

## Maintenance

APRIL 2025

**Project Title:** Evaluation of Remote Operations of Truck-Mounted Attenuator (TMA)-Equipped Shadow Vehicles for Use in Caltrans Operations

**Task Number:** 4161

**Start Date:** December 23, 2022

**Completion Date:** March 31, 2025

**Task Manager:**

Charina Guarino  
Transportation Engineer (Civil)  
[Charina.guarino@dot.ca.gov](mailto:Charina.guarino@dot.ca.gov)

## Evaluation of Remote Operations of Truck-Mounted Attenuator (TMA)-Equipped Shadow Vehicles for Use in Caltrans Operations

This project performed research to identify and evaluate the performance of a commercial off-the-shelf system for remote operations of truck-mounted attenuator vehicles in Caltrans highway operations.

### WHAT WAS THE NEED?

The California Department of Transportation (Caltrans) highway maintenance and repair activities often require a shadow (trailing) truck equipped with a Truck Mounted Attenuator (TMA) to provide protection for workers from errant vehicles. Shadow trucks or TMA trucks are intended to brace the impact from errant vehicles. While this increases the safety for the worker, each collision compromises the safety of the TMA truck driver. Commercial off-the-shelf systems can support remote operation of various vehicles from a distance. The remote-controlled TMA (RCTMA) held the potential of removing the driver from the TMA truck, placing them in a safe working environment.

### WHAT WAS OUR GOAL?

The goal of this project was to identify and evaluate the performance of a commercial off-the-shelf system for remote operations of TMA vehicles in Caltrans highway operations.

### WHAT DID WE DO?

This project performed research to identify and evaluate the performance of a commercial off-the-shelf system for remote operations of TMA vehicles in Caltrans highway operations. In this project, the research team from the Advanced Highway Maintenance and Construction Technology Research Center identified and procured a system that provided the needed remote control of a shadow truck and identified a suitable shadow truck to host the remote-control system. The research team developed a test plan for the system and executed



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

safety and performance tests on closed test tracks.

## WHAT WAS THE OUTCOME?

After 22 rounds of testing at varying speeds and driving scenarios, the research results indicated that the RCTMA satisfactorily performed the main functions of a TMA, which includes:

- Lane-keeping in straight and curved paths
- Maintaining gap distance with lead vehicle
- Taking the lane
- Avoiding obstacles
- Maintaining communication
- Pausing and stopping motion
- Acceleration and deceleration

It was determined that, with sufficient training, remote driving is a viable option for Caltrans TMA trucks in areas where cellular network has sound coverage, and the roadway lane width and geometry do not provide very tight and complex driving conditions.

A new research project has been proposed to assess an Intelligent TMA's performance under a variety of Annual Average Daily Traffic conditions and to further evaluate remote driving capabilities.

## WHAT IS THE BENEFIT?

The use of a commercial off-the-shelf remote-control system for the remote operation of TMA vehicles could allow Caltrans to remove shadow truck drivers from the vehicle, leading to significant reductions in TMA operator injuries and increase in overall worker safety.