A European Agenda for Motorcycle Safety

The Motorcyclists' Point of View

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Foreword

While in agreement with the overall objective of improving road safety, as a citizens' organization, FEMA has concerns about the approach often taken by public authorities both in general terms and more specifically regarding motorcycle safety.

Indeed, achieving the target of reducing the number of fatalities by half in Europe by 2010 has become a quasi corporate target for the European Union and its Member States. Reaching set targets within a specific time constraint is unquestionably important, but the measures to be implemented need to be carefully assessed and should not have a negative impact on any road user.

Improving road safety is a common objective and FEMA firmly believes that every life, whether a car driver, a motorcyclist, a cyclist or a pedestrian, is worth the same. Saving lives of one category of road users at the cost of raising the risk, and therefore the number of fatalities of another, is simply ethically unacceptable for FEMA members.

FEMA and its members are therefore working to ensure a holistic approach to road safety, taking into account all road users.

Road safety is an important issue for all motorcyclists. Contrary to some organisations and institutions that keep a high profile in the motorcycle safety debate, FEMA has no "hidden commercial agenda".

The motorcycling community has extensive, experience based knowledge of why accidents happen. The motorcyclists and their organisations are in many ways the "real experts".

With its *European Agenda for Motorcycle Safety (EAMS)*, FEMA intends to contribute to the road safety debate, providing stakeholders with the motorcyclists' expertise and real needs. The document emphasizes that motorcycles and motorcyclists have different characteristics from other vehicles and their drivers and identifies the specific needs of motorcyclists that must be addressed along with those of other road users.

The EAMS is aimed at providing legislators, decision makers, and all stakeholders dealing with motorcycle safety, with a brief summary of why motorcycle accidents happen from a rider's perspective and recommendations on how to improve motorcycle safety in some selected areas of particular concern.

Kees Meijer

FEMA president

Executive Summary

In Europe, more and more people are turning to motorcycling for a variety of reasons and one of the most important is traffic congestion. The number of motorcycles on European roads has more than doubled over the last two decades. Motorcycling offers an inexpensive, environmentally friendly and an effective means of transport.

However, motorcycle safety is becoming an issue of concern for an ever-increasing number of stakeholders – and there are those who use the safety argument to minimise the more positive aspects of motorcycling and the major advantages it brings to the transport mix. Some of the proposed solutions completely ignore motorcycling. For these reasons, FEMA would like to contribute to the motorcycle safety debate, by presenting the views of European riders[1] in relation to recognised – and potential - motorcycle safety problems, through a compilation of the expertise of its organisations in consideration of the requirements and wishes of the end-users.

No road safety initiative – whether from Governments or riders themselves - can ever make motorcycling risk-free. This is also true for walking or cycling. However, educating young riders how to tackle these risks and how to adapt and live comfortably in our modern society would unquestionably have an important impact to reduce injuries and accidents, which remain part of everyday life.

There is a need to put motorcycle safety concerns into the right context and the growth of motorcycling should not be used as an excuse that motorcycling is becoming less safe. Road safety targets should reflect casualty rates.

There is also a need to improve the monitoring of the effects of the various road safety initiatives. The extraction of data from police reports of accidents is of major interest in motorcycle safety. However, police accident reporting varies significantly between Member States, both in terms of qualitative and quantitative data, which is a formidable obstacle to meaningful analysis and comparison.

It is also important that various research projects use a common methodology. To establish a correct understanding of the major factors causing motorcycle accidents, projects following an internationally agreed methodology should be developed and carried out for other types of vehicles in order to have a better understanding of road accidents in the future.

No one should start riding a motorcycle without having undertaken structured, relevant and cost-effective basic training. It is vital to identify the key factors in basic training that effectively make the novice rider capable of safely operating a motorcycle in normal traffic situations on public roads. An impediment to a cost-effective Pan-European initial rider training scheme is lack of consensus. For this reason, FEMA and other motorcycling organisations have developed the *Initial Rider Training* (IRT) project, which defines the essential elements of, and the means by which a comprehensive, affordable and relevant European model for pre-licence rider training can be undertaken.

The Second and Third Driving Licence Directives have been seen by FEMA members as offering no safety improvements. As a solution, the European Commission should ensure that the IRT model training programme is included as a basis for improving pre-licence rider training within the 3rd Driving Licence framework. The main purpose of the licence test is quality assurance of the candidate's basic skills and knowledge, meaning: the minimum skills and knowledge needed to safely operate a motorcycle on public roads. Thus, it is of great importance that the licence test is designed to do exactly that.

[1] The term 'rider' is used to describe a motorcyclist, in the same way the term 'motorist' is used to describe a car driver.

In principle, FEMA supports the voluntary use of protective clothing, but two major concerns must be taken into account, namely comfort and cost. The positive attributes of personal protective equipment must always be balanced against their negative effects which can be dangerously uncomfortable for riders. The cost of buying a quality helmet, jacket, trousers, gloves and boots is considerable, and FEMA believes that a reduction in cost would lead to increased use. Equally, the use of personal protective equipment should not be made compulsory.

The design of motorcycles has made them increasingly more proficient and specialised and generally reflects a greater emphasis on safety. Because motorcyclists are usually separated from the motorcycle at some time during a crash, protective equipment attached to the motorcycle, e.g. so called "leg protectors" or airbags, is less likely to be effective than protective clothing and should not warrant serious attention.

In many European countries, collisions between cars and motorcycles constitute over 50% of all motorcycle casualties. Studies indicate that 8 out of 10 collisions between cars and motorcycles are caused by inattentive car drivers. FEMA is convinced that the most effective way to reduce fatalities and injuries resulting from collisions between cars and motorcycles is to emphasize driver awareness and rider collision avoidance strategies.

The problem of the lack of perception of motorcycles by car drivers is a key-area for motorcycle safety. The case in favour of daytime running lights still lacks scientific foundation which is due to the difficulties in achieving a reliable measurement of the effect of DRL. FEMA's opinion is that the whole debate remains purely intuitive and political and FEMA is concerned that too much focus on DRL and brightly coloured clothing may take attention away from far more important factors that prevent collisions between cars and motorcycles.

As far as DRL (dedicated-lights) is concerned, FEMA is not opposed to the introduction of DRL/dedicated lights on 4-wheeled vehicles providing that the shape is completely different for the one of a motorcycle and that the lights do not impair motorcycle conspicuity. However FEMA remains opposed to the harmonization of DRL/dipped-beam headlights during the transitional phase of introducing DRL/dedicated lights on all vehicles.

Traffic management applications of ITS should be developed to include motorcycles. However, while the technology of ITS road pricing applications to include motorcycles is feasible, FEMA calls governments to exempt them from road pricing as part of the solution to traffic problems that exist throughout Europe.

Road authorities should adjust traffic codes to the needs of the motorcyclist (access to bus and reserved lanes, filtering, double stop lines, etc.) as part of a new strategic approach to the problem of urban mobility. The Green Paper on Urban Transport is a key opportunity to harmonize positive motorcycle-friendly measures throughout Europe.

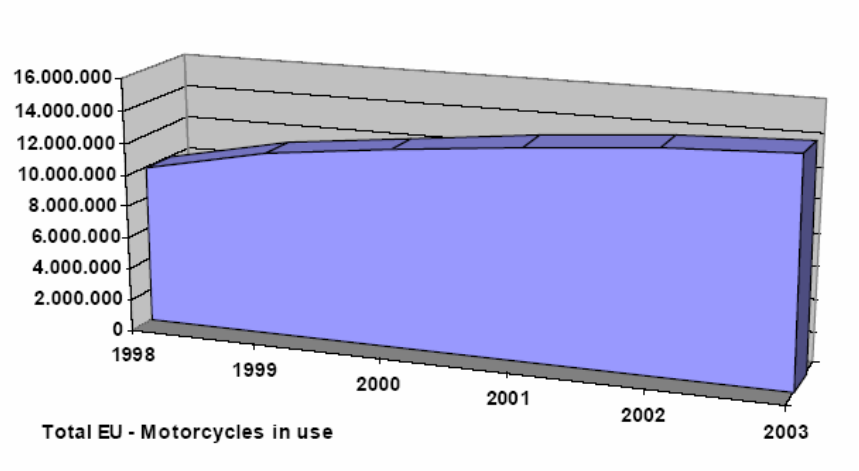
Some public road authorities in Europe have done little to improve road characteristics with regard to motorcycle safety due to a lack of competence and experience in this area of responsibility. Other public road authorities in some European countries have, in close cooperation with motorcyclist organisations, produced handbooks for motorcycle safety, with detailed guidelines for all personnel working on road construction and maintenance.

Fair and accessible insurance based on real risk factors could be a useful tool to improve motorcycle safety. Equally, fiscal incentives such as reduced VAT rate or fiscal deductibility for protective equipment, post-licence training, and other safety aspects, could easily give riders more safety-oriented choices.

The United States and the United Kingdom have recently set up motorcycle strategies with the aim to find the most appropriate solutions to improve motorcycle safety. These recent examples show that the best way forward is to involve all motorcycle safety stakeholders from Industry to End-users and from National Transport authorities to local road safety experts, this should be encouraged in Europe.

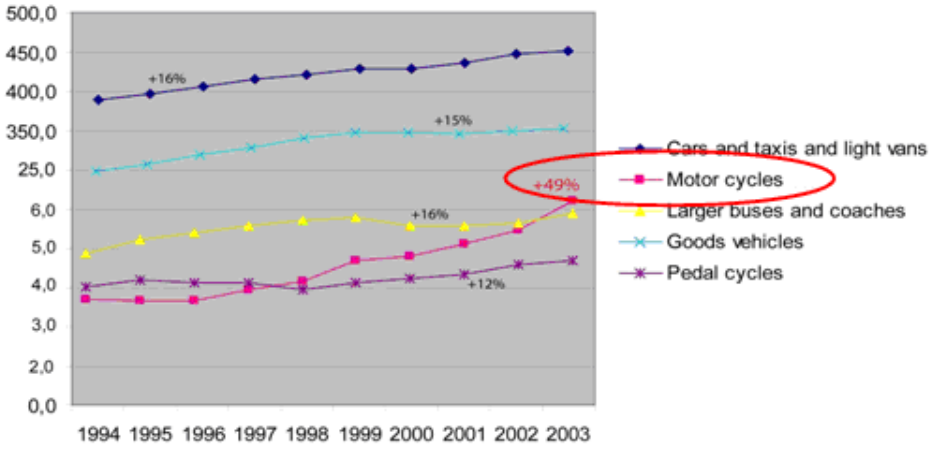
I. A brief introduction to motorcycling in Europe

The European Union has more than 27 million Powered Two-Wheelers (PTWs)[2] in use, including mopeds, scooters and motorcycles, which range from 50cc to over 1000cc in engine size.



Source: ACEM

Over the last 5 years, there has been a significant increase of +41% in the motorcycle circulating parc in Europe. When comparing the use of motorcycles with other modes of transport, the example from the United Kingdom shows that the kilometres travelled with motorcycles have increased by +49% over the last decade when other means of transport have increased only by 15%. This trend is similar in many other European countries.



Total kilometres travelled (UK) Source: Department for Transport

[2] PTWs include motorcycles, scooters and mopeds but are generically described as motorcycles.

WHO RIDES A MOTORCYCLE AND FOR WHAT PURPOSE?

The number of motorcycles on European roads has more than doubled over the last two decades. Different types of motorcycles (see annex 1) are chosen by different groups of motorcyclists. But in general terms, motorcycle use can be divided in three main categories: commuting, leisure riding and a combination of the two.

The "myth" describes the typical rider as an extreme individualist while the truth, however, is that there are many categories of motorcyclists using their motorcycle for a variety of reasons. These range from the **social rider**, who prefers the company of those who are like-minded - riding together, often members of a motorcycle club - to those who use motorcycles for their living.

Other categories include **leisure riders**, who tend to be long-term and returning riders and own larger-capacity machines. The presence of leisure riders on roads dramatically increases during summer months. **Commuters** are those who ride to and back from work, who use their motorcycle in all weather or combine it with other modes of transport, although many use their motorcycles for leisure purposes as well. **Off-road motorcyclists** ride road legal motorcycles on surfaced and un-surfaced public country roads for recreational enjoyment. Off road motorcycling is also a competitive sport and attracts riders of all ages. Another category of rider involves motorcycle racing – ranging from small race tracks for amateurs who race on classic or modern motorcycles to multi-million Euro events attracting **professional racers** and thousands of motorcycle enthusiasts.

Finally, motorcycles are an integral part of society. Businesses and governments rely on a wide range of **professionals** using this mode of transport. For instance, couriers are frequently used to transport vital documents around countries. Police motorcyclists are a crucial part of law enforcement throughout Europe, not only in their capacity to arrive at crash scenes quickly or deal with law breakers, but they also play an important role in public parades and state functions. Paramedics can cut through traffic in response to emergency calls and deliver vital medicines to save lives.

The motorcycling community is probably better organised than any other group of road-users, interlinked in a worldwide social and political "Motorcycling Network".

ADVANTAGES OF MOTORCYCLES

The current highway infrastructure in the proximity of many towns and cities is increasingly unable to cope with the demands placed upon it by heavy and constant traffic flows, whilst maintenance budgets cannot keep up with the level of repairs generated on overstretched local roads.

On the other hand, the picture for public transport is very mixed. While highly developed networks exist in some countries, in others, it has been subject to decline. A number of rural areas are practically cut off from access to public transport. Many people who live in urban areas have to walk long distances before they can take advantage of a public transport system which many see as simply too inconvenient and sometimes too expensive to use. This has led to an increased reliance on the car as a means of transport, leading to further declines in public transport and further traffic congestion.

Motorcycling offers major advantages to the transport mix: it is an inexpensive, environmentally friendly and an effective mean of transport, especially in congested urban areas:

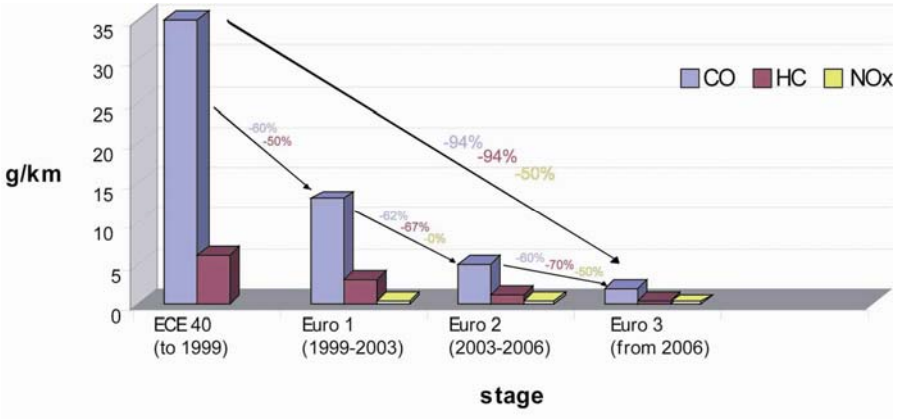
- Motorcycles occupy far less space on the road and do not contribute to traffic congestion. Motorcycling substantially increases vehicle capacity on congested urban roads;
- Motorcycles easily double-up in a lane or filter through congested areas. They contribute to alleviate gridlocks on high volume roads;
- In congested areas, motorcycles take approximately 16 to 48 % less time to cover the same urban trip as a car;
- Average motorcycles consume between 55% and 81% less fuel than cars on the same journey and require fewer resources to manufacture (1/7th)[3].
- Three or more motorcycles can park in the same space normally used by a car.
- Motorcycles cause a fraction of the damage to roads compared to other motorised transport, and thus are responsible for only a tiny percentage of the maintenance costs.

[3] European Commission Motor Vehicles Emissions Group

Environmental value

According to an independent expert chosen by the European Commission – the Laboratory of Applied Thermodynamics from the Aristotle University of Thessaloniky- motorcycle exhaust emissions are increasingly lower in comparison to the overall emissions of road transport. This trend is not only valid for what concerns the three main pollutants, but also with regards to CO_2 and particulate emissions. At the horizon of 2012, the share of these two pollutants will be under 0.5% of the overall road transport CO_2 and PM_{10} emissions.

The motorcycle manufacturers have achieved good progress in 7 years: Achieving a 94% reduction in CO and HC emissions, and a 50% reduction in emissions of oxides of nitrogen (NO_x). In addition, this reduction of the emissions has been coupled with more severe test conditions. In other words, the real percentage of reduction is much higher if calculated by the same test method.



Source: ACEM

This was confirmed in the recent ADEME study[4] which compared EURO4 cars with EURO3 motorcycles. Not only do motorcycles use less fuel and therefore emit less CO_2 emissions than small urban cars, but EURO3 motorcycles also emit less greenhouse gases than the best 4-wheel vehicle currently available on the market. This French study also confirmed that the design, the light weight and the reduced size ensure major advantages to ease the traffic flow.

Social and economic value

Due to their permanent flexibility and availability, motorcycles provide social integration by supplementing private and public transport, ensuring independence and mobility for all.

The wide range available allows a large variety of choice in terms of motorcycle, scooter and moped characteristics and budget, and hence contributes to expanding the access to

[4] "Study of real-world emissions of Euro3 PTW Comparison with Euro4 cars" – May 2007 - ADEME

education and employment opportunities while increasing working and leisure time, which leads to a better quality of life.

Furthermore, particular attention must be paid to the economical and social function that these vehicles can play in society. Given their moderate costs (initial and maintenance), motorcycles are an affordable means of transport (some cost less than 1000 €) contributing to social integration and offering young generations and low income citizens more opportunities, both from an educational and professional point of view.

Motorcycles play a vital role in modern service economies. Businesses, organizations and individuals active in urban areas place motorcycles at the heart of their business. Courier companies, delivery of small goods, delivery of food, health care services and the police take advantage of the incomparable cost/efficiency ratio offered by motorcycles. Motorcycles represent an efficient and effective answer to the need for more mobility, both in case of Labour Mobility and Social Mobility with interesting effects on GDP for instance. According to a study carried out in Milan[5], if 15% of the employees that usually go to work by bus and car should decide to go to work using two wheeled transport, the GDP of the Lombardy capital could increase by 600 million Euros (+0.5%GDP).

Looking at the most efficient transport modes

With more than 27 million riders, the financial impact of European motorcycling on the industry, jobs, tourism, tax revenues or congestion cost-savings is considerable and should not be overlooked. Motorcycling is not a "youth-phenomenon": The average age of the European motorcyclist is increasing and people from all classes and professions have taken up motorcycling for their convenience. In addition, more women are riding motorcycles today than ever before.

Motorcycles are ideally placed to be part of an integrated transport strategy, providing an ideal transport solution for many who live too far from work to cycle in a reasonable time frame and who have little or no access to the current, poorly funded, public transport arrangements. They

[5] Professor Beretta Zanoni (Professor of Business Economics and Strategic Management, Milan Bicocca University)

provide the viable alternative that many will need if they are to make a successful transition away from motor car use.

Increased motorcycle use would:

- require few changes to the current roads infrastructure. Land given over to car parking space can be used more efficiently;
- provide a sustainable alternative to cars in many aspects of modern life;
- offer viable solutions to today's mobility challenges, and
- have a major positive impact on safety.

In recognition of the congestion problem and the advantages offered by motorcycles, London (Great Britain) introduced Congestion Charging for cars, while motorcycles were allowed to enter the congestion zone free of charge. In London, motorcycling has increased to over 108,000 users in 2004[6] and congestion, pollution and road casualties have all decreased dramatically.

