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Environment for Testing and Assessing Infrastructure Support of Connected Vehicle and Cooperative Highway Automation

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Current Situation

The transportation landscape is rapidly evolving, with increasing interest in Connected Vehicles (CV) and Cooperative Driving Automation (CDA). Different from CV technology which enables vehicles to communicate with road infrastructure, CDA enables vehicle-to-vehicle communication alongside CV capabilities to make driving safer and more efficient.

However, CDA technology adoption remains low, which limits the realization of its full benefits. Current traffic management strategies rely on non-automated vehicles, but the Florida Department of Transportation (FDOT) is looking to integrate CDA to enhance safety and efficiency. Infrastructure support, especially through Vehicle-to-Infrastructure (V2I) communication, will be crucial for managing CDA and traditional vehicles.



This project deployed a physical cooperative driving automation (CDA) vehicle, the CARMA 1Tenth, on a facility at SunTrax test track. Image source: FHWA

Research Objectives

The primary goal of this project was to provide recommendations on incorporating CDA into FDOT's Transportation System Management and Operations (TSM&O). Specific objectives included developing a Concept of Operations (ConOps) for incorporating CDA features in traffic management; formulating methods to test and evaluate infrastructure support for CDA; and creating an action plan and a training plan to advance the necessary infrastructure and workforce practices.

Project Activities

The Florida International University project team developed a ConOps that outlines how FDOT can gradually evolve its existing infrastructure and traffic management strategies to accommodate CDA. The recommendations emphasize a phased approach where existing systems will be extended to support CDA needs as vehicle automation use increases. The initial focus is on collecting data from CVs and integrating basic CDA capabilities.

The team developed a test plan to assess CDA infrastructure in both simulated and real-world environments. The plan references the Cooperative Automation Research for Mobility Applications (CARMA) platform, an open-source tool for CDA testing developed by the Federal Highway Administration (FHWA). This platform allows for co-simulation environments that assess vehicle performance, safety, and system efficiency under different levels of CDA adoption.

The project also developed an action plan to identify key steps needed to build infrastructure support for CDA. The training plan focuses on equipping FDOT personnel with the skills required to manage and operate CDA-enabled transportation systems.

Project Conclusions and Benefits

The integration of CDA into Florida's transportation system will provide significant improvements in safety, mobility, and environmental sustainability. Although full adoption of CDA is expected to take time, FDOT can begin laying the groundwork by updating its current systems and collecting more traffic data. The gradual incorporation of CDA into traffic management, such as dynamic ramp metering and incident management, will enhance both short-term and long-term transportation efficiency.

For more information, please see fdot.gov/research.