UTC Project Information	
Project Title	Connected Motorcycle Crash Warning Interfaces
University	Virginia Tech Transportation Institute
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Funding Agencies	CVI-UTC (Tier 1 UTC)
Agency ID or Contract Number	TBD Fund Number from OSP
Project Cost	$166,025.00
Start and End Dates	February 1, 2013 – January 31, 2014
Project Duration	1 year
Brief Description of Research Project	Crash warning systems (CWS) are now readily deployed within the high-end vehicle market segment and trickling down to additional segments each year. This technology deployment has been built on a foundation of robust research and development conducted over the last couple of decades. A unique market segment, the motorcycle, has virtually no corresponding research and is without a deployed CWS. Traditionally, CWSs are based on relatively costly sensors such as radar and lidar to monitor objects in the roadway. Today, CWSs based on Connected Vehicle Technologies (CVT) are being actively developed and will likely be among the first applications deployed that capitalize on the advantages of vehicle-to-vehicle and vehicle-to-infrastructure communications (e.g. forward collision warning, blind spot warning, intersection movement assist, etc.). CVT provide an expanded list of capabilities and are inexpensive relative to radar; thus making their application on motorcycles feasible. Regardless of the sensor system employed, advanced algorithms continuously monitor objects within the driving environment. Algorithms will identify a either an increased risk situation or an imminent crash threat and will actively present a warning to drivers, and potentially riders, through a specialized user interface. In the seconds leading up to a predicted crash, these systems convey threat information to the driver using a variety of auditory, visual, haptic and tactile interfaces. The intent of these interfaces is to elicit an appropriate crash avoidance response. As such, it is important to develop interfaces that rapidly direct attention to the threat; permitting sufficient time for executing an evasive maneuver. This goal must be balanced with the recognition that systems are imperfect and that effectiveness depends on user acceptance, elimination of any unintended consequences, and acceptable levels of false alerts.

	The majority of the information necessary for four-wheel vehicle crash warning interface design can rely on the existing warning design work; even though it was aimed at sensor based systems. To date, however, motorcycles and their riders have not been considered. It is the purpose of this project to focus on the development and testing of CVT enabled CWS for motorcycles and riders within the surrounding transportation system. With an upcoming NTHSA decision on whether to pursue CVT regulation coupled with OEM support of CVT, it appears likely CVT will reach deployment. For motorcycles to benefit from this momentum, it is imperative that sufficient research is conducted in the near-term. The outcomes of this work will feed directly into the general CVT research. For the first time, the motorcycle industry will have data from which they can gauge the application of CWS interfaces on motorcycles and the effectiveness of such systems in a CVT context. Outcomes can be directly applied to the development of future motorcycle interfaces by the manufactures.
Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	This project will focus on the following primary objectives: • Refine the base connected motorcycle system to include warning capabilities • Design and develop the warning interface for riders • Evaluate prototype interfaces Report observations and provide recommendations on appropriate crash warning interfaces for motorcycles in a connected vehicle environment.
Impacts/Benefits of Implementation (actual, not anticipated)	This study is still in progress, actual impacts and benefits of implementation will be determined in Winter 2014 when the study is completed. This page will be resubmitted in the next round of reporting to state these actual impacts and benefits.
Web Links • Reports • Project Website	http://www.connectedvehicleinfrastructure-utc.org/?q=node/21 https://rip.trb.org/browse/dproject.asp?n=33459