IN BRIEF:

- ✓ Motorcycle use in Europe is increasing, both as a leisure activity and as a mean to fight congestion in urban centres.
- ✓ Motorcycling trends are evolving with the average age for taking up motorcycling increasing and more women riding motorcycles than ever before.
- ✓ There is a variety of motorcyclists using their motorcycle for a variety of purposes.
- ✓ Motorcycles offer a viable alternative to a reliance on the car. They have major advantages compared to any other motorised road transport mean, especially on climate change, with less emission of greenhouse gas, and on fuel consumption, with lower figures.
- ✓ Motorcycles represent an efficient and effective answer to the need for more mobility, both in case of Labour Mobility and Social Mobility.
- ✓ Supportive measures favouring the use of motorcycles will reduce motorcycles casualties.

[6] Source: Transport for London 2005

II. Putting motorcycle safety into the right context

FEMA strongly supports positive actions aimed at improving motorcycle safety on Europe's roads. FEMA's members believe that road safety is a basic right of all road users, and that it should be improved through shared responsibility and concerted actions, while taking the needs of motorcyclists into account.

For the debate to be balanced and focused on medium term viable solutions, it is a fundamental prerequisite to put the absolute figures within the appropriate context. It is also important to look into the causes of motorcycle accidents, in order to identify valid remedies.

Motorcycling can never be made risk-free

It is often said that riding a motorcycle is five, ten or even twenty times more dangerous than that of a car occupant. In one respect this is correct: the rider is subject to a greater risk of being killed or injured when an accident takes place. A minor collision between two cars usually causes material damage only, while a similar collision between a car and a motorcycle often results in an injured rider. Motorcyclists are vulnerable and have a high risk of injury. In another respect, however, insurance statistics show that motorcycles are not involved in more "unnecessary" road traffic incidents than cars, i.e. motorcyclists do not have a higher accident involvement risk than motorists.

No road safety initiative – whether from Governments or riders themselves - can ever make motorcycling risk-free. This is also true for walking or cycling. However, educating young riders how to tackle these risks and how to adapt and live comfortably in our modern society would unquestionably have an important impact to reduce injuries and accidents, which remain part of everyday life

It is interesting to note that statistically there is a far greater risk for pedestrians to be injured or die on the road than motorcyclists (see annex 2). The risk of injury and death for cyclists is also high in some countries such as the Netherlands and Belgium. Yet no one would call for pedestrians to wear a helmet or for cyclists to have limited road use.

Most riders are safety conscious

Most riders are fully aware of the fact that they are vulnerable road users and that motorcycling requires specific skills and a focused, alert behaviour.

The level of safety consciousness, however, may differ from place to place, depending on the general attitude towards road safety in each particular country. However, in most European countries, the motorcycling community has - with few governmental incentives - managed to substantially reduce the accident involvement rate over the last 20 years.

The fact that millions of European riders have purchased protective equipment worth millions of Euros indicates that motorcyclists are safety conscious. The motorcycling community also organises voluntary post-licence training courses and first aid courses and thousands of European riders participate in these courses at their own expense. This clearly indicates that motorcyclists want to improve safety.

Thus, it should not be constantly claimed that motorcyclists are a "careless" group of road-users!

The extreme "high risk takers"

It cannot be denied that motorcycling sometimes attracts "high risk takers" with extreme behaviour. This minority often provokes other road users, giving motorcycling a bad public reputation. It is doubtful whether any road safety initiative will change the attitude and behaviour of these individuals. The extreme "high risk takers" should instead be motivated to practise their "joie de vivre" in closed circuit riding, instead of on public roads, where they often violate highway codes.

In some countries, insurance statistics show that motorcycles with a "sharp" image, which attract extreme "high risk takers", represent as much as 70% of the settlement of insurance claims, while constituting only 10% of the total number of motorcycles in the country, indicating a high accident involvement rate. Motorcycles with a "sharp" image may also have "built-in-expectations" of hard and aggressive riding.

Motorcycles with a "sharp" image do not necessarily have the most powerful engines or the highest power-to-weight ratio: they can be as low as 125cc. Therefore, restrictive legislation based on engine capacity, power output or high power-to weight ratio would not solve the problem at all.

Rather, the industry needs to carefully consider the purpose of producing motorcycles for racing in relation to the advertising of sports bikes or ‘race replicas’ aimed at “high risk takers”. Industry advertising is often designed to confirm the dreams and expectations of extreme "high risk takers".

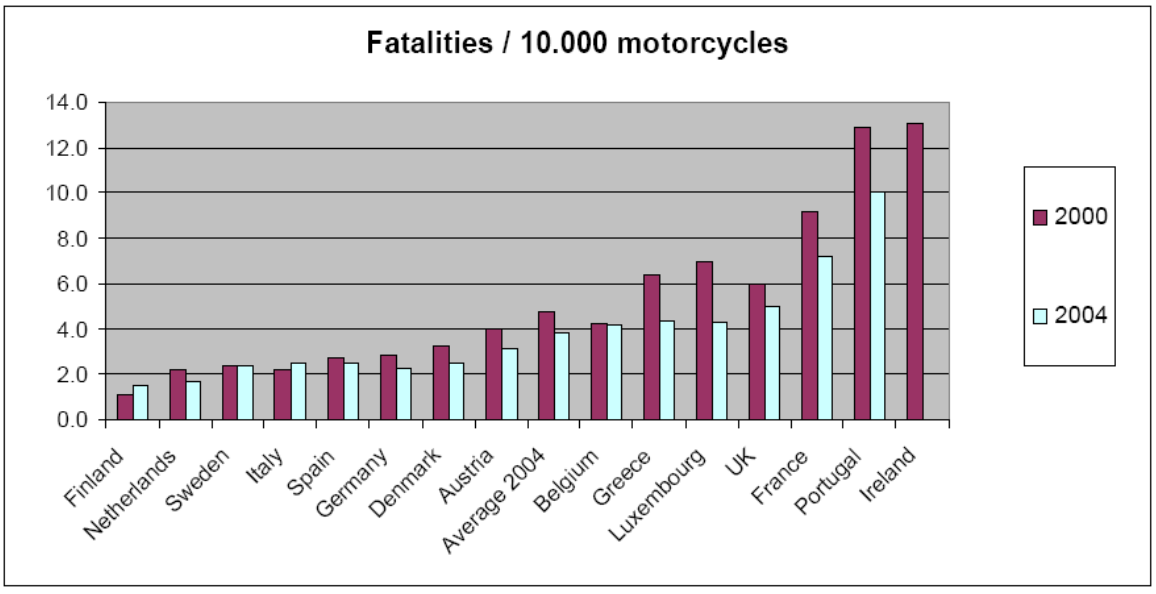
MOTORCYCLE ACCIDENT STATISTICS

The 2006 mid-term review of the European Road Safety Action Programme (RSAP) stated that ‘*the number of motorcyclists killed as a proportion of total road deaths, a figure which was relatively stable at around 9.5% until 1996, has risen in the meantime to 14% in 2003. It also states that the number of motorcyclists killed rose by 5.6% between 2000 and 2003, while the total number of people killed on the roads fell by 12% over the same period*’. It further

underlined that '*over the same period of time, the situation as being "alarming" in Italy, Belgium, Sweden and the United Kingdom*'. However, these figures are absolute and by observing relative figures a different story emerges (see Annex 2).

The European Motorcycle Industry, ACEM, also collected data and analysed the motorcycle safety situation for EU15. The key conclusions were more balanced and highlighted the need to study carefully the context before drawing any conclusions on motorcycle safety issues. According to ACEM's review, '*moped safety had been improving. Between 2000 and 2004, there have been - 26% less moped fatalities, this reduction has been going faster than the decrease in the circulating parc (-9.7%). When compared to the European average, high rates of fatalities per 10,000 vehicles were reported in Denmark, Greece, France, Portugal and The Netherlands.*'

Furthermore, ACEM confirmed that '*The motorcycle circulating parc has been increasing by 69% between 1994 and 2004. When comparing the trend between 2000 and 2004, an increase of 21% was measured. When looking at the rate of fatalities per 10,000 registered vehicles, improvement was reported in all countries, except Italy which represents 31% of the EU 15 circulating parc. The EU 15 average number of fatalities per 10,000 vehicles decreased from 4.7 in 2000 to 3.8 in 2004. In the same period, the EU 15 motorcycle circulating parc has increased faster (+ 21 %) than the rider fatalities (+3.4 %).*'[7]



Source: ACEM

Far from ignoring safety problems related to motorcycling, FEMA is convinced that it is simply a fundamental prerequisite to talk about motorcycle safety in the right context.

[7] ACEM's view on PTW fatality statistics in Europe, December 2006

Furthermore, FEMA believes that there is a need to monitor the effects of various road safety initiatives more effectively. For instance, road safety targets should reflect casualty rates, not only casualty numbers: fatalities/injuries per 10,000 registered vehicles (easily accessible) or fatalities/injuries per annual distance travelled (requires extensive data-collection and is subject to sample bias).

The former method takes into account the size of the circulating parc, so that when there is an increase in motorcycle use, with a commensurate increase in exposure to risk, motorcycling is not interpreted as becoming an increasingly hazardous activity, which in turns leads to limitative measures that have no real impact on safety, in fact, quite the opposite.

Crash reports and lack of useful data

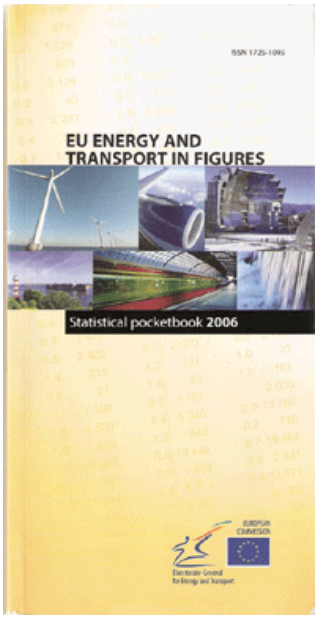
Official motorcycle accident reports - and as a consequence, the media coverage of motorcycle accidents - do not always communicate the true story. When a motorist violates a give way sign and hits a motorcyclist, a common explanation is that the rider was speeding, or that the rider was impossible to see because he was wearing black leathers, while in single vehicle crashes, when a rider loses control on a curve, a common explanation is that he was speeding.

However, in both rural and urban areas, motorcycle casualties are caused by a variety of factors that revolve around engineering and planning, coupled with behaviour, skills and attitudes between motorcyclists and other road users. Compared to car users, motorcyclists are particularly vulnerable, mainly due to the relative exposure to the external environment.

Extraction of data from police reports of accidents is of major interest in motorcycle safety. However, police accident reporting varies significantly between Member States, both in terms of qualitative and quantitative data, which is a formidable obstacle to meaningful analysis and comparison. This was formally recognized by the Luxemburg Ministry of Transport in its report on motorcycle safety.[8]

[8] La sécurité des deux-roues motorisés – Avis de la Commission de circulation de l'Etat (p.60)

Reliable EU statistics missing



Apart from an in-depth data collection of crashes, statistical information is generally a problem when talking about motorcycle safety.

Trying to collect and compare data between member states is a complete nightmare due to no common collection method and a lack of consistency. For instance, the CARE data on motorcycle fatalities show various discrepancies with national data (e.g. Luxemburg).

Other types of data are essential: data before and after the implementation of new safety policies and devices, along with impact assessment of new technologies on other road users (e.g. A-pillar and daytime running lights for cars, new ITS systems, etc). These data are crucial but often missing, as it is the case in Italy where, for instance, no data are currently available on motorcycle accidents on guardrails since the introduction of motorcycle protective guardrails on roads.

MOTORCYCLE ACCIDENT RESEARCH

Effective initiatives preventing motorcycle accidents require precise knowledge of why accidents happen. Thus, there is a need for focused research, based on valid hypotheses, involving research institutions with motorcycle expertise.

In an interview with an American magazine[9], Harry Hurt (see Annex 4) argued that 'motorcycle safety and crashes are poorly understood'. Hurt passionately believes that is because many investigators do not understand the difference between single-track and dual-track vehicles and they approach the subject with a car-centric bias instead of "looking to find what's there" rather than what seems to have happened. He used the common example of a bike "running off the road", when in reality it may have been forced off the road for some reason. He insists that 'investigators' also need to be riders themselves'. He said, 'If they aren't motorcyclists, they cannot accurately evaluate motorcycle accident cause factors'. FEMA agrees with Hurt's comments.

[9] Motorcycle Consumer News, February 2005

Another example given by Hurt was that 'other studies have looked at "characteristics" of motorcycle operators that make them dangerous. But, he asked, "Compared to what? They aren't doing any comparison to other populations." He believes that this faulty approach leads to self-determining results.

It is also important that various research projects use a common methodology. To establish a correct understanding of the major factors causing motorcycle accidents, projects following an internationally agreed methodology should be developed and carried out for other types of vehicles in order to have a better understanding of road accidents in the future.

FEMA Involvement in EU Research Projects

Aware of the challenges and the general trend to either include motorcycles in what is being designed for 4-wheelers or to develop new technologies that do not take motorcycle characteristics and motorcyclists' needs into account, FEMA decided that it was of crucial importance to be part of as many motorcycle-related research projects as possible.

The purpose of this collaboration is for FEMA to provide researchers with in-depth knowledge of motorcycling from the end-users' point of view and to ensure that the research and outcomes of the projects are for the benefit of motorcyclists and motorcycling.

Motorcycle accident studies reach the same conclusion

The mid-term review of the European Road Safety Action Programme (RSAP) states that there is more potential for improving the protection of vulnerable road users in the event of a collision with a motor vehicle. Indeed research (see annex 4) highlights that human factors play a major role in accidents involving motorcycles, and major in-depth motorcycle accident causation studies show that the basic problem is the issue of limited attention and perception of car drivers towards motorcycles and scooters.

In the case of motorcycle collisions with other vehicles:

- In the majority of cases, it is the other vehicle which is either fully or partly to blame;
- There is a marked problem with other road users observing motorcyclists;
- Intersections are the most likely place for motorcycle accidents, with the other vehicle violating the motorcycle right-of-way, and often violating traffic controls;
- The majority of accidents take place in urban areas;
- There were relatively few cases in which excess speed was an issue related to accident causation.

- The research identified motorcyclists as the primary cause factor in less than 1% of all cases while car drivers were identified as the primary cause factor in over 50% of all cases.

In the case of single vehicle crashes:

- While human behaviour has an important influence, the cause of the accident is frequently due to the motorcycle's tyres lost of traction or simply due to bad road design;
- In the case of speeding or going too fast for the conditions of the road, lack of experience is often an important factor;

However, poor road design and maintenance mainly contribute to motorcycle crashes, injuries, and fatalities. A variety of common road conditions and design factors represent hazards for motorcyclists. Debris on the road can also lead a motorcycle to crash. In addition, roadside objects may create an injury mechanism for a motorcyclist:

- Potholes are a hazard that can cause motorcycle crashes.
- Slick materials that interfere with traction are applied to road surfaces with increasing frequency. A motorcycle's traction can be seriously compromised by bituminous rubberized asphalt sealer used for crack repair and plasticized adhesive pavement-marking tape.
- Fluid spills can cause loss of traction and a resulting crash.
- Road debris poses a greater hazard to motorcycles than to larger vehicles. Debris can deflect a motorcycle's wheel when it is struck.
- Metal road surface components, either temporary or permanent, offer almost no traction, and when wet, may also be the most difficult to see.
- Many roadside barriers designed to retain cars and reduce injuries to the occupants are deadly to motorcyclists who collide with them. Wire-rope barriers are one example, but a motorcycle or the body of a fallen motorcyclist can also strike portions of other barrier designs in ways that an automobile cannot, causing severe injuries.
- Other roadside fixtures, such as signage, which may yield when struck by a car, can injure a motorcyclist who hits them. Even curbs can be deadly to a fallen rider who slides on them.
- Current work-zone signage practices may not adequately address the safety needs of motorcyclists[10].

[10] U.S. National Agenda for Motorcycle Safety

IN BRIEF :

- ✓ *Regardless of any road safety initiative motorcycling can never be made risk-free, no more than walking can be made risk-free.*
- ✓ *Most riders are fully aware of the fact that they are vulnerable road users.*
- ✓ *It can not be denied that a minority of motorcyclists are "high-risk takers" with an extreme behaviour, but this is also true for 4-wheeled vehicle drivers, and even, cyclists. This minority often gives motorcyclists a bad public reputation, but should not be considered as representative of the motorcycling population.*
- ✓ *Absolute figures do not show the true picture of motorcycling casualty trends. Not taking the parc increase/decrease into account distorts the exposure risk and may lead to inappropriate answers.*
- ✓ *There is a need to monitor the effects of various road safety initiatives more effectively.*
- ✓ *The extraction of data from police reports on accidents is of major interest to motorcycle safety but varies significantly between Member States. This is a formidable obstacle to meaningful analysis and comparison. There is a need to improve and utilize data collected by traffic police more effectively.*
- ✓ *Europe should develop and introduce a uniform Pan-European traffic crash report form.*
- ✓ *Better education of traffic police officers is needed to improve their understanding of the likely course of events in motorcycle accidents.*
- ✓ *Devising effective countermeasures requires comprehensive research into the current causes of motorcycle crashes and to define the motorcycle population at risk.*
- ✓ *Statistical information, both in qualitative and quantitative terms, is a general problem when talking about motorcycle safety.*
- ✓ *Europe should encourage the use of a common methodology for EU and national studies on motorcycle accident causation.*
- ✓ *EU Member States should provide reliable and consistent statistics to all EU and international databases of reference such as CARE.*
- ✓ *It could help motorcycle safety if the industry redesigned some advertising campaigns.*
- ✓ *Europe and its Member States should ensure that motorcycle research is carried out by experts who are motorcyclists themselves.*

III. Improving motorcycle safety in Europe

FEMA strongly believes that the success of any road safety action programme is dependent on the understanding, commitment and full cooperation of the institutions (at European, National and local level) and of all stakeholders, including the end-users themselves. The notion of "Shared Responsibility" is central. The larger traffic safety community (highway designers, law enforcement, the medical community, designers of other vehicles, government, researchers working in related areas, insurers, and all road users) can accomplish much more towards improving motorcycle safety.

Small contributions in these many different areas appear to offer significant reductions in motorcycle crashes, injuries, and deaths. This includes the presentation of reliable information that aims to achieve real reductions in casualties through a balanced approach seeking to improve the behaviour of all users, the vehicle and infrastructure.

As highlighted by the results of the London strategy, only an integrated approach brings visible results.

London Study Case

London is an excellent example of a coordinated effort to not only increase public transport, but also to encourage and support the use of motorcycles.

In 2004, a profile of the London rider was identified in a survey carried out by the University of Leeds[11]:

The results found that London motorcyclists are three times as likely to ride for commuting or as part of work. They report choosing to ride a motorcycle mainly to avoid congestion compared to the UK sample's general "love of motorcycling". They also commonly cite financial reasons for running a motorcycle. They use their machines, for commuting trips (or as part of their work), approximately twice as much as the remaining UK population.

