

Intelligent Transport Systems (ITS)

FEMA Position Paper

In principle, FEMA supports the implementation of ITS technology that has the potential to provide added safety, comfort and economy to road users provided that:

- **their use is not mandatory, and does not exclude unequipped vehicles from the road;**
- **they take into account the needs, characteristics and limitations of powered two wheeler users and their vehicles;**
- **they do not create an additional hazards to any category of road users.**

This applies to all systems and functions, installed on powered two wheelers (PTWs), but also on other vehicles, and along the road infrastructure, hence including communicative systems.

In order to guarantee that current deployment and future developments comply with the above principles, all research & development should be conducted on the basis that:

- **ITS functions developed for powered two wheelers should be adapted to their needs and capabilities, and**
- **ITS in infrastructure and other vehicles must integrate the existence of motorcyclists; impact assessments must fully study the direct and indirect consequences of their use for motorcyclists, cyclists and pedestrians.**

FEMA views these principles as essential in order to protect the safety, freedom of movement and freedom of choice of the millions of powered two-wheeler users in Europe, while ensuring a continued and equal access to transport technologies that offer safer, more efficient and greener transport for all.

1. What are Intelligent Transport Systems (ITS)?

Intelligent Transport Systems (ITS) cover a wide range of concepts, systems and applications aimed at applying Information and Communication Technologies (ICT) to infrastructure and road vehicles in order to improve road traffic safety, fluency and energy efficiency, while improving connections with other transport modes.

Presented as a natural evolution of technology, not different from anti-lock brakes or airbags, they however introduce communication technology in traffic, by allowing vehicles to talk to each other, or to fixed points in the road infrastructure.

Stemming from individual initiatives led by car manufacturers, these advances in

technology are increasingly picked up by policy-makers, who are keen on reaping the benefits expected from a wide use.

According to their proponents, various technologies, ranging from collision avoidance and automatic braking to traffic information and automatic distress calls, herald the dawn of a new age where personal mobility will be fundamentally changed.

1.1. Definition of terms

The blanket term “Intelligent Transport Systems” covers a wide range of items: standalone systems installed on vehicles, portable systems, systems allowing communication between vehicles or between vehicles and infrastructure, cooperative systems, or planned urban mobility schemes.

Systems with a single hardware can use a single software, or offer different functions, and can be updated over time. Human-Machine Interface (HMI), allowing the user to interact with the system, includes inputs and outputs, such as visual displays, audio messages, and touchscreen and/or audio-visual entries, among other options.

Systems can be split between several broad categories.

- **Assistance systems** (*Advanced Rider Assistance Systems, ARAS* or *Advanced Driver Assistance Systems, ADAS*) assist the user in the riding or driving task, and with the associated interface, are meant to provide increased safety and comfort.
- **Information systems** (*On-Board Information Systems, OBIS*, or *In-Vehicle Information Systems, IVIS*) provide connectivity with communication networks, in order to provide accurate information on travel conditions.
- Communications can also occur between vehicles with **Vehicle-to-Vehicle** (V2V) and **Vehicle-to-Infrastructure** (V2I) technologies, collectively known as V2X technologies.

Together, they could have the potential to:

- help drivers prevent or avoid traffic accidents
- mitigate the consequences of accidents that do occur
- provide drivers with real time information about traffic on road networks, thereby avoiding congestion
- find the most efficient and/or eco-friendly routes for any journey
- optimise engine performance, thus improving overall energy efficiency.

Developments in the field of ITS come from a variety of sources: vehicle manufacturers, satellite navigation companies, national and regional governments, private-public research partnerships (such as the European research programmes SAFERIDER, PiSA, SARTRE), and smartphones manufacturers and third party software developers.

Motorcyclists see a potential problem in the large number of producers and promoters, involving developers not adequately familiar with the specificities of transport or the demands of the driving task.

1.2. In practice: actual examples of ITS

Many ideas are still on the drawing board or in the lab, with relatively few systems actually in use. However, the industry and the research community provide pointers as to what users can expect to see on sale tomorrow. Many functions are therefore planned to be in use on powered two-wheelers.

