientations is the promotion of the use of modern technology to increase road safety, in particular Advanced Driver Assistance Systems (ADAS).

The European Parliament agrees that the potential of technology should be exploited to the full. In its report on road safety concerning the Policy Orientations, it called on the Commission to take steps to deploy various ITS technologies to improve road safety and to come up with legislative proposals in certain areas. The Commission has recently adopted its CARS 2020 Communication on an action plan for the European automotive industry, which underlines the need for the industry to keep a technological lead in order to remain competitive. The objective is to deliver vehicles that are 'fuel-efficient, safe, quiet and connected'. The action plan states that road safety should follow an integrated approach comprising driver, infrastructure and vehicles and includes the drawing-up of a roadmap for the deployment of in-vehicle safety systems by the end of 2013.

A considerable amount of work has been done, and is still ongoing, to implement the Action Plan for the deployment of Intelligent Transport Systems and the ITS Directive (Directive 2010/40/EU), which provides the legal framework for the deployment of interoperable, compatible and continuous ITS systems and services across Europe. Action 3.1 involves 'the promotion of deployment of advanced driver assistance systems and safety and security-related ITS systems, including their installation in new vehicles (via type-approval) and, if relevant, their retrofitting in used ones'. Priority actions c, d, e and f in the ITS Directive include 'the provision, where possible, of road safety related minimum universal traffic information free of charge to users', 'the harmonised provision for an interoperable EU-wide eCall' and 'the provision of information and reservation services for safe and secure parking places for trucks and commercial vehicles'.

Furthermore, in order to generalise the fitting of a number of efficient safety systems on motor vehicles through the EU type-approval legal framework, the legislator has recently adopted several measures. In particular, Regulation (EC) 661/2009 of the European Parliament and Council concerning type-approval requirements for the general safety of motor vehicles[1] has introduced Electronic Stability Control systems on cars, vans, trucks and buses and the fitment of Tyre Pressure Monitoring Systems on cars as well as the mandatory fitting on trucks and buses with Lane Departure Warning Systems (LDWS)[2] and Advanced Emergency Braking Systems (AEBS)[3] preventing vehicles to drift off the road and enabling them to brake automatically if an obstacle is detected on the road ahead and the driver does not react to this imminent collision risk.

In parallel to the General Safety Regulation, another Regulation of the European Parliament and Council was finalised in 2009, namely Regulation (EC) 78/2009 on the type-approval of motor vehicles with regard to the protection of pedestrians and other vulnerable road users[4]. This Regulation is a recast of Directive 2003/102/EC[5] concerning the same topic, but with modified and more advanced provisions (i.e. mandatory fitting of Brake assist systems). The requirements encompassed in the legislation concern passive safety requirements which mitigate the critical injury levels in case of a collision of a vehicle with persons.

Recently the Council and European Parliament have adopted a Regulation for market surveillance and approval of two- and three-wheel vehicles and quadricycles (L-category vehicles). L-category vehicle is the family name of light vehicles such as powered cycles, two- or three-wheel mopeds, motorcycles with and without sidecar, tricycles and quadricycles. That Regulation (to be published) includes new functional safety requirements such as mandatory fitting of advanced brake systems on powered two-wheelers and of the automatic headlamp on feature on all L-vehicle categories. Both type-approval measures are anticipated to contribute significantly to protect vulnerable road users such as powered two-wheeler riders from harm.

3. ROAD SAFETY STATE OF PLAY

The most recent road accident figures published by the Commission in March 2012 constitute a wake-up call. Progress in cutting road fatalities slowed significantly in 2011 (to -2%), as compared with a very promising EU-wide reduction throughout the previous decade (average -6% per year). In some Member States, the number of fatalities even increased in relation to 2010.[6]

Action is required on all fronts if Commission and Member State road safety policies are to reduce the number of accidents and minimise consequences further. Particular attention needs to be given to vulnerable road users: pedestrians account for 18.3% of all fatalities, cyclists for 6.8% and users of powered two-wheelers for 17.2% - and these percentages are rising.