The London Road Safety Unit (LRSU) has the responsibility for ensuring that London achieves its road casualty reduction targets. In that respect, the survey found that 18% of the riders surveyed had completed at least one voluntary training course. The popularity of police-organised training courses such as Bikesafe has increased and the motivations for

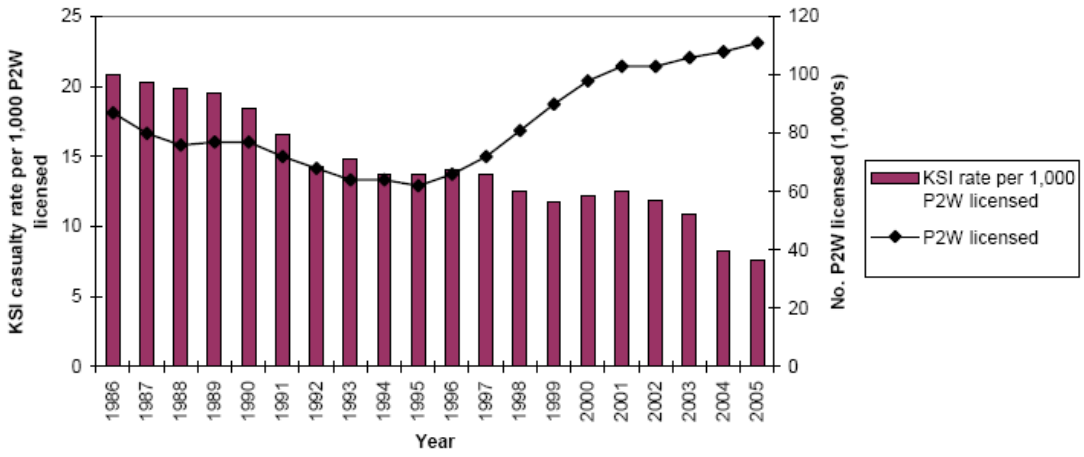
[11] Differences between London motorcyclists and those from the rest of the UK, Institute for Transport Studies, University of Leeds (2004)

attending these voluntary training courses tended to be improving and refreshing motorcycling skills.

Analysis of data[12] also showed that many of the accidents involved cars and lorries crossing the path of the motorcyclist. Changing the behaviour of car drivers is as important as educating motorcyclists how to avoid crashes. Transport for London (TfL) therefore commissioned a series of advertisements showing simulated crashes as a way of bringing drivers attention to the problem of "not seeing" the motorcyclist and for motorcyclists to ride defensively. These were shown on television and in cinemas.

The combination of a surge of motorcycle usage in tandem with a modal shift from other forms of transport, which was helped by the fact that motorcycles were not being charged with the newly introduced congestion charges. This, as well as awareness campaigns, voluntary training courses and schemes such as allowing motorcyclists in some bus lanes suggests that the concerted efforts of the LRSU and motorcyclist organisations have had a decisive impact - there was a significant decrease of killed and seriously injured between 2002 and 2004.

Fig. 5b: P2W user KSI casualties per 1,000 P2W vehicles licensed in Greater London 1986 to 2005



Source: Transport for London Street Management Report (2007, page 7)

[12] From Transport for London representative's – Bernie Hewing - speech at ACEM Annual Conference November 23rd, 2005 - Brussels

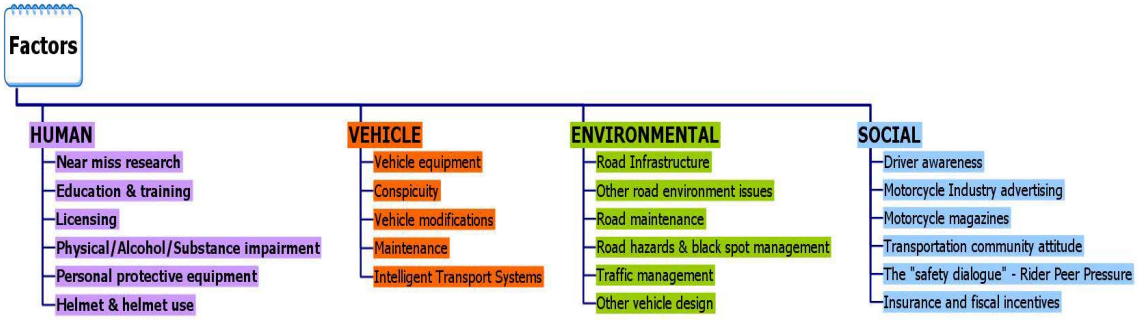
Motorcycle Safety Strategies

The United States and the United Kingdom have recently set up motorcycle strategies with the aim to find the most appropriate solutions to improve motorcycle safety. These recent examples show that the best way forward is to involve all motorcycle safety stakeholders from Industry to End-users as well as from National Transport authorities to local road safety experts. In FEMA's view, such an integrated approach is the only efficient way to bring sustainable results as the adopted strategy defines a balanced series of actions to be undertaken with the acceptance of all parties.

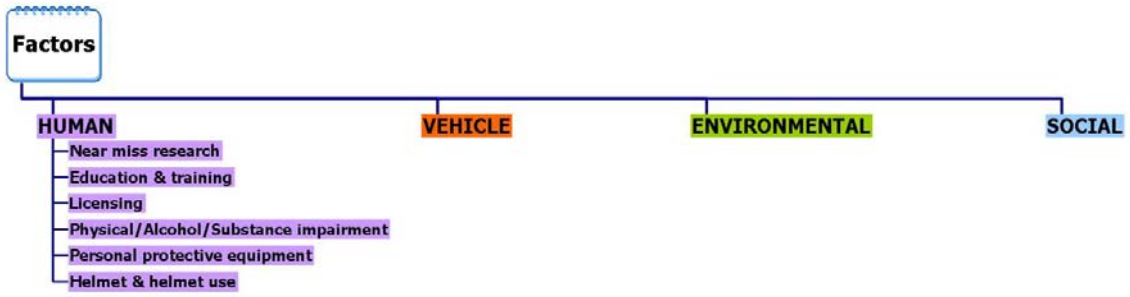
These examples should be followed by other countries and Europe should promote the development of such national integrated motorcycle strategies.

KEY MOTORCYCLE SAFETY ASPECTS

Using the concept of the Haddon Matrix, FEMA has selected what we believe to be the most important aspects to focus on in order to significantly improve motorcycle safety in Europe.



Human factors



Motorcycle research overwhelmingly recognises that human behaviour is the most common cause of crashes. However, at present the only available information about crashes is drawn from post accidents through accident causation data, casualty statistics and ad hoc research on post accident analysis.

Near Miss Research

While within the aviation, maritime and railway sectors, near miss – or pre-crash - studies have been an important part of safety research, neither the automotive nor the motorcycling sector has carried out any worthwhile research of near miss crashes.

Such studies are valuable in identifying potential hazards and could reveal what are the most common points of collision, the cause of the collision as well as perceptions of threats to near miss situations. They could bring a better understanding of the motorcycle dynamics, and hence offer invaluable scenario analysis.

Today's technology has the potential to produce simple, cost effective monitoring systems to carry out studies of this nature. In FEMA's view, this research is crucial to improve the understanding of accident causation and to assist in allaying myths and misconceptions relating to blameworthiness and motorcyclist behaviour.

Education & Training

Riding a motorcycle with an acceptable level of safety require skill, knowledge, a focused attitude and a conscious behaviour.

As highlighted by Klaas van der Valk and Wouter Rijnaerts[13], information processing should be the keystone of all education and training schemes. This is rarely or poorly understood by education, training and examination stakeholders, both for car drivers and motorcycle riders. In their analysis[14], the authors identified several phases that could be taught effectively, amongst which:

- Efficient gathering of visual information (visual scanning, use of periphery field of vision, risk perception);
- Attention management;
- Automation of riding skills;
- The survival reflex as opposed to the fright reaction;
- Riding experience and automation of information processing;
- Attitude, conduct and positioning as regard to one's own life and the lives of others.

FEMA's Initial Rider Training project

Indeed, no one should start riding a motorcycle without having undertaken structured, relevant and cost-effective basic training. FEMA members identified several shortcomings to European initial rider training programmes:

- Initial rider training programmes vary enormously from Member State to Member State - from virtually non-existent to extensive, compulsory and very expensive.
- It is not necessarily true that very advanced and expensive training gives the greatest road safety benefits.
- If initial rider training becomes too comprehensive, and therefore very expensive, A-licence candidates will probably try to avoid all non-compulsory parts.
- Most initial rider training schemes are influenced by the existing licence test. Thus, the quality of training inevitably reflects the quality of the licence test. Some rider training programmes may be criticised for just "teaching the skills needed to pass the licence test", instead of teaching the essential skills and knowledge needed to survive on the road.

[13] "Safety Aspects of Powered Two Wheelers Problems and Solutions" Klaas van der Valk and Wouter Rijnaerts
[14] Ibid.

- At present, many European initial rider training arrangements only address machine control skills. They usually focuses on the exercises of the national licence test rather than the rider's needs to control a motorcycle on the road. Rarely do national initial rider training arrangements address the crucial areas of hazard awareness and avoidance or rider attitudes and behaviour.

Thus, it is vital to identify the key factors in basic training that effectively make the novice rider capable of safely operating a motorcycle in normal traffic situations on public roads.

1. Learning and understanding the intentions of laws and regulations intended to promote and maintain road safety.
2. Learning basic rider traffic strategies, such as rider attitude and behaviour, interactions with other road users, speed choice, lane positioning, visual directional control, active hazard search, perception and anticipation are currently missing in most countries.
3. Learning precise and effective machine control skills, based on the laws of physics, enabling the rider to be in control of the motorcycle when accelerating, cornering and braking; which are the only three manoeuvres a motorcycle is capable of.

The motorcycling community can provide essential input in developing and implementing training programmes, but unfortunately, consultation of riders by responsible authorities is often insufficient.

Another impediment to a cost-effective Pan-European initial rider training scheme is lack of consensus: Various private companies and organisations offering rider training throughout Europe seem unable to agree on the basic guidelines, strongly defending their own particular approach, involving themselves in rather meaningless disagreements on minor, insignificant details.

It was therefore vital to start a process, find a common definition of concepts, develop an effective common methodology, define realistic and helpful training exercises and develop a harmonized and precise textbook in order to achieve a truly quality assuring European licence test.

FEMA, together with ACEM, FIM and other organisations, set up the *Initial Rider Training Project*[15], a Commission co-funded project that addressed the serious shortcoming in European initial rider training.

[15] http://www.initialridertraining.eu

The *Initial Rider Training project* defined the essential elements of, and the means by which a comprehensive, affordable and relevant European model for pre- licence rider training can be developed.

Such a European model places the correct emphasis on relevant machine control skills. It considers an understanding of the hazards that a rider will face and how these can be avoided and managed, together with an appreciation of the importance of rider attitudes and behaviour. Within this context, the *Initial Rider Training* report has outlined elements which set out a programme for the improvement of rider training throughout Europe.

The European Commission should use the IRT model as a basis for assessing the quality of existing national rider pre-licence training arrangements. Differing social and economic initial rider training arrangements and circumstances should be more clearly acknowledged within Europe's training policies and strategies. The European Commission should include the IRT model training programme as a basis for improving pre-licence rider training within the 3rd Driving Licence framework.

In addition to the *Initial Rider Training* model, the project also looked at the feasibility to develop an e-coaching module to address hazard awareness challenges (see below).

Rider traffic strategies

Motorcyclists cannot passively wait for the future impact of awareness campaigns and better driver education. Motorcyclists must themselves take co-responsibility for avoiding collisions with cars. Experienced riders are less likely to be involved in collisions with cars. This is due to the fact that experienced riders have developed effective strategies for recognizing and avoiding "encounters" with inattentive drivers.

Key factors in a collision-avoidance strategy are:

- active and conscious lane positioning, maximizing the rider's view on the traffic ahead and making the rider more visible to other road-users, such as car drivers waiting by or approaching a stop sign;
- observing techniques that enable the rider to foresee the actions of others;
- speed adaptation and braking readiness;
- attitude: a mind, set on teamwork and cooperation.

These key factors in a collision-avoidance strategy should be emphasized in initial rider training. Equally, collision-avoidance strategies should be emphasized in educational

programmes (booklets, CD Rom, website) supporting the "safety dialogue" within the motorcycling community.

Collision-avoidance skills

Reading the requirements and intentions of other road users and recognising potentially hazardous situations are very important skills. Managing them, however, requires the rider to realise that it is only he or she who is able to directly control his or her actions and make necessary adjustments to speed, position and distance in good time. Under certain, favourable circumstances, motorcyclists may avoid a collision if mastering effective collision avoidance techniques, such as emergency braking and swerving. The retrospective amendments to the 2nd EC Driving Licence Directive require braking and swerving exercises to be included in motorcycle licence test.

In real life, however, effective emergency collision-avoidance manoeuvres are among the most demanding vehicle operations a motorcyclist can perform, especially in wet conditions, requiring lots of practice and experience.

Thus, basic collision-avoidance techniques should be part of basic rider training.

Evaluation of crash avoidance skills training should include the following elements:

- Braking effectiveness in real-world traffic situations with the various existing and future braking systems.
- Cornering skills and strategies on the road.
- Swerving effectiveness on the road.
- Development of essential mental strategies for safe riding judgement, including visual directional control and an active hazard search, and anticipation process.

However, experienced based knowledge shows that such manoeuvres are extremely difficult to utilise in real-life situations, particularly for inexperienced, novice riders. Emergency braking and swerving training should always be practised in designated areas and not on public roads.

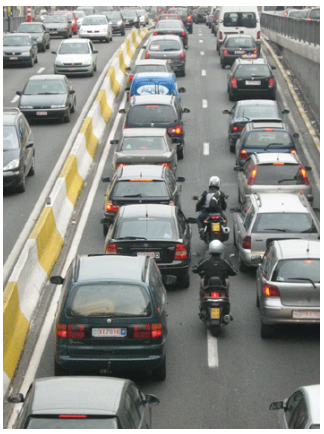
It requires skills and experience to be able to apply the correct braking force to the two systems. It is also one of the most critical operations, especially in panic situations. A typical error in a panic situation is generally the incorrect use of the brakes, causing the wheels to

lock and the tyres to loose grip. Riders often fail to avoid collisions by the insufficient use of braking force through fear of over-braking and losing control.

According to Duncan McKillop, a motorcycle instructor in Great Britain (2006), in an accident scenario the rider is confronted to a fundamental surprise, where the instinctive reaction is to try to stop rather than to take avoiding action. Because the rider is looking at the car, the result of this reaction is to collide with the car. One of the co existing conditions during fundamental surprise situations is most often that of fear.

In a fundamental surprise situation only those actions that are instinctive or which can be performed without command will be used (in an emergency, you will only do what you know), any strategies that need any conscious thought processes will immediately be abandoned. Hence, just knowing about a strategy will not be sufficient for that strategy to be implemented in an emergency. [16]

Filtering and Lane Splitting



In broad terms, filtering by motorcyclists is defined as moving between traffic when other surrounding traffic is stationary. This is standard motorcycle practice and necessary for safe motorcycle travel. Lane splitting is defined as moving through traffic when other traffic is in motion. It can also refer to overtaking within the same marked lane in moving traffic.

The primary advantage of motorcycle transportation is the narrowness and acceleration capacity of a motorcycle which allows a rider to overtake and filter past other traffic.

Filtering is useful in heavy traffic flow conditions and facilitates road space management and mobility policy through use of road space which cannot be occupied by vehicles such as passenger cars. Thus, filtering contributes to road safety as it can increase the road space between motorcyclists and other mixed traffic. Furthermore, filtering is a defensive driving measure that increases motorcyclist visibility to car drivers and prevents 'rear end' motorcycle collisions[17].

[16] Baird T, Hardy E (2006): How Close is Too Close: Concerning collisions with Cars
[17] Victorian Automotive Chamber of Commerce (VACC)
http://www.bikeraware.com/images/scen_docs/Terms%20Defined%20by%20VACC_Lane%20Splitting.doc Downloaded 15th August, 2007

Hazard Awareness

One method to train riders about hazard awareness has been analyzed in the Initial Rider Training project. The IRT e-Coaching module is to be used for training hazard perception and avoidance, and correct attitude and behaviour in traffic.

- To reach the young initial rider trainees around Europe easily.
- To fully utilise the Internet and communal collaboration.
- To update the simulation and exercises in the future easily.
- To be independent of any single vendor and his/her decisions.

With such a programme, the trainee can be exposed to hazardous situations without real danger to him/herself or other road users. Situations that would rarely occur in real life can be easily produced and replayed until the trainee can handle the situation safely. Observing the performance of the trainee and giving feedback is easier and more illustrative within the programme than it would be in real life. These factors would make The IRT e-Coaching programme offer an attractive addition to existing training methods.

Need for qualified instructors

The quality and effectiveness of training is also highly dependent upon the instructor's competence. No one should be allowed to offer training without having participated in a recognised instructors training programme.

From a road safety and consumer perspective, if basic rider training is comprised of a precise syllabus and methodology as well as competent instructors, more is learnt in a shorter period of time, i.e. society benefits from a better trained, safer rider and the consumer gets "value for money".

As previously mentioned, instructor training varies enormously throughout Europe - from virtually non-existent to the official requirement of a two-year course at college level.

FEMA firmly believes that European motorcycle safety would benefit enormously from basic guidelines for the education of motorcycle instructors.

Training facilities

The quality and effectiveness of rider training would benefit to some extent if designated safe areas for training were available.

Because most training schemes in Europe are operated by privately owned companies, this suggests that investments in training facilities are the responsibility of the training providers. However, it is a fact that very few companies are in a financial situation to allow such large investments.

From a road safety perspective, it could therefore prove cost-effective if governments and local authorities assisted in providing training facilities. Such training facilities could be used for both initial rider training, licence test and voluntary post-licence training.

Voluntary post-licence training

There is a variety of voluntary post-licence training courses available throughout Europe: From simple, almost cost free "refresher courses" organised by motorcycle clubs, to highly advanced, track based courses, costing up to 400 Euros or more per day.

Voluntary post-licence training is extremely useful for those attending, but at present such courses are insignificant in the overall motorcycle safety picture, simply because only a minority of European motorcyclists make use of the offers.

The need for voluntary post-licence training is closely connected to the quality of basic rider training: If basic rider training is insufficient, there may be a greater need for voluntary post-licence training, as a "remedy". If such courses are to be effective, there is a perceived need for instructors to be shown to be competent through officially recognised registration schemes.

As long as there are major improvements to be made in initial rider training, FEMA can see no need for mandatory post-license training. However, mandatory "remedial" training of offenders through rider improvement courses could improve their attitude and hazard perception skills.

The motorcycling community will continue to play the leading role in the provision of voluntary post-licence training in the foreseeable future. The only useful government incentive needed is assistance in providing proper training facilities.

Motorcyclists who participate in road safety orientated, voluntary post-licence training should be rewarded with a discount on their insurance premium.

Licensing

The main purpose of the licence test is a quality assurance of the candidate's basic skills and knowledge, which is the minimum skills and knowledge needed to safely operate a motorcycle

on public roads. Thus, it is of great importance that the licence test is designed to do exactly that.

Unfortunately, most European test regimes still expose candidates to some rather peculiar exercises with absolutely no relevance to real-life road safety. As a consequence, perfectly competent candidates may fail the test, while questionable candidates, who have "learned the tricks", may pass. The retrospective amendments to the 2nd EC Driving Licence Directive, which will bring changes to the motorcycle licence test, are an attempt to address this problem. However it is questionable as to whether they will improve the candidates' competence or introduce more 'tricks' to learn and make access to motorcycles more difficult.

All initial rider training schemes are influenced/steered by the existing licence test. Thus, the quality of training inevitably reflects the quality of the licence test. The task of evaluating an 'A' licence candidate requires a "trained eye". It is questionable whether a person without extensive motorcycle experience would be able to do the job properly.

European motorcycle safety would benefit largely from basic guidelines for a truly quality assured motorcycle licence test.

Physical/Alcohol/Substance impairment

According to the MAIDS report (2004), the number of cases involving alcohol use amongst motorcyclists was less than 5%, which is low in comparison to other studies, but such riders were more likely to be involved in an accident. Similarly, an analysis of data from the Department for Transport's Road Accident Statistics in Great Britain showed that the percentage of motorcyclists who failed breathalyser tests in 2004 was lower than for all road users[18].

Though alcoholic beverages are frequently available and promoted at events targeted at motorcyclists, the effects of alcohol on judgement and vehicle operation skills are well known among motorcyclists and most motorcyclists are cautious about drinking alcohol before riding.

Many organisers of motorcycling events are well aware of "the morning after" drunk-riding problem and have invested in alcoholmeters for voluntary testing in the morning after an evening of drinking before attempting to ride a motorcycle.

