

## **A product safety assurance system for motorcycle protective clothing**

Liz de Rome, LdeR Consulting, Sydney & Guy Stanford, Motorcycle Council of NSW

**Abstract:** The only safety standards for motorcycle protective clothing, any where in the world, have been introduced into Europe. These standards have proved a valuable source of information for Australian and New Zealand riders about the features of effective protective clothing. While no clothing can prevent serious high impact injuries, there is evidence that over half of all motorcycle injuries could have been reduced or prevented by the use of effective protective clothing.

As European products comprise some 30% of motorcycle gear sold locally, this created an opportunity to encourage the local motorcycle industry to develop a product safety assurance system in order to remain competitive. The objective was to encourage riders to be able to distinguish between products that will provide some injury protection and those which are just fashion.

A seminar was held to gain the support of key stakeholders including the importers, distributors and retailers of motorcycle clothing; riders and consumer protection and road safety agencies. The outcome was general consensus to establish performance standards and a regulatory system for protective clothing that would work in the best interests of riders and the industry. The mechanism by which this will be achieved is the subject of ongoing work.

### **INTRODUCTION**

This paper is a report on a project and on-going process to achieve a product safety assurance system for motorcycle protective clothing. In 2003, the Motor Accidents Authority of NSW (MAA) funded the development of a consumers guide to motorcycle protective clothing for the Motorcycle Council of NSW (de Rome, 2003). It was apparent at the time that in the absence of objective information, fashion and marketing were strong influences in riders' choice of protective clothing. In addition, much of the protective clothing available reflects the image of motorcycle racing fashions and is not appropriate for commuters and general road riding.

The development process included literature research and consultation with protective clothing experts from Europe. Standards for motorcycle protective clothing had recently come into force in Europe, whereby any clothing claiming to provide protection from injury must be tested and labeled as complying with the relevant standard. The absence of any equivalent Australian or New Zealand standards means that motorcycle protective clothing can be sold without any requirement, nor the means, to justify claims of providing protection from injury.

The research literature confirmed that there are significant rider protection benefits in the use of motorcycle protective clothing. However, the European consultation process revealed a lack of quality control in the market with serious implications for the protective value of many of the products currently available. In addition, consultations with key manufacturers and importers in Australia and New Zealand

revealed a general lack of awareness of the existence of the European standards and of the implications for the local industry.

## **1. Injury risk and protective clothing**

The injury reduction benefits of motorcycle protective clothing has been the subject of scientific discussion for at least 30 years (Feldkamp, et al 1976; (Zettas et al, 1979; Hurt, Ouellet & Wager, 1981; Schuller et al., 1982 & 1986; Otte & Middelhaue, 1987; Hell & Lob, 1993; Otte et al 2002; ACEM, 2004).

Schuller found injured riders, who had been wearing leathers, spent on average 7 days less in hospital, and returned to work 20 days earlier than unprotected riders. The protected riders were 40% less likely to have suffered permanent physical defect. It was concluded that protective clothing can prevent or reduce 43% of injuries to soft tissue and 63% of deep and extensive injuries (Schuller et al.,1986).

Most research has described the injury reduction benefits of protective clothing in relation to soft tissue injuries. Protective clothing has been found to prevent or reduce injuries such as cuts and abrasions, exhaust pipe burns, friction burns and the stripping away of skin and muscle. Protective clothing may also reduce the risk of infection from wound contamination and consequent complications in the healing of severe injuries. (e.g. Schuller et al, 1986, Pegg & Mayze, (1983) Otte & Middelhaue, 1987; Hell & Lob, 1993). Otte has also found that impact protectors reduced the incidence of complex fractures and reported significant injury reduction for riders wearing high boots, (Otte et al, 2002).

There is a limit to the extent that clothing can prevent injury, particularly in high impact crashes, but there is also evidence that most motorcycle crashes are not high impact.