The most important cause of accidents is human error: this is the main factor in 80-90% of all fatal traffic accidents. Research has identified excessive speed, distraction and drink-driving as some of its most common manifestations. Potentially, therefore, in-vehicle safety systems that effectively help to pre-empt or compensate for human error and prevent offences could reduce the number of traffic accidents. Care should be taken however to avoid that driver assistance systems have negative side effects for safety, like for example additional distraction factors.

1 OJ L 200, 31.07.2009, p. 1
2 Regulation (EU) No 351/2012 (OJ L 110, 24.4.2012, p. 18)
3 Regulation (EU) No 347/2012 (OJ L 109, 21.4.2012, p. 1)
4 OJ L 35, 4.2.2009, p. 1
5 OJ L 321, 6.12.2003, p. 15
6 http://ec.europa.eu/transport/road_safety/events-archive/2012_03_29_press_release_en.htm.

It is clear that road safety should follow an integrated approach and that vehicle safety is only one out of a number of factors that determine the outcome. In order to be cost-effective, road safety policy as a whole needs to take the full range of factors into account and keep a close eye on their interplay.

4. IN-VEHICLE SYSTEMS TO IMPROVE ROAD SAFETY

4.1. State of play

Along with improved infrastructure and driver behaviour, technological developments have contributed significantly to better road safety.

The promotion of advanced technology, especially intelligent transport systems, for active safety (accident prevention) and passive safety (accident protection) was already being looked at in 2003, when the Commission adopted its Road Safety Action Programme.[7] Among the measures considered at that time was the use of alcohol interlocks, intelligent speed adaptation devices and collision warning devices.

A lot has been achieved since then, particularly in the area of passive safety, thanks to improved technology and car design minimising injuries to passengers in the event of a collision. The rapid progress achieved in this area may be due to the greater marketing potential of such improvements, which are well understood and valued by the consumer, but also to the EU type-approval legal framework on vehicle safety in particular on frontal and lateral collision protection and pedestrian protection.[8] Probably the most high-profile consequence of this legislation is the routine installation of air-bags and brake assist systems as well as the design of the front of cars for pedestrian protection. Passive safety has also been improved by the mandatory fitting and use of seat belts for all passengers.

Various 'intelligent technologies' are now available which use sensors and information processing to advise, warn or assist the driver and thus tackle accident factors linked to behaviour. It has been assessed that some of these systems, of which many are standard or optional in high-end cars, trucks or buses, have a high potential to increase safety. Some of these technologies are already being included as minimum safety requirements for certain categories of vehicle.

As regards accident prevention, the General Safety Regulation for Type-Approval'[9] requires the fitting of anti-lock braking systems (ABS) and electronic stability control (ESC) in all passenger cars, vans, trucks, buses and trailer from 1 November 2011 (with a transitional period until 2016 depending on vehicle category). Advanced emergency braking systems (AEBS) and line departure warning systems (LDWS) are mandatory for new trucks and buses since November 2012.

In addition to that the General Safety Regulation for Type-Approval introduces a new set of requirements relating to tyres, including the mandatory fitting of tyre pressure monitoring systems for passenger cars as well as new requirements on tyre wet grip, rolling resistance and noise. In order to ensure a global level playing field, the European Union also played a very active role in developping internationally harmonised rules (United Nations) on ESC, AEBS and LDWS, TPMS and tyres.

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7 COM(2003) 311 final.

8 Regulation (EC) No 78/2009 of the European Parliament and of the Council of 14 January 2009 on the type-approval of motor vehicles with regard to the protection of pedestrians and other vulnerable road users.

9 Regulation (EC) No 661/2009 of the European Parliament and of the Council of 13 July 2009 concerning type-approval requirements for the general safety of motor vehicles, their trailers and systems, components and separate technical units intended therefor.