Safety objectives:

- **Primary safety:** assisting the driver or rider, providing information on infrastructure and black spots, improving detection of hazards and other users, communicating with other vehicles, both.
- **Tertiary safety:** reporting accidents to reduce response time, mitigating consequences, avoiding further collisions on accident sites

⇒ Safety applications:

- *Forward and Intersection Collision Avoidance* – (semi-) automatic system that detects an incoming collision with a vehicle or the environment, and intervenes by applying pressure to the brakes or warning the driver/rider.
- *Electronic Stability Control* – with (semi-) automatic action on brakes, engine power or steering.
- *Lane Departure Warning / Lane Keeping Support* – issues warning when leaving current lane without activating indicators.
- *Lane Change Support / Blind Spot Monitoring* - detects vehicles in blind spots.
- *Black Spot Warning* – provides information on notoriously dangerous road sections.
- *Incident Warning* – real-time information on accidents, road closures, etc.
- *Emergency services* – automatic and manual emergency call (eCall), breakdown services (bCall), automatic emergency lighting

Comfort objectives: assistance with navigation, weather and traffic information, finding parking spaces, paying tolls.

⇒ Comfort applications:

- *Adaptive Cruise Control*
- *OEM Remote Service*
- *Real-time Traffic Information* – to help with route planning
- *Stolen Vehicle Tracking*

Environment objectives: linked to comfort to an extent, covers functions to reduce congestion: improve traffic information, create traffic platoons, allocate parking space, adjust road use charging; improve fuel efficiency with smoother driving, improve co-modality by providing information on other transport modes.

⇒ Environment applications:

- *Stop&Go* – shutting down the engine at stops
- *Platooning* – grouping vehicles using the same route into a convoy with a lead vehicle determining pace and direction
- *Urban Traffic Guidance / Green Route Navigation* – suggesting alternative routes to reduce congestion and/or environmental impact
- *Parking Spot Management* – monitoring parking space

Enforcement/compliance objectives: speed and other traffic offenses, payment of road taxes and tolls, access management in cities.

⇒ Enforcement applications:

- *Black Box* – recording events and location, to be accessed later
- *Vehicle Tracking* – logging the vehicle's use of roads to calculate road tax or toll

2. Positive and negative aspects of ITS

As far as motorcyclists are concerned, ITS implementation may have both positive and some negative impact, and may also affect users who are not equipped with such systems.

Positive aspects

- Route planning and navigation systems may offer **real-time access to commercial or user-created databases of infrastructure information** of interest to motorcyclists (e.g. black spots, potential dangers, grade of curves, dangerous intersections, slippery surface...).
- **Vehicle-to-Infrastructure systems (V2I) can forward specific information to motorcyclists** about traffic, road surface condition, weather or accidents ahead, through direct link or variable roadside message signs. There are potential gains in more efficient mobility and reduced stress.
- **Post-crash automatic emergency call (eCall), crash lights (automatic emergency lighting) and fuel shutoff systems** can reduce the consequences of single-vehicle accidents by avoiding further accidents and reduce response time from emergency services.
- **Increased visibility of motorcyclists** in traffic, with specific warnings given to other drivers when a motorcyclist is in the vicinity (similar to systems proposed for emergency vehicles). Collision alert, lane departing warning, blind spot monitoring, vision enhancement or rear-view cameras installed on four-wheeled vehicles may be beneficial to motorcyclists.
- **Pre-crash systems** for four-wheeled vehicles originally aimed at pedestrians, such as external airbags or pop-up hoods, could benefit motorcyclists. New systems specifically aimed at motorcyclists could be developed.
- **Vehicle theft** could be tackled through the use of real-time positioning systems allowing law enforcement agencies to locate and retrieve stolen

vehicles.

- **Adaptive headlights, curve speed warning or excessive tilting warning** as well as other rider assistance systems could benefit inexperienced riders ; unless they prove invasive or hazardous.

