

Powered-Two-Wheelers Road Safety

The commitment of Piaggio & C.
SpA

Ljubljana, 23 April 2008

Summary

- The problem and the figures
 - PTW Accident analysis (MAIDS project)
 - PTW safety: the matrix approach and the research areas
- Piaggio group commitment to PTW safety
 - Aim of the projects
 - Ongoing activities
- The vision of PTW manufacturers

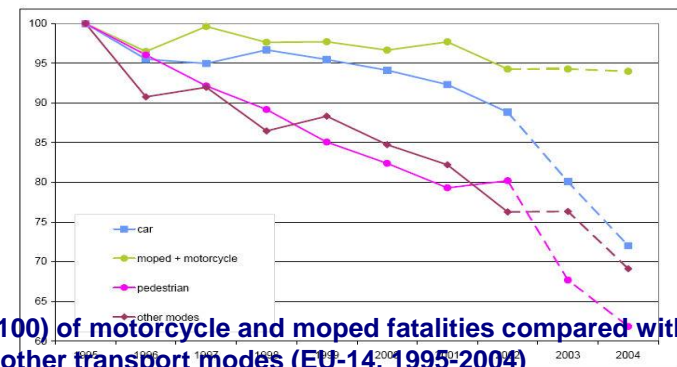
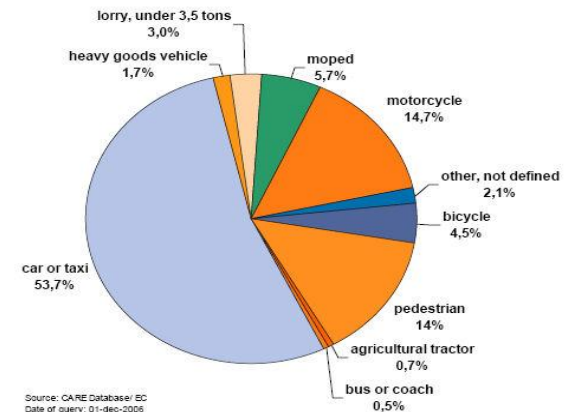
PTW peculiarities in road environment

- PTWs is an individual transport mean
 - Sharing the same operational environment of car and trucks
 - Differing mainly from cars/trucks in terms of weights, overall dimensions, power/mass ratio, dynamic behaviour and protection level
- PTW riders are the road users with the higher risk in accidents involvement and injuries/fatalities.

The figures

- In 2004, motorcycle and moped user fatalities made up 20,4% of the total number of road accident fatalities (EU-14)
- Pedestrians are 13,9% of fatalities
- Cyclist represent 4,5% of fatalities
- The share of moped and motorcycle fatalities as a proportion of total road fatalities is increasing.
- In 2002 the risk rate (fatalities/travelled km) respect to car occupants was:
 - 9 times higher for pedestrians
 - 7 times higher for cyclist
 - 20 times higher for motorcyclists

Source: European Road Safety Observatory
Annual Statistical Report 2006 –Traffic Safety Basic Facts 2006



Source: CARE Database / EC
Date of query: October 2006

PTW accident analysis: MAIDS project

Project targets:

- To have reliable and complete data on motorcycle accidents
- To identify “population-at-risk”
- To investigate mechanical, human and environmental factors as potential risk factors
- To propose countermeasures in order to improve motorcycle road safety

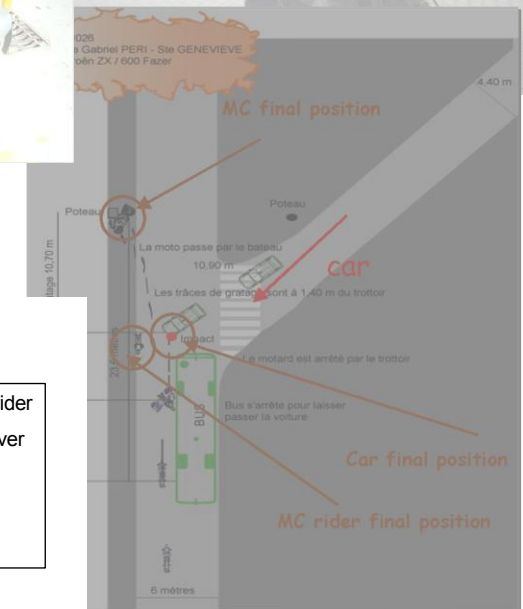
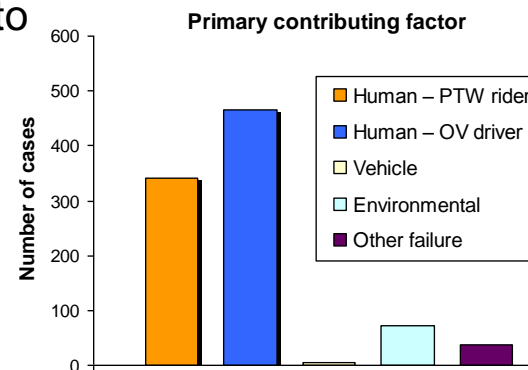
The figures:

- 921 collected cases in accidents database
- 923 controls cases in exposure database
- 2000 variables per accident in average

Data collection: Vehicle inspection and interviews



Analysis results



Accident reconstruction

MAIDS findings

- 72% of accidents happens in urban or semiurban areas.
- In more than 60% of accidents a passenger car is involved (this **percentage raises up to 82,5%** if also bus, trucks are considered)
- 17.5% are single vehicle accidents where the rider lost control of the motorcycle
- In 87% of cases the primary contributing factors are human errors (50% for Other Vehicle driver and 37% for PTW rider)

A matrix approach

- The pillars of safety

- Vehicle (PTW)
- Human factor
- Infrastructure

- The safety areas

- Active
- Preventive
- Passive
- (Post-crash)

	ACTIVE	PREVENT.	PASSIVE	POST-CRASH
PTW	Suspensions, Brakes, ABS, ESP...	HMI, conspicuity, ...	Limbs protection, kinematics, algorithm, ...	e-Call
RIDER HELMETS/ CLOTHING	Training and Education	HMI, comfort, strap fasten, info exchange, conspicuity ...	Helmets & Clothing performance ...	
INFRASTRUCTURE	Maintenance, audits, ...	e-Safety	Performance when a motorcyclist impacts	Maintenance, reparation, ...

Safety: R&D guidelines

How to improve safety for motorbikes?

Passive safety field covers all systems and devices designed for rider protection in case of accident

Thematic areas:

- **Vehicle architecture**
- **Airbag jacket**
- **Airbag on vehicle**
- **Inflatable leg protectors**

Active safety deals with devices that help rider to avoid accidents, mainly improving stability control in emergency situations

Thematic areas:

- **Advanced braking systems**
- **Traction control**
- **Brake by wire**
- **Electronic suspensions**
- **Conspicuity**
- **Aeroacoustic and thermal comfort**

Preventive safety aims to improve safety margin, providing informations to rider about potential risk

Thematic areas:

- **HMI improvement**
- **Vehicle-to-vehicle communication**
- **Vehicle-to-infrastructure inform. flow**
- **Enhanced conspicuity**

Passive safety

- Mitigating consequences

Active Safety

- Avoiding accidents

Preventive Safety

- Enhancing safety margin

Research fields and thematic areas

Passive safety field covers all systems and devices designed for rider protection in case of accident

Thematic areas:

- Vehicle architecture
- Airbag jacket
- Airbag on vehicle
- Inflatable leg protectors

Active safety deals with devices that help rider to avoid accidents, mainly improving stability control in emergency situations

Thematic areas:

- Advanced braking systems
- Traction control
- Brake by wire
- Electronic suspensions
- Conspicuity
- Aeroacoustic and thermal comfort

Preventive safety aims to improve safety margin, providing information to rider about potential risk

Thematic areas:

- HMI improvement
- Cooperative systems
 - Vehicle-to-vehicle communication
 - Vehicle-to-infrastructure inform. flow
- Enhanced conspicuity



• Mitigating consequences

• Avoiding accidents

• Enhancing safety margin

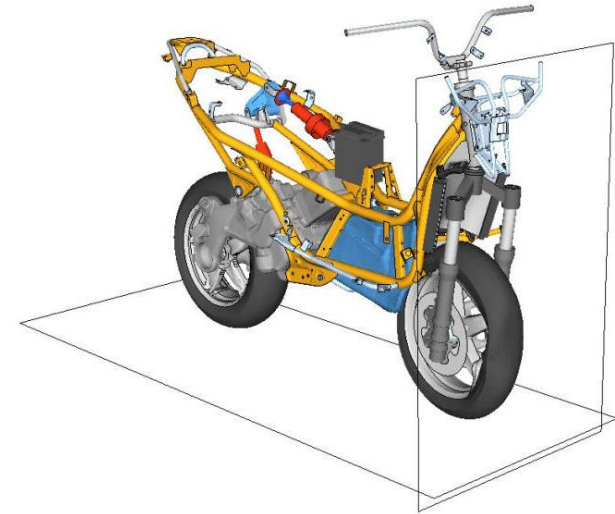
PTW safety improvement through EU funded projects

