

Maintenance

MAY 2026

Project Title: Equipment Simulators

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

Heavy Equipment Simulator Training Optimization

This project plans to provide an optimized heavy equipment simulator training for use in California Department of Transportation (Caltrans) maintenance.

WHAT IS THE NEED?

Caltrans is looking to improve the training program it provides to its maintenance personnel operating heavy equipment. Prior research done under Task ID 3833 has proven that training using heavy equipment simulators is beneficial to Caltrans. Caltrans would benefit from an optimized simulator training program to support training efforts at the Maintenance Equipment Training Academy (META) and in the Districts.

WHAT ARE WE DOING?

In this research, the Advanced Highway Maintenance and Construction Technology (AHMCT) Research Center at the University of California (UC) Davis will conduct human subject research using META's John Deere/CM-Labs simulator and fully immersive Caterpillar simulator with its optional Virtual Reality (VR) glasses. A CM-Labs minimal immersion desktop simulator system will also be used by UC Davis student volunteers to test training routines before being performed by Caltrans trainers on Caltrans premises. The results of the study are expected to allow the quantification of factors such as the training effectiveness ratio. AHMCT will provide training schedules, tasks, and logistics recommendations for Caltrans' Division of Maintenance's training program. The results will be compiled in a final report summarizing the study results and future recommendations.

WHAT IS OUR GOAL?

The goal of this project is to evaluate the effectiveness of heavy equipment simulator training and see how best to improve Caltrans' training efforts.

WHAT IS THE BENEFIT?

The results of this research will lead to a more optimal training program for Caltrans. A well-defined training program will lead to a safer training environment and reduced training costs. This research will also allow Caltrans to estimate return on investment using quantification of factors such as the training effectiveness ratio.

WHAT IS THE PROGRESS TO DATE?

Project panel meetings were held on June 18, and September 10, 2025. An internal meeting discussing simulator issues was held on October 16, 2025. Contractor has been collecting from the Applied Biological Systems Technology (ABT) 049 class with UC Davis students since September 2025, with a total of 62 unique participants to date.

Contractor rented a mini-excavator for testing 1 of 4 research hypotheses. Contract developed a Standard Operating Procedure (SOP) for operating the rental mini-excavator with UC Davis ABT 049 students. Testing on the mini-excavator was held with ABT 049 students and contractor staff between September 24 and December 12, 2025.

Project panel meetings were held on April 6 and May 5, 2026. Contractor started working on a procedure to test the effectiveness of simulator training with VR glasses. Training sessions on the actual heavy equipment have concluded as of December 12, 2025.