Negative aspects

- **Invasive technology** may take several forms: taking over from the rider (braking automatically, blocking acceleration), deterring the rider from taking a certain course of action (rendering acceleration more difficult past a certain speed), or force-feeding distracting or annoying information (constant warnings until the rider complies).
- **Rider distraction** can be caused by poorly designed ITS interfaces not suitable for motorcyclists. Besides, systems may point the obvious, divert rider attention at critical moments, or display too many 'false alarms' (collision alert or headway optimization).
- **Law enforcement** through the use of ITS is possible, through V2I (speed limits and other offences) and V2V (vehicle-to-vehicle) applications (ex: emergency vehicles sending signals to clear up the lane ahead). In-vehicle applications may include « alcolocks » or devices to prevent unlicensed riding. So far Member States remain free to implement such technologies.
- **Changes in driver behaviour** might be negative after the introduction of ITS. Reliance on electronics may lure some drivers into a false sense of safety, with reduced attention and awareness of powered two-wheeler users. For example, research has shown that car drivers operating under Intelligent Speed Adaptation systems tend to focus their attention on the speed limit and accept shorter safety distances in traffic and when merging lanes.
- **Legacy Systems Problem** is the technical term for issues dealing with, in this case, vehicles that cannot be retrofitted with new systems, but must still be able to perform on the road infrastructure with satisfying efficiency, comfort and safety. New legislation could effectively force those vehicles off the road, or impose expensive, unpractical or unsafe retrofitting.
- **Pay-as-you-drive insurance**, with payments based on distance traveled and driving style, is presented as beneficial to the consumer. However, drivers or riders refusing to sign up may face higher insurance costs in comparison, reducing mobility for those with less income.
- The European Commission, in its ITS Action Plan, points out that **a critical mass of equipped users is necessary to attract investment and pull prices down** for the user. Two-wheelers represent a small market compared to four-wheeled vehicles, and motorcycle-compatible ITS may not develop as fast or not at all, especially for specific needs such as head-up displays, voice commands or component miniaturization. In turn, **unequal distribution of ITS technology** may exclude two-wheeler users from accessing beneficial technologies, and potentially increase their vulnerability in an ITS-dense environment.
- **Data security and protection** can be sensitive issues, in the context of a wireless-heavy communications environment where personal information such as locations traveled and driving behaviour can be of great interest to law enforcement agencies and private companies (e.g. insurance,



advertising).

3 Expert views : impacting the riding task

As part of its work on ITS, FEMA has gathered the opinions of expert riding trainers from across Europe. Their views on systems, functions, interfaces and concepts can be of great help to better understand issues and provide countermeasures.

- **Speed warnings** can be good for distracted riders, or for reducing the amount of attention dedicated to tracking the current speed. However, as speed is not an accident factor in itself, but only inappropriate speed for the circumstances is, expectations on its safety benefits should not be unreasonable.
- Issues have been identified with systems developed not to assist, but to replace the driver or rider in some of her tasks. These can lead to losses of control when going under the rider's judgement, leading to potentially fatal crashes.
- Motorcycles should be equipped with **passive technologies only**, which do not take control of the vehicle against the rider's judgement.
- Everyone should avoid the lure of **simplistic technical solutions** to apparent road safety problems. For instance, a system meant to alert the rider if her speed in curve is too high has been proposed as a safety device. However, it's not speed that leads to a loss of control in a curve – it's insufficient training and experience. Therefore, a system that provides accurate information on the oncoming curve, allowing the rider to make a more informed decision upon engaging it, might be more beneficial.
- Systems should be **adaptable to the rider**, her bike and riding technique; all of which can vary greatly.
- The need for on-board technology should not be based only on the user's risk factors, but rather on their responsibility in causing accidents. For instance, motorcyclists are responsible for only a minority of collisions with cars; if a collision avoidance system is developed, it should be fitted on cars in priority, and not on motorcycles.
- The importance of **load shedding** must be stressed. The concept, used in aviation, is to allow pilots to continuously adjust their mental workload by switching off unnecessary equipment or information in order to focus on the most important tasks. Mental workload during riding can vary, based on factors such as lighting, rain, road surface, traffic, etc. It is therefore important to allow riders to switch off inputs from systems in order to avoid sensory or mental overload.
- **Tailored human-machine interfaces**, fully open to customization, are needed in order to suit the needs and limitations of each individual rider.
- Visual interfaces, when used, should be in the **natural line of sight**. For example, rear-view mirrors are closer to a rider's line of sight when riding than the dashboard, which requires more effort to put into view and focus.
- The **variety of inputs** from the rider into the riding task must be taken into account. Riding a powered two-wheeler requires more than steering the handlebars; other physical aspects come into play, down to the rider's weight and balance, and the vehicle's unique characteristics.

