

Motor vehicles overtaking cyclists on two-lane rural roads: analysis on relative speed and lateral clearance

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ABSTRACT

Two-lane rural roads in Spain accommodate significant bicycle traffic volumes, mainly associated to sport and leisure activities. Motor vehicles' higher speed, weight and volume represent a serious safety concern when they overtake a bicycle. Spanish traffic rules determine a minimum 1.5 m lateral distance.

This research characterized 2,928 overtaking manoeuvres in the overtaking lateral clearance between motor vehicle and bicycle, as well as in the motor vehicle speed, in contrast with previous research [1, 2]. An instrumented bicycle was equipped with laser rangefinders, a GPS tracker and three video cameras. It rode along seven rural road segments at a speed between 15 and 25 km/h, centered on the paved shoulder, or as close as possible to the outer edge. Besides, this methodology allowed the characterization of the overtaken vehicle type, its left lane occupation as well as its interaction with opposing traffic flow. For each session, rider's general risk perception was also registered.

The analysis suggested that lateral clearance is not the only factor that influenced rider's risk perception. On the contrary, a combined factor of lateral clearance, vehicle type and vehicle speed had a more significant correlation with it. This agreed with literature models of transient aerodynamic forces between overtaking and overtaken vehicles [3]. Results showed that effect of heavy vehicles on bicyclists was stronger. In addition to this, the combined factor was higher on tangent sections where overtaking was permitted, and in overtaking manoeuvres involving opposing traffic. The effect of bicycle type (mountain bike or racing bike) was not significant.

Keywords: overtaking, two-lane rural road, lateral clearance, instrumented vehicle.

REFERENCES

- [1] J. R. Chapman and D. A. Noyce, "Observations of Driver Behavior During Overtaking of Bicycles on Rural Roads," *Transportation Research Record: Journal of the Transportation Research Board*, vol. 2321, no. 1, pp. 38–45, 2012.
- [2] I. Walker, "Drivers overtaking bicyclists: objective data on the effects of riding position, helmet use, vehicle type and apparent gender," *Accident; Analysis and Prevention*, vol. 39, no. 2, pp. 417–25, 2007.
- [3] C. Noger, C. Regardin, and E. Széchenyi, "Investigation of the transient aerodynamic phenomena associated with passing manoeuvres," *Journal of Fluids and Structures*, vol. 21, no. 3, pp. 231–241, 2005.