



U.S. Department of Transportation  
Federal Transit Administration



# Driver Assist System (DAS) Technology to Support Bus-on-Shoulder (BOS) Operations

## Background

In 2015, FTA awarded the Minnesota Valley Transit Authority (MVTA) \$1.79 million under the research area of Resiliency to equip 11 buses with driver assist system (DAS) technology for bus on shoulder (BOS) operations. The Twin Cities Metropolitan area has an extensive network (approximately 250 miles) of BOS operations, and bus operators use roadway shoulders at their discretion when speeds on general purpose lanes drop below 35 miles per hour. This project tested and evaluated MVTA's second iteration, the Gen2 DAS, an updated and commercialized version of the original DAS.

## Objective

MVTA's primary goal for the Gen2 DAS was to enhance driver confidence during bus shoulder operations, especially during adverse weather, to bypass traffic congestion when speeds in general-purpose lanes drop below 35 miles per hour. Secondary goals included reduced travel times, increased reliability and safety, and improved customer satisfaction.

## Findings and Conclusions

*Implementation of the Gen2 DAS technologies for bus-on-shoulder operations was successful, and evaluation yielded important information related to their use.*

This report summarizes project activities and describes the components of the Gen2 DAS installed on 11 buses that operate on Cedar Avenue in the Minneapolis area and used by MVTA for bus shoulder operations. The Gen2 DAS is a GPS-based technology suite that provides lane position feedback to the driver via light emitting diode (LED) warning lights embedded in the dashboard, warning icons on a liquid crystal display (LCD) touch screen, and a vibrating seat. Several modifications distinguish Gen2 from Gen1, including elimination of the head-up display, virtual mirror, and steering feedback and the use of lidar for front collision sensing and radar for side collision sensing.

A revenue service demonstration took place over 12 months and included an independent evaluation. The evaluation examined route system performance (including measures of bus travel, on-time performance, and percentage of shoulder use), customer satisfaction, bus operator satisfaction, system maintenance, and safety impacts.

Evaluation results were mixed, yielding positive results related to customer satisfaction and maintenance, positive and negative results related to safety, and neutral to negative results related to route system performance and bus operator satisfaction.

## Benefits

The automotive industry has invested billions of dollars in automation research to learn what works and what does not work related to vehicle automation. The independent evaluation was able to measure bus operator use and acceptance of DAS technology, and information learned about what does and does not work is valuable. Although the project is complete, MVTA plans to continue use of the Gen2 DAS in regular service.

## Project Information

### FTA Report 0135

This research project was conducted by Tyre Fant of the Minnesota Valley Transit Authority. For more information, contact FTA Project Manager Steve Mortensen at (202) 493-0459, [steven.mortensen@dot.gov](mailto:steven.mortensen@dot.gov). All research reports can be found at <https://www.transit.dot.gov/about/research-innovation>.