4. FEMA position

As a matter of principle, FEMA is of the view that the below-listed principles are essential in order to protect the safety, freedom of movement and freedom of choice of the millions of powered two-wheeler users in Europe, while ensuring a continued and equal access to transport technologies that offer safer, more efficient and greener transport for all:

- It is necessary to issue positive recommendations for an introduction of ITS into the road environment that will **guarantee the safety and freedom** of movement of motorcyclists and other vulnerable road users. These have to be considered in all ITS developments.
- PTWs have **different characteristics** from other vehicles, and these differences must be integrated into the first stages of all vehicle-to-vehicle and vehicle-to-infrastructure technology: systems must identify powered two-wheelers as such and treat them accordingly.
- All technologies implemented should be **adapted to the needs, vulnerabilities and limitations of powered two-wheelers**. They should be financially and technically available to users who wish to use them.
- ITS in all vehicle types should **not introduce additional risk** or hazards to motorcyclists.
- **Installation must not be mandatory**, when installed use must not be mandatory, and when used must be non-intrusive. The rider must be able to keep control of his riding at all times, in continuity with current international regulations (1968 Vienna Convention)
- **ITS should not be used for law enforcement** purposes, other than within services to which the user voluntarily and freely subscribed (e.g. parking schemes, congestion charging, toll collection)
- **Data security and protection, privacy and liability** issues must be addressed and tackled. The right to move freely and anonymously must not be threatened by regulations or charges. (e.g. extra insurance or toll charges for drivers refusing monitoring devices)
- Technologies implemented in all vehicles and infrastructure must have **proven security benefits**, based on sound and objective research taking into account vulnerable road users.
- **A recognition of incompatibility** must be granted to vehicles manufactured before the implementation of ITS, and the right for their users to access all road systems should be maintained.

Improving future private & public research

Besides, FEMA's active participation in ITS policy-making groups and a broad review of research show that basic awareness of motorcyclists is often not taken into account at all. The mass market focus of the private sector in the implementation of new systems leads to thinking focused on personal cars and heavy goods vehicles, at the risk of neglecting other groups, such as two-wheeler users.

FEMA thinks that future research should be conducted on the basis 1) ITS functions developed for motorcyclists should be adapted to their needs and capabilities, and 2) ITS in infrastructure and other vehicles must integrate the existence of motorcyclists. These requirements are essential in order to deliver acceptable results.

More broadly, **the impact assessment of all ITS should always include the particular characteristics of powered two-wheelers.** Developments in integrated smart transport systems must include motorcycles, and not only focus on four-wheeled personal cars as is often the case. Two-wheelers are part of the transport mix, and will remain in the coming decades.

Vehicle-to-vehicle (V2V) and Vehicle-to-infrastructure (V2I), and assorted technologies and systems, should also integrate the presence of motorcycles in traffic. Systems that rely on the whole fleet being equipped should not leave powered two-wheelers out.

Contributions from the outside should not be ignored either. For instance, the increased use of smart phones as on-board navigational units could revolutionize current thought on nomadic devices and soon render personal navigation devices (PND) and other GPS units obsolete.

In addition, ITS research on motorcycles should involve extra efforts to stick to market-oriented developments, in order to avoid a widening gap between user demand and product offer. Creating products that do not address an actual demand from users will only prove to be a waste of money that could have been better spent elsewhere.

Product adequation with user demand must be assessed not only beforehand, with surveys and focus group, but also during the development cycle, with extensive testing in real-life conditions. Testing should make use of expert advice, and user groups large enough to be representative of the motorcycling population, and over a time period long enough to fully understand the systems' impact on user perception, mental workload and behaviour.

In practice : simple technology, complex issues

A critical issue lies with the available expertise in the field. Many proponents of a fast and thorough introduction of new technologies are those who manufacture and sell them.