Both the General Safety and Pedestrian Safety Regulations establish that the Commission has to report to the European Parliament and Council on technical developments in the field of enhanced passive safety requirements, the consideration and possible inclusion of new and enhanced safety features as well as enhanced active safety technologies. The commitments are laid down in Article 17 of the General Safety Regulation and Article 12 of the Pedestrian Protection Regulation. The study which will be the basis for this report will be launched in 2013 by the Commission.

Finally, the legislator recently adopted a new EU Regulation on the type-approval of motorcycles, mopeds and quadricycles (not yet published). This Regulation will make mandatory the fitting of ABS on bigger motorcycles as well as the fitting of advanced braking systems (e.g. combined braking systems) on other motorcycles.

In recent years, a lot of work has been done to evaluate new in-vehicle safety technologies in terms of their impact on road safety, their effectiveness and costs. Some of the results are briefly presented below. The terminology used for each system in the different studies is not always the same as that used below, but has been maintained to avoid misinterpretation. The functionalities of the systems may vary in the details. A table describing the functionality of each system or technology referred to has been included in Annex I.

In 2006, a study[10] carried out at the request of the Commission evaluated some in-vehicle safety systems' potential to reduce accidents and fatalities, and the related benefit-to-cost ratios.

More recently, another study[11] carried out for the Commission on the safety and comfort of vulnerable road users (action 3.4 of the ITS Action Plan) included a qualitative analysis of the ITS in-vehicle safety systems that should be prioritised on the basis of their potential to improve the safety and comfort of vulnerable road users. The results are presented in Annex II, Table II.1.

In 2008, the eSafety Forum identified eleven 'eSafety' systems, five in-vehicle systems and six cooperative systems as priority systems whose deployment should be promoted[12] (Table II.2).

The eIMPACT[13] project, co-financed by the Commission under the 7th Framework Programme, carried out an impact assessment of twelve Intelligent Vehicle Safety Systems.[14] A list of the most promising non-cooperative and cooperative in-vehicle safety systems was prepared on the basis of this assessment (Table II.3).

Some manufacturers already offer advanced in-vehicle safety systems and an overview of the current market penetration for some of them has been produced under the iCar Support project.[15] The European New Car Assessment Programme (EuroNCAP) is gradually incorporating in-vehicle technologies in its assessment programme. Through 'EuroNCAP Advanced', the programme rewards the fitting of advanced safety technologies and a roadmap is being drawn up for the inclusion of emerging crash-avoidance technologies in the assessment scheme by 2015.

10 *Cost-benefit assessment and prioritisation of vehicle safety technologies*. Framework Contract TREN/A1/56-2004. Final report January 2006.

11 Report on Action 3.4 — *Safety and comfort of the Vulnerable Road Users*. Final report May 2011.

12 eSafety Forum. *Final Report and Recommendations of the Implementation Road Map Working Group,* 30 March 2008.

13 eIMPACT: www.eimpact.info.

14 *Stand-alone and cooperative Intelligent Vehicle Safety Systems — Inventory and recommendations for in-depth socio-economic impact assessment* (Deliverable 2 of eIMPACT [Vollmer et al., 2006]).

15 www.icarsupport.eu.

4.2. Assessment of costs and benefits

Benefit-to-cost ratios have been estimated for various in-vehicle safety systems. Some examples are referred to below. While these estimates cannot replace a detailed evaluation as part of the impact assessment that would be required for a legislative proposal, they provide a clear indication as to which systems have the highest safety potential.

Cost-benefit analysis results

The benefit-to-cost ratios of some priority systems were estimated in the eIMPACT project for two target years (2010 and 2020) and in each case for two deployment scenarios. The results are summarised in Table II.4.

One study estimated the benefit-to-cost ratio for Intelligent Speed Adaptation (or Speed Alert in the table) as ranging between 3.4 and 7.4, depending on the deployment scenario[16]. Benefit-to-cost ratios were also evaluated for the Advanced Emergency Braking and Lane Departure Warning systems as part of the impact assessment[17] accompanying the proposal for the General Safety Regulation. Despite their significant potential to reduce accidents and fatalities, their benefit-to-cost ratios were too low for cars at that time.

