# Training Vehicle Control for Accident Avoidance

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From 1980 to 2005, three soldiers have died from motor vehicle crashes for every one lost in combat. Many of these accidents can be prevented through improved vehicle control. In the US, we frequently look towards technology to reduce crashes and overlook the skills required for a driver to effectively control the vehicle. To make the situation worse, the majority of roads our troops encounter both in training and on deployments are narrow, unimproved gravel or dirt surfaces. To reduce these problems, the Army Cold Regions Research and Engineering Laboratory (ERDC-CRREL) has teamed with Vehicle Control Technology and Team O'Neil loose-surface rally car drivers in a three year project called S.A.V.E. (Synthetic Automotive Virtual Environments). The objectives of the S.A.V.E. project are to determine the most effective methods for training people to avoid accidents in diverse environments and develop basic simulation capabilities that reflect those specific conclusions.

Team O'Neil has been teaching vehicle control at their driving school for over ten years, however, on-site training can be expensive to perform and dangerous to personnel. Therefore, the S.A.V.E. program aims to explore the benefits of using a simulator for vehicle control training. During year one of the S.A.V.E. program, the team developed a first generation simulator capable of moving in reaction to road surfaces and driver inputs. This simulator provides drivers with a realistic sense for how driver input will affect vehicle control in challenging high-speed situations, while safely in the simulator. The S.A.V.E. simulator enables students to gain muscle memory, making motions and reactions automatic. Skills taught include eye placement, effective braking, vehicle weight transfer and accident avoidance.

To monitor the effectiveness of the training, a live testing experiment consisting of trained and untrained drivers was conducted. Test vehicles were instrumented for driver input – brake, throttle, steering – as well as for vehicle response – accelerations, rates, speed. Most recently, the team added eye tracking capability to the instrumentation package. To assess the effectiveness of the training, ten students were trained in vehicle control and accident avoidance in the S.A.V.E. simulator and were then asked to drive through an accident avoidance course in an instrumented vehicle. Ten drivers who had not been through the simulator training drove through the same course after a short orientation. An analysis of the data from the vehicle showed that simulator-trained drivers had better reaction time, vehicle control, and accident avoidance capabilities than drivers who had not trained in the simulator. This outcome demonstrated that simulator-learned skills transfer tangibly to real-life situations.

The next phase of the S.A.V.E. program will include a continued focus on motion-based simulator training that models vehicles on unpaved surfaces; an assessment of requirements for sustainment training to keep skills up to date; and consideration of how this research can transition to implementation in more real-life scenarios. Ultimately, the research team aims to transfer this simulation capability to the military for integration into driver training programs across installations. The vision for S.A.V.E. is for both soldiers and civilians to have access to an accident avoidance curriculum and equipment that incorporates the skills and reaction training developed through our joint team. When drivers employ their vehicle control skills in a real, naturalistic field environment, S.A.V.E. can have a significant impact on lowering vehicle accident rates.

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