



# A Safety Plan **for Action**



# Safety Plan for Action

Safety is a top priority for the Powered Two-Wheeler (PTW) industry. ACEM, the Motorcycle Industry in Europe, dedicates energy and resources to acquiring and analysing data regarding road safety and Powered Two Wheelers in order to identify and prioritize areas for improvements. This process follows an integrated approach looking at human, vehicle and infrastructure related factors, seeking to involve policymakers and other relevant stakeholders at European, National and local level.

Shared responsibility is the key-expression of the European Road Safety Action Programme, in striving towards the ambitious goal of halving the number of fatalities on Europe's roads by 2010. ACEM members actively support the 'shared responsibility' concept and are committed to reducing accidents by funding research, financing and participating to road safety projects and acting towards the common objective of improving the road safety of powered two-wheeler users.

## Road Safety: the Industry Strategy

- Improving the knowledge about motorcycling safety
- The Integrated approach
  - Act on the human factor
  - Act on the vehicle
  - Act on the infrastructure
- Cooperate with institutions and stakeholders



Based on scientific research, on the combined knowledge of ACEM members and supported by the findings of the MAIDS study, the Motorcycle industry devised a strategy centered on four action fields:

**Improving the Knowledge - Human Factors - The Vehicle - The Infrastructure**

## Improving the knowledge

In order to better understand the nature and causes of PTW accidents, ACEM conducts studies of motorcycle and moped accidents intended at improving the knowledge of PTW accidentology. ACEM finances and participates to road safety projects aimed at contributing to curbing road accidents. The results of these projects are then implemented and shared as best practices with policymakers and other stakeholders.

### MAIDS Motorcycle Accident In-depth Analysis

PTW riders form one of the most vulnerable groups of road users and road accidents are of growing social concern. Reducing PTW's riders fatalities in the European Union and achieving the goals of the European Road Safety Charter require solutions and the implementation of policies aiming at fully integrating PTW in mobility plans.

Proper knowledge of how road accidents involving PTWs occur is fundamental to identify the right priorities. With the European Commission's co-funding, ACEM



*In-Depth investigation of motorcycle accidents*

Safety figures differ significantly across the EU member states, with statistics on PTWs indicating that, with the same vehicles available on the market, a considerable disparity exists between best and worst performing countries. Reducing this gap by improving national transport policies through integration of PTW will bring considerable and tangible benefits to European road safety. The identification and dissemination of best practices would facilitate the introduction of successful road safety policies by low performing countries.



carried out the most comprehensive in-depth study currently available for PTWs accidents in Europe: MAIDS - Motorcycle Accident In-Depth Study. The investigation was conducted by dedicated research teams during 3 years on 921 accidents from 5 countries.

In order to maintain consistency in the data collected in each sampling area the MAIDS team adopted the methodology developed by the Organisation for Economic Co-operation and Development (OECD) for on-scene in-depth motorcycle accident investigations. The survey produced approximately 2000 variables for each accident. To provide comparative information, data was collected in a further 923 cases of riders and PTWs that were not involved in accidents in the same area. The collection technique is commonly referred to as an exposure or case-control study.

MAIDS is the only study that analyses and categorizes the different types of rider and driver error for each accident. This analysis suggests a variety of different potential countermeasures, depending on the type of causing factors involved. The MAIDS study confirmed that amongst the wide variety of accident and crash configurations, there is no single configuration that dominates another.

The MAIDS database is made available to external researchers and institutions for further analysis. Since the publication of the MAIDS report several analysts have referred to MAIDS and partnerships have been built in order to continue to make the most of the data gathered by the MAIDS team.

### Focus on urban road safety

The higher presence of PTWs in cities justifies the need to gather further information on their use and specific safety needs.

Users choose PTW in cities and towns to beat congestion and parking problems making mopeds, scooters and motorcycles a common sight especially in all major European cities.

ACEM is actively involved in projects and partnerships aimed to increase safety for PTWs in cities. While considerable progress has been made concerning the benchmarking of road safety at national level, no exercise of the same scale and depth exists at the urban level. It is crucial to extend the benchmarking work to examine urban road safety performance, with the aim to consolidate work already started by some cities on Powered Two-Wheelers urban accidents.

### EURSP project

Accidents are proportionately more frequent in urban areas than elsewhere. Because of the growing PTW participation in urban traffic ACEM is a partner of POLIS, the network of European cities and regions promoting innovation in local transport. The POLIS network supports a European Urban Road Safety Platform (EURSP) that will benchmark cities road safety figures for all transport modes. A dedicated safety policy for cities depends on a specific focus on those areas with dedicated tools and authoritative partners. ACEM believes that the POLIS

network will make it possible first to gather those data and then to devise in partnership the best strategy to curb PTW accidents. The data gathered will be then disseminated and will serve as a database on safety in European cities.

