European Transport Safety Council

BRIEFING

Cooperative Intelligent Transport Systems (C-ITS)

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Contents

1. Introduction

The European Transport Safety Council (ETSC) welcomes the communication by the European Commission outlining a European Strategy on Cooperative Intelligent Transport Systems (C-ITS)[1] as well as the preparations by the European Parliament on a report responding to the C-ITS Strategy. One of the main potential benefits of the use of C-ITS is improved road safety.

25,670 people lost their lives on EU roads in 2016. As a small reduction in road deaths of 2% - following an increase of 1% in 2015 and stagnation in 2014 – it is the third consecutive poor year for road safety. In addition, more than 130,000 people were recorded as seriously injured in 2016. These poor figures underline that targeted measures and new technologies with clear road safety benefits are urgently needed.

2. Cooperative Intelligent Transport Systems (C-ITS)

2.1 Background

Digital technologies have developed rapidly over the past decades and they are increasingly being introduced in transport. While Intelligent Transport Systems (ITS) focus on digital technologies providing intelligence placed at the roadside or in vehicles, C-ITS focuses on the communication between those systems – whether it is a vehicle communicating with another vehicle, with the infrastructure, or with other C-ITS systems.

Vehicles and infrastructure equipped with C-ITS can, for example, communicate a warning to each other, after which the drivers are informed about the upcoming traffic situation in time for them to take the necessary actions in order to avoid potential harm. Other potential benefits of the use of C-ITS include reduced congestion and improved driver comfort.

The European Commission's Strategy outlines its plan for the coordinated deployment of C-ITS in Europe, setting out the issues which it feels should be addressed at EU level such as the priorities for the deployment of C-ITS services and the security of C-ITS communications, among others. The

[1] European Commission (2016) Communication 'A European strategy on Cooperative Intelligent Transport Systems, a milestone towards cooperative, connected and automated mobility' https://goo.gl/MeLqpo

European Commission states in the Strategy that the full-scale deployment of C-ITS services and C-ITS enabled vehicles is expected to start in 2019[2].

ETSC contributed to both phases of the European Commission's C-ITS Platform, in which national authorities, C-ITS stakeholders and the Commission discussed the deployment of C-ITS as part of the way towards cooperative, connected and automated mobility.

ETSC endorses the conclusions and recommendations of the C-ITS Platform's Working Group on Road Safety[3]. However, ETSC feels that additional recommendations can be made, such as a proposed timetable for the introduction of the respective safety-related C-ITS services, and fast tracking those that will have the highest safety benefits and potential.

2.2 Benefits for Road Safety

Based on the results of various studies and projects, the C-ITS Platform concluded that the cooperation between intelligent systems has the potential to significantly improve road safety[4], as it helps the driver to take the right decision and adapt to the traffic situation.

Given that several C-ITS technologies and services are already available and have proven their safety benefits, ETSC calls for their deployment without further delay.

Furthermore, C-ITS services that deliver large safety benefits should be available on all new vehicles across Europe.

2.3 Preparing for the Future of Automated Driving

Communication and cooperation between vehicles and between vehicles and infrastructure are essential for the safe integration and operation of automated vehicles in the future transport system. While the theoretical safety benefits of connected and automated driving are huge as they will clearly mitigate some risks, they may also create new ones[5].

In addition, while several C-ITS technologies are mature enough to prevent collisions, others are still being developed and have not yet shown this maturity. There is therefore an urgent need to put in

[2] European Commission (2016) Communication 'A European strategy on Cooperative Intelligent Transport Systems, a milestone towards cooperative, connected and automated mobility' https://goo.gl/MeLqpo
[3] C-ITS Platform Phase II (September 2017) Cooperative Intelligent Transport Systems towards Cooperative, Connected and Automated Mobility. Final Report. https://goo.gl/XMbwF8
[4] IBID, p. 79
[5] ETSC (2016) Prioritising the Safety Potential of Automated Driving in Europe. https://goo.gl/UUfmV6

place certain prerequisites prior to the wider deployment of both connected and automated vehicles in Europe.