The benefit-to-cost ratio of the mandatory installation of alcohol interlock for drivers who have been caught with high levels of alcohol in their blood was evaluated for four countries in the framework of the IMMORTAL project[18] and assessed as yielding a benefit in three of them.

The mandatory fitting of advanced brake systems (combined brake systems and/or antilock brake systems) on powered two-wheelers has been estimated to result in a benefit-to-cost ratio between 2.4 and 3.2, possibly saving 5 332 lives over the 10 years following the adoption of the mandate, which is foreseen for 2016.

Considerations regarding cost-benefit evaluation

The unit cost of new in-vehicle safety systems will certainly decrease in line with technological improvements and economies of scale. Some savings may result from synergies between various systems that share hardware components. Nevertheless, the number of accidents and casualties will also be reduced. This could result in a situation where pure economic analysis does not yield a favourable benefit-to-cost ratio, despite an obvious societal demand to further improve road safety. In these circumstances, the assessment of costs and benefits for in-vehicle safety systems should take reasonable account of societal benefits that are not quantifiable in economic terms. Also, the assessment of economic costs should be comprehensive and include, in addition to the cost of fatalities:

(a) a more accurate estimate of the cost of serious injuries, particularly that resulting from permanent disabilities;

(b) the cost of non-serious injuries;

(c) the cost of accidents without injury; and

(d) the cost of infrastructure repair and maintenance.

16 Lai, F., Carsten, O., Tate, F., 2011. *How much benefit does Intelligent Speed Adaptation deliver: An analysis of its potential contribution to safety and environment*.

17 COM(2008) 316 and SEC(2008) 1909.

18 W.P., Wesemann, P., Devillers, E., Elvik, R. & Veisten, K. (2005). *Detailed Cost-Benefit Analysis of Potential Impairment Countermeasures*. Deliverable P.2 of IMMORTAL project.

5. PRIORITY IN-VEHICLE SAFETY SYSTEMS

A list of in-vehicle safety systems whose deployment could be promoted has been compiled based on a review of recent studies and research projects, and taking into account the priority objectives established in the 2010-20 Policy Orientations for Road Safety. The systems proposed are classified in two groups according to their potential to increase road safety: those which are judged to have high potential and should be given priority, and those requiring further assessment.

5.1. In-vehicle safety systems with high safety potential

Cooperative in-vehicle safety systems

5.1.1. Intelligent speed adaptation

Various studies have assessed Intelligent Speed Adaptation (ISA) as having a high benefit-to-cost ratio. This is logical given that excessive or inadequate speed is one of the most common accident factors. Its deployment requires Member States authorities to collect, register and update information on speed limits in the network, ideally including real-time communication between vehicles and the infrastructure to feed in variable speed limits. The European Parliament's Report on Road Safety called on the Commission to 'draw up a proposal to fit vehicles with "intelligent speed assistance systems" which incorporates a timetable, details of an approval procedure and a description of the requisite road infrastructure'.

Non-cooperative in-vehicle safety systems

5.1.2. Advanced emergency braking

Advanced emergency braking systems (AEBS) will become mandatory for new trucks and buses as of 1 November 2013 for new types of vehicle and as of 1 November 2015 for all new vehicles in the relevant categories. In the impact assessment for the General Safety Regulation, the benefit-to-cost ratio was not considered high enough to mandate AEBS on other vehicle categories[19]. The extension of the scope to other categories of vehicles (e.g. passenger cars) will however be assessed by the Commission in the framework of the report foreseen in article 17 of the General Safety Regulation.