- Piaggio's strategy is to apply R&D activity in all the cells of the safety matrix through EC initiatives and funding with the aim of
 - Sharing the knowledge among the partners
 - Ensuring that the activities are in line with EC policies

Passive safety

Exploratory studies in Aprosys SP4 project (2004-2008)

- Identification of parameters for the activation of the passive safety system through crash simulations and tests
- Development and testing of passive safety devices in SIM project (2006-ongoing)
 - Airbag on vehicle
 - Airbag jacket



Active safety

- The main relevant activities are covered within SIM project (2006-ongoing)
- Among the SIM technical targets the below active safety features will be implemented into a new concept of safe vehicle (e.g. tilting 3-Wheeler)
 - Safety and comfort analysis and improvement through dynamic simulation and aerodynamic studies
 - Design and implementation of Integral Dynamic Stability Control managing subsystems such as semi-active suspensions, traction control and enhanced ABS

SIM Project (2006-2009)

Expected Results

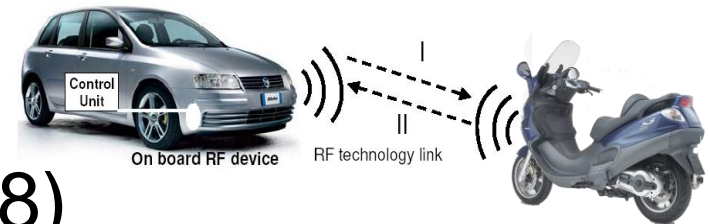
- Two vehicle prototypes: one tilting 3-wheel vehicle with enhanced preventive and active safety systems and one tilting 3-wheel vehicle with enhanced passive safety devices



Preventive safety

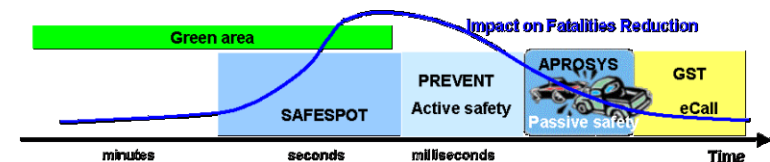
- Two aspects has to be considered
 - The communication
 - The HMI
- The communication activities are covered within WATCH-OVER and SAFESPOT projects
- The HMI improvement is studied also in SIM and SAFERIDER projects

Preventive safety: communication



- WATCH-OVER (2006-2008)
 - Aim: development of an accident prevention system for those events involving vulnerable road users (PTW and pedestrians)

- SAFESPOT (2006-2009)



- Development of a cooperative telematic system based on V2V and V2I communication aimed at the increasing of the safety margin for road users.

Preventive safety: The HMI

- Preliminary studies on PTW HMI improvement are carried out in SIM and WATCH-OVER project
 - Information management study
 - Visual and audio solution implementation and testing (bluetooth audio, HUD)

A PTW key issue: the HMI

- HMI plays a key role in the effectiveness of cooperative safety system and ADAS/IVIS use, especially for PTW riders
- SAFERIDER ongoing activities are focused on ADAS/IVIS impact on PTW rider comfort and safety
 - Study and implementation of riding assistance (ADAS) and infomobility (IVIS) systems for PTW
 - HMI design and implementation

- Powered-Two-Wheeler rider safety is a complex phenomenon that requires a comprehensive approach.
- Piaggio Group is determined to contribute to this study and to bring on the market effective technological solutions to improve safety for its customers.
- The responsibility as a manufacturer can only be addressed within the design and development of new products featuring advanced technologies in all fields of safety: preventive, active and passive.
- However, Piaggio Group is aware that this does not suffice alone. Road safety can be achieved in a structural way only with the support and common effort of all stakeholders, first of all road users that have to make the most out of the new technologies available today and in the foreseeable future on the market.
- It is therefore very important to ensure that the level of training of new and old road users, in all groups and categories, is up-dated and strengthened.