### eSUM

In March 2008 the European Commission approved eSUM a project focusing on PTW safety in cities. The project is led by the city of Barcelona involving ACEM PTW manufacturers and three major European capitals (London, Paris, Rome). eSUM (European Safer Urban Motorcycling) is a collaborative initiative between industry and local authorities of Europe's principal motorcycle cities to identify, develop and adopt measures designed to deliver safer motorcycling in the city environment.

# Human Factors

## What does MAIDS say regarding experience and age:

1. there is no significant difference in the occurrence of accidents between countries that have historically allowed access to mopeds and light motorcycles at younger ages
2. as riders gain experience they have fewer accidents
3. trained riders have fewer accidents
4. young moped riders (14-17) are, under-represented in the accident population, confirming that age is not an issue in the occurrence of accidents.

Human Factors 6

The MAIDS study found out that human factors are the primary accident contributing factor in 88% of all cases. Other vehicle drivers are largely responsible for accident causation, which represent 61% of the multi-vehicle accidents. However, PTW riders are responsible of fatal accidents in 52% of the MAIDS fatal accidents cases. Primary accident contributing factor:

	Frequency	Percent
Human – PTW rider	344	37.4
Human – OV driver	465	50.5
Vehicle	3	0.3
Environmental	71	7.7
Other failure	38	4.1
<b>Total</b>	<b>921</b>	<b>100.0</b>



## Safety through adequate training and awareness

Good education can be a good substitute for experience since it allows the rider to acquire the necessary skills within controlled conditions.

**A properly managed progressive license system, based on gradual levels of education and training, will create the best conditions for improving road safety. The MAIDS study provides several elements in support of the stepped licensing system that is now a central element of the European driver licence Directive provisions.**

Nearly 70% of riders within the MAIDS database were found to have attempted some form of collision avoidance manoeuvre. This is a high percentage compared to around 33% of car drivers in this and other studies. However one third of these PTW riders lost control while performing the manoeuvre. These statistics show that proper training in hazard awareness and collision avoidance techniques could help to reduce the frequency of loss of control with a resulting accident.

ACEM promotes the introduction into the practical examination of skills which address hazard awareness and loss of control while executing emergency manoeuvres.



PTW riders who operate PTWs without the proper licence are more likely to be involved in accidents than those holding a licence. Enforcement and campaigns in schools are appropriate tools to deal with these riders.

## Results of the Initial Rider Training Project:

- created a model 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;
- positively evaluated the potential of e-Coaching and virtual training;
- reviewed recent rider and driver training research and surveyed national training and testing arrangements.

## Initial Rider Training Project

Initial Rider Training (IRT), a project launched in 2004 by FEMA and co-funded by the European Commission, identified a considerable number of differences on how new riders were trained in Member States. The enlargement of the European Union has resulted in an overall worsening of this situation. By comparing a wide array of training schemes the IRT project found out that the main common weaknesses of existing programmes were an **over emphasis on machine control skills, little focus on hazard awareness and avoidance, and - finally - that rider attitude and behaviour were rarely addressed.**

If we consider that the human factor is the main contributing factor to accidents involving PTWs, the development of a European approach to initial rider training can make a considerable contribution to reducing accidents amongst this group of vulnerable road users. While seeking to harmonise a wide range of different teaching schemes across the Member States, the Initial Rider Training projects focuses on crucial areas such as rider attitude and behaviour and hazard awareness and avoidance.

ACEM participated to the IRT project as a partner believing that an improved pre-licence training will lead to a reduction of accidents involving PTWs.



The Initial Rider Training Project

The MAIDS database indicates that many accidents (50.4%) were due to a failure of the **other vehicle driver** to see and correctly perceive the PTW and PTW rider prior to the impact. Often these accidents are due to the other road users insufficient knowledge of PTW operational features, and their underestimation of the presence of PTWs in traffic. This is highlighted by the fact that the MAIDS data analysis shows that OV drivers holding a PTW license have significantly less of these perception failures.