5.1.3. Lane departure warning systems

Lane departure warning systems (LDWS) will become mandatory for new trucks and buses as of 1 November 2013 for new types of vehicle and as of 1 November 2015 for all new vehicles in the relevant categories. As in the case of AEBS, the safety impact and benefit-to-cost ratio were assessed under the impact assessment for the General Safety Regulation. Again, the extension of the scope to other categories of vehicles (e.g. passenger cars) will be assessed by the Commission in the framework of the report foreseen in article 17 of the General Safety Regulation.

5.1.4. Pedestrian detection system/emergency braking

Pedestrian detection systems combined with automatic emergency braking (PDS/EBR) have been identified as one of the technologies with high potential for improving vulnerable road users safety. Various technologies are starting to be commercially available. Their inclusion into the type-approval legislation will be assessed by the Commission in the framework of the report foreseen in article 17 of the General Safety Regulation.

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19 Impact assessment accompanying the proposal for a regulation of the European Parliament and the Council concerning the type-approval requirements for the general safety of motor vehicles, SEC(2008) 1908

5.1.5. Blind spot detection for trucks

Blind spot detection for trucks (BSD-T) has been identified as having potential for improving the safety of vulnerable road users, particularly cyclists in urban areas. Some technologies are available commercially but additional work will be required for type-approval. Its inclusion into the type-approval legislation will be assessed by the Commission in the framework of the report foreseen in article 17 of the General Safety Regulation.

5.1.6. Alcohol interlocks

Alcohol is one of the main causes of road accidents and several studies have concluded that alcohol interlock devices have the potential to reduce the number of accidents related to drink-driving. The European Parliament's Report on Road Safety recommends that alcohol interlocks be fitted to the vehicles of road users who already have more than one drink-driving conviction and to all new types of commercial passenger and goods transport vehicles. Some Member States already regulate the use of alcohol interlocks for certain drivers or vehicle types. The Commission has launched a study to assess the safety benefits of alcohol interlocks resulting from various options for installation; the results will be available in late 2013.

5.2. In-vehicle safety systems that require further assessment

The safety benefits of the in-vehicle safety systems discussed below require further assessment.

5.2.1. Event Data Recorders

Event Data Recorders (EDRs) do not prevent road accidents but can help accident investigators and researchers to draw conclusions on the relationship between safety incidents, accident occurrence and accident severity. A study to assess the potential safety benefits of EDRs is planned for 2013. Manufacturers could produce multifunctional devices by linking EDRs to digital tachographs.

5.2.2. Speed limiters for light commercial vehicles

Speed limiters are already mandatory for trucks and buses. A study will be carried out in 2013 to assess the effects of their installation, on the basis of which a decision can be made on extension of such systems to light commercial vehicles. An alternative to speed limiters could be mandatory ISA.[20]

5.2.3. Tyre-pressure monitoring systems

Tyre-pressure monitoring systems (TPMSs) are mandatory for passenger vehicles. The impact of TPMSs for goods vehicles too will be assessed by the Commission in the framework of the report foreseen in article 17 of the General Safety Regulation.

5.2.4. eCall for powered two-wheelers

Work is currently under way, in the framework of Directive 2007/46/EC, on a legislative proposal to make eCall mandatory in all new types of passenger cars and light duty vehicles. The fitting of eCall on motorcycles needs further technical development and assessment before being considered for type-approval.

6. THE WAY FORWARD

On the basis of the various assessments presented above, it appears that in-vehicle safety systems could significantly reduce the number of accidents and their consequences. Given these systems' potential to tackle human error (the main cause of road accidents) and the level of technical maturity that some of them have reached, it is likely that their widespread

[20] i.e. a version of Intelligent Speed Adaptation that prevents the driver from exceeding a certain speed limit.

deployment would yield favourable benefit-to-cost ratios in comparison with other alternatives like e.g. driver awareness and training or enforcement or better infrastructure. Certainly, various studies point in that direction. The arguments in favour of measures to promote deployment of these systems include the following:

1) Road safety is a serious societal problem and should be addressed across the board, including in the field of vehicle technology;
2) Widespread use of the ITS and in-vehicle safety systems discussed above could yield significant benefits for road safety;
3) The unit cost of the new systems would be reduced with wider deployment for some vehicle categories;
4) Where several systems are fitted, there may be synergies between them that result in more efficient design and lower costs;
5) Raising minimum safety requirements would help maintain the European car industry's technological lead in this area;
6) In-vehicle safety systems complement action taken in the context of ITS policy.