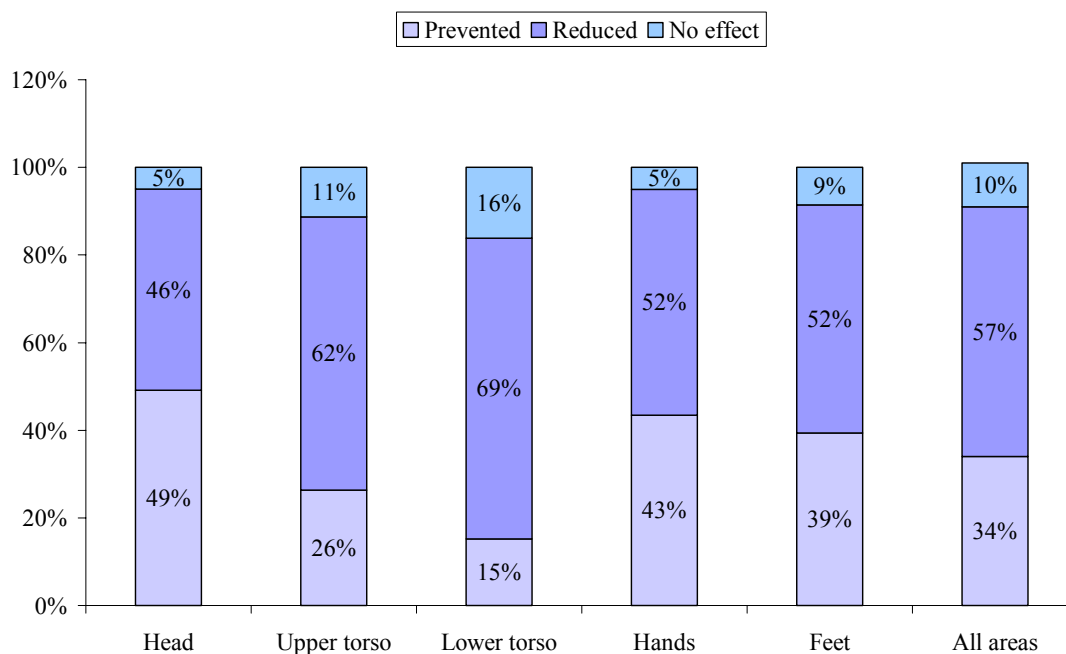
The European Experimental Vehicles Committee's review of research into motorcycle accidents, found that the majority of motorcycle collisions take place at fairly low speeds, between 30 and 60 kilometers per hour (EEVC, 1993). According to the recent MAIDS (Motorcycle Accident In depth Study), 75% of all motorcycle crashes occur at speeds of 50 km/h or less. Otte (2002) found that 80% of injured riders who had been wearing protective clothing, had been injured in impacts at speeds of 60 km/h or more.

The MAID Study also reported that some 40% of riders tumbled, rolled or slid along the road from the point of the crash without any further impact with another object (ACEM, 2004). Crashes where the rider slides along the road surface without impacting a fixed object are less likely to result in severe injuries and are the types of crashes where protective clothing can offer the greatest injury reduction (Hell & Lob, 1993, Otte et al, 1987). Overall, almost half (49%) of all the injuries recorded in the MAID Study were rated to be minor or Level 1 on the Abbreviated Injury Scale.

The MAIDS investigators tried to establish whether clothing had reduced or prevented minor injuries such as cuts, gravel rash, friction burns etc. Figure 1 illustrates the proportion of riders who were considered to have been protected from minor injury by their clothing. The graph includes only those riders who were wearing protective

clothing and sustained a direct impact that could have caused an injury to that part of the body. For example, the column for the upper torso indicates that clothing prevented superficial injury for more than a quarter (26%), and reduced injuries for over half (52%) of these riders. Only 11%, just over 1 in ten riders were injured despite wearing upper torso clothing<sup>1</sup>.

**Figure 1. Riders protected from minor injury by clothing.**



## 2. Standards and quality control for protective clothing

The findings of studies such as MAIDS can be used to encourage riders as to the benefits of protective clothing, however there is some evidence of poor quality products in the market which may undermine such efforts. The development of the European standards has provided objective tests for measuring the protective performance of motorcycle clothing products.

The tests measure performance in relations to:

1. Abrasion resistance to determine how long the material will last when being dragged against the road surface.
2. Burst strength to ensure that seams, fastenings and the material itself, will not split open on impact.
3. Tear and cut resistance is required to ensure the material cannot be cut, penetrated or torn by sharp objects in a crash.

