

Publishable Executive Summary

SIM Project has been co-funded by the European Commission DG RTD under 6th Framework programme and was aimed at carrying out R&D activities addressing in-depth studies of a suitable and comprehensive safety strategy for powered-two-wheel (PTW) vehicles, proven to be able to reduce road accidents and/or mitigate their consequences. Main objectives of SIM were:

- to identify a suitable integrated safety strategy for PTWs;
- to enhance preventive and active safety based on electronic vehicle sub-systems management and improving Human-Machine-Interaction (HMI);
- to focus on integral passive safety devices;

An integrated approach to the complex concept of motorcycle safety shall establish a matrix relationship between the three main factors or pillars for safety (PTW, rider and infrastructure) and the different aspects related to accident dynamics, from before-precipitating event to crash event (dealing with preventive, active and passive safety) and post-crash motions. The research was based on the analysis of motorcycle accident databases from MAIDS, GIDAS and DEKRA. According to that, SIM project focused on the vehicle safety aspects, including the human-machine-interaction.

Main results were:

- development of electronic active devices (e.g. enhanced anti-lock braking system, traction control and suspension system) for powered two-wheelers;
- development of a suitable firing algorithm to activate passive safety devices;
- adaptation of protective inflatable devices located on the vehicle (frontal impact airbag) and on the rider (garment);
- implementation of innovative HMI

On-road and laboratory tests, based on the most relevant accident scenarios, were conducted in order to evaluate the effectiveness of the selected safety system devices (e.g. reduction of injuries via inflatable devices, probability of avoiding accidents, etc...) implemented in an integrated concept vehicle.

Innovation aspects were mainly a comprehensive approach to the motorcycle safety issue and the technological implementation of the most relevant safety technologies in PTW field.

The partners involved in the SIM Project are:

- Piaggio & C. SpA
- Fundación para la Investigación y Desarrollo en Automoción (CIDAUT)
- Continental Teves AG&Co. oHG
- Centro Ricerche Fiat ScpA
- Technical University of Prague
- DALPHIMETAL ESPAÑA S.A.
- DEKRA e.V.
- NZI Technical Protection S.L.
- OHLINS RACING AB
- Savatech d.o.o., Industrial Rubber Products and Tyres
- University of Pisa

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During the third year of activities, main achievements were related to the development of the active, preventive and passive safety devices and their implementation and integration in the final prototype.

Concerning the active safety systems, a stability management system and an automatic variable damping suspension have been developed and integrated. The two systems are not standalone but they continuously exchange data through a dedicated CAN bus architecture. In such a manner the suspension system cooperates with the brake system adapting its behaviour according to targets.

The study of preventive safety was focused on HMI improvement. An HMI system made of an Information Management concept for motorBike (the IMB) manages the messages and sends them to HMI display and helmet in different modes. Also handlebar controls for enhancing ease-of-use while riding have been implemented.

The improvement of passive safety maybe has been the most challenging objective in SIM project, due to the highly variable rider motion during crash or fall.

A cooperative architecture made of frontal airbag and an inflatable device has been implemented as well as an airbag control unit with a specific algorithm for firing the devices.

The development process followed a new methodological approach that started from crashworthiness studies till to the test of the entire chain in full crashes.

The final result was a vehicle prototype (with helmet and clothing) that integrates all the features.

The deliverables submitted during the third year of the project are the following:

Nr.	Deliverable	Description	Responsible
D1.1.4	Third Year Report	Project Reporting documents	PIAGGIO
D1.1.5	Final Report	Project Reporting documents	PIAGGIO
D1.2.9	9 th Quarterly Report	Project Reporting document	PIAGGIO
D1.2.10	10 th Quarterly Report	Project Reporting document	PIAGGIO
D1.2.11	11 th Quarterly Report	Project Reporting document	PIAGGIO
D1.2.12	12 th Quarterly Report	Project Reporting document	PIAGGIO
D1.2.13	13 th Quarterly Report	Project Reporting document	PIAGGIO
D2.3.2	"Blue Book on Motorcycle Overall Safety Strategy"	Report	PIAGGIO
D3.3.3	Automatic control system of suspension in braking and acceleration	Report	PIAGGIO

D3.4.1 (I)	HMI information management concept (Internal Report)	Report	CIDAUT
D3.4.2	Active safety systems and HMI implementation	Prototype	CRF
D3.5	System tests and validation	Report	PIAGGIO
D4.2	Crashworthiness analysis of the vehicle	Report	DALPHIM
D4.3	Algorithm development: activation strategy	Prototype	CONTI
D4.4.1	Passive safety systems implemented in the vehicle	Report	CIDAUT
D4.4.2	System test and validation	Report	CIDAUT
D5.1	Vehicle modifications and assembly	Report	PIAGGIO
D5.2	Active and Preventive Safety Systems vehicle integration	Report	CRF
D5.3	Passive Safety Systems vehicle integration	Report	CIDAUT
D5.4.1	Assembled prototypes	Prototype	PIAGGIO
D5.4.2	Test results	Report	DEKRA
D6.1.2	Dissemination conference proceedings	Report	CTUP
D6.1.3	Public Workshop proceedings	Report	CTUP
D6.1.4.6	Public Newsletter 6	Newsletter about SIM activities	CTUP
D6.1.4.5	Public Newsletter 5	Newsletter about SIM activities	CTUP
D6.1.4.7	Public Newsletter 7	Newsletter about SIM activities	PIAGGIO
D6.2	Exploitation plan results		PIAGGIO

All the public deliverables are available in the project website (<http://www.sim-eu.org>).