The promotion of additional safety systems should take into account that some of the measures recently adopted in the type-approval legislation with regard to in-vehicle safety are still being phased-in. Furthermore, the possible negative effects of ITS (e.g. distraction, reliability/complexity of the systems, possible lack of control by the driver) should also be taken into account.

7. QUESTIONS FOR DISCUSSION

- What is the potential of in-vehicle safety technologies for accident reduction, in particular in comparison with other road safety actions? What are their possible negative effects?
- How can this potential be better assessed? What data are available or missing?
- What are the most effective technologies today? What is their cost?
- Are there any other promising technologies under development?
- How to deal with the uncertainty of effectiveness and cost evaluation?
- How should the deployment of effective technologies be promoted (legislation, incentives, retrofitting, awareness campaigns)?
- How can legislation be adapted to the technology development cycle?
- What is needed in terms of technical standards/requirements?
- How to balance safety measures with the privacy protection of vehicle owner?

ANNEX I. TERMINOLOGY

Safety System	Type of system	Functionality
Adaptive Head Lights (AHL)	In-vehicle Non-cooperative	Directs the lights into the bend when the vehicle begins cornering to ensure optimum illumination of the lane.
Advanced Emergency Braking System (AEBS)	In-vehicle Non-cooperative	Advanced emergency braking systems detect an emergency situation and activate the vehicle brakes in order to avoid or mitigate the collision.
Blind Spot Detection for Trucks (BSD-T)	In-vehicle Non-cooperative	Detects and warns the driver about the presence of other road users, particularly vulnerable road users, or objects in the blind spots.
Blind Spot Monitoring	In-vehicle Non-cooperative	Same as Lane Change Assist (LCA)
Driver Drowsiness Monitoring and Warning (DDM)	In-vehicle Non-cooperative	Warns drivers when they are getting drowsy.
Electronic Stability Control (ESC)	In-vehicle Non-cooperative	Stabilises the vehicle within the physical limits and prevents skidding through active brake intervention and engine torque control.
Event Data Recorder	In-vehicle Non-cooperative	Collects certain vehicle parameters to be stored in the event of an accident. The data can be used for scientific, technical and legal purposes.
Full Speed Range Adaptive Cruise Control (ACC)	In-vehicle Non-cooperative	Adapts the speed of the vehicle and its distance to vehicles ahead down to standstill. May restart the vehicle.
Lane Change Assist (LCA)	In-vehicle Non-cooperative	Warning for of vehicles next to or at the rear of the vehicle just before lane change.
Lane Departure Warning (LDW)	In-vehicle Non-cooperative	Monitors the vehicle trajectory and warns the driver of an unintentional drift of the vehicle out of its travel lane.
Night Vision and Warning	In-vehicle Non-cooperative	Enhanced vision at night through near or far infrared sensors, including obstacle warning.
Obstacle & Collision Warning	In-vehicle Non-cooperative	System detects obstacles and gives warnings when collision is imminent.
Pedestrian Detection System/Emergency Braking (PDS/EB)	In-vehicle Non-cooperative	Detection of vulnerable road users and fully automatic emergency braking.
Pre-Crash Protection of Vulnerable Road Users (PCV)	In-vehicle Non-cooperative	Same as Pedestrian Detection/Emergency Braking
Dynamic Traffic Management	Infrastructure Non cooperative	Manage traffic flows by influencing speeds, lane use, route choice or merging operations by employing variable message signs (VMS).
eCall	Cooperative	Automatic emergency call for help in case of an accident.
Extended Environmental Information (Extended Floating Car Data)	Cooperative	Uses vehicle data (e.g. switched-on lights, windscreen wipers on, fog lights on, information from ABS, stability control systems) to create useful information about the conditions in which the vehicle is driving.
Intelligent Speed Adaptation (ISA)	In-vehicle Cooperative	Compares the actual speed of the vehicle with the local speed limit and/or the appropriate speed depending on the actual driving conditions. It advises the driver or controls the vehicle until the speed is reduced to the appropriate limit.
Intersection Safety (INS)	Cooperative	Red light warning, right of way information at signalised intersection and stop signs and left turn assistance.
Local Danger Warning	Infrastructure Non cooperative	Spot-wise warnings via variable message signs, flashing or electronic beacons, radar-based excessive speed information.

