CMC Newsletter October 2025: Smart warnings for safer riding - Highlights from our latest studies

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CMC honoured at International Symposium on Active Safety

In September 2025, CMC took part in the FAST-zero conference in Arles, France—formally titled the “8th International Symposium on Future Active Safety Technology toward Zero Traffic Accidents.”

The event brought together researchers and engineers from industry and academia to present the current state-of-the-art and progress in research and development of active safety technologies.

Representing CMC, Sebastian Will from the Würzburg Institute for Traffic Sciences (WIVW) presented findings from the Rider Reaction Time I–III studies in a talk titled *“User-Centred Warning Design for Powered Two-Wheeler Riders.”* His presentation was recognised with a **Best Paper Award** and a **Best Presentation Award**, underlining the relevance of CMC’s research and its growing impact in the field of motorcycle safety.

At the time of the symposium, work on a follow-up study—**Rider Reaction Time IV**—was already in progress. That study has been completed meanwhile, and in this newsletter, we’ll have a closer look at its findings and what they mean for the future of rider safety.

Sebastian Will at the FAST-zero conference

Introduction: ARAS systems rely on warnings

Motorcyclists are particularly vulnerable in traffic, often due to hazards that are hidden or difficult to anticipate. That's where Advanced Rider Assistance Systems (ARAS) can play an increasingly valuable role in preventing accidents. Unlike in cars, however, these systems for motorcycles do not (yet) intervene automatically, and therefore depend on clear, timely warnings to alert the rider about unseen threats. Optimisation of these warnings is therefore a key factor for the success of these systems.

In this latest study, WIVW investigated how riders respond to different types of warnings, taking into account that things don't always work perfectly, for example when false warnings happen. The simulator study investigated the impact of different types of false positive warnings on rider behaviour and acceptance, and how the reliability of an ARAS influences that.

Simulator study at WIVW

False warnings are not all the same

As with well-established Advanced Driver Assistance Systems (ADAS) in cars, it is expected that motorcycle-based safety applications will occasionally issue false warnings, particularly during the early stages of market introduction. The study examined two key types:

- **Real False Positives**: warnings issued without any recognisable reason.

- **Unnecessary False Positives**: early warnings that appear misplaced at first, but later prove justified as the situation unfolds.

The findings were clear: early imminent crash warnings—even if the reason wasn't immediately obvious—were still seen as useful. Riders appreciated the heads-up, especially for providing more time to react.

But warnings with no clear reason at all caused confusion and led to riders forming the wrong idea of how the system works.

Mental models matter

When riders receive a warning with no clear threat in sight, they often try to rationalise it—"Was it due to the bend? Gravel? A slippery patch?" This leads to false expectations about the C-ITS functionality or its operational design domain. For example, some participants assumed the system issued warnings about sharp corners, even though in fact they received a false warning before a corner and nothing else happened.

Such biased mental models may lead riders to incorrectly assume the system is watching out for things like slippery roads or sharp corners—when in fact it's not.

Rider responses were consistently quick

Warnings were Imminent Crash Warnings, delivered through red flashing LEDs mounted on mirrors. Riders said they noticed the warnings clearly and described the system as easy to use and helpful. Interestingly, acceptance remained high—even when the system was designed to be only 60% reliable in some cases. Reaction times were similar across all warning types—whether true, unnecessary, or false.

Red flashing LEDs mounted on the mirrors were used as Imminent Crash Warning

(picture source: WIVW)

Key takeaways

- Riders prefer some warning over none, as long as it makes sense. **Unnecessary False Positives** (with a delayed justification) are quite acceptable to them, and they accept the technology even when it occasionally gets it wrong.
- **Real False Positives** (with no apparent reason) should be avoided, as they undermine trust and lead to misunderstandings about what the system is designed to do.
- **Rider-centered system design** is essential—not just for acceptance, but for ensuring warnings align with rider expectations and real-world behaviour.

User focused design

These findings also highlight the importance of user-focused design in motorcycle safety systems.

If we want to reduce motorcycle accidents, we need technology that riders trust and understand. This study shows that intelligent warnings can work, even if they're not perfect—as long as they're predictable, timely, and designed with the rider in mind. Smart warning systems must match what riders expect—and that means understanding their mindset and behaviour in real scenarios.

As ARAS systems move closer to real-world use, this research aims to help ensure that they are trusted, accepted, and acted upon.

More information about the *Rider Reaction Time IV* study is available on the CMC website: https://www.cmc-info.net/rider-reaction-time.html

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Together for Rider Safety