[18] Of the 26,857 motorcyclists involved in injury accidents, about 46 per cent were tested and there were 423 failures (1.6% compared to 2% for all road users). Failure rates were highest among 20 to 24 year-olds mirroring the situation for all road users.

However, FEMA recognises that general attitude towards drinking and riding differs from country to country and this needs to be addressed in the framework of national drink-drive campaigns.

Personal protective equipment

FEMA recognises that personal protective equipment may well have injury-reducing effects when a motorcycle accident occurs, but such equipment does not prevent accidents. In the overall motorcycle safety picture, injury-reducing equipment is of far less importance than accident-prevention initiatives.

In principle, FEMA supports the voluntary use of protective clothing, but two major concerns must be taken into account, namely comfort and cost:

- The use of protective jackets, trousers, gloves and boots could be uncomfortable to the extent of being unsafe when weather gets really hot - the explanation why even the motorcycle police officers in southern parts of Europe, riding officially marked police motorcycles, do not use protective clothing! The positive attributes of personal protective equipment must always be balanced against their negative effects which can be dangerously uncomfortable for riders. Research is therefore needed to allow the development of affordable riding gear, which is more suitable in warm climates.
- The costs of buying a quality helmet, jacket, trousers, gloves and boots are considerable: FEMA estimates the average cost of such equipment exceeds 1,000 Euros. In addition, the equipment wears out, requiring replacement at regular intervals. High cost is one reason why riders do not purchase personal protective equipment. FEMA believes that a reduction in costs would lead to increased use. Fiscal incentives would be an effective way of reducing costs, and FEMA recommends that personal protective equipment for motorcycle use is subject to a lower VAT rate.

Personal protective equipment available on the European market includes:

- Integral and open helmets, in combination with visors/goggles.
- Jackets, trousers and overalls, made of leather or abrasion-resistant synthetic material, with or without impact-absorbing shoulder, elbow, hip and knee protection.
- Gloves made of leather or abrasion-resistant synthetic material, with or without additional impact protection.
- Leather boots, with or without additional impact and abrasion protection.
- Back-protectors bought separately or integrated in jacket.

The motorcycling community is safety conscious and riders have purchased protective clothing worth hundreds of millions of Euros. It is FEMA's view that the use of personal protective equipment should not be made compulsory.

Helmet and helmet use

Helmets are designed to prevent head injuries and are regarded as the most important piece of personal protective equipment. The injury-reducing effects of good quality helmets are well known by motorcyclists, and even though some national motorcycle organisations, on principle and philosophical grounds, are against compulsion, helmet use is widely accepted in the motorcycling community.

However, much can be done to improve helmet designs. Helmet use in hot climates, e.g. during summer in the southern parts of Europe, can be uncomfortable to the extent of being unsafe. This is the explanation of why helmet use, even where required by national law, seems to be less common in Southern Europe than in Northern Europe.

Other serious helmet safety problems are:

- limited field of vision;
- extremely noisy existing helmet design;
- weight;
- fogging of the visor when riding in the rain.

Thus, research and product development is needed.

Accordingly, greater compliance with helmet wearing requirements, the use of better quality helmets and riders' renewing their helmets more frequently can be encouraged by permitting member states to levy a reduced rate of VAT on the purchase of new helmets.

HUMAN FACTORS IN BRIEF

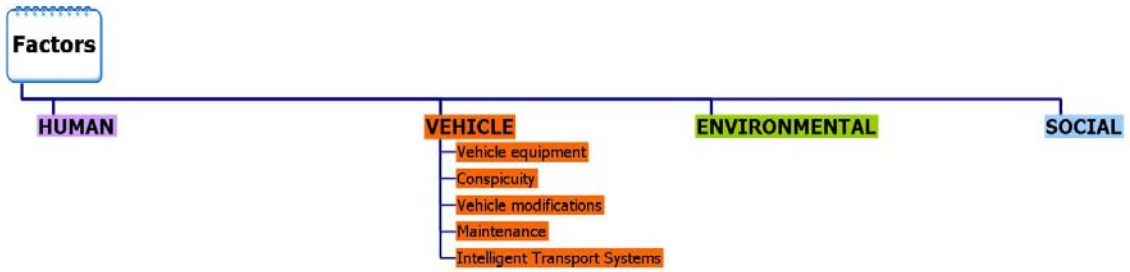
FEMA's views:

- ✓ Near miss research is crucial to improve the understanding of accident causation and to assist in allaying misconceptions relating to blameworthiness and behaviour.
- ✓ Basic rider training is essential. Providing there are major improvements in initial rider training, FEMA can see no need for mandatory post-license training.
- ✓ The quality and effectiveness of training is highly dependent upon the instructor's competence. No one should be allowed to offer training without participation in a recognised instructors training programme.
- ✓ European motorcycle safety would benefit largely from basic guidelines for a truly quality assured motorcycle licence test.
- ✓ Experienced riders are less likely to be involved in collisions with cars.
- ✓ Basic collision-avoidance techniques should be part of basic rider training.
- ✓ Drink-riding can cause motorcyclists to crash, although statistically, this refers to a minority of riders.
- ✓ The positive attributes of personal protective equipment must always be balanced against their negative effects which can be dangerously uncomfortable for riders. Much more can be done to improve helmet and protective equipment designs.

FEMA's recommendations:

- ✓ Europe should integrate the results of the *Initial Rider Training project* in the annexes of the 3rd European Driving Licence Directive. The EU Driving Licence framework should ensure basic guidelines for education of motorcycle instructors.
- ✓ The key factors in a collision-avoidance strategy should be emphasized in initial rider training programmes. These strategies should be emphasized in educational programmes.
- ✓ Governments should finance the development of an e-coaching module to allow novice rider to improve their hazard awareness before confronting road traffic.
- ✓ National governments should offer incentives and assistance for the development of post-licence training programmes.
- ✓ Insurance companies should reward post-licence training with a discount on riders' insurance premiums.
- ✓ Mandatory "remedial" training of offenders through rider improvement courses should be introduce to improve their attitude and hazard perception skills.
- ✓ National Member States should lower VAT rate for personal protective equipment and helmets for motorcycle use
- ✓ Governments and local authorities should assist in providing for training facilities. Such training facilities could be used for both initial rider training, licence test and voluntary post-licence training.
- ✓ Europe should carry out research aimed at developing affordable riding gear, more suitable in warm climates.
- ✓ European Research programmes should encourage research and product development of helmets (to improve helmet weight, fogging, noise and field of vision) and personal protective equipment.

Vehicle factors



The design of motorcycles has made them increasingly more proficient and specialised and generally reflects a greater emphasis on safety. Current motorcycles have better brakes, greater stability, more responsive steering, more effective controls, improved ergonomics for reduced fatigue and improved reliability in all systems, than those of even a decade ago.

Vehicle equipment

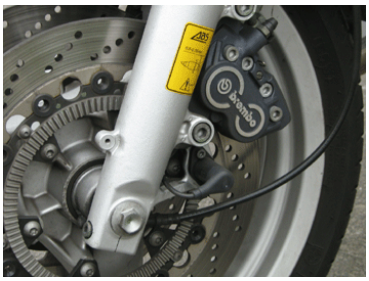
Because motorcyclists are usually separated from the motorcycle at some time during a crash, protective equipment attached to the motorcycle, e.g. so called "leg protectors" or airbags, is less likely to be effective than protective clothing and should not warrant serious attention[19].

Tyres

Tyres are crucial components of motorcycles and have advanced significantly, contributing to vehicle performance, reliability and safety. Modern tyres offer better traction for turning and stopping, particularly in wet conditions.

Braking systems

Brakes are significantly more powerful, and most motorcycles now have hydraulically actuated disc brakes. The majority of motorcycles still have two separate brake-control systems, one for the front wheel and one for the rear wheel.



To compensate for the tendency of riders to over-brake the motorcycle in a panic-situation, several motorcycle producers have developed anti-lock braking systems (ABS) or linked front and rear applications (Combined Braking Systems). FEMA supports the progressive introduction of affordable advanced braking systems (anti-lock braking systems and/or

[19] as highlighted in both the Hurt report (1981) and the MAIDS report (2004) – see Annex 4

combined braking systems) on all new motorcycles and scooters through voluntary commitment and respecting consumer choice.

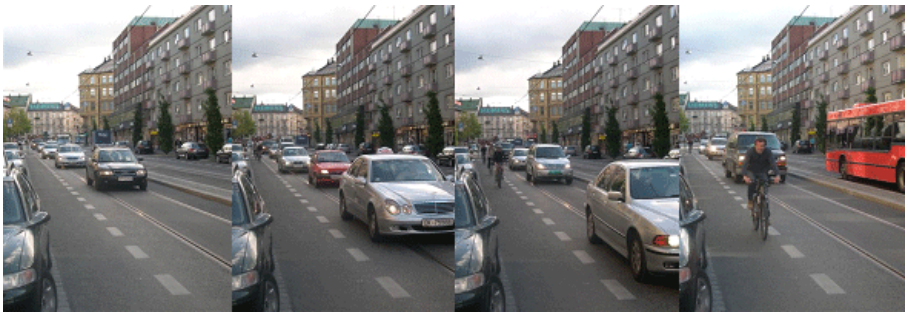
Conspicuity

The problem of the lack of perception of motorcycles by car drivers is a key-area for motorcycle safety.

The European Road Safety Action Programme (RSAP) addresses the problem but at the same time calls for the mandatory use of Daytime Running Lights (DRL) for all vehicles. Introducing mandatory dipped-beam headlights for all vehicles will obviously reduce the conspicuity-effect of daytime running lights on motorcycles only.[20]

FEMA is opposed to the EU harmonization of DRL requiring dipped-beam headlights, because they:

- are deemed to increase visual glare;
- obscure directional signal lights;
- increase visual clutter;
- distort distance perception;
- mask the presence of obstacles in the road, such as pedestrians and less conspicuous vehicles like motorcycles and bicycles;
- attract the attention of drivers, detrimentally distracting them from vulnerable road users;
- add to the driver's perceptual load the need to constantly adjust his vision to contrasting levels of illumination, the perceptual capacity of persons being finite.



[20] Mandatory DRL for motorcycles applies in all European countries but the United Kingdom.
There are contradictory opinions about the effectiveness of automatic dipped-beam headlights for motorcycles. Indeed under some circumstances, e.g. when riding on motorways in heavy rain, the positive effects of fluorescent rain suits and daytime running lights are well known and accepted. Under other circumstances, e.g. when riding in cities in bright sunshine, brightly coloured clothing and daytime running lights may have a "camouflaging" effect, in that they make the motorcycle and rider "blend" with colourful, bright objects in the traffic environment.

In spite of more than fifty studies on daytime lighting over thirty years, the case in favour of daytime running lights still lacks scientific foundation which is due to the difficulties in achieving a reliable measurement of the effect of DRL [21].

The lack of evidence regarding the contribution of DRL is confirmed by official statistics, when these are available. In FEMA's opinion, the whole debate remains purely intuitive and political.

FEMA is concerned that too much focus on DRL and brightly coloured clothing may take attention away from far more important factors that can prevent collisions between cars and motorcycles, namely:

- **Better awareness:** theoretical and practical hazard perception tests must identify motorcycle awareness as a fundamental part of the testing regime of car drivers;
- **Better training:** extend the testing and training of car drivers to look for vulnerable road users, including motorcyclists; training and awareness techniques for motorcycle riders;
- **Improvement of all road users' vision;**
- **Improvement of data collection:** preventative information, casualty and accident statistics, accurate data and realistic definitions;
- **Further research:** the impact of DRL (dipped-beam headlights) needs further and proper (objective) investigation.

As far as DRL (dedicated-lights) is concerned, FEMA is not opposed to the introduction of DRL/dedicated lights on 4-wheeled vehicles as long as the shape is completely different for the one of a motorcycle and the lights do not impair motorcycle conspicuity. In principle, FEMA is not opposed to the introduction of an automatic switch between dedicated lights and dipped-beam headlights, but remains very cautious regarding its implementation and the issue of "sensors". FEMA remains however opposed to the harmonization of DRL/dipped-beam headlights during the transitional phase of introducing DRL/dedicated lights on all vehicles.

[21] Prower, S., Research officer of the British Motorcyclists Federation: "First, a comparison must be made of the accident rate of motor vehicles not using lights against a background of 0% of all vehicles using lights and the accident rate of motor vehicles using lights against a background of 100% of all vehicles using lights. Otherwise one measures only the provisional 'novelty' or 'distractive' effect of daytime running lights, not the enduring effect, once all vehicles use them, to modify and improve driver behaviour. Second, even the most sophisticated measure that has been used to date to detect a reduction in daytime multi-vehicle accidents from daytime running lights, the 'odds-ratio' test, by its formulation responds identically to a reduction in night time single-vehicle accidents from a lower volume of late night-time driving. So in order to distinguish the effect of daytime running lights, one must record and analyse, not just data of accidents, but also data of the volume of late night traffic (and according to study design, proportion of vehicles using daytime lights).

Vehicle modifications (tampering)

The relatively simple design of a motorcycle and the availability of "bolt-on" replacement or accessory components make it easy and popular to modify. The quality and safety of "bolt on" aftermarket components have steadily improved and are in some cases, significantly superior to equivalent standard components.

Some skilled motorcycle owners take modification even further and design and produce the components themselves. This creative approach has brought about innovative, highly functional designs, sometimes adopted by the motorcycle industry and used on standard, mass-produced motorcycles.

Modifications favoured by motorcyclists change with technology, fashion, and other factors, which make more specific regulation not only unrealistic, but also unjustifiable, most of the time.

Accordingly, anti-tampering measures such as those implemented in Germany (which require that any modification must be tested or certified prior to the sale of motorcycles) have produced negative side-effects such as limiting the access of riders to superior tyres, brakes, suspension, and other components.

Finally, accident research from some European countries demonstrate that modified motorcycles, such as so called "choppers", are under-represented in accident statistics. FEMA can see no road safety benefits from restricting the historic tradition of modifying motorcycles.

Maintenance

Most motorcyclists have an "enthusiastic" relation to their vehicle and spare little effort and money keeping the bike in immaculate condition. As enthusiasts, many motorcyclists have a certain degree of technical knowledge, enabling them to perform regular, qualified safety inspections of their motorcycles.

Enthusiasm for riding is closely linked to the technical condition of their motorcycle, which means that riding is less fun if the motorcycle is not in good mechanical condition.

MAIDS and other studies have demonstrated that very few motorcycle accidents are caused by mechanical failure as a result of poor maintenance. Thus, FEMA can see no need for compulsory safety controls of motorcycles such as mandatory pan-European roadworthiness tests.

Through the "safety dialogue", experienced riders can share their knowledge of machine maintenance with novice riders, preventing accidents caused by ignorance.

Intelligent Transport Systems




According to a Monash University report published in 2006[22], "very few Intelligent Transport Systems (ITS) have been developed specifically for motorcycles, and all of those that do exist are in-vehicle systems; (...) 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. There have been no formal studies of the acceptance to riders of ITS in motorcycles. Of those systems that have been developed, very little evaluative data exists. Hence, the effectiveness of these systems in improving safety and user performance is as yet largely unknown".

FEMA recognizes that the development of ITS applications may have the potential to significantly improve road safety and is therefore addressing ITS issues in several EU research projects.

Some 4-wheeled ITS applications will need specific development to enable them to be used on motorcycles. The use of ITS applications which can influence the behaviour of a motorcycle - for example by applying the brakes or regulating the fuel management system - should always be optional. These applications should only be considered when it has been demonstrated that they will not destabilise a motorcycle in a range of conditions and circumstances. Furthermore, because of the dynamics of motorcycles, some ITS applications will not be able to be adapted to motorcycles, or may not be cost effective.

In that respect, recognition of the principle that "no ITS application should be developed if it can put at higher risk a specific group of vehicles or users" is in FEMA's opinion, fundamental for any government policy on ITS applications.

Traffic management applications of ITS should therefore be developed to include motorcycles which could usefully be adapted to give them priority over other vehicles. However, while the technology of ITS road pricing applications to include motorcycles is feasible, FEMA calls for governments to exempt motorcycles from road pricing as part of the solution to traffic problems that exist throughout Europe.

[22] Bayley M, Regan M, Hosking S (2006) Intelligent Systems and Motorcycle Safety, Monash University Accident Centre Research. Report No. 260

VEHICLE FACTORS IN BRIEF

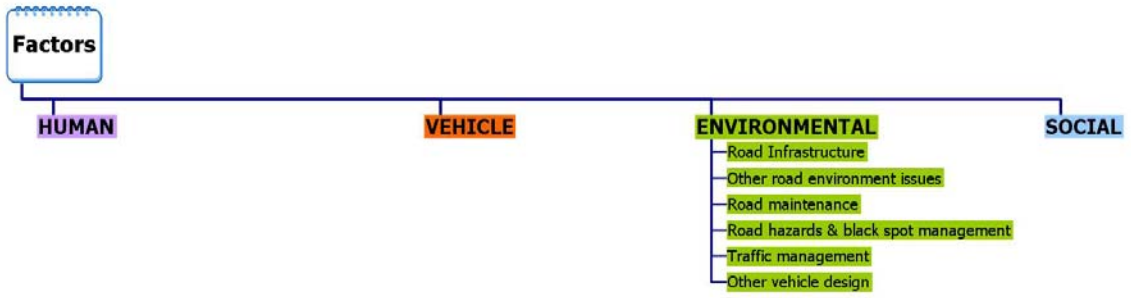
FEMA's view:

- ✓ Current motorcycles have better brakes, greater stability, more responsive steering, more effective controls, improved ergonomics for reduced fatigue and improved reliability in all systems, than those of even a decade ago.
- ✓ Because motorcyclists are usually separated from the motorcycle at some time during a crash, protective equipment attached to the motorcycle, e.g. so called "leg protectors" or airbags, is less likely to be effective than protective clothing and should not warrant serious attention.
- ✓ FEMA supports the progressive introduction of affordable advanced braking systems (anti-lock braking systems and/or combined braking systems) on all new motorcycles and scooters through voluntary commitments, respecting consumer choice.
- ✓ FEMA is opposed to the EU harmonization of DRL (dipped-beam headlights) on all vehicles. However, FEMA is not opposed to the introduction of DRL/dedicated lights providing that the shape is completely different for the one of a motorcycle and the light does not impair motorcycle conspicuity.
- ✓ FEMA is concerned that too much focus on DRL and brightly coloured clothing may take attention away from far more important factors preventing collisions between cars and motorcycles, namely increased driver awareness and conscious rider traffic strategies, through dedicated awareness campaigns for drivers and motorcyclists.
- ✓ FEMA can see no road safety benefits from restricting the historic tradition of modifying motorcycles.
- ✓ Studies show that very few motorcycle accidents are caused by mechanical failure as a result of poor maintenance. Thus, FEMA can see no need for compulsory safety controls of motorcycles such as mandatory pan-European roadworthiness tests.
- ✓ FEMA recognizes that the development of Intelligent Transport Systems (ITS) applications may have the potential to significantly improve road safety. However, in that respect, recognition of the principle that "no ITS application should be developed if it can put a specific group of vehicles or users at higher risk" is in FEMA's opinion, fundamental for any government policy on ITS applications.
- ✓ Governments should exempt motorcycles from road pricing as part of the solution to traffic problems which exist throughout Europe.

FEMA's recommendations:

- ✓ Traffic management applications of ITS should be developed to include motorcycles which could usefully be adapted to give them priority over other vehicles.
- ✓ National Governments should exempt motorcycles from road pricing as they are part of the solution to traffic problems which exist throughout Europe.