---

<sup>1</sup> The graph is derived from data provided in the MAIDS Final Report, 1.1, ACEM, 2004.

4. Impact resistance is required to slow down the rate of transfer of forces in an impact. Protection is required over specified high impact areas of the body and must remain in place during an impact.

The application of these tests by independent consumer organizations to products currently available in the European market has revealed serious failings.

Out of 18 leather suits tested by Ride Magazine in August 2004, 7 scored 5 or less out of 10 for abrasion, 10 scored 5 or less on the burst test, 9 scored 5 or less on the impact test, 8 scored 5 or less on the tear test, 2 had zip failure (Crick, 2004).

None of these failings could have been reliably predicted by visual inspection. The results have also indicated that neither brand name nor cost can be used as indicators of protective quality. The most expensive suit from a world renowned company came second last in the rankings, whereas one of the cheapest came third to suits costing more than three times its price. Similar tests of textile jackets, gloves and boots by Ride magazine have also found the majority of those products do not perform well on these tests (Crick, 2003 & 2004).

Similar independent tests have been conducted by consumer groups in the UK since the European Directive on Protective Personal Equipment was announced in 1989. From a comparison of such tests over the intervening period it is apparent that manufacturers have responded to calls for better protection. Most European manufacturers now include impact protectors in the appropriate places. The abrasion resistance scores for textile jackets have improved significantly. However quality of construction remains a weak point and many of the tested suits continue to fail on seam strength and material burst resistance. The tests have also indicated that relatively minor adjustment to production methods could achieve compliance and produce protective products that are fit for purpose.

While there are no corresponding standards in Australia or New Zealand, guidelines on the manufacture of motorcycle protective clothing were developed for Standards Australia in 2000. These guidelines provide useful information, but there is no compulsion for manufacturers to follow it, nor any means for consumers to know whether products do comply with the Guide.

### **3. Industry seminar on motorcycle protective clothing**

A seminar was held in May 2005, for the motorcycle accessories industry and other parties with an interest in motorcycle protective clothing. The seminar was coordinated by the Motorcycle Council of NSW (MCC) and funded by the Motor Accidents Authority (MAA)<sup>2</sup>.

The primary objectives were to:

---

<sup>2</sup> The MAA is the regulator of the compulsory third party (CTP) injury insurance scheme in NSW. The MAA aims to contribute to the reduction of road crashes involving serious and high incidence injuries and subsequent costs to the CTP scheme.

1. Raise awareness of the features of effective motorcycle protective clothing.
2. Explore the options and gain broad support for establishing a process for ensuring motorcycle protective clothing sold in Australia is fit for purpose.

Representatives from all key stakeholder groups were invited. Of the 88 people invited, 52 attended. Those attending included representatives of:

- ❖ manufacturers, importers, distributors and retailers of motorcycle protective clothing;
- ❖ the motorcycle vehicle industry;
- ❖ key professional rider groups (police, courier, ambulance and postal delivery riders);
- ❖ the rider community;
- ❖ the motorcycle media, and
- ❖ relevant consumer protection and road safety agencies.

The morning sessions of the seminar program were designed to ensure all participants were well informed about the process, options and benefits to riders and industry of adopting agreed standards of performance for protective clothing. The speakers and their topics included:

**Guy Stanford, Chairman of the Motorcycle Council of NSW** described the background to the project and the MCC objectives in holding the seminar. He argued for the establishment of a means of verifying the protective value of motorcycle gear as being essential if riders were to be encouraged to use it. He argued that current advertising claims were impossible to verify and this leaves riders confused as to what is truly protective.

**Liz de Rome, Research Consultant, LdeR Consulting** summarized the literature on the injury risk patterns in motorcycle crashes and presented data that confirmed the benefits of effective protective clothing in reducing up to half of all motorcyclist injuries. She also reported on a number of published consumer reports which have revealed that much of the motorcycle gear currently produced for the European market fails these tests when undertaken by independent consumer groups. Liz also provided data on Australian rider's usage of protective clothing.

