The U.S. Department of Transportation is committed to improving safety and mobility on our Nation’s roadways. As we look ahead to the next stage of roadway safety in America, vehicle-to-vehicle (V2V) technology shows great promise in transforming the way Americans travel. Through V2V wireless technology, vehicles ranging from cars to trucks and buses to trains could one day be able to communicate important safety and mobility information to one another that helps save lives, prevent injuries, ease traffic congestion, and improve the environment.

HOW V2V TECHNOLOGY WORKS

U.S. DOT is collaborating with some of the world’s largest automobile manufacturers to research how wireless technology enables vehicles to communicate with each other and with the infrastructure around them. Vehicle-to-vehicle and vehicle-to-infrastructure (V2I) communications could one day alert motorists of hazardous roadway conditions, impending collisions, or dangerous curves. Vehicles equipped with this technology could also talk to traffic signals, work zones, toll booths, school zones, and other types of infrastructure.

V2V communication systems are based on Dedicated Short Range Communications (DSRC), which is fast, secure, reliable, and unlikely to be vulnerable to interference. Using in-vehicle or after-market devices that continuously share important safety and mobility information, vehicles ranging from cars to trucks and buses to trains would be able to “talk” to each other and to different types of roadway infrastructure.

IMPROVING SAFETY

Analyses by the U.S.DOT’s National Highway Traffic Safety Administration show V2V technology could potentially address approximately 80 percent of the crash scenarios involving non-impaired drivers. Specifically, NHTSA research shows that this technology could help prevent the majority of types of crashes that typically occur in the real world, such as crashes at intersections or while changing lanes.

- Through in-vehicle warnings, a driver would be alerted to imminent crash situations, such as a merging truck, a car in the driver’s blind side, or when a vehicle up ahead brakes suddenly.
- By communicating with roadside infrastructure, drivers would be alerted when they are entering school zones, if workers are on the side of the road, and if upcoming traffic lights are about to change.

IMPROVING MOBILITY

According to the Texas Transportation Institute, American drivers spent 4.8 billion hours stuck in traffic in 2010—the equivalent of nearly one full work week for every traveler on our roadways each year. V2V and V2I technology could enable drivers and transportation system operators to make smart choices to reduce travel delay.

- Anonymous signals in vehicles would help generate up-to-the-minute data on how, when, and where vehicles travel in real time. Informed travelers may be able to avoid congestion by taking alternate routes, using public transit, or by rescheduling their trips.
Connected vehicles could one day also include buses, trains, and other forms of public transit. By providing real-time information, V2V technology would give travelers realistic ideas of when transit vehicles will arrive while improving bus and train connections to make public transportation more appealing to everyone.

This technology could also help pave the way to other innovations that improve the way Americans live and travel.

**IMPROVING THE ENVIRONMENT**

According to the Texas Transportation Institute, the total amount of wasted fuel topped 3.9 billion gallons in 2009, the latest year that this data is available. V2V and V2I technology could give motorists the real-time information they need to make “greener” transportation choices. Information about traffic conditions would help motorists eliminate unnecessary stops and let their vehicles reach optimal fuel-efficiency.

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**A COLLABORATIVE APPROACH TO V2V AND V2I RESEARCH**

Working together with the automotive industry, the U.S. Department of Transportation’s National Highway Traffic Safety Administration, Office of the Assistant Secretary for Research and Technology, and Federal Highway Administration—in coordination with other Federal and State agencies—are conducting research to better understand how vehicle-to-vehicle and vehicle-to-infrastructure systems that use DSRC technology can improve safety and mobility—and whether they could be effectively applied in the real world. Current research efforts are focused on V2V safety applications that would operate alongside and in concert with sensor-based crash avoidance technologies that are already on the market and available to consumers. This research is being conducted through joint agreements including the Vehicle Infrastructure Integration Consortium, University of Michigan Transportation Research Institute (UMTRI), and the Crash Avoidance Metrics Partnership.


**SAFETY PILOT OF V2V AND V2I TECHNOLOGY**

The Safety Pilot program was a two-phase, joint research initiative led by NHTSA and the Office of the Assistant Secretary for Research and Technology to examine vehicle-to-vehicle technology and real-world applications. The Safety Pilot laid the groundwork for understanding how this technology interacts in a real-world setting between vehicles and between vehicles and the infrastructure.

**PHASE ONE – DRIVER ACCEPTANCE CLINICS**

In August 2011, the Department began its first phase of research through a series of driver acceptance clinics. Driver clinics were designed to obtain driver acceptance
data in cars equipped with V2V safety systems. The driver assistance applications that were tested included in-car collision warnings, “do-not-pass” alerts, warnings that vehicles ahead have stopped suddenly, and other similar safety messages. The six-month program evaluated approximately 700 drivers at the six driver clinics in Michigan, Minnesota, Florida, Virginia, California, and Texas and was completed in January 2012. The information gathered from the program showed that an overwhelming majority of drivers (9 out of 10) would like to have the V2V features included in their own vehicles and most believe the technology would be useful in improving driver safety.

Dates and locations included:

- August 8–11, 2011: Michigan International Speedway in Brooklyn, MI;
- September 23–29, 2011: Brainerd International Speedway, Brainerd, MN;
- October 22–25, 2011: Walt Disney World Speedway, Orlando, FL;
- November 7–10, 2011: Smart Road, Virginia Tech Transportation Institute, Blacksburg, VA;
- December 6–9, 2011: Texas Motor Speedway in Fort Worth, TX; and
- January 18–21, 2012: the former Naval Air Station Alameda, Alameda, CA.

Nine out of 10 drivers in the driver acceptance clinics agreed that they would like to have vehicle-to-vehicle safety features in their own vehicles and believe the technology would be useful in improving driver safety.

PHASE TWO – MODEL DEPLOYMENT

August 21, 2012, the U.S. Department of Transportation and its research partners launched the second phase of the Safety Pilot with a model deployment to further test connected vehicle technology in a year-long effort through summer 2013. Supported by a diverse team of industry, public agencies, and academia, the model deployment operated on roads in Ann Arbor, Michigan, and tested V2V and a limited number of V2I safety applications.

The U.S. Department of Transportation contracted with UMTRI to conduct the model deployment, which used...
V2V technology in a real-world environment and gathered extensive data about system operability, effectiveness, and security. The test site created a highly concentrated environment of vehicles “talking” to each other using approximately 3,000 vehicles (including cars, trucks, and buses) equipped with vehicle-to-vehicle communications devices. These vehicles sent and received electronic data from other equipped vehicles at the site and translated the data into a warning to the drivers if and when specific safety hazards occurred.

The devices that were tested include systems that are directly embedded in the vehicle, as well as aftermarket safety systems, and “simple” communications beacons that are brought into the vehicle. All systems and devices emit a basic safety message 10 times per second that forms the data stream that other in-vehicle devices use to determine when a potential traffic hazard exists. Combined with the vehicle’s own data, this information provides highly accurate data that is used by the crash avoidance safety applications. The Safety Pilot model deployment obtained empirical test data for determining the technologies’ effectiveness at reducing crashes. These capabilities were also extended to a limited set of applications in which vehicles communicated with highway infrastructure (or V2I).

**FOR MORE INFORMATION:**

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