

Pre-crash kinematics of bicyclists preceding car crashes in Sweden

R. Fredriksson¹, J. Strandroth²

¹ Autoliv Research
447 83 Vårgårda, Sweden

e-mail: rikard.fredriksson@autoliv.com

² Swedish Transport Administration
Borlänge, Sweden

e-mail: johan.strandroth@trafikverket.se

ABSTRACT

Every year more than 500 000 pedestrians and bicyclists are killed worldwide according to Naci et al [1]. Cars have recently been equipped with pedestrian detection sensors and autonomous emergency braking (AEB) systems. EuroNCAP will in 2016 begin to include the performance of pedestrian AEB systems in the safety rating of cars. The natural next step is to develop these systems to also detect and brake for bicyclists and EuroNCAP has announced that they plan to start this kind of testing in 2018. Studies have estimated these systems to have potential to reduce pedestrian and bicyclist fatalities and severe injuries [2]. To develop these systems for optimized protection also for bicyclists it is necessary to understand the pre-crash kinematics and other important parameters in car-to-bicyclist crashes.

The aim of this study was to study the pre-crash conditions of bicyclists in car-to-bicyclist crashes. Two datasets were used. The Swedish Transport Administration fatal database was queried 2002-2013 for fatal car-to-bicyclist crashes. This database performs in-depth investigations of all fatal crashes in Sweden. The STRADA database was queried 2002-2013 for AIS2+ car-to-bicyclist crashes. The STRADA database consists of all accidents when the victim is seeking care in an emergency department. All emergency care hospitals but one have specially trained nurses to code data for the hospital STRADA database. In parallel the police STRADA database consists of police information from the accidents, and these databases can be coupled together. The focus of the study was on the bicyclist and car motion preceding the accident, but parameters included were also traffic environment, light and weather conditions, victim age and size, clothing details etc. To understand the pre-crash kinematics, each crash was studied in detail.

The query resulted in 116 fatal and 682 AIS2+ car-to-bicyclist crashes. The most common scenarios were concluded, as well as the most common accident parameters. These scenarios and parameters can be used to develop test scenarios for evaluation of bicyclist detection and autonomous braking systems.

Keywords: bicyclist car crash pre-crash kinematics.

REFERENCES

1. Naci, H., D. Chisholm, and T.D. Baker, *Distribution of road traffic deaths by road user group: a global comparison*. Inj Prev, 2009. **15**(1): p. 55-9.
2. Rosén, E. *Autonomous Emergency Braking for Vulnerable Road Users*. in *IRCOBI (International Research Council On the Biomechanics of Impact) Conference*. 2013. Göteborg, Sweden.