# New York City, New York

# CONNECTED VEHICLE PILOT DEPLOYMENT PROGRAM

According to the National Highway Traffic Safety Administration, speeding was a factor in more than one in four deaths in New York City. Moreover, human factors were the critical cause in about 94 percent of all crashes, while vehicle-related factors applied only to about 2 percent of all crashes. These traffic incidents (e.g., crashes, stuck oversize vehicles) cause significant delays, injuries, fatalities, and vehicle and infrastructure damage.

Manhattan, in particular, has high levels of pedestrian traffic, which result in frequent interactions between pedestrians and vehicles. Seventy-three percent of all crash fatalities in the area involved pedestrians compared to 14 percent nationwide. Senior citizens over the age of 65 comprise 12 percent of the population in New York City but about 33 percent of all pedestrian fatalities. In addition, the primary reason for crash-related deaths of children under 14 was from being struck by a vehicle.

LEGEND: ● Indicates at least one fatality (2012–2014) ━━ Connected Vehicle Roads

Photo Source: USDOT

## Connected Vehicle Pilot Deployment Program

The Connected Vehicle Pilot Deployment Program was launched in September 2015 to deploy, test, and operationalize cutting-edge mobile and roadside technologies and to enable multiple connected vehicle applications. Sponsored by the Intelligent Transportation Systems (ITS) Joint Program Office (JPO), the U.S. Department of Transportation (USDOT) awarded cooperative agreements to three agencies:

- New York City Department of Transportation (NYCDOT)
- Tampa Hillsborough Expressway Authority
- Wyoming Department of Transportation.

## New York City Connected Vehicle Pilot

The New York City Connected Vehicle Pilot aims to improve the safety of travelers and pedestrians in the city through the deployment of connected vehicle technologies. This objective directly aligns with the city's Vision Zero initiative, which began in 2014 to reduce the number of fatalities and injuries resulting from traffic crashes.

Led by the NYCDOT, the pilot aims to reduce crash frequency and severity, manage vehicle speeds (to the regulatory limit), and evaluate the benefits of deploying connected vehicle technology in a dense urban environment with frequent interactions among the participating vehicles.

## Approach

New York City's planned deployment provides an ideal opportunity to evaluate connected vehicle technology and applications in tightly-spaced intersections typical in a dense urban transportation system.

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It is expected to be the largest connected vehicle technology deployment to date. The pilot area encompasses three distinct areas in the boroughs of Manhattan and Brooklyn. The first area includes a 4-mile segment of Franklin D. Roosevelt (FDR) Drive in the Upper East Side and East Harlem neighborhoods of Manhattan. The second area includes four one-way corridors in Manhattan. The third area covers a 1.6-mile segment of Flatbush Avenue in Brooklyn.

The NYCDOT's approach is to:

- Deploy connected vehicle technology in large fleets that operate in the same area
- Provide system capabilities to manage the large fleets and their safety applications
- Measure the system's performance while preserving privacy for fleet owners' and participants' personally identifiable information
- Focus on the stability and robustness of the roadside unit (RSU) and onboard unit (OBU) platforms to support over-the-air (OTA) software updates and data collection
- Require that the operation of the applications can be adjusted and tuned for the characteristics of the dense urban environment and varied driving conditions within New York City.

## Partners

The New York City Connected Vehicle Pilot includes a diverse team of stakeholders:

- NYCDOT Bureau of Traffic Operations
- NYCDOT IT Department
- New York City Department of Information Technology and Telecommunications
- NYCDOT Fleets
- Taxi and Limousine Commission and Taxi Fleets
- Metropolitan Transportation Authority (MTA)/New York City Transit
- New York City Department of Sanitation (DSNY)
- Department of Citywide Administrative Services (DCAS)
- Port Authority of New York and New Jersey (PANYNJ)
- Pedestrians for Accessible and Safe Streets Coalition.

## Applications

The New York City Pilot will deploy the following applications on participating vehicles.

### Vehicle-to-Vehicle (V2V) Safety Applications

- *Forward Crash Warning* – Alerts the driver in the event of an imminent rear-end crash with a remote vehicle ahead
- *Emergency Electronic Brake Lights* – Alerts the driver of stopped or hard-braking vehicle(s) ahead in time to safely avoid a crash
- *Blind Spot Warning* – Alerts the driver when a remote vehicle is in the adjacent lane in the same direction of travel to avoid a side-swipe crash
- *Lane Change Warning* – Alerts the driver during a lane change attempt when a remote vehicle is in the adjacent lane in the same direction of travel to avoid a side-swipe crash

## Deployment by the Numbers

The New York City Connected Vehicle Pilot is deploying:

**up to 8K** **fleet vehicles and at least 5 vehicle types:**

- 3,200 taxis
- 700 MTA buses
- 700 NYCDOT fleet vehicles
- 170 DSNY vehicles
- 3,200 DCAS vehicles

