Photo Source: USDOT

LIMIT 35 SAFETY

CONNECTED VEHICLES:
VEHICLE-TO-PEDESTRIAN COMMUNICATIONS

LIMIT 35

In 2013, there were 32,719 people killed in motor vehicle traffic crashes in the United States. Pedestrians, bicyclists, and other nonvehicle occupants made up 17 percent of these deaths. Despite a steady decline in the number of roadway fatalities in recent years, the number of pedestrian and bicyclist fatalities has remained relatively consistent. The U.S. Department of Transportation (USDOT) understands that these vulnerable groups have special safety needs and challenges that must be addressed. Thus, the protection of pedestrians, bicyclists, and other nonvehicle occupants is part of the Department's ongoing efforts in the areas of connected and automated vehicle research.

Photo Source: USDOT

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Vehicle-to-Pedestrian Communications Research

For the past decade, the USDOT has been researching and testing a system of vehicles that can sense the environment around them and communicate that information to other vehicles, infrastructure, and our personal mobile devices. This connected vehicle communication will enable safety, mobility, and environmental advancements that current technologies are unable to provide. The technology is expected to reduce unimpaired vehicle crashes by 80 percent.

Currently, the connected vehicle environment includes three major approaches to communication:

1. Vehicle to vehicle (V2V)
2. Vehicle to infrastructure (V2I)
3. Vehicle to pedestrian (V2P).

The V2P approach encompasses a broad set of road users including people walking, children being pushed in strollers, people using wheelchairs or other mobility devices, passengers embarking and disembarking buses and trains, and people riding bicycles.

The USDOT's research into V2P communications will include:

- Pedestrians and bicyclists
- Various vehicle types, including passenger vehicles, transit (buses and trains), and commercial vehicles
- Technologies that notify drivers and/or non-motorists
- Domestic and international approaches
- Technologies specifically intended for V2P, and others that may be used innovatively.

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V2P Devices and Applications

Pedestrian detection systems can be implemented in vehicles, in the infrastructure, or with pedestrians themselves to provide warnings to drivers, pedestrians, or both:

- **In-Vehicle Systems:** In-vehicle warning systems are becoming more and more commonplace (e.g., blind spot warning, forward collision warning). The current field of V2V communications is providing the development of even more advanced warning systems (e.g., intersection movement assist, left turn assist). In-vehicle warnings to the presence of a pedestrian in the roadway might be logical.
- **Handheld Devices (for pedestrians):** Perhaps the simplest and most apparent warning system for pedestrians is a handheld device.

Some of the V2P applications in development include:

- **Mobile Accessible Pedestrian Signal System:** An application that allows for an automated call from the smart phone of a visually impaired pedestrian to the traffic signal, as well as audio cues to safely navigate the crosswalk. In addition, drivers attempting to make a turn are alerted of the presence of a visually impaired pedestrian at the crosswalk.
- **Pedestrian in Signalized Crosswalk Warning (Transit):** An application that warns transit bus operators when pedestrians, within the crosswalk of a signalized intersection, are in the intended path of the bus

In terms of automated technologies, the Department has been researching systems that can automatically brake a vehicle to avoid striking a pedestrian, referred to as pedestrian crash avoidance and mitigation systems. The National Highway Traffic Safety Administration estimates that these systems could potentially address up to 46 percent of pedestrian crashes.

The USDOT plans to test V2P technologies at the Turner Fairbank Highway Research Center intersection test bed for market readiness and real-world implementation. Both intersection and non-intersection (i.e., mid-block) crashes will be tested.

V2P research has developed the following technology categories based on their ability to detect and notify the driver and/or pedestrian:

- **Unilateral Pedestrian Detection and Driver Notification:** Technologies that provide collision alerts only to the driver
- **Unilateral Vehicle Detection and Pedestrian Notification:** Technologies that provide collision alerts only to the pedestrian.
- **Bilateral Detection and Notification Systems:** Technologies that provide collision alerts to both drivers and pedestrians in parallel

Each of these systems could be enhanced by communicating with infrastructure. That is, a pedestrian device that communicates with various infrastructure components has the potential to more accurately interpret and predict pedestrian movement than a pedestrian device that only communicates with vehicles within a short range.

Photo Source: USDOT

For more information about this initiative, please contact:
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FHWA-JPO-15-245