Environmental factors



Riding defensively and with anticipation is of crucial importance for motorcyclists. Riders need to concentrate on the traffic environment rather than on the road surface quality. In Belgium, over 21% dead or seriously injured motorcyclists hit an obstacle such as lighting poles or 4-wheel protective guardrails. In fact, infrastructure is the primary or contributing factor in many motorcycle accidents:

This was confirmed by MAIDS[23]:

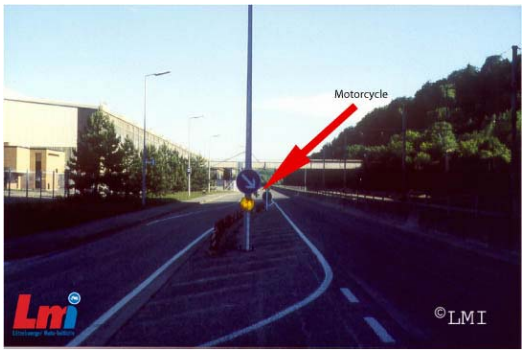
- The road and other vehicles were the most frequent collision partner reported.

- Roadside barriers present a substantial danger to motorcyclists causing serious lower extremity and spinal injuries as well as serious head injuries.

[23] Motorcycle Accident in-depth Study, 2004 – http://maids .acembike.org/ - the most recent European study on motorcycle accident causations.

- For motorcyclists, road maintenance defects either caused the accident or were a contributing factor in 6.6% of all cases.

- The presence of stationary objects which obstruct the view of the rider or the driver was found to be a common cause of accidents.



Road design, maintenance and construction are generally directed towards the needs of multi-track vehicles, with the needs of motorcycles often not taken into consideration. A possible explanation could be a lack of experience or awareness by engineers and maintenance staff.

Road design and maintenance contribute to motorcycle accidents, particularly single vehicle accidents. Basic motorcycle needs for the best type of road network include:

- good adhesion whatever the weather conditions;
- clear signage that riders can see and understand;
- good mutual visibility;
- minimum risk of impact against obstacles.

Unfortunately, public road authorities in Europe have done little to improve road characteristics with regard to motorcycle safety. FEMA does not believe that it is caused by prejudice or anti-motorcycling attitudes, rather the explanation is that public road authorities have little competence and experience in this field of responsibility and rarely consult motorcycle experts when considering road design.

Thus, standards need to be revised and developed to reflect the safety needs of motorcyclists, by encouraging motorcycle-friendly design, construction and maintenance procedures. It follows that road design and maintenance personnel must be educated about conditions posing hazards to motorcyclists. Above all there is a need for quality audits to be undertaken on a regular basis, in which the needs of motorcyclists are included.

FEMA appreciates that some of the improvements required will need both research and investment, which will probably take some time to accomplish. Other improvements, however, are easily accomplished and may simply require a shift of focus and level of consciousness by public road authorities.

Literature on these issues exist (See Annex 5), both at national and at European levels. What is missing is dissemination and real consideration by local road authorities and engineers.

Road infrastructure

The road network of today is basically conceived for cars, buses and commercial vehicles. Shaping it according to the needs of motorcyclists would not require a huge investment. It should be pointed out however, that cast metal sewage covers, potholes, road humps as well as rain grooves and tram rails can be dangerous for motorcyclists. Also when it comes to the choice of asphalt types, paints and rail guards, as well as building and design standards, more thought should be given to the needs of motorcyclists and to the risks that might be created by choosing inappropriate designs.

Conditions which are fundamental for road planning and quality/safety audits during this phase are required. Metal road surface components such as manhole covers, tramlines etc offer almost no traction, especially when wet. Metal road surface components should be positioned outside the road or the line taken by single-track vehicles.

The European Parliament's 2005 report on road safety commented that '*Infrastructure in particular, must be thought and developed considering the needs of all road users including the more vulnerable ones namely motorcyclists, cyclists and pedestrians. Roads should be upgraded to accommodate the current traffic levels. Driver errors can be avoided and their consequences mitigated by means of a systematic inclusion of road*

safety issues at any stage of the design, construction and operation of roads'[24]. The European Parliament also commented that *"Roads should be built according to standards which take into account the needs of all road users."* The EU Parliament also recognised that driver errors could be avoided and their consequences mitigated by means of a systematic inclusion of road safety issues at any stage of the design, construction and operation of roads.

The European Parliament also supports the view that "*Roads should be built according to standards which take into account the needs of all road users*" and called on the Commission to "*promote best practices for road construction and maintenance and to encourage the use of motorcycle friendly protective barrier and promote the regular updating of CEN standards*"[25].

Infrastructure requirements for motorcycles would not lead to a substantial increase in public expenditure. It could however make a sizeable contribution to the sustainability of urban traffic.

Road Restraint systems

Road restraint systems in Europe have so far been designed and tested to protect all categories of vehicles, except motorcycles. This situation has not been amended but rather reinforced with the development of a European standard. Although the standard proved to be inadequate for motorcyclists, Member States rigorously applied it. Motorcyclists immediately denounced the problem, calling for the EU standard (EN1317) to be adapted and to take their specific characteristics into account. Indeed, when impacting, colliding or simply sliding on a road, motorcyclists are obviously not protected by traditional "road restraint systems". On the contrary: these turn into a major additional hazard when the motorcyclist impact the supporting poles.

Roadside barriers are often placed where they are not needed. Most barrier systems, in the form of prefabricated safety fence, designed to retain cars and reduce injuries to automobile occupants, are deadly to motorcyclists who collide with them. The problem is carefully described in the FEMA Crash Barrier Report (2000)[26] and the FEMA report "The Road to Success" (2005) [27], which in turn aims to give an overview of the projects that have been successfully carried out in a number of European countries. FEMA has identified exposed safety fence posts as the most hazardous

[24] See European Parliament own initiative Report on Road Safety - 2005.
[25] Ibid.
[26] http://www.fema.ridersrights.org/crashbarrier/index.html
[27] http://www.fema.ridersrights.org/crashbarrier2005/index.html

part of commonly used roadside barrier systems. The Netherlands, Germany, UK, Norway, France and Spain and now, Italy have developed and tested motorcycle-friendly barrier designs and attenuation devices as additions to existing designs of safety fence, solving the problem of the hazardous exposed safety fence posts and bolts. Continuous cast concrete barriers are also less hazardous to fallen riders. The document also describes the difficulties and obstacles that motorcyclists' organisations often encounter with public authorities in promoting the use of motorcycle-friendly roadside safety barriers and discouraging in particular the use of wire rope barriers.

In January 2007, FEMA was granted *liaison status* as the representative of European motorcycle riders. At the CEN/TC226 meeting in Oslo, Norway in June 2007, the FEMA representative explained the concerns of motorcyclists about the existing EN1317 standard and current designed guardrails and convinced TC226 members to start working on the issue of protection for motorcyclists with regards to road restraint systems.

In its resolution 287, CEN members unanimously accepted in principle to work on the protection of motorcyclists in respect of road restraint systems. The members asked the Chairman, the Secretary and the convenor of WG 1, in consultation with FEMA, to prepare the scope for a new work item based on the existing standards, regulations and technical specifications in the CEN member countries".

The vote at the CEN/TC226 meeting marked a milestone for FEMA and its members in their collective fight to have protective guardrails that do not become an additional road hazard in the unfortunate case of an accident.

Other Road Environment Issues

Some types of asphalt offer almost no traction when wet. The types of asphalt known to offer poor traction should be banned. Existing forms of low-friction asphalt should be improved or replaced.

With only two points of support, aquaplaning is extremely dangerous for motorcyclists, often causing the motorcycle to fall over and crash. Thus, good water drainage is important.

All sharp edged objects in the immediate vicinity of the road could constitute a danger to motorcyclists. Thus an improved kerb design is required.

Positioning and construction of road signs, lighting standards and other road furniture must include the safety needs of motorcyclists.

A motorcycle's traction can be seriously compromised by plasticized adhesive road-marking tape and slick road-marking paint. Research and development of better road-marking paints, offering more traction is needed.

Road maintenance

Repair materials and procedures often do not respect the original specified quality standards.

Potholes are a hazard that can cause motorcycle crashes. Potholes should be detected and repaired through regular road inspection routines. If, for some legitimate reason, they cannot be repaired immediately, motorcyclists should be warned of these hazards by appropriate traffic signs.

Bituminous asphalt sealer used for crack repairs is extremely slick, especially when wet and is well known for causing motorcycle crashes. Alternative repair methods exist and should be adopted. Further research and a review of standards (EN 1423) are needed. A replacement for existing bituminous asphalt sealants such as the cold-setting Austrian product *Stohflex* which retains high frictional properties when subject to wear, is recommended.

Longitudinal road ridges caused by heavy goods vehicles, road settlement or road repair can be very hazardous to motorcyclists. Hazards often occur in connection with resurfacing work. Longitudinal road ridges of more than 2cm should always be tapered. If not possible to remedy immediately, motorcyclists should be warned of hazard by appropriate traffic sign and longitudinal road ridges should be marked with cones.

Oil and diesel spills can cause loss of traction and a resulting crash. Oil and diesel spills should be detected and removed through regular road inspection routines. If it, for some legitimate reason, is impossible to remedy immediately, motorcyclists should be warned of the hazard by appropriate traffic sign. Also, the construction of diesel tanks should be redesigned, making it impossible to over-fill, warning the driver if the diesel-cap is not in place. A fast-track

system of reporting spillages to responsible highways authorities through the emergency services should be put into place

Road debris, such as gravel or sand, often the result of uncovered loads, poses a greater hazard to motorcycles than to multi-wheel vehicles. Road debris should be detected and removed through regular road inspection routines. If, for some legitimate reason, it is impossible to remedy immediately, motorcyclists should be warned of hazard by appropriate traffic signs. Sweeping of roads should be part of regular maintenance routines, particularly in parts of Europe where sand/salt is used to increase traction on icy roads in winter. A similar fast-track reporting system for debris similar to that suggested for spillages should be implemented.

In many European countries, road construction and maintenance contracts are out-sourced to private companies with little experience in motorcycle safety who are, therefore, likely to disregard or neglect motorcycle safety.

The public road authorities of some European countries have, in close cooperation with the motorcyclists' organisations, produced handbooks for motorcycle safety (See Annex 5), with detailed guidelines for all personnel working with road construction and maintenance FEMA would welcome similar initiatives in all Member States.

Road hazards and black spot management

Specific road sections are, for known and unknown reasons, notorious for causing motorcycle accidents. However, road conditions posing hazards to motorcyclists are rarely signposted, simply because these conditions do not pose hazards to the majority of road-users.

Identification and signposting of "Black Spots".

Specific signposting (a combination of existing traffic signs), particularly aimed at warning motorcyclists of hazards - as tested in some European countries, such as Germany and Norway - would be an extremely cost-effective road safety initiative as motorcyclists will react to such signposting by reducing speed, readiness to brake and greater alertness.

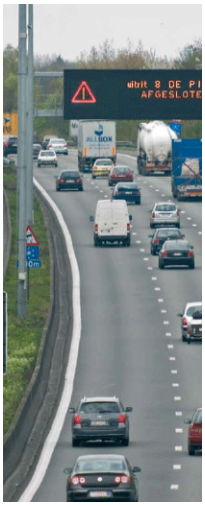
Equally, public road authorities should look into the circumstances creating these "Black Spots" and when identified, take measures to improve conditions.

A pan-European Road Hazard Report form

Developing and deploying a uniform, Pan-European *Road Hazard Report Form*, as an instrument of assistance to public roads authorities, would prove effective - particularly when official inspection routines fail. Riders are the first to recognize conditions hazardous to motorcyclists, and in many European countries, several motorcyclist organisations have designed and utilized a *Road Hazard Report Form*. FEMA would be prepared to participate in a working group aimed at creating a uniform *European Road Hazard Report Form* to be put on the websites of the national motorcycle organisations.

Traffic management

At present, traffic guidance by telematics is still in its infancy, but as it develops it will become standardised in order to improve traffic flow, thereby saving time, reducing accident risks and cutting emissions. The information provided should also be made available to motorcyclists.



In that respect, adjusting traffic codes to the needs of motorcyclists would work the same way. As part of a new strategic approach to the problem of urban mobility the use of motorcycles could be encouraged by:

- giving motorcycles access to bus lanes, high occupancy lanes and other reserved lanes;
- allowing motorcycles to filter through slow or standstill traffic;
- giving low and zero emission motorcycles free and unrestricted access to city centres closed to individual motorised traffic;
- providing for double stop lines with the advanced line assigned to motorcycles.

Some cities such as London have set examples to that effect. When in 2003, Congestion Charging was introduced motorcycles were exempt from paying this charge. Furthermore, in London, motorcycles have access to some bus lanes and other advantages. The Green Paper on Urban Transport is an opportunity to harmonize positive motorcycle-friendly measures throughout Europe.

Other Vehicle Design

The design of other vehicles is important for motorcycle safety. Vehicle design or safety components sometimes create additional hazards for motorcyclists (along with other road users). For example, car height impedes motorcyclists from surveying the surrounding traffic environment, but it also obscures the car driver's view of motorcycles.

Furthermore, in a collision with a tall car (such as SUVs), a motorcyclist is less likely to vault over the vehicle after the collision than in a collision with lower cars. Blind spots on cars and trucks make it harder for drivers to see motorcyclists, while mirror design may compromise the ability of drivers to detect oncoming motorcycles. In fact, while there have been improvements in the design and safety of cars in relation to VRUs, there has been very little testing for the safety of cars in relation to motorcycles.

An ongoing issue in this field is the improved 4-wheeled structure by using thicker, more steeply angled *A-Pillars*. A-pillars have been thickened in recent years to stop the main structure crumpling in crashes and to accommodate airbags. Manufacturers have also lengthened the pillars to produce sleeker designs.

The detrimental effect of this car safety improvement is that the front field of vision for drivers is being greatly impaired. While conspicuity - and drivers pulling out at junctions without seeing an approaching vehicle in particular - is being recognised as the major cause of car/motorcyclist (and in fact other vulnerable road user) accidents, the new thicker designed *A-pillar* aggravates the situation, forcing alert drivers to move front and backward to check additional blind-spots. A loophole in European safety rules on visibility allows longer pillars to be thicker. These rules - because they are based on an average-sized man – also fail to take into account the

viewing positions of smaller or taller drivers, and seem to significantly affect conspicuity[28].

ENVIRONMENTAL FACTORS IN BRIEF

FEMA's views:

- ✓ As riding defensively and with anticipation is of crucial importance for motorcyclists, riders need to concentrate on the traffic environment rather than on the road surface quality.
- ✓ Today, road design, maintenance and construction are generally directed towards the needs of multi-wheel vehicles (car, buses, and commercial vehicles), with the needs of motorcycles often addressed as an afterthought or not taken into consideration.
- ✓ Basic motorcycle needs for an improved road network include good adhesion whatever the weather conditions, clear information, good mutual visibility, and minimum risk of impact against obstacles.
- ✓ Road restraint systems have so far been designed and tested to protect all categories of motorized vehicles, except motorcycles.
- ✓ Specific road sections are, for whatever reasons, notorious for causing motorcycle accidents. However, road conditions posing hazards to motorcyclists are rarely signposted, simply because these conditions do not pose hazards to the majority of road-users.
- ✓ Riders are the first to recognize hazardous conditions for motorcyclists, and in several European countries, the motorcyclists' organizations have designed and utilized a Road Hazard Report Forms. FEMA would be prepared to participate in a working group aimed at creating a uniform *European Road Hazard Report Form*.
- ✓ Collisions associated with A-pillars are significantly more likely to occur at T-junctions and are more likely to involve car drivers failing to see vulnerable road users.
- ✓ As telematics develops and become standardized in order to improve traffic flow, the information provided should also be made available to motorcyclists.

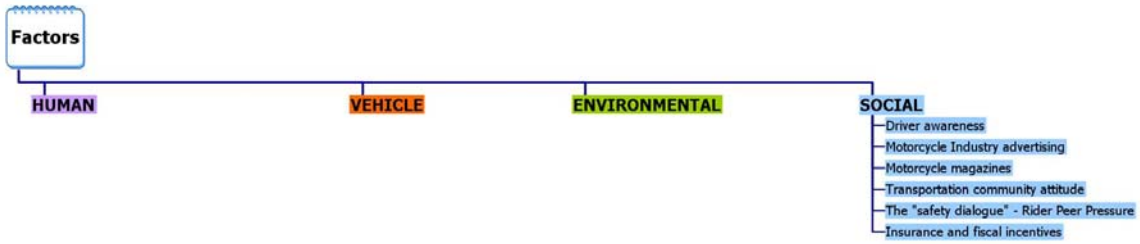
FEMA's recommendations:

- ✓ All standards need to be revised and developed to reflect the needs of motorcyclists, encouraging motorcycle-friendly design, construction and maintenance procedures.
- ✓ Quality audits, in which the needs of motorcyclists are included, should be undertaken on a regular basis.
- ✓ National governments should promote the use of motorcycle-friendly infrastructure guidelines when they exist, and develop such literature where it is missing.
- ✓ Road authorities should place specific signposting (combination of existing traffic signs), particularly aimed at warning motorcyclists of hazards.
- ✓ At the same time, public road authorities should at the same time look into the circumstances creating these "Black Spots" and when identified, take measures to improve conditions.

[28] A report from the Transport Research Laboratory (March 2006) confirmed that smaller drivers have a particular problem in seeing around the pillars because they sit closer to them and their line of sight intersects with the thicker base. The researchers reconstructed ten crashes in which a driver claimed not to have seen a vehicle before colliding with it. They found that that the A-pillars in smaller cars may have contributed to crashes. It concludes that the pillars could obscure the view of approaching vehicles for several seconds, meaning that drivers might not see them even if they look more than once. The report highlights that car A-pillar obscuration could be a contributory factor in some road traffic crashes. Collisions potentially associated with A pillars were significantly more likely to occur at T-junctions and are more likely to involve car drivers failing to see vulnerable road users (motorcyclists, pedal cyclists and pedestrians).'

- ✓ Europe should develop and deploy a uniform, Pan-European *Road Hazard Report Form*, as an instrument of assistance to public roads authorities.
- ✓ Europe should promote best practices for road construction and maintenance
- ✓ The European Commission should support FEMA's work in CEN in order to develop a European motorcycle-friendly standard for road restraint systems quickly, and encourage the use of motorcycle friendly protective barriers at national level.
- ✓ EU and national Research authorities should ensure that motorcycles are also included in traffic management schemes using telematics.
- ✓ Road authorities should adjust traffic codes to the needs of the motorcyclist (access to bus and reserved lanes, filtering, double stop lines, etc.) as part of a new strategic approach to the problem of urban mobility. The Green Paper on Urban Transport is a key opportunity to harmonize positive motorcycle-friendly measures throughout Europe.
- ✓ Consideration for motorcycles should be incorporated into the design of other vehicles.
- ✓ UNECE forum should review safety rules on visibility to tackle the problem caused by A-pillar with regards to the conspicuity of vulnerable road users.

Social factors



Social factors cover a wide range of topics concerning choices of personal transport and interactions with other road users in terms of human behaviour, campaigns, advertising, publishers' influence, peer pressure and so forth.

Driver awareness

In many European countries, collisions between cars and motorcycles constitute nearly 50% of all motorcycle accidents. Studies indicate that 8 of 10 collisions between cars and motorcycles are caused by inattentive car drivers, e.g. the car driver is the offending party, usually violating the motorcyclist's right-of-way. [29].

Several factors have been put forward, trying to explain why car drivers tend to overlook motorcyclists:

- Motorcycles and their riders are a relatively small component of the total traffic mix and therefore their visual recognition is reduced. Many drivers do not anticipate routine encounters with motorcyclists in traffic. Motorcycles are smaller visual targets and are more likely to be obscured.
- Drivers tend to scan for large rectangular objects with their main axis being horizontal (cars) rather than smaller objects with their main axis being vertical (motorcycles).
- Cars have blind spots, such as door pillars, that can hide a motorcycle and rider.
- Objects and environmental factors, including other vehicles, roadside objects and light patterns can make it more difficult for drivers to identify motorcyclists in traffic.
- Traditional distractions for drivers, such as eating, smoking, managing audio systems and operating mobile phones or GPS systems.