The urgent need for prerequisites for automated driving was underlined by the fatal accident in 2016 involving a Tesla vehicle that was equipped with an 'Autopilot system' but which was used incorrectly. C-ITS is one means by which the accident could have been prevented, as vehicle to vehicle communication could have warned of the imminent collision.

While much of the hype in the media these days is concerned with autonomous vehicles, ETSC believes that policymakers should not merely focus their regulatory eyes on very futuristic systems, but should also ensure the adoption of life-saving technologies that are available now or that are near-to-market.

In the short term, regulators should still focus on solutions that address the main killers currently on the road: speed, alcohol and distraction. Mandating life-saving technologies that make use of C-ITS, for example Intelligent Speed Assistance using dynamic speed limit information, can both help to address these killers as well as enhance the deployment of C-ITS.

3. Prioritising Safety Services

3.1 Day 1 and Day 1.5 Services

The C-ITS Platform and the Commission agreed on C-ITS services that are highly beneficial and therefore should be deployed quickly. These services are collected in the Day 1 and Day 1.5 lists based on their technological maturity[6].

ETSC calls for the C-ITS services that will have the highest safety potential to be prioritised and rapidly deployed. ETSC supports the list of safety services identified by the C-ITS Platform in their Phase II Report[7], whose deployment should be prioritised. This list consists of[8]:

Day 1 Services:

- In-vehicle speed limits, including dynamic speed limits
- Emergency electronic braking light
- Road works warning
- Weather conditions, if linked to dynamic in-vehicle speed limits
- Intersection safety

Day 1.5 Services:

- Vulnerable road user protection

Although the C-ITS Platform's Report provides a description[9], there are currently no definitions nor requirements set for these C-ITS services. ETSC therefore calls for urgent work on these definitions and requirements, coordinated by the European Commission.

3.2 Prioritise Low Cost Solutions

ETSC supports the conclusion of the C-ITS Platform's Working Group on Cost-Benefit Analysis on the need to prioritise low cost solutions which can bring immediate safety benefits[10]. ETSC would also welcome a push for functionalities that exploit mobile phone technologies which are already

[6] European Commission (2016) Communication 'A European strategy on Cooperative Intelligent Transport Systems, a milestone towards cooperative, connected and automated mobility' https://goo.gl/MeLqpo
[7] C-ITS Platform Phase II (September 2017) Cooperative Intelligent Transport Systems towards Cooperative, Connected and Automated Mobility. Final Report p.81 https://goo.gl/XMbwF8
[8] More information on these services can be found in Chapter 8.
[9] European Commission (2016) C-ITS Platform Final Report. WG1-Annex 1 https://goo.gl/7VCxBe
[10] C-ITS Platform Phase II (September 2017) Cooperative Intelligent Transport Systems towards Cooperative, Connected and Automated Mobility. Final Report p.81 https://goo.gl/XMbwF8

available on vehicles, making use for instance of the in-vehicle communications devices needed for eCall.

3.3 Infrastructure Needs

Infrastructure managers across the EU would benefit from a long term plan by the European Commission for gradual C-ITS implementation, in order to make the right investments in the infrastructure with a limited budget.

4. A Timetable for the Deployment of C-ITS Services

The swift introduction of C-ITS services has great safety potential, however a clear timeframe for their introduction is currently lacking. Establishing a clear timeline would enhance investment security for both infrastructure managers and industry, which in turn will benefit the deployment of C-ITS.

The Commission should therefore, as soon as possible, establish a detailed timetable for the introduction of the previously mentioned safety enhancing C-ITS services. The Commission's timetable should provide a clear set of targets for what it envisages the EU needs to achieve between 2019 and 2029 in the context of the gradual EU-wide deployment of C-ITS, and include a timeline with estimates of when different C-ITS services will need to be deployed.

The Commission should furthermore define a timeline with enabling actions, in which it lists the steps that will be taken in order to assist Member States in implementing the C-ITS services.

While developing these timelines, the Commission should prioritise those C-ITS services which have been tested and have a proven road safety record. It should also prioritise low cost solutions and those with a high cost-benefit ratio.

