

## **Intelligent Transport Systems – The Motorcycle Factor**

10<sup>th</sup> June, 2009

High on the European Road Safety agenda is focus on passive and active Intelligent Transport Systems (ITS) to reduce road casualties.

Drawing together stakeholders from within Europe: from the Europe Union (EU) Commission through to user organisations, an initiative called e-Safety claims that:

*“eSafety brings together the European Commission, industry, public authorities and other stakeholders to accelerate the development, deployment and use of eSafety systems - Intelligent Vehicle Safety Systems - that use information and communication technologies in intelligent solutions, in order to increase road safety and reduce the number of accidents on Europe’s roads”.<sup>1</sup>*



**Write To Ride – Right To Ride**

In June 2008, representatives of Motorcyclist Associations and Government Agencies in Europe actively participated in an International Transport Forum (ITF)/Organisation for Economic Co-operation and Development (OECD) OECD workshop held in Lillehammer, Norway. This workshop identified twenty priorities aimed at improving conditions for motorcyclists throughout the world, which were in the main, in agreement with the views of riders.

However, ITS, (including speed warnings), is still very much in the experimental stage. This technology has already been tested for cars, with conflicting results. The dynamics of motorcycles are entirely different than a four wheel based platform. The most important task of a rider is to keep the motorcycle stable which in itself requires considerable concentration.

- ***Amongst the recommendations (priority number fifteen) from the ITF/OECD workshop on motorcycle safety was the recognition that “enhanced awareness of motorcycles should be incorporated into the development of all vehicle ITS projects”.***
- ***Priority number seventeen recommends the use of Speed warning systems “The safe management of vehicle speeds in the road network is improved by the use of speed warning systems, which may be on the vehicle or part of the road infrastructure; such systems should be encouraged as the technology is developed”.***

While at first glance these recommendations seem to be positive for motorcycling, it is the physical application of these technologies that can be fitted to the rider or to the motorcycle, creating reliance on external communication between the rider, the motorcycle, road infrastructure and other vehicles (e.g. vehicle to vehicle communication) that needs examining.

The Intelligent Speed Adaption (ISA) trials held in the West Midlands for motorcycle speed limiters was a failure. Every motorcyclist that tested the trial bikes came to the same conclusion: that the device was dangerous, because of the propensity to make the motorcycle unstable and because of the real possibility of distracting the rider and thus causing the vehicle to crash.

There are dangers of enthusiasm overtaking rational, sober research for short term solutions and in some cases, commercial gain, rather than for the objective of saving lives<sup>2</sup>.

<sup>1</sup> [http://www.esafetysupport.org/en/esafety\\_activities/](http://www.esafetysupport.org/en/esafety_activities/)

<sup>2</sup> From the website <http://cordis.europa.eu/fp7/ict/> Information and Communication Technologies (ICT) are critical to improve the competitiveness of European industry and to meet the demands of its society and economy. ICTs have a catalytic impact in three key areas: productivity and innovation, by facilitating creativity and management; modernization of public services, such as health, education and transport; advances in science and technology, by supporting cooperation and access to information.

## Discussion

A Monash University report published in 2005<sup>3</sup> concluded that “ITS applications currently in existence, and being developed, have tremendous potential to reduce the incidence and severity of road crashes. To do so, however, human factor principles and knowledge must be incorporated into the design of these systems and they need to cater for the special needs of various road user groups. Failure to do so could seriously compromise the safety of the entire road transport system”.

Another Monash report published in 2006<sup>4</sup> commented that “motorcycling groups have expressed concern about the potential for ITS technologies to automate aspects of the riding task to compromise motorcycle rider safety. It is critical that the views of the motorcycling community be properly reached and understood, and that this knowledge is used to inform the design and deployment of technologies which are acceptable to them”.

## Warning Systems

An EU Commission funded project in which Advanced Driver Automated Systems (ADAS) and In Vehicle Information Systems (IVIS) are being developed for motorcycles in order to make them “safer” will include the use of Human Machine Interface (HMI) technology in order to warn the rider of a potential crash or collision in a number of scenarios. The project proposes to develop the ADAS systems for curve, speed, frontal collision, intersection warnings etc.

HMI systems may include vibration, pulsation, flashing lights on the display panel (dashboard), head-up displays on helmet visors and/or audio systems to act as an alarm to “warn” the rider. Of particular interest is the “force feedback throttle” in which the throttle can have variable force feedback when the rider is required to slow down (similar to the system used in the ISA trials). Other possible warning systems would be the “haptic handle and/or helmet”. In these latter cases, the handle or helmet would vibrate in order to warn the rider of a potential crash scenario.