[29] 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%)

However, research shows that drivers who also ride motorcycles, and those with family members or close friends who ride motorcycles, are more likely to observe motorcyclists and less likely to collide with them. This illustrates that the most important factor causing car drivers to overlook motorcyclists is that the driver's mindset is not geared to observe motorcycles (or other vulnerable road users).

One possible explanation may be that the car driver does not have a mental perception of a collision with lighter vehicles like motorcycles or mopeds being an impending danger to him personally, feeling protected by the bodywork of the car. Car drivers can see motorcyclists, whom they might otherwise overlook, if they are mentally trained to do so. Thus, better education of drivers is the single most important action to prevent collisions between cars and motorcycles.

FEMA is convinced that the most effective way to reduce fatalities and injuries resulting from collisions between cars and motorcycles is to emphasize driver awareness and rider collision-avoidance strategies. Awareness of motorcycles and mopeds should become a compulsory element in initial driver training and licensing.

FEMA also recommends Pan-European awareness campaigns, particularly focusing the life-long personal consequences for car drivers being responsible for having killed or injured a motorcyclist. FEMA identified several areas where Pan-European motorcycle safety campaigns would be extremely effective and useful:

- Motorcycle awareness campaigns.
- Driver awareness campaigns.
- Helmet awareness campaigns.
- Road hazard awareness campaigns.
- Diesel Spills campaigns.
- Educational programmes supporting the "safety dialogue".

However, the message could easily fail to reach their targets, and thousands of Euros be wasted, if such campaigns are not designed in close cooperation with user-groups. For example, a video that gratuitously intends to shock people with an unintelligent message to convey that

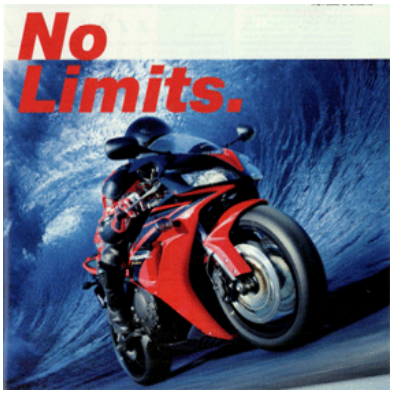
France – 2006

Example of a "bad" awareness campaign. The message is saying "the best protection when riding a motorcycle is to respect the Traffic Code", putting the blame on motorcyclists which reinforces the image of disrespectful road users at the same time – while evidence shows that in the vast majority of accidents, the motorcyclist is not to blame.

motorcycles are bad. By putting the blame on the rider to watch out for car drivers without offering any constructive advice on how to avoid accidents to motorcyclists or other road users, this type of video will discourage people from taking up motorcycling. Conversely, videos that show what can be achieved with the right message to riders and drivers through a high level of consultation, intelligence and research can have very positive results.

Motorcycle Industry advertising

Advertising provides a powerful instrument for creating and sustaining wants by creating even psychological dependence. Advertising is important for the whole motorcycle industry and their products require an emotional acceptance by consumers. In that respect, manufacturers and spare parts producers have a duty of care to ensure that the products they sell does not encourage excessive risk taking especially by inexperienced riders.



Motorcycle Magazines

Overwhelmingly, motorcycle magazines are an important commercial part of motorcycling and cover issues from classic motorcycles, racing, maintenance, owner groups and so forth. However some motorcycle magazines can and do give messages that are overtly irresponsible: features relating to 'doughnuts' (spinning wheels), reckless riding on the back wheel, encouraging high speeds on public roads and a high risk mentality are not uncommon.

These publishers are effectively doing motorcycling a great disservice and giving motorcyclists a bad name. On the one hand they encourage bad habits and on the other complain about unfair legislation against motorcyclists.

In FEMA's view, these publishers need to think very carefully about the consequences of the mixed messages they give to young riders.

Transportation Community Attitude

Medical community attitude

As rightly pointed out by the U.S. National Agenda for Motorcycle Safety (NAMS) report, 'despite the efforts to prevent motorcycle crashes, they still occur'. Providing rapid and appropriate emergency medical response is vital to limit death and disability resulting from these crashes.

Motorcyclists have predictable injury patterns that emergency medical personnel may not always recognize. Issues, such as proper helmet removal technique, are still misunderstood and may be incorrectly handled by those who are first to aid an injured motorcyclist.

While there are motorcycle-specific training programs for first responders and Emergency Medical Technicians, these are not widely used and have not been integrated with local trauma systems.

Emergency medical personnel training must include information specific to the medical needs of injured motorcyclists. We want motorcyclists and others to have available and take advantage of motorcycle-specific first response training programs'. (p.57)

The NAMS report suggests that the motorcycle community should also work with national Emergency Medical Services, emergency medicine, and trauma groups to disseminate information and aid in developing training on the initial care of injured motorcyclists to likely first responders.

This training should include issues such as helmet removal and other life-support techniques for injured motorcyclists'. Although such courses exist in some European countries, they are sporadic and in many cases, entirely dependent on the good will of volunteers.

In FEMA's view, medical emergency services need to identify opportunities to integrate principles of motorcycle safety with its core content.

Police forces

Traffic police must be trained to improve their knowledge of the course of events in collisions between cars and motorcycles. This will result in more concise crash reports and a better understanding of motorcycle accidents.

The "Safety Dialogue" – Rider Peer Pressure

The "safety dialogue" amongst motorcyclists is an important, often overlooked instrument for passing on vital safety information and forming positive attitudes towards safety: Experienced riders share their knowledge of riding techniques, traffic strategies and machine maintenance with novice riders, thus assisting in the prevention of accidents caused by ignorance.

Experienced riders bring novice riders "back to reality" when exaggerated self-confidence makes their riding dangerous. When motorcyclists meet at a clubhouse or a local roadside cafe, or ride together in groups, safety issues are often the subject of debate. Therefore, the "safety dialogue" among motorcyclists should be encouraged and developed. Even though extremely useful and positive, the "safety dialogue" is often anecdotal and lacking in structure. The "safety dialogue" would benefit largely from Pan-European educational programmes (booklets, CD Rom, website) providing accurate and precise information on key subjects.

Information distributed through articles in motorcycle magazines are an important part of the "safety dialogue".

Insurance and fiscal incentives

In terms of compulsory motor insurance, public welfare is an important aspect of governance because mobility and social inclusion are dependent on the ability to have an affordable means of transport. This is especially the case for two wheeled transport.

Motor insurers in Europe are left to decide tariffs and rates with little or no interference from governments, but with the added bonus (for insurers) of compulsion.

Table one shows a comparison of motorcycle insurance in Europe and the vast difference in motorcycle insurance. Theoretically, these variations are dependent on the application of the (so-called) 'no –fault' schemes, and; 'liability-based' (or tort-based) systems.

Table One

Country	Insurance Type	€
Austria	Premium (Third Party Only)	184.75
	All Risk (Fully Comprehensive)	190.38
Belgium	Premium (Third Party Only)	427.33
France	Premium (Third Party Only)	458.00
	All Risk (Fully Comprehensive)	769.00
Germany	Premium (Third Party Only)	130.70
	All Risk (Fully Comprehensive)	128.20
Italy	Premium (Third Party Only)	738.00
Netherlands	Premium (Third Party Only)	***126.58***
Spain	Premium (Third Party Only)	249.76
	All Risk (Fully Comprehensive)	472.78
U.K.	Premium (Third Party Only)	***545.00***
	All Risk (Fully Comprehensive)	781.00

Source: Bikes in the Fast Lane - Daily Motorcycle News - 12/12/2005: http://blogs.motorbiker.org/blogs.nsf/dx/10252005103202MWEC24.htm

However, as argued by Hans Dieter Meyer, the Executive Secretary of the German Consumers' Association in 2001[30] "*it is completely unclear, which tariff criteria are authorized and which are not. Tariff criteria with risk relevance stand side by side with those which have nothing to do with the insured risk, as for example rating according to zodiac signs (England) or to the ownership of a garage (Germany). Other tariff criteria could also be difficult such as citizenship, age, sex, profession, health or place of residence. There may not even be any risk relevance for these factors*".

Fair and accessible insurance based on real risk factors could be a useful tool to improve motorcycle safety, by allowing younger people access to motorcycles and with premiums reflecting efforts by riders to improve their skills through voluntary post-licence training.

Equally, fiscal incentives such as reduced VAT rate or fiscal deductibility (as in Belgium) for protective equipment, post-licence training, and other safety aspects, could easily naturally lead riders to more safety-oriented choices.

ENVIRONMENTAL FACTORS IN BRIEF

FEMA's views:

- ✓ Studies indicate that collisions between cars and motorcycles constitute nearly 50% of all motorcycle accidents, among which 8 of 10 collisions are caused by inattentive car drivers.
- ✓ The most important factor causing car drivers to overlook motorcyclists is that the driver's mindset is not geared to observe motorcycles (or other vulnerable road users).
- ✓ The most effective way to reduce fatalities and injuries resulting from collisions between cars and motorcycles is to emphasize driver awareness and rider collision-avoidance strategies.
- ✓ Manufacturers and spare parts producers have a duty of care to ensure that the products they sell does not encourage excessive risk taking especially by inexperienced riders.
- ✓ Some motorcycle magazines can give messages that are overtly irresponsible. They encourage bad habits and provide mixed messages to young riders.
- ✓ Fair and accessible insurance based on real risk factors could be a useful tool to improve motorcycle safety, with premiums reflecting efforts by riders to improve their skills through voluntary post-licence training.
- ✓ Fiscal incentives such as reduced VAT rate or fiscal deductibility for protective equipment, post-licence training, and other safety aspects, could easily naturally lead riders to more safety-oriented choices.

[30] Meyer H.D. (2001): Summary: Tariff models for Motor Liability Insurance and their Conformity with the Insurance Technique and with General Theories of Production and Competition (Do cartel-style selection practices curtail vehicle owners' individual freedom?)

FEMA's recommendations:

- ✓ Awareness of motorcycles should become a compulsory element in initial driver training and licensing.
- ✓ Europe should finance Pan-European awareness campaigns, particularly focusing the life-long personal consequences for car drivers being responsible for having killed or injured a motorcyclist.
- ✓ Motorcycle magazines should support the motorcycle community to debate safety issues through articles and take their share of the responsibility in the motorcycle safety debate.
- ✓ Road design and maintenance personnel must be educated about conditions posing hazards to motorcyclists.
- ✓ Medical emergency services need to identify opportunities to integrate principles of motorcycle safety with its core content.
- ✓ National authorities should encourage and develop the "safety dialogue" among motorcyclists.
- ✓ European and national Research authorities should promote appropriate research into motorcycle dynamics.
- ✓ Member States should ensure all motorcyclists have fair and accessible insurance based on real risk factors.
- ✓ Governments should promote safety aspects through fiscal incentives.

Conclusion

There is a tendency in research concerning motorcycles to stereotype riders as having a unique identity which separates them from the rest of society. In fact there have been numerous ethnographic studies[31] about 'bikers' with a specific lifestyle. However, these stereotypes represent a very small part of a much bigger picture. As explained in chapter one, many social riders are part of a motorcycling network with international affiliations and there are strong cultural foundations underlying riders' rights movements which form the backbone of FEMA, with concerns that stem from the social networks of the motorcycling community. But as this document has attempted to highlight, motorcyclists come from all walks of life and motorcycles come in all shapes and sizes.

Unfortunately, the motorcycle remains a largely misunderstood mode of transport, for far too long shrouded in clouds of misconception about both the nature of the machines themselves and the nature of the people who ride them. The reality is that motorcycles have long since evolved and modern motorcycles are clean, quiet, well designed and come in a variety of different styles.

Whether a person rides a motorcycle for social, leisure, professional or commuter purposes, for many people a motorcycle is a transport mode of choice. Many parts of Europe are inaccessible by public transport and for some journeys private transport is the most practical modal choice.

While many urban areas have excellent transport links, not everyone who travels enjoys the same access from their journey's starting point and will require personal powered transport, especially those who live in rural areas.

This document has aimed to provide evidence that motorcycles are a convenient, economical and environmentally friendly form of personal powered transport, providing the ideal 'half way house' between the present traffic chaos and the transportation vision of the future.

What is also evident from our review is that there is no appropriate Pan European motorcycle strategy. The examples of the United States and the United Kingdom that have developed specific Motorcycle Strategies with the participation of all stakeholders, has demonstrated the power of a concerted effort to improve conditions for motorcycles and this should be encouraged in Europe.

[31] http://ijms.nova.edu/index.html International Journal of Motorcycle Studies

The Federation of European Motorcyclists Associations

The Federation of European Motorcyclists Associations (FEMA) is the representative federation of motorcyclists throughout Europe. FEMA represents the interests of 23 national associations from 18 countries in the European Union and the Transport Division of the United Nations Economic Commission for Europe (UN-ECE). For almost 20 years, FEMA has taken an active part in the road safety debate in these arenas.

The FEMA secretariat is based in Brussels, in the heart of the European Union. It employs three full time members of staff dedicated to safeguarding the interests of riders. Within the framework of FEMA, experience based knowledge of motorcycle safety is continually improved and disseminated.

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Annex 1 – Types of motorcycles[32]

There are two major types of motorcycle, “street” and “off-road”. Within these categories, there are many different types of motorcycles used for different reasons.

STREET

Choppers: highly customized motorcycles based on a cruiser-style frame with long rake (longer front forks) and individually painted. These are created more for show than dependability and ridability. A chopper is a radically customized motorcycle, archetypal examples of which are the customized Harley-Davidsons seen in the 1969 film Easy Rider.

Photograph by Joachim Köhler

Cruisers: A range of small to large motorcycles designed for comfort and looks with a relaxed upright seating position.

Cruiser is the term for motorcycles that mimic the design style of American machines from the 1930s to the early 1960s. The riding position places the feet forward and the hands up, with the spine erect or leaning back slightly, which many find to be more comfortable for long-distance riding. Cruisers are often custom projects and are sometimes called custom even in the absence of aftermarket modifications.

Photograph by Jeff Dean

Electric motorcycles: nearly silent, zero-emission electric motor-driven vehicles. Though electric motorcycles are emission free during operation, producing the electricity that charges the batteries in them can be a cause of pollution. Operating range and top speed suffer due to the limitations of battery technology.

Peugeot Ludix

Mopeds: a class of low-powered motorized two-wheeled vehicles, with or without pedals. Some motorized bicycles, small scooters, and small motorcycles fit the definition of a moped. For the European Motorcycle Industry, a “moped” is a *two wheeled vehicle with an engine cylinder capacity in the case of a thermic engine not exceeding 50cm3 and whatever the means of propulsion a maximum design speed not exceeding 50km/h.*

Photograph by Longhair

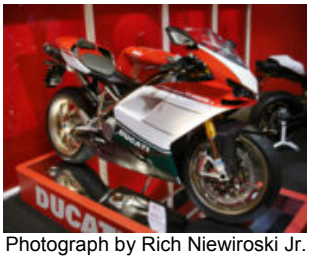
Naked/Standard/Street bikes: have a riding position midway between the forward position of a sports bike and the reclined position of a cruiser. Unlike touring motorcycles, naked motorcycles or bikes often have little or no fairing. Naked bikes are popular for commuting and other city riding as the upright riding position gives greater visibility in heavy traffic and are more comfortable than the hunched over sport bikes.

Photograph by Rich Niewiroski Jr.

[32] Excerpts downloaded from "http://en.wikipedia.org/wiki/Motorcycle#Types_of_motorcycles”

Scooters Motorcycles with a step-through frame and generally smaller wheels than those of a traditional motorcycle. Can be ridden without straddling any part of the bike. Available in sport, commuter, and touring models.

Sports motorcycles: Designed for maximum performance, for racing or spirited road riding. They are distinguishable by their full fairings and the rider's tipped-forward seating position. They are also called "race replicas". The power to weight ratio of the 900cc+ models typically matches or exceeds one bhp of power for every one Kg of mass.



Photograph by Rich Niewiroski Jr.

Touring motorcycles: Touring bikes are designed for rider and passenger comfort, luggage carrying capacity, and reliability. Cruisers, sport bikes and some dual-sports can also be used as touring bikes with the addition of aftermarket luggage and seats.

Photograph by Jeff Dean

Sport touring motorcycles: Sport-tourers are factory-built hybrids of a sport motorcycle and a touring motorcycle, for those who desire the qualities of both.

Photograph by Jeff Dean

Mini bikes: also known as a mini moto or pocket bike, is a miniaturized version of a motorcycle and replicate dirt bikes and racing motorcycles. They generally have an engine size of <50cc. and can go as fast as 55 kilometres per hour, but can be only 55cms high. The two stroke engines typically produce between 2.5 and 3.5 horse power (hp). All are air-cooled.

These bikes are not street legal.[33] However, ridden within a safe and legal environment, mini bikes can be used to introduce young people to motorcycling and many local authorities have set up designated areas to encourage the use of these bikes for competition and sport for young riders.

Photograph by Pete Walker

[33] From http://www.minimotosandmore.com downloaded 9th August, 2007

OFF-ROAD

Motocross: Motorcycles designed for racing over closed circuits, often with jumps, over a varied terrain of gravel/mud/sand.

Supermotos: Beginning in the mid-1990s, motocross machines fitted with street wheels and tyres similar to those used on sport bikes began to appear. These are also known as "Supermotards", and riders of these machines compete in specially organized rallies and races.

Trial motorcycles: Motorcycles made as light as possible, with no seat, in order to provide maximum freedom of body positioning for use in observed trials competition.

DUAL PURPOSE

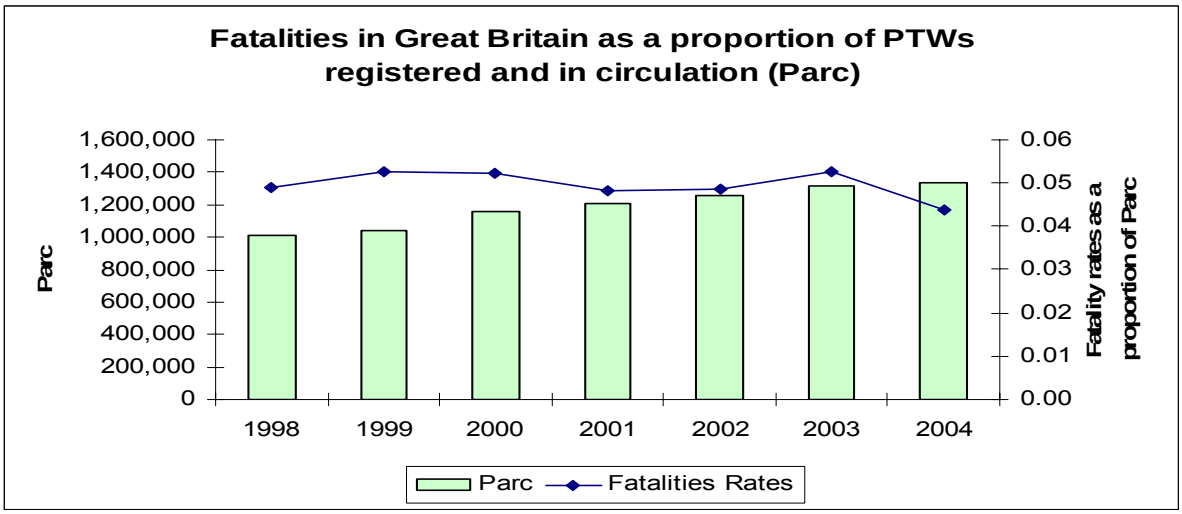
Dual-sports: Road-legal motorcycles offering a compromise in highway and off-road performance, durability and comfort. Since the requirements are often conflicting, the manufacturer has to choose one or the other, resulting in a great variety of motorcycles in this category.

