UTC Project Information	
Project Title	Innovative "Intelligent" Awareness System for Roadway Workers Using Dedicated Short-Range Communications
University	Virginia Tech
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Funding Agencies	CVI-UTC (Tier 1 UTC)
Agency ID or Contract Number	451183/4
Project Cost	$150,000.00
Start and End Dates	September 1, 2012 – August 30, 2013
Project Duration	1 year
Brief Description of Research Project	Every day, there are thousands of roadway workers that must perform their duties near passing motorists in both defined and undefined work areas. These roadway workers include construction crews, public safety workers, survey crews, and roadway clean-up/mowing personnel. In defined work zone areas, the movement of vehicles (e.g., traffic, dump trucks and powered mobile construction equipment) around a work zone poses a significant safety risk to nearby workers-on-foot (WOFs). Each year more than 20,000 injuries and more than 100 fatalities occur at road construction zones. Nearly two-thirds (62 percent) of these incidents involved a worker being struck by a construction vehicle. In undefined roadside work areas, such as traffic stops, vehicle accidents, surveying for future construction, or clean-up, there are several groups of vulnerable roadway workers that are particularly exposed to vehicle strikes due to the fluidity of the traffic site and the lack of infrastructure protections (e.g., barriers) afforded more established work zones. For instance, public safety (e.g., police and firefighters) personnel are at a particular risk for being struck by passing vehicles as they perform their duties along roadside incidents and vehicle stops. According to the Bureau of Labor Statistics (BLS), about 18 percent of police officer fatalities from 1992-1997 were due to officers being struck by vehicles while issuing traffic citations or performing duties on the roadway. From 2001-2010, there were 118 law enforcement officers who were struck by a vehicle and killed. Of these 118 deaths, 37 percent occurred during duties like traffic stops and road blocks while the majority (63 percent) occurred

	while directing traffic or assisting motorists along the roadway. The BLS also estimates that approximately six percent of firefighter fatalities from 1992-1997 resulted from being struck by a vehicle while either directing traffic or conducting roadside emergency rescues. While all roadway personnel (i.e., workers in both defined and undefined work areas) could benefit from an intelligent traffic awareness system; this project will primarily focus on developing the system for workers in and around undefined work areas. These individuals would gain the greatest benefit from such a wearable intelligent traffic awareness system. Given the prevalence and severity of these struck-by injuries, a novel approach is needed to mitigate the conflicts between vehicle and WOFs. Connected vehicle technology offers this opportunity to develop an effective and reliable alerting system for all roadway workers whether working within a structured work zone or standing along the roadway in an undefined work area. This project will use the expertise of the research team in the fields of vehicle-to-vehicle (V2V) communication and pervasive computing to develop an innovative "intelligent" awareness system. The system will comprise dedicated short-range communications (DSRC) technology mounted on vehicles and worn by roadway personnel. Since roadway personnel are required to wear Class 2 or 3 apparel while working in right-of-ways on federal-aid highways, this project will embed the DSRC technology within these types of garments for the purposes of demonstration.
Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	The objectives of this study are twofold. The first is to develop and test a wearable "intelligent" traffic awareness system, *InZoneAlert*, to be deployed on both vehicles and WOFs. The system will alert WOFs and vehicle operators of impending struck-by incidents. This system will alert workers only in the case of accidental close interactions and will not provide false alarms for intentional close interactions between traffic and the equipped worker. The alert system should provide warnings in sufficient time to allow the accident to be avoided and should require minimal, cost-effective redesign of both vehicles and workers' clothing. The second objective is to evaluate the functional effectiveness of the developed *InZoneAlert* system under operational conditions. This evaluation will occur on the Connected Vehicle/Infrastructure University Transportation Center (CVI-UTC) test bed at the Virginia Smart Road in Blacksburg, Va. This project will provide a solid research-to-practice (R2P) approach to mitigating work zone struck-by incidents via the development of a novel countermeasure specific to the problem and verification of its effectiveness under realistic operational conditions.

Impacts/Benefits of Implementation (actual, not anticipated)	This study is still in progress, actual impacts and benefits of implementation will be determined in Summer 2013 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/66 http://rip.trb.org/browse/dproject.asp?n=32361