There has been research on HMI warning systems which has raised concerns and has highlighted the apparent lack of understanding of the relationship between ITS and human behaviour, however up till now, this seems to have taken second place in the ITS debate.

In his presentation to the (United Nations Economic Commission for Europe) UNECE WP.29 ITS Informal Group in 2007, Peter Burns<sup>5</sup> highlighted that

“There are more effective and reliable ways to protect people and property than warnings:

1. Eliminate the hazard through improved design, or
2. Offer some form of protection to limit damage.
3. If that does not work then – Warn”

Studies such as one carried out by Bliss and Acton<sup>6</sup>, indicated that their experiment participants (70) “reacted poorly to alarm urgency, becoming distracted and confused. Urgent, reliable alarms evoked responses that, while appropriate, led to a greater number of collisions.

For this reason, advocating quick, reflexive reactions to automated alarm systems may not be a wise course of action. Furthermore, the negative impact of such reflexive behaviour may well be compounded in situations where task workload is heightened, or where there are a number of collateral alarm systems”. (2003:507).

<sup>3</sup> Regan M, Oxley J, Godley S and Tingvall C: (2005) Intelligent Transport Systems: Safety and Human Factors Issues Royal Automobile Club of Victoria (RACV) Ltd – Report 01/01

<sup>4</sup> Bayley M, Regan M, Hosking S (2006) Intelligent Systems and Motorcycle Safety, Monash University Accident Centre Research. No. 260

<sup>5</sup> Guidelines for Safety Critical Warnings; Peter Burns IHRA-ITS Informal Document No. ITS-15-09; 15th ITS informal group, 16 November 2007, agenda item 5.

<sup>6</sup> Bliss J.P, Acton S.A.(2003): Alarm mistrust in automobiles: how collision alarm reliability affects driving; Applied Ergonomics 34 pp 499–509

A National Highway Traffic Safety Administration (NHTSA) report (2006) on distractions highlighted that “glances totalling more than 2 seconds for any purpose increase near-crash/crash risk by at least two times that of normal, baseline driving”<sup>7</sup>.

According to Burns (2007) a signal informing the driver of a hazardous situation, which if not corrected by an immediate action (0 to 3 seconds), will result in equipment damage and/or personal injury.

Dingus et al reported that “The relation between advisory and collision warnings is conceptually similar to that between preventative medicine and disease treatment. An advisory warning may provide information and draw a driver’s attention early in the consequence chain for the prevention of an emergency situation, but a collision warning follows a chain of events close to a crash or to a near-crash that needs immediate treatment.

Thus the potential value of some advisory warnings, might be the avoidance of the very need for collision warnings” (1998:73)<sup>8</sup>. NB: an advisory warning system could be simply a warning sign on the side of the road.

Dingus et al also argued that “Long term use of the systems and their effect on driver behaviour will have to be closely monitored. It is possible that behaviours such as driver over-reliance could result in a crash rate increase for particular designs. Technology has given system designers an opportunity to make great strides in crash reduction and improvements in transportation safety. However it must never be forgotten that technology in this application is a double-edged sword that must be wielded with care” (1998:91)

In a scenario where the rider has all these warning systems available but still crashes, who would be liable: the rider, the vehicle manufacturer, the ITS developer, the government, or the insurance company? The responsibility of system failure and liability is highly relevant in terms of who pays.

There are a number of other factors that need consideration, such as the accuracy of Global Navigation Satellite System (GNSS) and Global Positioning System (GPS) maps which are fundamental to the design of some of these warning systems. Furthermore, there are concerns about the reliability of hardware and software, the propensity for malfunction and the potential to go into a dangerous and/or unanticipated safety mode.

## Speed

From a presentation of motorcycle fatalities and speed limits (Police Service of Northern Ireland (PSNI) Central Statistics Unit)<sup>9</sup>, of 53 fatalities recorded between 2005 and 2007, 42 occurred in a speed limit of 60 mph. (It is not clear whether the fatalities occurred within the speed limit or whether the motorcyclists were exceeding the speed limit).

The ‘On The Spot’ (OTS) study on accident causation, carried out in Great Britain for the Department for Transport, reports that the majority of motorcycle accidents (52.9%) occurred at posted speeds of 30 m.p.h.

Posted Speed	Frequency
<30 mph (excluded from model)	2
30 mph	109
40-50 mph	37
60 mph	39
70 mph	15
Missing (excluded from model)	4

This table considers the ‘type of vehicle/object hit’ by all accidents where the precipitating factor was attributable to a motorcycle: most motorcycle accidents occurred at a posted speed limit of 30 mph.