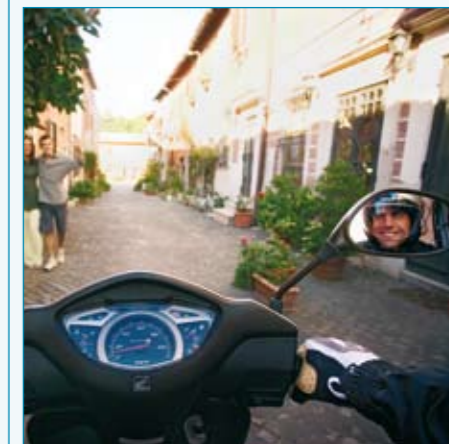
Supported by the findings of MAIDS, ACEM underscores the importance of raising awareness on PTW riders also among other road users in order to ensure the highest levels of risk awareness and collision avoidance techniques. Rider training schemes should emphasise knowledge of the most frequently occurring accidents patterns. Special attention should also be given to the finding that 90% of the risks that riders need to address are directly in front of their PTW.

## Speed

Speed is often a discussion topic when it comes to PTW safety. It is however interesting to note that 70 % of cases in the MAIDS study had a PTW collision speed of less than 50 km/h.

In general the travelling speeds and the impact speed data did not indicate that excessive speed or speed differential are major causes of accidents in the MAIDS study. However MAIDS indicates that speeding is present in a significant part of the most severe accidents. If not a major cause, speed is an obvious worsening factor that should be addressed through awareness and enforcement.

All vehicle operators should continuously be made aware of the increased risk associated with alcohol intake. ACEM supports activities and alcohol awareness campaigns.





Clear and consistent **enforcement** of existing traffic regulations, reinforced in rider training programs, can be a most effective way of improving rider behaviour, reducing accident rates.

## Rider Equipment

PTW riders are commonly defined as vulnerable road users since they are more exposed to the improper actions of other road users. Correct helmet wearing is important as a helmet can reduce the risk of a fatality of up to 50% (ETSC). World Bank and World Health Organisation figures show that **head injuries are responsible for about 75% of deaths among motorized two-wheeler users.**

All PTW riders and passengers must be made aware of the benefits of using proper helmets, and fitting/fastening them correctly, to reduce head injury severity. Enforcement of legislation for helmet wearing and helmet quality, to avoid low quality or inadequate helmets being sold to PTW riders is also important.

In co-operation with authorities, helmet manufactures and riders' organisations, ACEM supports public awareness and education campaigns to emphasize the importance of using the helmet and the helmet retention system properly for head protection and in order to avoid losing the helmet during an accident.

PTW riders and passengers should be made aware that the use of appropriate motorcycle clothing can reduce the risk of sustaining abrasions, lacerations or 'road rash' and will, in many instances, reduce the level of injury sustained.

Lower extremity injuries dominate the injury patterns found in most crashes, although most of these were minor to moderate injuries. Research to date has found

## Integrated Helmet Campaign



ACEM's analysis on helmet wearing indicated that there is evidence that a share of riders do not properly wear or fasten the helmet (eg. size, position, type), or do not wear a helmet at all, although this is a legal requirement throughout the EU27.

The 'Wear & Lock' campaign was launched during the 2007 Road Safety Week in April. It targeted young riders and it involved 3 National Associations (Anesdor, Ancma and Rai) as well as national, regional and local authorities, police forces, schools and dealership organisations.

The 'Wear & Lock' pilot campaign was an ACEM initiative following thorough ACEM analysis on helmet use and reports from the European Commission in its Mid Term Review of the Road Safety Action Plan (2006).

The project involved the use of television broadcast, information leaflets and billboards. Schools participated to the campaign with dedicated classroom education and with the dissemination of information material. National, regional and local authorities and police forces, as contributing partners, have been performing dedicated helmet wearing monitoring and enforcement.

The key messages that were conveyed to the PTW riders were:

- Always wear a helmet
- Always lock the helmet's chinstrap
- Always choose ECE type approved helmets
- Always use a proper size helmet
- Never take a passenger without a helmet.

ACEM will continue to build on the four pillars of prevention, enforcement, education and icon-branding for future campaigns dedicated to the proper use of helmets. The positive results of the 'Wear and Lock Campaign' will serve as a guideline for possible further actions by the industry and other stakeholders in similar projects.



no solution to this problem. For several decades the industry has looked into various leg protector concepts, including proposals from other researchers, and has come to the conclusion that the concepts considered to date have substantial negative effects. These negative effects involve injuries to the legs and/or the transferring, and in some cases increasing, of injuries to other parts of the rider's body. The industry efforts continue and have led, in a cooperative exercise with several other specialists in the field worldwide, to the International Standard ISO 13232 that defines how motorcycle crashworthiness research needs to be done.



