BP5: PTW Design and Protective Equipment

Reference: BP5 001	Title of Project:	**Motorcycle Airbag Systems** **Ref: European Road Safety Observatory**
Version: 1	**Website:**	http://www.erso.eu/knowledge/fixed/50_vehicle/Vehicles.pdf
Brief Description of Project:	**Chest Air Bags** In head on collisions, the rider continues to move forward in a seated position and hits the opposing object at close to pre-impact velocity. These crashes often result in fatal or serious injury to the head and upper body of the motorcyclist. This type of collision is more typical of junction collisions in urban environments. In some collisions, however, the rider loses control of the vehicle during the braking phase and falls from the vehicle prior to impact. While the provision of air bags on motorcycles is more complex than installation in cars, because the dynamics of a motorcycle crash are more difficult to predict, early crash tests with airbags on motorcycles (1973) indicated that an airbag system could be beneficial in frontal impacts. In the early 1990s tests were completed in the UK in which three different types of motorcycle were fitted with an airbag [1]. The results showed that full restraint was not possible above a speed of 30 mile/h, though reducing speed and controlling rider trajectory could still be beneficial. Further work was carried out by the Transport Research Laboratory and Honda during the 1990s.	

	In 2004, Honda announced that it had developed the world's first production motorcycle airbag system to be made available in 2006 on new Gold Wing motorcycles. See Honda Motorcycle Airbag System. The airbag module, containing the airbag and inflator, is positioned in front of the rider.  A unit in the airbag positioned to the right of the module analyses signals from the crash sensors to determine whether or not to inflate the airbag. Four crash sensors attached on both sides of the front fork detect changes in acceleration caused by frontal impacts. Although motorcycle airbag systems are improving in design, current research appears divided on the overall cost benefits. Crucial to effectiveness appears to be rider trajectory following impact. Any 'best practice' system would need to show that the rider's exit path is not affected in such a way as to increase the risk of injury. [1] Happian-Smith, J. and Chinn, B. P. (1990) Simulation of airbag restraint systems in forward impacts of motorcycles, International Congress and Exposition, Detroit (SAE 9000752)
Monitoring Data:	No specific casualty data available at present.
Results:	Computer modelling and simulated crashes show reduced impacts on the rider in the majority of collision configurations.
Key Effective Conclusions:	Research into motorcycle airbags appears to demonstrate reduced rider impacts in the majority of collision situations but those collisions where the rider and motorcycle are separated before impact would not be affected. There is an unresolved issue with altered rider exit path in a collision due to airbag deployment. The research (Honda and TRL) suggests that the cost benefit of the airbag in the majority of collisions is still very positive. Honda has committed to further research and the standard fitment of airbags to Honda models will allow monitoring of casualty reduction performance to be undertaken.
Projects for Comparison:	Leg protection systems. Rider airbags.

Justification:	There appears to be sufficient evidence that motorcycle airbags will reduce the impact/injury to riders in the majority of collision configurations and particularly in those common at urban junctions. ***** Ongoing research and the evaluation of the performance of the Honda system now in production should be monitored. The measure appears to meet the eSUM objective for WP3, BP5 in offering the potential for reduction in risk of injury in a collision through technological improvement in PTW design.