Additionally, the Commission should clarify which C-ITS services are encouraged, and which ones will be mandatory and by when. C-ITS services enhancing road safety should however be mandatory. Retrofitting older vehicles with an on-board unit that can provide basic C-ITS services that enhance road safety should also be considered if found cost-effective.

5. Human-Machine Interaction

ETSC supports the C-ITS Platform's recommendation that the underlying principle for the design of human-machine interfaces (HMI)[11] should be a safe operation of the vehicle, taking into account the human capabilities[12].

When C-ITS services warn a driver of a dangerous situation, the information provided to the driver should be limited to the minimum necessary for understanding and taking adequate action in the available timeframe. C-ITS messages should not distract the driver, especially when managing an emergency manoeuvre.

The timing of alerts is furthermore essential and should be adapted to the emergency situation. They should be provided early enough for the driver to be able to react properly. For emergency cases, the C-ITS message should provide the driver with only the information on his/her expected behaviour.

The interaction between human and machine should be designed in such a way that any licensed driver is able to effectively and safely use the C-ITS services. As a consequence of this, HMI for safety-critical situations should be consistent across all vehicles, including pictograms' form, colour and positions, auditory warning sounds, and haptic warnings.

ETSC furthermore calls for the *European Statement of Principles on Human Machine Interface for In-Vehicle Information and Communication Systems* to be updated[13]. Currently, the Statement of Principles concerns the safe, distraction-less design of a vehicle's functions and parts with which a driver interacts. These statements should be updated to also include the HMI of C-ITS services whose design it is to warn the driver.

[11] Human-Machine Interfaces are those instruments in a vehicle which inform the driver or with which the driver can control the vehicle's systems. For example icons and displays as well as buttons and touchscreens.
[12] C-ITS Platform Phase II (September 2017) Cooperative Intelligent Transport Systems towards Cooperative, Connected and Automated Mobility. Final Report p.81 https://goo.gl/XMbwF8
[13] European Commission (2008) European Statement of Principles on Human Machine Interface. https://goo.gl/zXSXHe

6. Adapting Driver Behaviour

While most drivers are expected to adapt to the deployment of C-ITS applications, not all drivers will. The training, testing and licensing of drivers therefore needs to be adapted alongside the development of new technology features in vehicles.

Drivers also need to be aware of what safety features are available on the market and aware of which safety features are installed in their vehicles.

7. C-ITS for Vulnerable Road Users

As yet, vulnerable road users, such as pedestrians, cyclists and powered two-wheelers, are only starting to benefit from new vehicle safety technologies[14]. The C-ITS Platform's first report already highlighted the challenge posed by unequipped users[15]. A recent EU funded project VRUITS has come up with a list of recommendations on how VRUs can be integrated and reap the full benefits of C-ITS[16]. This covers issues such as integration of C-ITS into bicycles, and the need for research into use cases in order to assess risk amongst VRUs of C-ITS. It also looks at the different implications of using C-ITS applications in smart phones including also challenges regarding sensor accuracy. It has prepared a road map for deployment of VRU applications. One of its key recommendations is that cyclists could benefit from the development of a statement of principles (similar to the HMI Statement of Principles for in-vehicle systems) for ITS[17].

8. Safety C-ITS Services

The C-ITS Platform identified the following Day-1 services whose deployment should be prioritised. While ETSC supports this list of prioritised services, several service-specific issues also need to be taken into account.

[14] ETSC (2016) The European Union's Role in Promoting the Safety of Cycling. https://goo.gl/Jw99Ea
[15] European Commission (2016) C-ITS Platform Final Report. https://goo.gl/7VCxBe
[16] VRUITS (2016) Recommended practices for improving usability of ITS applications and the integration of VRUs in C-ITS systems. http://goo.gl/3uK6hz
[17] European Commission (2008) European Statement of Principles on Human Machine Interface. https://goo.gl/zXSXHe

8.1 In-vehicle (dynamic) speed limits

This type of service would inform the vehicle of the speed limit that applies to the road it is currently driving on. One example of vehicle technology that would use this service is Intelligent Speed Assistance (ISA), of which those using dynamic speed limits can be considered as C-ITS.