Safety System	Type of system	Functionality
Real-time Travel and Traffic Information	Cooperative	Provides information to the driver, via in-vehicle systems and nomadic devices, about the traffic (congestion) and weather conditions.
Wireless Local Danger Warning (WLD)	Cooperative	Inter-vehicle communication distributing early warnings for accidents, obstacles, reduced friction and bad visibility.

ANNEX II. RESULTS FROM SOME STUDIES AND RESEARCH PROJECTS

Table II.1	
Study on action 3.4 of the ITS Action Plan **Safety and comfort of vulnerable road users** **Advanced Driver Assistance Systems to be prioritised**	**Overall Score***
Pedestrian Detection System/Emergency Braking	13
Intelligent Speed Adaptation	11
Blind Spot Detection for Trucks	9
Adaptive Head Lights	8
Night Vision and Warning	7
Alcohol Interlocks**	7
Driver Drowsiness Monitoring and Warning	4
Lane Change Assist	3
Lane Keeping Support	3
Blind Spot Detection for Cars	3

* Based on a multi-criteria qualitative assessment

** Alcohol Interlock is not classified as Advanced Driver Assistance System but as a 'regulatory application'

Table II.2

Priority systems identified by the eSafety Forum

In-vehicle safety systems	**Infrastructure related systems**
ESC (Electronic Stability Control)	eCall
Blind Spot Monitoring	Extended Environmental Information (Extended Floating Car Data)
Adaptive Head Lights	Real-time Travel and Traffic Information
Obstacle & Collision Warning	Dynamic Traffic Management
Lane Departure Warning	Local Danger Warning
	Speed Alert

Table II.3
eIMPACT Most promising stand-alone and cooperative Intelligent Vehicle Safety Systems
1. Electronic Stability Control (ESC)
2. Full Speed Range ACC (FSR)
3. Emergency Braking (EBR)
4. Pre-Crash Protection of Vulnerable Road Users (PCV)
5. Lane Change Assistant (Warning) (LCA)
6. Lane Keeping Support (LKS)
7. Night Vision Warning (NIW)
8. Driver Drowsiness Monitoring and Warning (DDM)
9. eCall (one-way communication) (ECA)
10. Intersection Safety (INS)
11. Wireless Local Danger Warning (WLD)
12. Speed Alert (SPE)

Table II.4 eIMPACT: Synopsis of benefit-to-cost ratios

Safety systems	2010		2020	
	Low	High	Low	High
Electronic Stability Control	4.4	4.3	3	2.8
Full Speed Range Adaptive Cruise Control	n.a.	n.a.	1.6	1.8
Emergency Braking	n.a.	n.a.	3.6	4.1
Pre-Crash Protection of Vulnerable Road Users	n.a.	n.a.	0.5	0.6
Lane Change Assistant (Warning)	3.1	3.7	2.9	2.6
Lane Keeping Support	2.7	2.7	1.9	1.9
Night Vision Warning	0.8	0.9	0.7	0.6
Driver Drowsiness Monitoring and Warning	2.5	2.9	1.7	2.1
eCall	2.7		1.9	
Intersection Safety	n.a.		0.2	
Wireless Local Danger Warning	n.a.	n.a.	1.8	1.6
Speed Alert	2.2	2	1.9	1.7
n.a. = not available				