**Ray Giblett, Senior Associate, Clayton Utz**, explained the concept of negligence and the provisions of the Trade Practices Act (TPA) in terms of the duties and liabilities of manufacturers, importers and retailers. He advised that riders may have a right to compensation in cases of crashes where injuries are related to the failure of motorcycle protective clothing. Although there are no standards for motorcycle protective clothing in Australia, he noted that the Australian Courts would recognise the European standards as a guideline of relevance in such cases.

**John Wunsch, Director, Product Safety Policy, Australian Competition and Consumer Commission** described the product safety system in Australia. He described the range of regulatory and voluntary options that might be applied to improve certainty for riders and industry. He recommended a market based solution through voluntary adoption of available standards, possibly in conjunction with a

voluntary code of practice as the preferred approach in the best interests of riders and industry.

**John Linnios, Group Manager, Environment and Consumer Standards, Standards Australia** explained the range of options and processes involved for adopting or adapting the EU standards as Australian Standards. He said the benefits of standards include promoting confidence in products and services, facilitating international trade and promoting safety, quality and reliability.

**Norm Crothers, Deputy Chief Executive Officer, Australian Consumers' Association** provided an over view of the pros and cons of the different options from the consumer's point of view. He commented that the failure of motorcycle protective clothing is not an isolated example of products being unfit for purpose, and that some 70% of unintentional injuries requiring medical attention were due to product failures.

**The key note speaker was Paul Varnsberry, Technical Director PVA Technical File Services Limited.** Paul described the research background and technical specifications that form the basis of the EU standards for motorcycle protective clothing. He allayed participants concerns about the process and costs involved in manufacturing motorcycle protective clothing that complies with the EU Standards. Paul provided indicative costs for testing individual models of clothing against the EU Standard. The costs were:

1. Leather or textile jackets and pants approximately \$2900 (aus),
2. Gloves (\$5,000)
3. Boots (\$6,000).

He explained that boots are the most expensive due to the comprehensive panel of tests involved. He also noted that this has not prevented key brands such as BMW, Hein Gericke and Oxtar from launching accredited boots at prices which do not appear to be much different from the previous versions of the same models. He also commented that it was the smaller British companies that were the first to produce CE marked motorcycle clothing in Europe.

He concluded by summarizing the benefits of working to a standard:

- ❖ An independent mark of fitness for purpose
- ❖ Single technical benchmark for manufacturers
- ❖ Improved consumer choice
- ❖ Safeguard against litigation (3rd party certification)
- ❖ Prospect of insurance discount incentives (product liability)
- ❖ Motivational force for further development
- ❖ Positive press test reports will assist sales

#### **4. Outcomes**

Participants formed small discussion groups to identify issues and options for ensuring that motorcycle protective clothing in Australia is fit for purpose. The seminar concluded with a consensus to establish a system based on the EU standards.

A number of issues and preferred options were identified and recorded as a guide for further action.

#### **4.1 There was a general consensus of agreement:**

- 4.1.1 To develop an industry regulated system for ensuring motorcycle protective clothing sold in Australia is fit for purpose.
- 4.1.2 To use the EU standards for motorcycle protective clothing as the basis of a voluntary standard.
- 4.1.3 To devise an industry code of practice for the application of the standard.
- 4.1.4 To develop an ongoing independent process for the verification of product performance standards.
- 4.1.5 To create a new class of products in the market place that are verified as meeting performance standards based on the EU standards.

#### **4.2 Regulation and enforcement**

- 4.2.1 There was a general preference for a system that is not dependent on government action and would be driven by market forces.
- 4.2.2 There was general opposition to any form of mandatory standard or the compulsory use of protective clothing by riders.
- 4.2.3 A number of participants raised concern as to the adequacy of existing standards and lack of enforcement by government regulators at state and federal levels. In particular, concern was raised as to the apparent inability of the Federal government to prevent the importation of motorcycle helmets which do not comply with the Australian Standard.

#### **4.3 Adoption or adaption**

- 4.3.1 Companies whose business focused on importing products already developed for the European market were keen to ensure that the European standards be simply adopted by Australia without additional testing or labeling requirements. This approach was also favoured by those local manufacturers with an interest in export to Europe.
- 4.3.2 Consumer groups and those with a focus on the local market were more in favour of establishing Australian standards, which would be based on the European standards.
- 4.3.3 A third group amongst the participants were those who import products from non-European sources such as the USA. Their concerns centred on the logistical difficulties of having those products tested and labeled for the relatively small Australian market.