Powered two-wheelers are different from four-wheeled vehicles in many aspects that are critical to ITS designs: the absence of bodywork around the passengers, unique steering physics with different inputs from the rider, dashboard layout and interface limitations, higher influence of the road environment, to name a few. These characteristics, intrinsic to the vehicle, mean that some solutions developed for cars and their drivers will not work on motorcycles. For example, the dashboard is near the natural line of sight of a car driver, and because of this is used as an display of important information. A motorcycle's dashboard is typically at the edge of peripheral vision, and requires a head movement to be



brought in view: therefore, displays should be placed elsewhere on the vehicle. These fundamental differences, well-known to researchers in the field and to motorcyclists - the majority of whom are also car drivers - must be understood to deliver products that will bring an added value to their users.

FEMA, as a consequence, warns against the dangers of a rushed deployment that would not properly explore negative consequences and potential shortfalls.

5. eCall: automatic emergency calls

eCall is an automatic emergency call system, with an onboard black box that detects the occurrence of a crash and alerts emergency services wirelessly, providing information on the vehicle and its location, and allowing passengers to talk directly to an operator.

It represents an answer to long response times and single vehicle accidents, and its proponents are vocal about its safety potential. *eCall* systems have been developed and deployed by private operators, namely vehicle manufacturers and mobile phone network operators.

However, in the views of opponents, *eCall* is also:

- A technology widely presented as beneficial for safety by policy-makers and manufacturers, without evidence. No assessment of the system has been made, especially with regards to adverse effects and cost-effectiveness. Money might be better spent elsewhere to increase user safety.
- A function only useful in certain accident configurations, typically single-vehicle accidents on country roads, at night, with no witnesses. Only a thorough assessment can show exactly what benefit can be expected for the use of *eCall*.
- An answer to the needs of some road users, but by no means all of them. A commuter travelling mostly in urban areas and motorways could expect a better benefit from buying, say, ABS or a better helmet, than from *eCall*.
- A technology built by car manufacturers for personal cars. Fitting *eCall* on two-wheelers requires the complete reworking of several elements. Will manufacturers be ready to assume the research and development costs? If not, will governments step in? If no one will, should systems of insufficient quality be allowed on the market?
- An expensive system. With introduction costs well above 200€, it represents a price increase of up to 10% for the most commonly used scooters and motorcycles. This is money that, pending a cost-efficiency study, might be better spent in safety equipment and advanced rider training.

FEMA, in turn, **supports** the introduction of *eCall*, and believes that a **voluntary approach** based on products proposed on the market will provide the best benefit for the consumer in terms of choice and cost-effectiveness, brought by fair competition between manufacturers. *eCall* coverage should be maximal if the system is to be offered to consumers. Without sufficient confidence in the system's efficiency, customer following will be low.

However, FEMA is **not** supporting any **mandatory introduction** of *eCall*, because

- the safety benefits from its use have not yet been established. Any legislative measure with such wide-reaching implications should be based on solid impact assessments. In addition, current technology for *eCall* systems is not mature, especially for two-wheeler vehicles.
- since 20 EU member states have already signed the *eCall* Memorandum of Understanding to promote the voluntary deployment of *eCall*, ensuring a fast deployment.

- for powered two-wheelers eCall induces a higher cost relative to vehicle price, as well as technical issues surrounding system input and integration in the vehicle.
- originally designed for cars, the technology must be adapted to two-wheelers. Crash detection cannot rely on deployment of airbags as it does on cars; sensors specific to motorcycles have to be designed; they must be reliable and avoid false positives. For instance, a fall at travelling speed can indicate an accident; a fall while the vehicle is parked might not. Additional research and development is needed, and will require funding.
- more and more Europeans turn to motorcycling for a variety of reasons, and there is a wide variety of vehicle types and use thereof. eCall will not provide any benefit to a large number of riders, who use their vehicles in busy cities or high traffic zones, to name a few cases.
- applying mandatory eCall for all categories of powered two-wheelers would be misaimed, inefficient, unacceptably costly and would have a negative impact on research, innovation and product development.

