

# Driver's electric skin variations response and Emergency Braking Systems' requirements

---

*Alain Priez, Claire Petit, & Christophe Brigout  
Renault Research Department  
Technocentre, Guyancourt  
France*

## **Abstract**

Braking is the most frequent manoeuvre in emergency situations, quite often, however, it has been observed that the driver did not brake hard enough. To help the driver an assisting emergency braking system was envisaged. The aim of this study is to define requirements for emergency braking systems based on the behaviour of the driver.

One hundred drivers volunteered to drive on a closed track in order to study their braking behaviour. Participants were not informed that they would be placed in an emergency situation. Their behaviour was assessed by measurements on the car and video recordings. Their workload and emotional strain were evaluated by analysis of electrodermal recordings. From these electrophysiological measures it has been possible to distinguish standard, accurate and emergency braking. It was found that skin resistance is relevant to workload whereas skin potential is more linked to emotional strain.

## **Introduction**

The most obvious manoeuvre in an emergency situation is to brake to avoid an accident or to restrict effects of an accident. An accident study based on German insurance company reports shows that the emergency braking reaction played a role in car to car crashes in 30-40 % of the accidents on straight roads and in 20-30 % in bends (Danner *et al.*, 1980). A survey of 4885 fatal crashes that occurred in France between March 1990 and February 1991 found that 54 % of the drivers involved in crossing crashes braked (Thomas *et al.*, 1999). In the same study Thomas found from an in-depth survey (accidents reported assessed on the spot by specialised "accidentologists") that the percentage was actually 61 %.

In a study on the efficiency of the ABS (Priez *et al.*, 1994), volunteers were asked to drive on a closed track. A dummy car ran into their lane at a crossing while they were not aware that a critical situation could occurred. ECG was recorded and the mean heart rate increase of 40 beats per minute during the emergency situation

In D. de Waard, K.A. Brookhuis, J. Moraal, and A. Toffetti (2002), *Human Factors in Transportation, Communication, Health, and the Workplace* (pp. 165 - 173). Maastricht, the Netherlands: Shaker.