Enduros: Road-legal versions of motocross, i.e. featuring high ground clearance and copious suspension with minimal creature comforts. Highly unsuitable for long distance road travel. The features that differ from the motocross versions are the silencers, the flywheel weights and the presence of features necessary for highway use.

Photograph by Dario Agrati

Annex 2 – Overview of motorcycle use and accident statistics in EU 15

In **Great Britain**[34] the following figure demonstrates that the trend for motorcycle fatalities has remained stable since 1998 with a significant decrease in 2004.



Sources: Casualty data: Department For Transport;
Parc data: Motorcycle Industry Association

In 2004, total car occupant fatalities were 1,671 while total pedestrian fatalities were 671 and total motorcycle (PTW) fatalities were 585. 49% of these 2,927 deaths were caused by collisions with cars[1] as highlighted in the following table.

Table Two

Vehicle involvement 2004			
Fatalities resulting from collisions with cars **presumed caused by car*		Fatalities resulting from collisions with PTWs * *presumed caused by PTW*	
car/ptw*	227	ptw/ptw*	8
car/pedestrian*	388	ptw/pedestrian*	23
car/bicycle*	61	ptw/bicycle*	1
car/car	494		
car/van	13	ptw/van	0
car/hgv-bus	4	ptw/hgv-bus	1
Total Fatalities	1,187	Total Fatalities	33

Source: Table 23 DfT Report NB car/ptw collisions represent 38.8% of all PTW fatalities.

In 2004, there were 494 deaths of car drivers and passengers, followed by 388 pedestrians, then 227 motorcycle (PTW) riders and/or passengers, caused by cars. Table Three below, highlights that there were 6,147 serious injuries for car drivers and passengers, 5,177 serious injuries for pedestrians and then 2,899 serious injuries for PTW riders and passengers, caused by cars. In both tables, blame is not apportioned.

[34] Generally the United Kingdom figures are rarely used because this would entail a separate analysis of Northern Ireland, which has its own registration authority and analysis of road casualties. We therefore refer to Great Britain.

Table Three

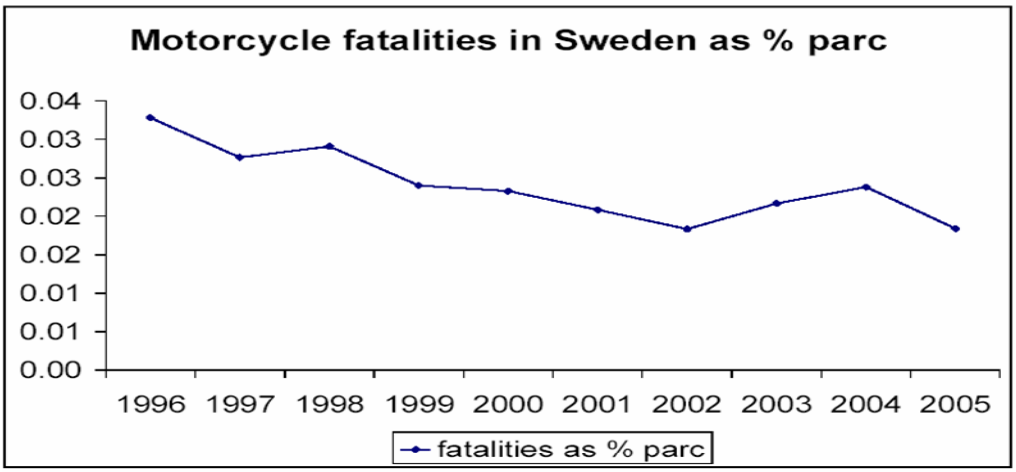
Vehicle involvement 2004			
Serious injuries resulting from collisions with cars **presumed caused by car*		Serious injuries resulting from collisions with PTWs * *presumed caused by PTW*	
car/ptw *	2,899	ptw/ptw*	105
car/pedestrian*	5,177	ptw/pedestrian*	266
car/bicycle*	1,601	ptw/bicycle*	49
car/car	6,147		
car/van	170	ptw/van	5
car/hgv-bus	157	ptw/hgv-bus	4
Total serious injuries	16,151	Total serious injuries	429

Source: Table 23 DfT Report NB car/ptw collisions represent 47.8% of all ptw serious injuries

The total number of collisions involving cars resulting in serious injuries was 16,151 of which 9,677 or 60% of those were collisions between cars and more vulnerable road users.

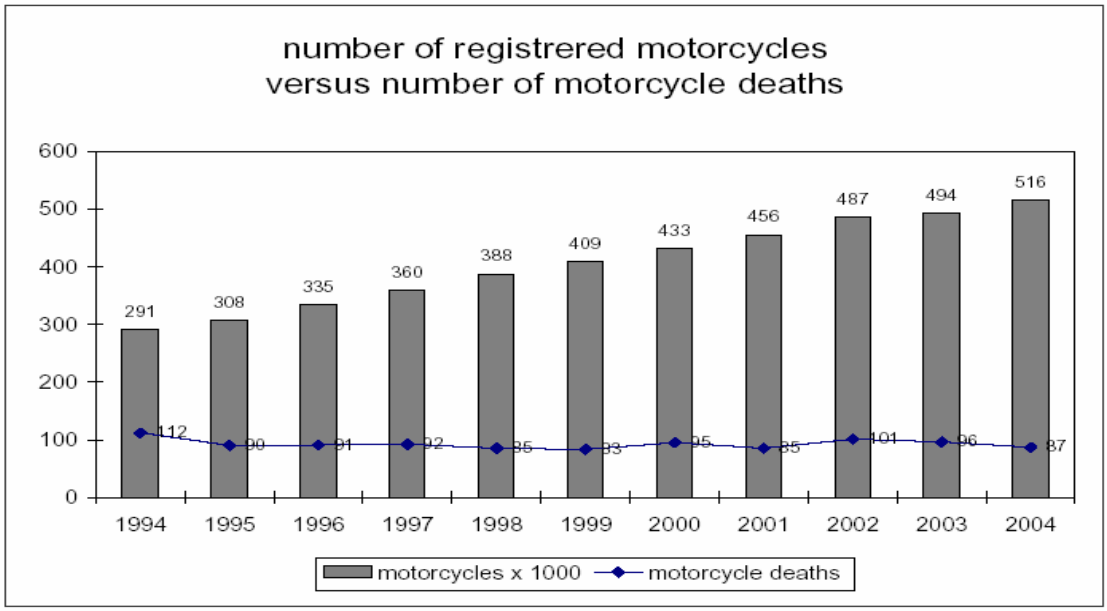
In **Italy**, the number of PTWs is the highest across the EU, amounting to approximately 10.000.000 vehicles in use on a daily basis. Since the year 2000, the PTW parc has evolved in its structure, with a decrease in the number of mopeds, whilst the number of motorcycles increased substantially, as well as the total kilometres travelled. Effectively, the fatality risk per single motorcycle in use in Italy is the lowest across the whole of the European Union, because of the widespread awareness of car drivers towards the presence of PTW in traffic.

In **Sweden**, the number of motorcycles registered has been constantly growing since 1990. In the year 2000, 39 motorcyclists' fatalities were recorded for 167.436 motorcycles in use. Despite a growth in the circulating parc, the number of fatalities decreased in 2001 (38 for 182.092 vehicles) and 2002 (37 for 201.526 vehicles); it increased to 47 in 2003 (217.015 vehicles). The latest data for 2005 shows a figure of 46 fatalities for 250.000 vehicles. Therefore, as the following graph highlights, over the last 10 years there has been a reduction in fatalities rates and the trend is converging towards the number of fatalities/1000 cars.



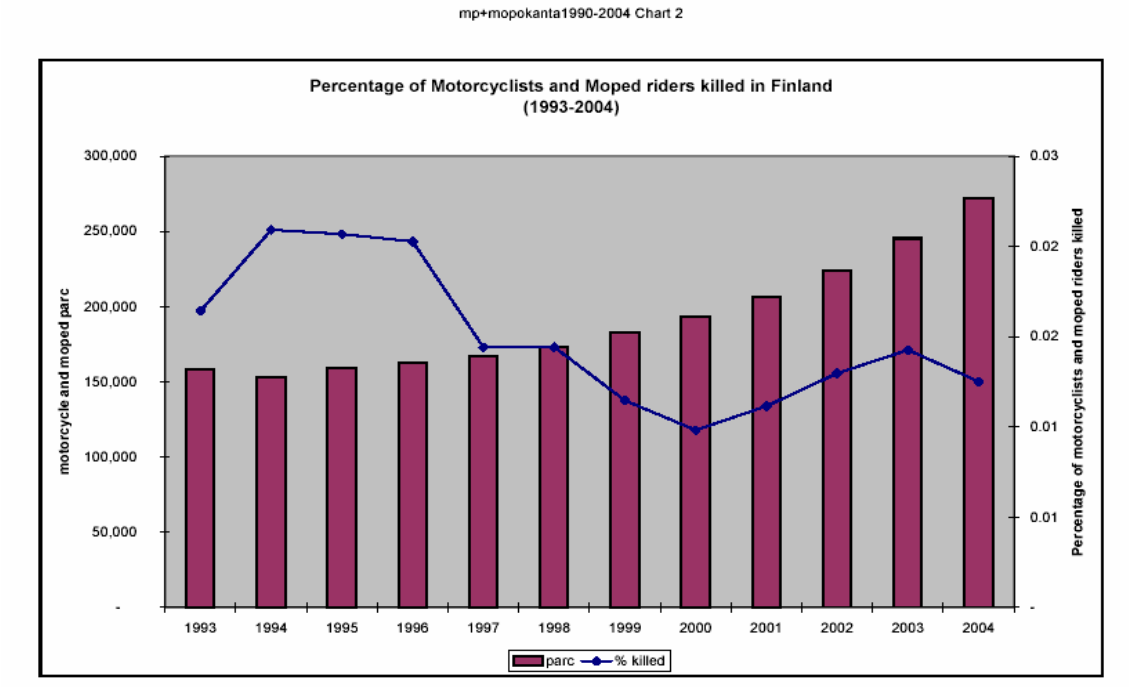
Source – SCB

Similar results are found in other European countries such as **The Netherlands**, where the number of fatalities has fallen over the last years. The number of deaths, in relation to the number of registered motorcycles, has decreased significantly.



Source - Central Bureau of Statistics (CBS)/Ministry of Transport

Similarly, in **Finland**, the data show the same trend both for injuries and fatalities. Since 1996, there has been a decrease in the motorcycle fatality rates.



Source - Finnish National Statistics

Overview of motorcycle use in EU 15

		GDP	Population	PTW parc	Motorcycle parc	Moped parc	Car parc	Motorcycle Deaths	Moped Deaths	Total PTW Deaths	Total Road Deaths	% PTW/Car parc	% PTW/Total Road Deaths	% PTW Deaths/PTW parc
		GDP per capita, at current prices and current PPP US dollars, 2000 · Sources: UNECE Statistical Division;(Data for UK)	Sources: UNECE Statistical Division;(Data for UK)	(Source: ACEM (NL:Bovag; GB:MCIA; BAST: DK)	(Source: ACEM (NL:Bovag; GB:MCIA; Sweden: Finland; BAST: Germany)	(Source: ACEM (NL:Bovag; GB:MCIA; Sweden: Finland; BAST: Germany)	Source: ACEA (GB:SMMT; NL:Bovag; LU:Statec; BAST: Germany)	Source: ACEM; CARE (includes passengers)(BAST: Germany)	Source: ACEM; CARE (includes passengers)1(BAST: Germany)	Source: ACEM; CARE (includes passengers)1; (BAST: Germany 2001-05)	Source: International Road Traffic and Accident Database (OECD), ECMT and CARE (EU road accidents database) (Ireland: Garda Siochana 2004-05; BAST: Germany; GB:DfT; Luxembourg-Ministère des Transports 2001-03)			
Austria	***2001***	28,841	8,043,046	636,888	294,843	342,045	4,182,027	107	37	144	958	15.2	15.0	0.02
	2002	28,940	8,083,660	595,259	292,569	302,690	3,987,093	89	46	135	956	14.9	14.1	0.02
	2003	29,169	8,121,148	605,405	305,481	299,924	4,054,308	109	47	156	956	14.9	16.3	0.03
	2004	29,635	8,173,323	610,835	315,638	295,197	4,109,129	98	44	142	878	14.9	16.2	0.02
	2005	30,056	8,236,224	612,000		n/a	4,156,743	98	41	139	768	14.7	18.1	0.02
Belgium	***2001***	26,773	10,286,569	639,813	289,813	n/a	4,684,504	147	63	210	1,486	13.7	14.1	0.03
	2002	27,048	10,332,784	651,217	301,217	n/a	4,724,856	158	68	226	1,213	13.8	18.6	0.03
	2003	27,200	10,376,132	605,405	315,422	n/a	4,772,584	124	45	169	1,213	12.7	13.9	0.03
	2004	27,886	10,421,136	628,617	328,617	n/a	4,818,571	120	33	153	1,162	13.0	13.2	0.02
	2005	28,036	10,478,617	n/a		n/a	4,861,352	123	30	153	1,089		14.0	
Denmark	***2001***	28,918	5,358,783	146,365	78,390	67,975	1,875,252	12	43	55	431	7.8	12.8	0.04
	2002	28,950	5,375,930	151,322	82,731	68,591	1,889,979	24	38	62	432	8.0	14.4	0.04
	2003	28,985	5,390,573	155,740	87,779	67,961	1,894,209	25	43	68	432	8.2	15.7	0.04
	2004	29,532	5,404,522	162,128	94,815	67,313	1,914,370	23	46	69	369	8.5	18.7	0.04
	2005	30,345	5,419,432	n/a	n/a	n/a	1,961,162	16	29	45	331		13.6	
Finland	***2001***	26,713	5,188,008	206,235	102,811	103,424	2,331,000	16	7	23	433	4.4	5.3	0.01
	2002	27,084	5,200,598	223,577	116,021	107,556	2,146,243	22	7	29	415	5.4	7.0	0.01
	2003	27,501	5,213,013	245,382	129,670	115,712	2,180,025	23	12	35	379	5.9	9.2	0.01
	2004	28,449	5,228,171	271,720	142,703	129,017	2,259,383	22	14	36	375	6.3	9.6	0.01
	2005	29,179	5,246,095	272,000	n/a	n/a	2,414,477	32	4	36	379	11.3	9.5	0.01

France 	***2001***	26,232	61,120,171	2,440,000	1,019,000	1,421,000	28,700,000	1,092	450	1,542	8,160	8.5	18.9	0.06
	2002	26,325	61,530,195	2,441,000	1,054,000	1,387,000	29,160,000	1,063	387	1,450	7,655	8.4	18.9	0.06
	2003	26,438	61,932,472	2,448,000	1,091,000	1,357,000	29,560,000	883	393	1,276	5,731	8.3	22.3	0.05
	2004	26,921	62,324,407	2,462,000	1,131,000	1,331,000	29,900,000	866	339	1,205	5,530	8.2	21.8	0.05
	2005	27,217	62,702,371	n/a	n/a	n/a	30,100,000	892	356	1,248	5,318		23.5	
Germany 	***2001***	25,822	82,349,924	5,152,109	3,410,480	1,594,749	44,383,323	964	138	1,102	6,977	11.6	15.8	0.02
	2002	25,778	82,488,494	5,339,396	3,557,360	1,682,523	44,657,303	913	131	1,044	6,842	12.0	15.3	0.02
	2003	25,718	82,534,175	5,328,680	3,656,873	1,583,917	45,022,926	946	134	1,080	6,613	11.8	16.3	0.02
	2004	26,044	82,516,260	4,565,277	3,744,763	1,662,765	45,375,526	858	122	980	5,842	10.1	16.8	0.02
	2005	26,293	82,469,422	5,630,000	2,902,512	1,785,620	46,090,303	875	107	982	5,361	12.2	18.3	0.02
Greece 	***2001***	17,428	10,949,957	847,732	679,817	167,915	3,242,204	426	77	503	1,880	26.1	26.8	0.06
	2002	18,033	10,987,542	869,047	703,682	165,365	3,477,059	341	55	396	1,634	25.0	24.2	0.05
	2003	18,828	11,023,513	881,382	707,369	174,013	3,696,944	310	53	363	1,615	23.8	22.5	0.04
	2004	19,638	11,061,700	893,186	714,549	178,637	3,960,189	379	55	434	1,670	22.6	26.0	0.05
	2005	20,321	11,103,965	n/a	n/a	n/a	4,204,463	399	58	457	1,658		27.6	
Ireland 	***2001***	30,064	3,866,424	32,913	n/a	n/a	1,384,704	50	0	50	412	2.4	12.1	0.15
	2002	31,333	3,931,770	33,147	n/a	n/a	1,447,908	44	0	44	378	2.3	11.6	0.13
	2003	32,146	3,994,698	35,094	n/a	n/a	1,507,106	55	0	55	337	2.3	16.3	0.16
	2004	32,970	4,068,452	37,000	n/a	n/a	1,582,833	n/a	n/a	n/a	374	2.3		
	2005	34,061	4,159,096	n/a	n/a	n/a	1,664,868	n/a	n/a	n/a	396			
Italy 	***2001***	26,328	56,980,738	9,979,890	3,729,890	6,250,000	33,239,029	807	508	1,315	6,691	30.0	19.7	0.01
	2002	26,335	57,157,406	10,149,540	4,049,540	6,100,000	33,706,153	869	420	1,289	6,739	30.1	19.1	0.01
	2003	26,140	57,604,657	10,295,449	4,370,449	5,925,000	34,310,446	980	461	1,441	6,065	30.0	23.8	0.01
	2004	26,196	58,175,310	10,224,644	4,574,644	5,650,000	33,973,147	1,070	388	1,458	5,625	30.1	25.9	0.01
	2005	26,060	58,607,043	n/a	n/a	n/a	34,667,485	1,143	409	1,552	5,700		27.2	
Luxembourg 	***2001***	51,651	441,525	33,576	11,961	21,615	n/a	6	0	6	70	0.0	8.6	0.02
	2002	53,155	446,175	34,701	12,671	22,030	213,177	0	0	0	64	16.3	0.0	0.00
	2003	53,390	449,950	35,959	13,380	22,579	212,472	13	0	13	52	16.9	25.0	0.04
	2004	54,964	453,300	36,909	13,901	23,008	212,063	n/a	n/a	n/a	48	17.4		
	2005	56,768	457,250	37,739	14,268	23,471	211,567	n/a	n/a	n/a	46	17.8		
Netherlands 	***2001***	28,705	16,046,180	964,822	460,822	504,000	6,539,000	76	78	154	993	14.8	15.5	0.02
	2002	28,542	16,148,928	1,002,450	494,450	508,000	6,710,000	93	98	191	987	14.9	19.4	0.02
	2003	28,503	16,225,302	1,015,567	516,567	499,000	6,855,000	95	94	189	1,028	14.8	18.4	0.02
	2004	28,966	16,281,779	1,038,934	536,934	502,000	7,151,000	91	87	178	804	14.5	22.1	0.02
	2005	29,336	16,319,868	n/a	552,949	n/a	7,299,000	95	94	94	750	7.6	12.5	
Portugal 	***2001***	18,620	10,292,999	709,000	158,000	551,000	3,746,000	229	184	413	1,671	18.9	24.7	0.06
	2002	18,626	10,368,402	604,000	149,000	455,000	3,885,000	225	145	370	1,675	15.5	22.1	0.06
	2003	18,359	10,441,075	633,000	153,000	480,000	3,966,000	213	157	370	1,356	16.0	27.3	0.06
	2004	18,497	10,501,970	611,000	159,000	452,000	4,100,000	181	121	302	1,294	14.9	23.3	0.05
	2005	18,473	10,549,423	n/a	n/a	n/a	4,200,000	188	106	294	1,247		23.6	