**ACEM signed the European Road Safety Charter supporting the European Commission initiative to save 25,000 lives by 2010. Our commitment includes concrete measures in two separate fields:**

**Brakes:** In 2004 ACEM signed the European Road Safety Charter agreeing to progressively supply powered two-wheelers with advanced braking systems taking into account their distinctive characteristics and costeffectiveness of the technical solutions. By 2010 the majority of street models will be available on the European market with advanced braking systems, at least as an option. In June 2008, ACEM member manufacturers decided to renew this commitment beyond 2010, extending its coverage to 75% of street models by 2015.

**Advertisement Guidelines.** Communication and marketing can enhance safety-awareness. In 2006 ACEM committed itself to ensure that all promotion and advertisements for powered two-wheelers destined for use on public roads show the powered two-wheelers used in a safe and responsible manner, in order to positively influence the attitude of the user. Starting in 2008 the manufacturers' advertisement for powered two-wheelers will feature, where and when appropriate, message recommending that users ride responsibly and wear approved helmets.

## The Vehicle

In developing their products, ACEM Manufacturers assure the highest standards of construction. To meet type approval requirements, and high safety and environmental performance standards, ACEM Manufacturers resort to more complex and refined technologies.





**ACEM has identified PTW conspicuity as an important item in the PTW safety research and is fully committed to further improve the possibility for other road users to correctly detect the PTWs. The on-going research may lead to on-vehicle improvements in the future. The longer-term ITS efforts will explore how to cooperate with the car and component industry, among others in the context of the e-Safety Forum initiative.**

## Periodic inspection

To maintain initial construction standards, the vehicle needs to undergo regular maintenance and servicing. Currently, a majority of Member States have introduced PTWs periodic inspection for safety and, increasingly, for environmental reasons. MAIDS confirms that lack of proper vehicle maintenance is a contributing factor in PTW accidents (5% of all PTW contributing factors). Periodic inspections reduce the incidence of safety related defects to tyres, brakes and lights, particularly those of which the owner is unaware of and are likely to discourage tampering of mopeds. ACEM therefore supports the inclusion of PTWs in the scope of Directive 96/96/EC.

## Conspicuity

'Being seen' and being perceived correctly and accurately by other road users are extremely important factors in PTW related accidents. Most of this stems from the relatively narrow frontal silhouette of PTWs, in comparison to that of other road users. To address this, a variety of countermeasures, both human and vehicle related, should be considered.

Proper training (of both PTW and OV operators) is fundamentally important and must be addressed. In addition, however, ACEM is committed to address the vehicle conspicuity of PTWs. For this reason the motorcycle industry is engaged in a multi-year, three-phase programme of work:

1. voluntary introduction of AHO (automatic headlamp on) since 2003

2. a research programme to identify "lighting treatment(s)" that improve(s) the PTW conspicuity to other vehicles in the future European traffic environment
3. the exploration of and research into intelligent transport systems (ITS) that can help in the "communication" between PTWs and other road users

## Tampering

PTW engine driveline tampering – to increase performance above legal limits – is a major concern in several European countries. During accident investigations the MAIDS teams were only able to assess the "presence of tampering" by visual inspection. This may explain why the recorded percentages of tampered vehicles are so low in both the cases and the controls samples, in comparison to other studies. The fact that the exposure data are lower than the accident data may suggest that tampering is a risk factor. MAIDS figures further indicate that a significant proportion of moped severe accidents occur at travel speeds greater than 50 km/h.

ACEM is therefore in favour of adopting measures preventing moped users from illegally raising the maximum speed of the vehicle and proposes further anti-tampering devices complementing the existing regulatory provisions. These new measures would cover electrical/electronic devices participating in the vehicle's maximum speed limitation, the interchangeability of components, the Continuously Variable Transmission's components, the exhaust silencing system and marking.

Authorities enforcing controls will have a significant effect in minimizing tampering.





ACEM's member manufacturers committed themselves to progressively increase the number of PTWs fitted with advanced braking systems. This will provide brake systems which are easier to use by riders. By 2010 the majority of newly sold street models on the European market will have advanced braking systems, at least as an option. Based on latest data available, ACEM can report that in June 2008, 35% of the European PTW offer was already available with an advanced braking system, which translated into 35% actual penetration in terms of PTW sales. ACEM member manufacturers decided to renew this commitment beyond 2010, extending its coverage to 75% of street models by 2015.

## Braking

Compared to the past brake/tyre combinations on today's PTWs have very high performance capabilities in a very wide variety of traffic and road conditions.

In those emergency situations, where the rider has to make decisions in a split second, human 'decision failures' and faulty collision avoidance manoeuvres sometimes lead to loss of control, tyre lock up, rear tyre slide out, etcetera.