Note: The different needs of these three groups may be accommodated by a locally based testing and labeling system that accepts the CE mark of the European standards as equivalent.

#### **4.4 Scope**

- 4.4.1 It was generally agreed that the system should be nationally developed rather than state based.
- 4.4.2 A question was raised as to whether the European Standards, having been developed for road-riding conditions, could adequately represent the needs of off-road riders. The response of Paul Varnsberry was that the standards and all the tests remain relevant although impact, impact cut, tensile strength and burst strength probably sit higher in the hierarchy than abrasion resistance.
- 4.4.3 There was also some concern as to whether the European Standards could adequately meet the needs of Australian climatic conditions. It was pointed out that no motorcycle clothing, without electronic climate controls, could be expected to cope with the extremes of any climate. It was also noted that most riding is not undertaken under extreme conditions and average summer temperatures in Australia are actually similar to much of southern Europe. However it was agreed that gear appropriate for very hot weather was generally unavailable, resulting in low wearing rates. It is hoped that the demand for high level protection in hot weather will apply pressure to develop suitable riding apparel

#### **4.5 Community education**

- 4.5.1 Industry representatives commented that they would need some assurance that consumers will be prepared to pay for higher quality products, in order for industry to undertake the increased costs that may be involved in manufacturing to a higher standard.
- 4.5.2 Consumer education with funding support by road authorities was perceived as essential to this process. That the main issue was to encourage wearing of “useful” protective gear with at least some effectiveness and that to concurrently promote verifiable protective gear would enhance wearing rates.
- 4.5.3 Additional incentives for consumers to use certified products were discussed including rebates on personal injury and private health insurance premiums for expenditure on protective clothing. Such proposals would require further investigation.

### **5. The next stage**

A working party of industry and rider community representatives was appointed to establish a motorcycle clothing industry association to have carriage of the quality control system and supporting processes.

The first meeting of the working party was held in July 2005 some two months after the seminar. The members of the working party represent the leading manufacturers, importers and retailers in Australia. There remained a strong sense of interest and agreement on the formation of an industry association. The role of the association was defined as being to speak with a united voice on clothing and personal equipment issues. The association would establish and administer the quality assurance system



for protective clothing. It would also represent members' interests in relation to the importation of goods such as fraudulently labeled and counterfeit clothing.

Following the meeting, a draft structure for the industry association was developed and circulated for comment. The next stage will involve:

- ❖ Establishing the capability of local testing facilities,
- ❖ Calibrating those facilities to an EU notifying authority;
- ❖ Establishing a protocol for local compliance labeling, and
- ❖ Establishing a process for the administration of testing and labeling.

Despite the initial enthusiasm, there has been no further action and the process has stalled. This seems to be due to a lack of leadership and administrative support rather than a lack of interest. The members of the working party still want to be involved but are unwilling or unable to commit the time to drive the process. It is essential that the industry is closely involved in this process, but it is perhaps unrealistic to expect them to drive and resource it as volunteers from small business. While there are commercial incentives for the formation of a motorcycle clothing industry association, the primary purpose would be to establish and administer the product safety assurance system. The primary beneficiaries of such a system would be motorcyclists and others with an interest in injury prevention, rather than the industry itself.

It took over 11 years for the EU standards to be developed in consultation with the motorcycle rider community and clothing manufacturers in Europe. The success of the seminar in achieving such a degree of consensus from the Australian industry was a remarkable feat and it would be a pity to lose the momentum. The MCC proposes to seek further funding to continue the process rather than risk losing the opportunities that have been created.

