



## Project Number

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# Florida Department of Transportation Research Study on Motorcycle Safety in Negotiation with Horizontal Curves in Florida and Development of Crash Modification Factors

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## Current Situation

Curved segments on Florida roads account for 6% of road mileage, but for single-motorcycle crashes, they are the site of almost 60% of fatal incidents, over 35% of incapacitating injury incidents, and over 25% of non-incapacitating incidents. On Florida's many rural roads, higher speed limits and fewer safety countermeasures make the problem more significant. Yet currently, there is limited knowledge of how motorcyclists interact with horizontal curves or speed control treatments and what factors contribute to motorcycle crashes on horizontal curves.

## Research Objectives

University of South Florida researchers examined single-motorcycle crashes on horizontal curves in Florida. They also studied safety interventions and developed factors to aid in designing road designs and made recommendations aimed at preventing single-motorcycle crashes on horizontal curves.



*Curves pose a special risk to motorcyclists.*

## Project Activities

A literature review was conducted of relevant past studies and current practices of motorcycle safety research and management. Motorcycle crash modeling on horizontal curves, behavior studies of motorcyclists on curves, countermeasures, and development of crash modification factors were examined among other topics.

The researchers then identified over 10,000 horizontal curves in Florida, of which about one quarter were on rural two-lane roads. Data about the geometry, pavement, and historical motorcycle crashes were collected for these curves. These data formed the basis of an extensive crash analysis to address questions about the factors contributing to (1) occurrence of these crashes on rural two-lane curves, (2) injury severity on horizontal curves in general, and (3) motorcyclist errors in two-vehicle crashes on horizontal curves. Crash modification factors were developed based on this part of the project.

The researchers found that speeding was the predominant factor in crashes on curves and that motorcyclists adjusted their speed based on their perception of the road quality, perhaps explaining why roads in poorer condition have fewer crashes. The tendency to make a driving error and the risk of injury or death both increased with the speed above the posted limit and with driver age. Helmet use and proper riding behaviors both caused a significant reduction in crash risk and injury severity. The presence of trees or structures increased the severity of crash.

In a field experiment, motorcycles were equipped with speed recorders and riders with eye-tracking devices. Then, the motorcyclists rode through curves at locations equipped with dynamic speed feedback signs which detect a driver's speed and display a message. The researchers found that sign placement relative to the curve was important and that the presence of an activated sign effectively increased driver attention while riding through the curve, indicating a positive safety effect.

## Project Benefits

A better basis for curve design, effective signage, and proper education and training can prevent motorcycle crashes and reduce the severity of incidents.

*For more information, please see [www.fdot.gov/research/](http://www.fdot.gov/research/).*