The relatively low number of accidents involving PTWs with "advanced braking systems" (non-conventional) within the MAIDS database was probably due to their recent introduction at the time the research was performed. The overall number of PTWs with advanced brakes in the MAIDS accident population was 26, against 53 in the exposure population, initially suggesting that PTWs with advanced braking systems are less likely to be involved in accidents. However these descriptive statistics cannot say anything substantial if we take into consideration the number of cases when braking action was actually involved in the accidents.

Using the full potential of the brakes, especially in an emergency situation, is one of the most difficult tasks of riding a motorcycle especially for novice riders. Errors in braking a motorcycle may easily lead to skidding, capsizing or the vehicle becoming unstable. Incorrect use of motorcycle brakes is considered to be a factor in many accidents. It should be noted that the characteristics of braking systems for motorcycles are different from those of cars.

Advanced braking systems encompass different systems, such as anti-lock brake systems (ABS) acting on one or both wheels, combined brake systems (CBS), rear

wheel lift-off protection (RLP), automatic brake force distribution, amplified braking systems, brake by wire and new vehicle architectures. These systems are present individually or in combination on a PTW. Due to the high cost (starting at 400 €), it is not realistic and not cost effective to fit antilock systems on smaller, less expensive machines. Combined brake systems are however already attractive for the range of lighter and less expensive motorcycles (starting from 100 €).

The ACEM commitment to supply the majority of street models is expected to increase rapidly as many new models will be equipped with the technology.

However the importance of driving market demand towards these new safety enhancements is crucial if its spreading is to be achieved.

## Airbags

The first motorcycle featuring airbags has recently been introduced to the market. However work now continues to find concepts that function in a wide range of accident configurations and operating conditions, for different styles of PTWs, for all types of riders' builds etc.



Analysis of the MAIDS database continues in order to improve the industry's understanding of the critical criteria to be considered in the airbag research.

Discussions are taking place in Europe now, among others in the context of the e-Safety Forum initiative, to investigate the potential of installing emergency call or e-call on road vehicles. Such systems could possibly shorten the crucial time between the occurrence of the accident and the arrival of rescue teams and police, thereby reducing the risks of fatal or serious injuries.

ACEM is closely monitoring the developments of e-call and it will verify the potential benefits of having such systems also on PTWs, as an aid to riders in post-crash situations.



# The Infrastructure



Road Infrastructure Safety Management can be considered as being part of the 'integrated approach to road safety' (linking the users the vehicle and the infrastructure aspects) and a step in the right direction to reach the EU's objective of halving the number of deaths on European roads by 2010.

The MAIDS database indicates that, in the sampling areas chosen for the study, accidents occur much more frequently in urban areas than in rural environments. The presence of stationary objects which obstruct the view of the rider or driver and road maintenance defects were found to be relatively common causes of PTW accidents.

Accidents caused by the infrastructure account for 8% of the total according to MAIDS. Poor conditions of many European roads and the fact that PTWs are often neglected by transport plans are the principal reasons for this situation. **Road-side barriers** were found to present an increased danger to PTW riders, causing serious lower extremity and spinal injuries as well as serious head injuries.

Stakeholders who are responsible for improving the urban PTW environment are urged to work with local agencies to identify and develop solutions which will reduce the number of view obstructions, to improve the line-of-sight. This would effectively reduce accidents and injuries that are due to infrastructural causes.

A handbook with **Guidelines on Safer Road Design for Powered Two-Wheelers** has been published by ACEM with the aim of explaining how PTWs differ in their use of the road from other vehicles and which are the rider's needs. Predictable road geometry, good visibility, obstacle free zones and good quality road surface with high levels of skid resistance are some major examples. While important for all road users, they are essential for PTWs. This handbook provides useful information for those responsible for road design and road maintenance and contribute to the integrated approach to road safety.

## European Safety campaigns: Lucky 13, a cartoon character pinpointing the risks related to the infrastructure

Safety campaigns are a fundamental part of ACEM's Safety Plan for Action. On October 13, 2008 in Paris on the occasion of the European Road Safety Day organised by the European Commission, ACEM launched a European wide safety campaign to help motorcycle and scooter riders avoiding the potential risks related to the infrastructure.

Based on the technical guidelines provided by ACEM's 'Infrastructure Handbook', Lucky 13 was edited with the support of motorcycle training instructors. By providing more information on the road environment, this safety campaign will help riders making better choices and reducing their chances of having an accident. The Lucky 13 cartoon can be downloaded from [www.acem.eu/cartoon](http://www.acem.eu/cartoon). It is available in eleven languages and will be covering 14 European countries.





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