Source: OTS Study 2008, Department for Transport

<sup>7</sup> Report No. DOT HS 810 594 The Impact of Driver Inattention on Near-Crash/Crash Risk: An Analysis Using the 100-Car Naturalistic Driving Study Data; 2006:V

<sup>8</sup> Dingus T.A, et al. Human Factors Design Issues for Crash Avoidance (Chapter 3) Systems in Barfield and Dingus (1998) Human Factors in Intelligent Transport Systems

<sup>9</sup> Road Safety Council of Northern Ireland “Understanding The Risks from a motorcyclist’s perspective” 24 October 2008 DAMIAN COLL

External speed warning systems such as speed-limit signs already exist (in all European countries) and they are there to warn or advise road users of the appropriate speed limits; electronic speed detection systems (cameras) are becoming used more widely throughout Europe. They should be an effective deterrent due to the consequences of fines and penalties - including bans from driving. Even so, road users continue to ignore signs and cameras and risk having their licences revoked.

Crashes can and do occur at low speeds as highlighted in the OTS study, thus ITS speed limiters such as Intelligent Speed Adaptation (ISA) may not be appropriate in many situations whereby the cause of the crash could be due to *inappropriate* speed for that particular circumstance.

The vast majority of motorcyclists respect speed limits and ride sensibly, but research in Sweden (2003), the U.K. (2004), Europe (2008) and in the U.S (2009) all highlight the same issues of rider casualties<sup>10</sup> and suggest that the correlation between “inappropriate” speed and single vehicle casualties is overwhelmingly due to a minority of riders and points the finger at sports bike riders in particular. Ironically, no government, authority or safety organization has addressed the issue of motorcycle manufacturers advertising speed and prompting riders to race on the roads like their heroes<sup>11</sup>.

Equally, further research<sup>12</sup> highlights that the problems of collisions with other vehicles are mainly the responsibility of the driver of the other vehicle. Indeed, collisions between cars and motorcycles can constitute more than 50% of all motorcycle accidents, yet studies indicate that 8 of 10 collisions between cars and motorcycles are caused by inattentive car drivers, usually violating the motorcyclist's right-of-way.

## Surveillance

A Canadian report “Eyes on the Road: Intelligent Transportation Systems and Your Privacy” (1995)<sup>13</sup> argues that “Perhaps the greatest threat to privacy posed by ITS lies in its ability to conduct unwarranted and unwelcome surveillance on specific individuals. ITS can track and monitor a person’s movements, transactions, and communications — and do so without his or her knowledge. This may be achieved through the video camera monitoring of vehicles, satellite-based global positioning systems, Automated Vehicle Identification (AVI)<sup>14</sup>, or other means.”

The report suggests that ITS can, not only have the ability to identify individual travellers, but could also be used over time to create individual travel profiles indicating driving habits and traffic violations, place of residence, place of work etc which can, in turn, be matched with other personal information, such as insurance, credit, buying habits, income, bankruptcies, age, marital status, health data, and so forth. On a large scale, all of this could be arrayed geographically, resulting in amazingly detailed personal profiles on potentially millions of people<sup>15</sup>.

Data protection laws vary throughout the European Union. Moreover there have been serious security breaches such as those recently experienced in the UK. According to Richard Thomas, Information Commissioner, “There have been 28 breaches by central government; 75 within the National Health Service and other health bodies; with 80 reported in the private sector” (NB: 277 breaches between November 2007 and October 2008).

<sup>10</sup> Studies include the Swedish Vägverket SRA in-depth study (2003); DfT In-depth study of Motorcycling page 28 and 29, Road Safety Research Report No.54, Nov. 2004; European Road Safety Observatory (2006) Powered Two Wheelers, page 29, retrieved August 1, 2008 : [www.erso.eu](http://www.erso.eu); Motorcycle Crashes (2009): Insurance Information Institute. <http://www.iii.org/media/hottopics/insurance/motorcycle> ;

(SSB) Statistics Norway on behalf of the MC-Council: The Council consists of representatives from the Motorcycle Wholesaler's Association (MGF), Safe Traffic, Police, Vegdirektoratet and NMCU (Norsk Motorcykkel Union) – see page 37 this report.

