

# DRISI

CALTRANS DIVISION OF RESEARCH,  
INNOVATION AND SYSTEM INFORMATION

TRANSFORMING IDEAS INTO SOLUTIONS

# Research

# Notes

Maintenance

MAY 2024

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

Task Number: 4159

Start Date: January 2, 2023

Completion Date: December 31,  
2024

Task Manager:  
Hamid Ikram  
Transportation Engineer (Electrical)  
hamid.ikram@dot.ca.gov

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

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

### 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.

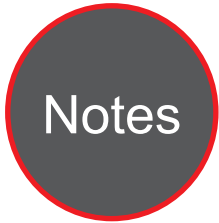
### WHAT ARE WE DOING?

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 Construction Technology (AHMCT) Research Center at UC Davis will work with Kratos on any system modifications that



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



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. In June 2024, the research team plans to conduct demonstration of ITMA system in District 11.

### IMAGES

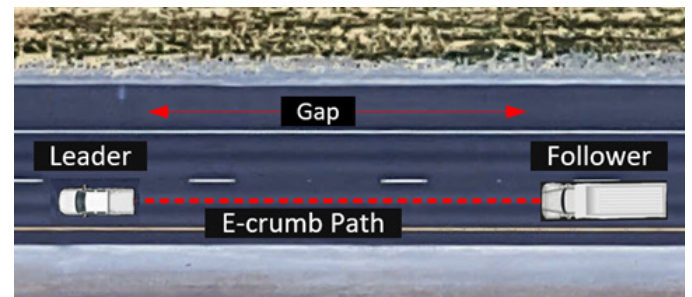


Image 1: E-crumb path guidance

The contents of this document reflect the views of the authors, who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the California Department of Transportation, the State of California, or the Federal Highway Administration. This document does not constitute a standard, specification, or regulation. No part of this publication should be construed as an endorsement for a commercial product, manufacturer, contractor, or consultant. Any trade names or photos of commercial products appearing in this document are for clarity only.

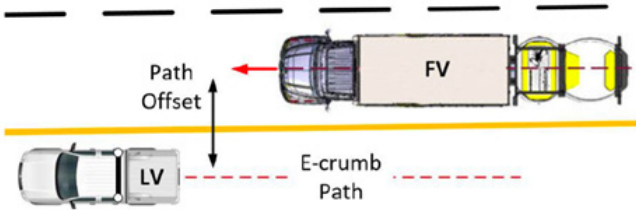


Image 2: E-crumb offset functionality



Image 3: ITMA system

The contents of this document reflect the views of the authors, who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the California Department of Transportation, the State of California, or the Federal Highway Administration. This document does not constitute a standard, specification, or regulation. No part of this publication should be construed as an endorsement for a commercial product, manufacturer, contractor, or consultant. Any trade names or photos of commercial products appearing in this document are for clarity only.