**353** **RSUs at approximately 310 signalized intersections**

- *Manhattan*:
  - 202 intersections on the arterials (1st, 2nd, 5th, and 6th Avenues)
  - 79 intersections on the cross streets (14th, 23rd, 34th, 42nd, and 57th Streets)
- *Brooklyn*:
  - 28 intersections on Flatbush Avenue
  - 8 RSUs on FDR Drive
  - 36 RSUs at support locations outside the pilot area (e.g., river crossings, airports, vehicles garages, and Port Authority facilities)

- **Intersection Movement Assist** – Alerts the driver attempting to cross or turn when it is not safe to enter the intersection
- **Vehicle Turning Right in Front of Bus Warning** – Alerts the bus operator if a remote vehicle attempts to pull in front of the bus to make a right turn

## Vehicle-to-Infrastructure (V2I) Safety Applications

- **Speed Compliance** – Alerts the driver when exceeding the posted regulatory speed limit
- **Curve Speed Compliance** – Alerts the driver when approaching a curve and exceeding the posted regulatory speed limit
- **Speed Compliance in Work Zone** – Alerts the driver when approaching a designated work or school zone and exceeding the speed limit
- **Red Light Violation Warning** – Alerts the driver of impending red-light violations
- **Oversize Vehicle Compliance** – Alerts the driver of restricted roadways and impending height-restricted infrastructure such as bridge or tunnel clearance
- **Emergency Communications and Evacuation Information** – Alerts the driver of New York City's emergency and evacuation traveler information obtained from the Traffic Management Center, Office of Emergency Management, Office of Emergency Response, and National Weather Service

## V2I Pedestrian Applications

- **Pedestrian in Signalized Crosswalk** – Alerts the driver of the presence of pedestrians crossing at a signalized intersection
- **Mobile Accessible Pedestrian Signal System** – Informs the visually-impaired pedestrian of the pedestrian signal status and provides orientation to the crosswalk to assist in crossing the street

Additional applications being deployed include:

- Support applications for configuration and system management; these will monitor the radio frequency performance, monitor the overall health of the system elements including aftermarket safety devices and RSUs, manage the software operation of the units, and support OTA software updates and application management
- Applications to collect data associated with driver warnings and alerts to support the evaluation of the safety benefits
- Vehicle traffic sensor application for integration of connected vehicle technology with New York City's Midtown in Motion adaptive traffic signal system.

The New York City Pilot focuses on using only IEEE 802.11p dedicated short-range communication (DSRC) technology, utilizing six of the seven channels. This project will be a case study for the use of this spectrum space to improve safety and mobility.

Connected vehicle technology has yet to be deployed in a high-density environment like New York City. With its mix of high pedestrian and vehicle traffic and commercial and residential areas, the New York City Connected Vehicle Pilot will be a model for future large-scale deployments in urban environments. The New York City Pilot is expected to be operational in fall 2019.



Photo Source: USDOT

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# Connected Vehicle Pilot Deployment Program

## Connected Vehicle Pilot Interoperability Testing

In the summer of 2018, the pilots successfully achieved a major milestone in paving the way for a nationwide deployment by demonstrating the connected vehicle devices and equipment are interoperable, meaning they can operate as designed anywhere in the country, regardless of where they were built.

Over the course of four days at the Turner-Fairbank Highway Research Center (TFHRC), a federally owned and operated national research facility in McLean, Virginia, the three Connected Vehicle Pilot sites conducted an interoperability test to demonstrate whether a vehicle with an onboard device from one site was able to receive messages from the OBU and RSUs of another site in accordance with the key connected vehicle interfaces and standards. A test of this nature and scope, involving three deployment sites and six device vendors, had never been done before.

Results of the testing indicated successful, interoperable transfer of V2V messages between the OBUs from different vendors, four of which used DSRC and one used a combination of DSRC and satellite communications. Additionally, equipment from each vendor demonstrated the successful transfer of messages between RSUs and each site's OBUs.

## 6 Things to Know About the Connected Vehicle Pilots

**New Wireless Technology Is Being Tested**
- Vehicle and pedestrian applications
- Wireless devices
- Standards
- Interoperable technology

**All Types of Travelers Are Involved in the Tests**
Testing is taking place in commuter traffic, in congested city centers, in crosswalks, and on rural roads

**The Pilots' Results Will Transform Transportation**
A connected infrastructure can improve the safety, mobility, and efficiency of trucks, cars, buses, pedestrians, traffic signals, work zones, and trolleys

**Other Communities Can Replicate the Pilots' Success**
Through sharing and collaboration, communities nationwide can follow the successes of the Connected Vehicle Pilot sites

**The Data Is Free for Public Use**
Detailed reports from each Connected Vehicle Pilot will be published and available for anyone to access for free

**Connected Vehicles Could Be in Your Community in the Next Decade**
The goal is to create a national system of interoperable connected vehicles and infrastructure

For more information, visit the Connected Vehicle Pilot Deployment Website: https://www.its.dot.gov/pilots/index.htm or contact:

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