<sup>11</sup> <http://replica.yme.com/aerox-team-replica>; <http://www.youtube.com/watch?v=JHw2BpclmZE>;

<sup>12</sup> Data in the UK Department for Transport (DfT) report (2003) relating to collisions with other road users, highlights that 43% of motorcycle serious injuries are due to collisions with cars. The data from DfT Road Casualties report (2003) show that serious injuries are proportionately 3 times higher (24.5%) for motorcycles than for cars (8.2%); Also see [http://www.writetoride.co.uk/How\\_20Close\\_20is\\_20Too\\_20Close.pdf](http://www.writetoride.co.uk/How_20Close_20is_20Too_20Close.pdf)

<sup>13</sup> Information and Privacy Commissioner Ontario; Tom Wright Commissioner March 1995  
[http://www.ipc.on.ca/images/Resources/up-its\\_e.pdf](http://www.ipc.on.ca/images/Resources/up-its_e.pdf)

<sup>14</sup> NB: in the UK, Automatic Number Plate Recognition (ANPR)

<sup>15</sup> For example, geographic profiling (GIS mapping) can be used as the building block for several investigative strategies, including suspect and tip prioritization, address-based searches of police record systems, patrol saturation and surveillance, neighborhood canvasses and searches, DNA screening prioritization. GIS technology offers high-end spatial analysis and querying, highlights the crime location, any physical boundaries that were present (that might not otherwise be noticed), and the types of roads and highways (...) <http://www.gisdevelopment.net>

Mr Thomas told an audience at the RSA Conference Europe on data breaches<sup>16</sup>, that “We (Information Commissioner’s Office) are currently investigating 30 of the most serious cases. We have already taken enforcement action against HMRC, the Ministry of Defence, the Department of Health, the Foreign and Commonwealth Office, Virgin Media Ltd, Skipton Financial Services, Carphone Warehouse, Talk Talk, and Orange Personal Communications Services Ltd”.

## Summary

ITS is not all negative, these systems can offer positive advantages to motorcyclists and other road users in an advisory capacity, for example traffic light controls to allow the freer movement of all traffic; road side warning systems to advise road users of their speed and other potential dangers, such as ice, snow, floods, land slides etc; motorway advisory systems to provide information about traffic congestion or accidents. Other systems being developed are active crash barrier systems to warn emergency services in the case of a collision by a vehicle.

What is imperative and in accordance with UNECE guidelines<sup>17</sup>, is that if any information and communications systems device is installed on a vehicle, “it should be possible to switch “off” the output of information by the system, in order to leave it to the driver whether or not he wishes to use the system” (7.3.). Also, “The information system should be designed such that it does not distract the driver excessively and could not potentially cause him to drive in a dangerous manner (for instance by overreacting)” (7.7.).

There is a call by national governments, the European Union, OECD, World Health Organization (WHO), United Nations Economic Commission for Europe (UNECE), to reduce motorcycle fatalities (especially those caused by speed). But the jury is still out about using active warning systems as a replacement for human judgement to solve the problems of road traffic accidents, indeed as this paper has attempted to demonstrate, they may well compound them.

Road accident causation research starting with the Hurt Report (1981)<sup>18</sup>, have all identified that the greatest cause of accidents is human behaviour. Riders have been insisting for years to have:

- appropriate basic rider training with special focus on attitude and risk awareness<sup>19</sup>
- awareness of motorcycles included in car driver training<sup>20</sup>.

Focussing on the human element could be a far more cost effective and longer lasting solution than relying on Intelligent Transport Systems to save lives.

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<sup>16</sup> Held in London October, 2008

<sup>17</sup> Guidelines For The Design And Installation Of Information And Communications Systems In Motor Vehicles

<http://www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29fdoc/78r1a1e.pdf>

<sup>18</sup> The EU Transport Commission has recently now decided to consult stakeholders about harmonizing driver training in Europe

[http://ec.europa.eu/transport/road\\_safety/consultations/doc/2009\\_06\\_22\\_training\\_education\\_consultation\\_paper.pdf](http://ec.europa.eu/transport/road_safety/consultations/doc/2009_06_22_training_education_consultation_paper.pdf).

<sup>19</sup> See [http://www.writetoride.co.uk/virtual\\_library\\_-\\_rider\\_safety.html](http://www.writetoride.co.uk/virtual_library_-_rider_safety.html) for more information about rider safety research

<sup>20</sup> In the case of the 3rd EU Driving Licence Directive (which had no mention of car driver training), the problem was that the EU Commission (and politicians) put together the structure for this Directive, profoundly altering the licensing regime for motorcycles, ignoring the advice of motorcycle experts. Therefore the category (engine size/output) of motorcycles to be used in the training/testing is now being decided retrospectively by committee. In other words, legislation has been introduced without a clear understanding of the issues, and now there is a rush to consult experts in order to make the directive operative. What is possibly the most unfortunate outcome of this directive is that there is no guarantee that it will have the slightest affect on road safety.