It is suggested that eCall could also be used to offer optional private or public telematic services, such as pay as you drive insurance schemes, dangerous goods tracking, dynamic navigation, breakdown calls, vehicle localisation in case of theft. FEMA opposes such plans at this early stage. Intelligent Transport Systems on motorcycles are still in their infancy, and the question of sensory overload through a high number of on-board systems remains crucial. FEMA encourages innovation but remains wary of attempts at tying the sale of additional systems to eCall (tying remains illegal in several Member States).

The same holds true for car drivers. Accident data and research throughout the EU now unequivocally demonstrate that cell phones and navigational units are the number one source of distraction to drivers, and that distraction is the number one factor in accidents. Additional in-vehicle systems should only be introduced and promoted once research has shown they are not an accident risk.

Finally, eCall should not be unreasonably pushed in order to open the way for other telematics services in Europe. eCall being based on existing mobile phone technology (GPRS, 3G), a mandatory introduction will not have any effect on the deployment of Intelligent Transport Systems technologies using different communication links. In addition, FEMA strongly opposes legislative action where the promotion of road safety is used as a cover for the promotion of other, non-safety related systems. It is especially the case when said systems are being developed and deployed by private companies, for their own interest. Such a course of action would be a clear abuse of public trust, and would seriously undermine the confidence users place in safety campaigns.

6. Advanced braking systems: braking isn't everything

Efforts by manufacturers to improve braking performance on two-wheelers have led to the introduction on the market of different systems, together called *advanced braking systems*. They include anti-lock braking systems (ABS), brake-by-wire technology (where an electric command replaces the braking cable), combined braking systems (CBS; where a single command controls front and rear brake), as well as derivative traction control technologies to avoid rear wheel skid.

Anti-lock and combined brake systems can increase braking efficiency, and limit the occurrence of wheel-locking during emergency braking, which can lead to falls.

For these reasons, the European Commission recently proposed that all new powered two-wheelers sold from 2013 be equipped with ABS, or CBS for smaller bikes.

FEMA does not share the Commission's hope that mandatory ABS will have a tremendous impact on motorcycle safety. Instead FEMA believes, while increasing vehicle cost, the measure is reducing consumer choice, giving the wrong impression that motorcycle safety will be tackled only with technical improvement of the vehicle.

Road safety is a common endeavour which should include efforts from all stakeholders. FEMA believes that many avenues for improving safety for riders are not sufficiently explored and the focus of attention should not only be the mechanical aspects of motorcycles. In particular, the introduction of mandatory ABS should not be presented nor understood as a silver bullet for road safety issues, be used as a justification for reducing efforts in other critical areas of road safety, or refusing to tackle identified challenges.

As human behaviour remains by far the largest single accident factor, efforts and money would be better spent in supporting driver and rider training and improving infrastructure. If the goal is really to save the lives of motorcyclists, many other avenues should be explored in priority, and the focus of attention should not only be the mechanical aspects of motorcycles.

FEMA supports the progressive introduction of affordable advanced braking systems on all new motorcycles and scooters through voluntary commitment only.



Glossary

ACC : Adaptive Cruise Control

ADAS : Advanced Driver Assistance Systems

CBS : Combined Braking Systems

GPS : Global Positioning System

HMD : Helmet Mounted Display

HMI : Human-Machine Interface (including screens, buttons or displays)

HUD : Heads-Up Display

ISA : Intelligent Speed Adaptation

Nomadic device : an item of communication or information equipment that can be brought inside the vehicle by the driver to be used while driving, such as a mobile phone, navigation system or pocket personal computer

OEM : Original Equipment Manufacturers

Platform : the encompassing functional, technical and operational environment enabling the deployment, provision or exploitation of ITS applications and services

VMS : Variable Message Sign

V2V : Vehicle-to-Vehicle

V2I : Vehicle-to-Infrastructure

The Federation of European Motorcyclists' Associations

The Federation of European Motorcyclists' Associations (FEMA) is the representative federation of motorcycle (comprising all powered two-wheeled vehicles) users throughout Europe. FEMA represents the interests of citizens' national organisations at the European Union and agencies of the United Nations. FEMA's primary objective is to pursue, promote and protect the interests of motorcyclists. FEMA recognises that motorcycles have different characteristics from other vehicles and emphasises the need for motorcyclists' specific requirements to be addressed.