ISA is an overridable system that communicates the current speed limit to the driver using digital maps and speed sign recognition, and helps the driver to keep within the limit. Excessive speed is the single biggest contributory factor in fatal road crashes, and ISA is expected to reduce collisions by 30% and deaths by 20%[18].

Considerable safety and efficiency benefits can thus be expected from the use of in-vehicle speed limits linked with ISA, provided that dynamic information is used.

ETSC therefore calls on Member States and the European Parliament in the upcoming revision of the General Safety Regulation 661/2009 to mandate an overridable assisting Intelligent Speed Assistance system that defaults to being switched on for all new passenger cars by 2020.

ETSC furthermore calls for all new commercial vehicles to be fitted with an assisting ISA system by 2020, in line with the European Commission's evaluation study[19]. The system should be overridable up to 100km/h for buses and 90km/h for lorries, in line with existing EU legislation on speed limiters.

In addition, while speed limit icons are generally well understood, thought should be given to how temporary speed limits are displayed in the vehicle.

8.2 Weather conditions

This C-ITS service would inform the driver of hazardous weather conditions, such as fog, rain and ice. It would be especially beneficial if the service is linked to in-vehicle speed limits, thereby informing the driver and vehicle of the appropriate speed for the weather condition he or she is driving in.

In addition, the system would warn for those dangerous weather conditions which are hard to be visually perceived by the driver, such as wind gusts. However, clearly understood messages and symbols still need to be developed.

[18] ETSC (2017) Briefing: Intelligent Speed Assistance (ISA) https://goo.gl/yXUo1k
[19] Transport & Mobility Leuven (2013) Ex-post evaluation of Directive 92/6/EEC on the installation and use of speed limitation devices for certain categories of motor vehicles in the Community, as amended by Directive 2002/85/EC. https://goo.gl/4kWEvL

8.3 Road works warning

This service would inform drivers about upcoming road works, including possible restrictions and lowered speed limits. It will therefore improve the safety for the workers, especially if the lower speed limits around the work site are communicated to the vehicles' Intelligent Speed Assistance system.

8.4 Emergency electronic braking light

When a driver abruptly breaks hard, the vehicle will switch on the emergency electronic brake lights. This service would warn the following drivers in time of the abrupt reduction in speed, who can then adapt in order to avoid a collision.

The service has the potential to reduce crashes as an extended forward collision warning system, notably in weather conditions where visibility is poor, such as fog. However, there is potential that drivers will solely rely on the system and therefore drive at a higher speed, thereby again increasing the risk of a collision. Drivers therefore need to be informed about the safe functioning of the system.

The HMI of this service furthermore also needs to be specified, as there is a possibility that without consistency drivers will not understand why they are being warned. In addition, low latency and high reliability of the signals are required for the effective functioning of this system.

8.5 Intersection safety

Intersection crashes are a major problem and tend to be quite severe. With this service, drivers would be warned when they are at risk of violating a red light, or when another road user is about to make such a red light violation. Drivers could also receive warnings and be assisted in negotiating non-signalised intersections. In addition, combining the technology with automatic emergency braking should be considered.

Extensive research is however still needed in order to identify how negative impacts, such as the possible encouragement of signal violation, could be curtailed and its benefits maximised. To achieve maximum benefits and prevent drivers from expecting assistance when none is available, retrofitting for vehicles is likely to be necessary.

Further reading

- ETSC 2017, Briefing on the revision of the General Safety Regulation. https://goo.gl/3nd5Uh
- ETSC 2017, 11th Annual Road Safety Performance Index (PIN) Report. https://goo.gl/NNNakD
- ETSC 2016, Prioritising the Safety Potential of Automated Driving in Europe. https://goo.gl/UUfmV6
- ETSC 2016, The European Union's Role in Promoting the Safety of Cycling. https://goo.gl/Jw99Ea

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The European Transport Safety Council (ETSC) is a Brussels-based independent non-profit making organisation dedicated to reducing the numbers of deaths and injuries in transport in Europe.