Spain 	***2001***	21,603	40,720,483	3,596,045	1,483,442	2,112,603	18,150,880	370	461	831	5,516	19.8	15.1	0.02
	2002	21,869	41,313,973	3,561,450	1,517,208	2,044,242	18,732,632	401	383	784	5,347	19.0	14.7	0.02
	2003	22,164	42,004,522	3,657,119	1,513,526	2,143,593	18,688,320	367	391	758	5,399	19.6	14.0	0.02
	2004	22,515	42,691,688	3,854,128	1,612,082	2,242,046	19,541,918	399	361	760	4,741	19.7	16.0	0.02
	2005	22,931	43,398,142	4,118,000	n/a	n/a	20,250,377	472	312	784	4,442	20.3	17.6	0.02
Sweden 	***2001***	27,391	8,895,960	328,838	182,092	146,746	4,018,533	38	9	47	583	8.2	8.1	0.01
	2002	27,847	8,924,958	351,526	201,526	150,000	4,042,792	37	12	49	560	8.7	8.8	0.01
	2003	28,214	8,958,229	367,015	217,015	150,000	4,075,414	47	9	56	529	9.0	10.6	0.02
	2004	29,261	8,993,531	385,137	235,196	149,941	4,113,424	56	18	74	480	9.4	15.4	0.02
	2005	29,991	9,029,572	395,000	250,000	145,000	4,153,674	46	8	54	440	9.5	12.3	0.01
United Kingdom* 	***2001***	26,238	59,108,686	1,212,000	1,033,200	178,800	28,604,238	n/a	n/a	583	3,450	4.2	16.9	0.05
	2002	26,682	59,327,657	1,255,800	1,077,000	178,807	29,320,899	n/a	n/a	609	3,431	4.3	17.7	0.05
	2003	27,314	59,568,775	1,314,000	1,131,500	182,476	29,895,832	669	24	693	3,508	4.4	19.8	0.05
	2004	28,072	59,879,864	1,338,300	1,160,900	177,448	30,267,204	560	25	585	3,221	4.4	18.2	0.04
	2005	28,420	60,226,500	1,367,100	1,193,500	173,600	30,674,000	547	22	569	3,201	4.5	17.8	0.04

Note: PTW refers to motorcycles, scooters and mopeds

* Economic and population data refer to United Kingdom (England, Wales, Scotland, Northern Ireland, Channel Islands and Isle of Man); Parc and Casualty data refer to Great Britain (England, Wales and Scotland)

1 http://ec.europa.eu/transport/roadsafety_library/care/doc/annual_statistics

Annex 3 – Overview of FEMA involvement in Motorcycle Research Projects

FEMA PROJECTS:

With the financial support of the European Commission (DG TREN), FEMA undertook two major pieces of research in the field of motorcyclist protective guardrails and initial rider training.

Motorcyclists & Crash Barrier project

2000

http://www.fema.ridersrights.org/crashbarrier/index.html

Aims:

- Investigate the effects of crash barriers on motorcyclists
- Identify ways to reduce severity of motorcycle accidents against metal crash barrier
- Make recommendations for road traffic authorities to reduce injuries in collision with crash barriers;
- Make these recommendations relevant to road type, preferred crash barrier system, installation and replacement considerations, ...

Note:
In addition to this report, FEMA published the ***Road to Success*** the aims of which were:

http://www.fema.ridersrights.org/crashbarrier2005/crashbarrier2005.PDF

- To provide an overview of the projects that have been successfully carried out in a number of European countries
- To describe the difficulties and obstacles that motorcyclist organizations encounter;
- To list conclusions and recommendations to assist politicians, road authorities and motorcyclist organizations to implement successful policies with the aim of improving the safety of motorcyclists by improving crash barriers.

Initial Rider Training Project (IRT)

2007

http://www.initialridertraining.eu

The IRT project has created a European initial rider training programme which includes a modular approach to initial rider training, the essential elements and aspects for initial rider training, a method and approach to support initial rider training, and a comprehensive manual for use in a range of situations. It has also evaluated the potential of e-Coaching for initial rider training, reviewed recent rider and driver training research, and surveyed national training and testing arrangements.

MOTORCYCLE INDUSTRY PROJECTS:

MOTORCYCLE ACCIDENT IN-DEPTH STUDY (MAIDS) 2004

http://maids.acembike.org

MAIDS is the most comprehensive in-depth data currently available for Powered Two Wheeler (PTW) accidents in Europe. The investigation was conducted during 3 years on 921 accidents from 5 countries using a common OECD research methodology.

6TH EUROPEAN RESEARCH FRAMEWORK PROGRAMME (FP6):

Framework programmes are major milestones in EU policies as they define priorities to the research sector according to the various objectives the EU tries to reach. As far as transport is concerned, the EU is financing more and more research towards intelligent systems which is believed will help to fight congestion, improve road safety and reduce all environmental costs.

Integrated Projects on Advanced Protection Systems (APROSYS)

http://www.aprosys.eu

The objectives of this research project are:

- To improve passive safety for all European road users in all relevant accident types and accident severities.
- To increase the level of competitiveness of the European automotive industry.
- To improve efficiency by adopting an Integrated Approach.

With regards to two wheeled vehicles:

- Identification of the main accident scenarios for motorcyclists
- Injury characterization for motorcyclists in the selected accident scenarios
- Proposal of a new test procedure for rider-infrastructure interaction
- Guidelines to design motorcyclist friendly roadside infrastructure
- Design concepts for innovative motorcyclist protective equipment

Towards Integrated Safety for Powered Two Wheelers (MYMOSA)

http://www.mymosa.eu/

Aims:

- to educate ten Early Stage Researchers (ESR) in the partially unexplored field of Powered Two Wheelers' (PTW) and rider safety
- to facilitate the development of R&D abilities (personal career development plan) and the formation of a European network of personal relationships in an early stage of the careers of the researchers (many years benefiting their careers/specialization)
- to stimulate co-operation between researchers of 5 universities, 3 research centres and 6 industries (2 SMEs) through visits, secondments and training (Transfer of Knowledge)

7TH EUROPEAN RESEARCH FRAMEWORK PROGRAMME (FP7) - ICT AND SST:

The EU 7th research framework programme was launched early February 2007. With this framework, the EU gives new guidelines for the research work to be undertaken by the whole research community – comprising not only research institutes and academics, but also the private sector and civil society organizations, such as FEMA.

CALL2007 - Proposals including FEMA's participation:

- **SAFERIDER** (On Board Technology) (ICT)
  The aim of this project – the proposal has been successful – is to enhance PTW riders' safety by applying ADAS/IVIS on PTWs of all types to develop efficient and rider-friendly interfaces and interaction elements for the riders' comfort and safety.
- **2BeSafe** (SST)
  The aim of this project – if successful - is to design and implement a broad ranging research programme to produce knowledge of PTW rider performance, behaviour and safety, alone or when interacting with other road users.
- **Inter2Wheel** (Protective Clothing) (SST)
  The aim of this project – if successful - is to produce a prototype of a holistic protection system that will be comprised of helmets and garments that will cooperate together in order to protect the rider from severe or even deadly incidents.
- **IRIS** (Crash Barriers) (SST)
  The aim of the project – if successful - is to introduce innovative and competitive road safety systems capable of increasing road safety by turning barriers into active systems that can interact with the infrastructure and with the users.
- **IRRS** (Crash Barriers) (SST)
  The aim of this project – if successful - is to apply energy absorption techniques and designs to new concepts of Road Restraint Systems (RRS) for motorcyclist protection in case of traffic accident by using 'Intelligent' Road Restraint Systems.

Annex 4 –Motorcycle Accident Research Studies

Motorcycle casualties are often the focus of research, with many reports highlighting the perceived risk-taking of motorcyclists and the dangerousness of motorcycles. What is apparent from these reports is a lack of understanding of motorcycles and motorcyclists, which is mainly due to the fact that the majority of researchers do not ride motorcycles and therefore do not understand the social issues surrounding two wheeled transport.

Only a few motorcycle accident research studies have the support of FEMA, amongst which are:

THE HURT REPORT (1981 – US)

The most influential accident causation study was the report *"Motorcycle Accident Cause Factors and Identification of Countermeasures", also known as the "Hurt Report", January 1981*. It was a study conducted by the University of Southern California (USC). Using funds from the National Highway Traffic Safety Administration, researcher Harry Hurt investigated almost every aspect of 900 motorcycle accidents in the Los Angeles area. Additionally, Hurt and his staff analyzed 3,600 motorcycle traffic accident reports in the same geographic area.

Major findings are summarized as follows:

- Approximately three-fourths of these motorcycle accidents involved collision with another vehicle, which was most usually a passenger automobile.
- Approximately one-fourth of these motorcycle accidents were single vehicle accidents involving the motorcycle colliding with the road or some fixed object in the environment.
- Vehicle failure accounted for less than 3% of these motorcycle accidents, and most of those were single vehicle accidents where control was lost due to a puncture flat.
- In the single vehicle accidents, motorcycle rider error was present as the accident precipitating factor in about two-thirds of the cases, with the typical error being a slide out and fall due to over braking or running wide on a curve due to excess speed or under-cornering.
- Road defects (pavement ridges, potholes, etc.) were the accident cause in 2% of the accidents; animal involvement was 1% of the accidents.
- In the multiple vehicle accidents, the driver of the other vehicle violated the motorcycle right-of-way and caused the accident in two-thirds of those accidents.
- The failure of motorists to detect and recognize motorcycles in traffic is the predominating cause of motorcycle accidents. The driver of the other vehicle involved in collision with the motorcycle did not see the motorcycle before the collision, or did not see the motorcycle until too late to avoid the collision.
- Intersections are the most likely place for the motorcycle accident, with the other vehicle violating the motorcycle right-of-way, and often violating traffic controls.
- Most motorcycle accidents involve a short trip associated with shopping, errands, friends, entertainment or recreation, and the accident is likely to happen in a very short time close to the trip origin.
- The median pre-crash speed was 29.8 mph [48.0 Kph], and the median crash speed was 21.5 mph [34.6 Kph], and the one-in-a-thousand crash speed is approximately 86 mph [138 Kph].
- The typical motorcycle pre-crash lines-of-sight to the traffic hazard portray no contribution of the limits of peripheral vision; more than three-fourths of all accident hazards are within 45 degrees of either side of straight ahead.

- Conspicuity of the motorcycle is most critical for the frontal surfaces of the motorcycle and rider.
- Vehicle defects related to accident causation are rare and likely to be due to deficient or defective maintenance.
- The motorcycle riders involved in accidents are essentially without training; 92% were self-taught or learned from family or friends. Motorcycle rider training experience reduces accident involvement and is related to reduced injuries in the event of accidents.
- More than half of the accident-involved motorcycle riders had less than 5 months experience on the accident motorcycle, although the total street riding experience was almost 3 years. Motorcycle riders with dirt bike experience are significantly underrepresented in the accident data.
- Motorcycle riders in these accidents showed significant collision avoidance problems. Most riders would over brake and skid the rear wheel, and under brake the front wheel greatly reducing collision avoidance deceleration. The ability to counter steer and swerve was essentially absent.
- The typical motorcycle accident allows the motorcyclist just less than 2 seconds to complete all collision avoidance action.
- The driver of the other vehicles involved in collision with the motorcycle is not distinguished from other accident populations except that the ages of 20 to 29 and beyond 65 are overrepresented. Also, these drivers are generally unfamiliar with motorcycles.

THE MAIDS STUDY (2004 – EU)

The only European motorcycle study which looked at the accident causation of 921 motorcyclists in four European countries was carried out in 2004 by a Consortium led by the Association of European Motorcycle Manufacturers – ACEM. This was called "MAIDS, In-depth investigation of motorcycle accidents".

According to the authors of the MAIDS report:

- The object most frequently struck in an accident was a passenger car.
- The second most frequently struck object was the road itself, either as the result of a single vehicle accident or of an attempt to avoid a collision with another vehicle.
- Whilst each sampling area contained both urban and rural areas, the majority of the accidents took place in an urban environment.
- Travel and impact speeds for all PTW categories were found to be low, most often below 50 km/h. There were relatively few cases in which excess speed was an issue related to accident causation.
- Overall, the study found that human factors were the primary accident contributing factor in approximately 87.5% of all cases indicating that vehicle operators are largely responsible for accident causation.
- The research identified PTW riders as the primary cause factor in less than 1% of all cases while car drivers were identified as the primary cause factor in over 50% of all cases.
- The study found that in general riders with more experience are less likely to be the primary contributory factor of an accident. Furthermore, 29% of riders with less than 6 months experience had insufficient skills and this percentage went down to 6.4% for riders with over 98 months of experience.
- 55.7% of PTW rider and passenger injuries were to the upper and lower extremities. The majority of these were minor injuries, e.g. abrasions, lacerations and contusions. Appropriate clothing was found to reduce, but not completely eliminate, many of these minor injuries. The data indicates that lower extremity injuries were most frequently

reported (1159 injuries, or 31.8% of all injuries), followed by upper extremity injuries (871 injuries, or 23.9% of all injuries). These injuries included passengers.

- However, 58.4% of all lower extremity injuries sustained by riders were minor or moderate (e.g., lacerations or abrasions) and two-thirds of these were due to road/roadside contact. Serious lower extremity injuries were due mainly to Other Vehicle collision contact (e.g. 40.6% of all 70% of accidents occurred under 50 km/h.
- Roadside barriers presented an infrequent but substantial danger to PTW riders, causing serious lower extremity and spinal injuries as well as serious head injuries. For PTW riders, a road maintenance defect caused the accident or was a contributing factor in 3.6% of all cases. For PTW riders, a traffic hazard caused the accident or was a contributing factor in 3.8% of all cases.
- Weather-related problems either caused the accident or contributed to accident causation in 7.4% of PTW accidents in the study.

THE "BEHAVIOURAL RESEARCH IN ROAD SAFETY" (2004 - UK DEPARTMENT FOR TRANSPORT)

In November 2004, the Department for Transport in Great Britain published a report called 'Behavioural Research in Road Safety'. The report covers a variety of studies which focus on specific causes to road accidents. One of these studies is called 'An in-depth case study of motorcycle accidents using police road accident files' by the authors DD Clarke, P Ward, W Truman and C Bartle.

This study considers accidents 'involving motorcyclists (and their blameworthiness) and the problem surrounding other road users' perception of motorcycles, particularly at junctions' (page 5). The report considers factors such as 'drivers with relatively high levels of driving experience who nonetheless seem to have problems detecting approaching motorcycles' (ibid).

The study examined 1,790 motorcycle accidents from the West Midlands police reports with follow up questionnaires. However, the authors concentrated on c.1000 of these accident reports identified as 'A' class' which provided more detail of the accidents.

Accordingly, 'of the total cases, 681 (38%) involve ROWVs[35]. However, less than 20% of these involve a motorcyclist who rated as either fully or partly to blame for the accident. The majority of motorcycle ROWV accidents have been found to be primarily the fault of other motorists. This is an even higher level of 'non-blameworthiness' in ROWV accidents than that observed in other in-depth studies, e.g. Hurt *et al 1981*. (op. cit.)'.

The study supports the DfT 2004 casualty data by identifying that '*The majority of ROWVs occur at T-junctions, which are three times as common as roundabouts or crossroads. This finding is in accordance with the work of Hole et al. (1996), who found that the majority of such accidents occurred at 'uncontrolled' (i.e. no stop light or sign with only give-way markings and/or signs present) T-junctions in urban environments*' (page 7).

The report highlights that '*Over 65% of ROWV accidents where the motorcyclist is not regarded as to blame involve a driver who somehow fails to see a motorcyclist who should be in clear view, and indeed frequently is in view of witnesses or other road users in the area. Failures of observation that involve drivers failing to take account of restricted views of one kind or another, and failing to judge the approach speed and/or distance of a motorcyclist are not included in this category*' (Ibid).

The most significant finding of this study with regards to right of way violation (ROWV) accidents, suggests that in particular, there is a marked problem with other road users observing motorcyclists. This is the phenomenon whereby drivers overlook a motorcyclist in

[35] ROWVs – Right of Way Violations

the immediate foreground seems to be in agreement with the work of Mack and Rock (op. cit.), whose theory of 'inattentional blindness' showed that subjects may be *less* likely to perceive an object if they are looking at it directly than if it falls outside the centre of the visual field. 'Inattentional blindness' is suggested by research to be affected by four main factors: conspicuity, expectation, mental workload, and capacity (page 8).

'*Some results would seem to permit the discussion of conspicuity and expectation. The fact that many motorcyclists in our sample appear to be trying to make themselves more conspicuous but are not seen* (however the report does not indicate what methods were used – i.e. whether this conspicuity included bright clothing, headlights on etc)*, nevertheless lends credence to the idea that there is something amiss in the cognitive processes of the other involved driver. The 'expectation' factor, in particular, raises the possibility that some road users have a poor perceptual 'schema'*[36] *for motorcycles in the traffic scene, and therefore do not process the information fast enough when motorcyclists are observed*' (page 14).

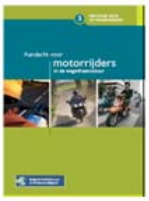
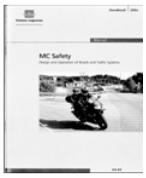
Furthermore, the research shows that '*the average age of drivers in 'at fault' ROWV accidents involving motorcycles, 41 years, is significantly higher than the equivalent group in non-ROWV accidents, 36 years (t = 3.45, p < 0.05)*' (page 15).

The study continues '*For right of way accidents that involve other drivers pulling out in front of motorcyclists who are perhaps further away, it could also be that more global visual failings are contributing to the age effect. The proportion of visual error compared with other 'at fault' errors rises with age. The change in ratio occurs at too greater an age (65' years plus) to be related purely to driver skill factors, and suggests an age-related deficit*' (page 16).

According to the study, '*reasons for such an increase in global visual failings with age are many. Isler et al. (1997) found, in an analysis of the effect of reduced head movement and other deteriorations in the visual system on the useful field of view for the drivers aged 60 years' plus, that there was an evident restriction on the distances at which approaching traffic could be brought into the central, stationary field. Even at maximum head rotation plus one saccadic eye movement*[37]*, approaching vehicles would not be clearly perceived beyond a distance of 50 metres*' (Ibid).

[36] A mental representation that consists of general knowledge about events, objects or actions
[37] Very rapid, ballistic eye movement (with speeds up to 800 degrees per second)

Annex 5 –Road Infrastructure handbooks

	Belgium	*Aandacht voor motorrijders in de weginfrastructuur* 2005 BIVV (Belgisch instituut voor verkeersveiligheid)	
	France	*Prise en compte des motocyclistes dans l'aménagement et la Gestion des infrastructures* 2000 SETRA – CERTU	
	Germany	*Motorradfreundlicher Straßenbau. Motorradfreundlicher Anforderungen an Planung, Bau und Betrieb von Straßen.* 2003 IfZ (Institut fűr Zweiradsicherheit e.V.)	
	The Netherlands	*Handboek gemotoriseerde tweewielers. Een handreiking voor veilig wegontwerp, wegonderhoud en beheer.* *2003* *CROW*	
	Norway	*MC Safety. Design and Operation of Roads and Traffic Systems* 2004 Norway Public Roads Administration	
	The United Kingdom	*Guidelines for motorcycling. Improving safety through engineering and integration* 2005 IHIE (Institute of Highway Engineers)	
	ACEM recently published a compiled version of these documents called "Guidelines for PTW-safer road design in Europe"