DRISI

CALTRANS DIVISION OF RESEARCH, INNOVATION AND SYSTEM INFORMATION

TRANSFORMING IDEAS INTO SOLUTIONS

Research Notes

Caltrans Field Trials of the Intelligent Truck-Mounted Attenuator (ITMA)

To evaluate the effectiveness of ITMA in actual California Department of Transportation (Caltrans) operating conditions and identify any problems which arise during the on-road field trials.

Maintenance

MAY 2025

Project Title:
Caltrans Field Trials of the Intelligent Truck-Mounted Attenuator (ITMA)

Task Number: 4159

Start Date: January 2, 2023

Completion Date: June 30, 2025

Task Manager:
Charina Guarino
Transportation Engineer (Civil)
Charina.Guarino@dot.ca.gov

WHAT IS THE NEED?

Caltrans highway maintenance and repair activities often require a shadow (trailing) truck equipped with a Truck-Mounted Attenuator (TMA) to provide impact protection for workers from errant vehicles. The nature of shadow trucks, or TMA trucks, dictates that they will be hit by errant vehicles, so while the TMA truck increases safety for the workers, each collision still compromises the safety and well-being of the shadow truck driver. There is a need to remove Caltrans' shadow truck drivers from the risks associated with errant vehicle impacts. This is expected to reduce operator injuries due to public vehicle impacts with the TMA vehicles in highway work zones.

The ITMA, which achieves this, was successfully evaluated on closed test sites in previous research, including testing on a closed segment of State Route 905 (SR905). To proceed towards deployment of the ITMA for regular Caltrans operations, controlled field trials on public roads with and without an ITMA safety operator are essential.

WHAT ARE WE DOING?

This research project plans to perform monitored field trials of the Intelligent Truck-Mounted Attenuator (ITMA) system on California public roads, to demonstrate its feasibility. During normal operations of the ITMA system, the lead vehicle (LV) lays down electronic breadcrumbs (E-crumb) utilizing Global Positioning System (GPS) technology. The steering, engine throttle, and braking of the follower vehicle (FV) are controlled by the Kratos system to follow the E-crumb path of the LV and maintain a user- defined distance.

The contractor from Advanced Highway Maintenance and

Caltrans

DRISI provides solutions and knowledge that improves California's transportation system.

Construction Technology (AHMCT) Research Center at UC Davis will work with Kratos on any system modifications that may be necessary, develop a test plan, provide ITMA system training to Caltrans maintenance personnel, conduct system field trials, and collect operator feedback following trials (through survey or interviews), and will perform evaluation of the performance and suitability of the system, including operator acceptance and identification of any concerns.

The initial field trials will be performed on a remote Caltrans-operated public roadway with a safety operator in the ITMA FV. After the review of initial field trials and a consensus to proceed with the test plan, final field trials will be performed with the safety operator moved to the LV, removing operator from the ITMA FV.

WHAT IS OUR GOAL?

The purpose of this research project is to confirm that the Intelligent TMA is safe and effective in actual Caltrans operating conditions and identify any problems which arise during the on-road field trials.

WHAT IS THE BENEFIT?

This research project provides an opportunity to field test the ITMA in closely monitored rural highway operations. The ITMA will remove the TMA operator from this vehicle and can lead to significant reductions in operator injuries due to public vehicles' impacts with the TMA vehicles.

WHAT IS THE PROGRESS TO DATE?

Kick-off meeting was held on January 6, 2023. Meetings were held on February 14 & March 15, 2023. Contractor performed modifications to the leader vehicle by installing a 10-inch display (for multiple camera views) and a cellular modem. Contractor also updated the training materials Panel meetings were held on April 3 & 20, 2023, and July 28, 2023. Contractor provided training to six equipment operators (from district 11) and two trainers from META (Maintenance Equipment Training Academy). During May to July 2023 the contractor worked with paint striping crew in District 11 and performed field trials of the ITMA system on state highways. In August 2023 the ITMA system was tested on sweeping operations. On September 7, 2023 an informal demonstration of ITMA system was conducted (performing sweeping operations) in El Centro California. Participants included staff from California Highway Patrol (CHP), District 11, and DRISI.

In October and November 2023, the ITMA system was tested on the Raised Pavement Marker (RPM) operations on state highways. Panel meeting was held on November 30, 2023.

On March 5 and 6, 2024 training for final field testing was developed and six operators were trained. On March 7 and 8, 2024, the contractor supported sweeping operations, in which operators controlled FV from the LV (Note: there was a safety operator in the FV also).

On March 13, 2024 California State Transportation Agency (CalSTA) approved Issue Memo to allow moving the safety operator from FV to the LV. On August 8, 2024 the fully intelligent field testing of ITMA started, in which the safety operator moved to the LV and there is no operator in the FV. The safety operator in LV is still able to control the FV during the operations.

On October 6 through 8, 2024, contractor travelled to El Centro, California to support fully intelligent raised pavement marker operations. On November 12 through 14, 2024, the contractor supported fully intelligent paint striping operations. Due to delays in the approval of final field trials, the project was extended until April 30, 2025.

On February 19 and 20, 2025, the contractor supported fully intelligent paint striping operations. Final field testing of the ITMA system supporting sweeping, stripping and raised pavement marker maintenance operations were conducted at this time. Due to further time delays in the approval of final field trials and necessary repairs on the vehicles, the project was extended until June 30, 2025.

IMAGES

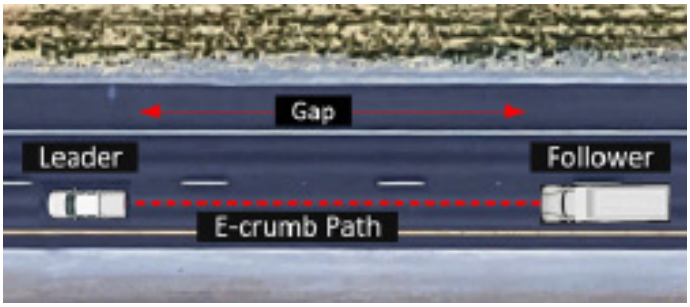

Image 1: E-crumb path guidance.

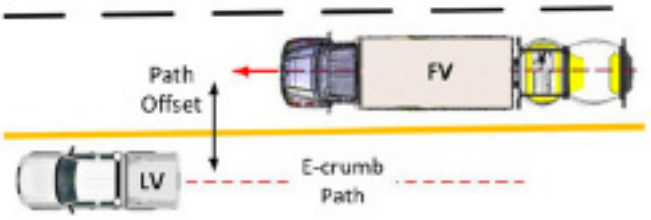

Image 2: E-crumb offset funcationality.

Image 3: ITMA system.