## REFERENCES

1. ACEM (2004) *MAIDS - In-depth investigation of accidents involving powered two wheelers*. Association of European Motorcycle Manufacturers (ACEM), Brussels.
2. Crick, Oliver (2004) *Summer Gloves*, **Ride**, April, 2004, UK.
3. Crick, Oliver (2004) *Leather Suits*, **Ride**, August, 2004, UK.
4. Crick, Oliver (2004) *All season Boots*, **Ride**, December, 2004, UK.
5. Crick, Oliver (2003) *Winter Jackets*, **Ride**, January, 2003, UK.
6. de Rome, L.; Stanford, G & Wood, B (2002), MCC Survey of Motorcyclists, Motorcycle Council of NSW.
7. de Rome, L. & Stanford, G. (2003) *Motorcycle Protective Clothing*, Proceedings **2003 Road Safety Research, Policing and Education Conference**, Sydney.
8. EEVC (1993), *Report on Motorcycle Safety*, European Experimental Vehicles Committee.
9. Feldkamp, G. & Junghanns, K. (1976), *The typical traffic accident in adolescents: The motorcycle accident - some epidemiologic features and the effectiveness of safety helmets and clothing*. **Proceedings of IRCOBI** Amsterdam, 1976, p75-80.
10. Hell, W. & Lob, G. (1993), *Typical injury patterns of motorcyclists in different crash types- Effectiveness & improvement of countermeasures*. In proceedings

- 37th Annual Proceedings Association for the Advancement of Automotive Medicine**, 77-86, Nov 4-6, San Antonio, Texas.
11. Hurt, H. H. Jr., Ouellet, J.V. & Thom, D.R. (1981), *Motorcycle Accident Cause Factors and Identification of Countermeasures*, **Final Report to the National Highway Traffic Safety Administration**, US Department of Transportation, PB 81-206443, 81-206450.
  12. Hurt, H. H. Jr., Ouellet, J.V. & Wagar, I.J. (1981), *Effectiveness of motorcycle safety helmets and protective clothing*, **Proceedings of the Annual Conference of the American Association for Automotive Medicine**, San Francisco, pp 223-225
  13. MCN (2003), *How Safe is Your Skin*, 16 page special investigation, **MCN Supplement, Motorcycle News**, May 21, 2003.
  14. 19. MCN (1997), *Tread Carefully at Boot Sale*, **Motorcycle News**, May 21, 1997.
  15. MCN (1997), MCN (1997), *Altberg gives rival kit a good kicking*, **Motorcycle News**, May 28, 1997
  16. Otte, D. & Middelhaue, V (1987), *Quantification of protective effects of special synthetic protectors in clothing for motorcyclists*, **1987 International RCOBI Conference of the Biomechanics of Impacts**, Birmingham, pp.1-18,
  17. Otte, D.; Schroeder, G. & Richter, M. (2002), *Possibilities for load reductions using garment leg protectors for motorcyclists - a technical, medical and biomechanical approach*, **46th Proceedings, Association for the Advancement of Automotive Medicine**, 367-385.
  18. Ouellet, J (1982) *Environmental Hazards in Motorcycle Accidents*, **26th Annual Proceedings American Association for Automotive Medicine**, Ottawa. pp117-129
  19. Pegg, S.P. & Mayze. T.D (1983), *Burn Injuries associated with motorcycles*,
  20. **Burns** Vol. 9(40) pp 288-91 March.
  21. Schuller, E.; Beier, G. & Spann, W. (1982), *Effectiveness of protective clothing in Munich area motorcycle accidents*, **Proceedings 26th Stapp Car Crash Conference**, Ann Arbor, SAE Technical Paper 821162, pp.259-267.
  22. Schuller, E.; Beir, G. & Spann, W. (1986), *Disability and impairment of protected and unprotected motorcycle riders*, **Proceedings of the SAE International Congress and Exposition - Crash Injury Impairment and Disability: Long Term Effects**, Detroit, MI, Warrendale, PA, pp.51-56, ISBN 0-89883-932-7.
  23. Standards Australia (2000), **Motorcycle Protective Clothing: Guidelines for Manufacturing**, HB 173-2000.
  24. Varnsverry, P (2003), **Personal Protective Equipment (PPE), A Briefing from the British Motorcycle Federation**, British Motorcyclists Federation, Conwyn House, 14-16 Briton Street, Leicester LE3 0AA.
  25. Zettas J.P.; Zettas P. & Thanasophon, B. (1979), *Injury patterns in motorcycle accidents*, **Journal of Trauma-Injury Infection & Critical Care**. 19(11), 833-836.