INNOVATIONS IN TRANSPORTATION

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Oak Ridge National Laboratory (ORNL) conducts research and development activities for the Department of Transportation focused on national safety and security challenges, planning and policy issues, and the efficient mobility of people and goods.

Federal Motor Carrier Safety Administration (FMCSA) projects

Field testing new technologies — ORNL operates the Commercial Motor Vehicle Roadside Technology Consortium (CMVRTC) for the FMCSA. In 2014, the Consortium expanded to five participating states, encompassing 2,400 miles of interstate highways along the I-40, I-75, and I-65 corridors. Inspection stations along these highways field test new safety technologies in a real-world environment.

Wireless roadside inspections — The Wireless Roadside Inspection (WRI) program is a key CMVRTC initiative. Once in place, the WRI will enable an increase in commercial motor vehicle safety inspections from 3.4 million to 1.2 billion annually without additional enforcement personnel or new roadside infrastructure. ORNL has completed determining the system specifications and is currently developing the WRI software from scratch to ensure system security and focused capabilities.

Work zone safety — ORNL arranged and hosted a workshop on Work Zone Safety for Commercial Vehicles in November 2014 with Jack Van Steenburg, Chief Safety Officer of the FMCSA. The participants identified research and development targets leading to a near-term solution that will help save lives by notifying drivers early about emerging traffic congestion.

Federal Highway Administration (FHWA) projects

Prevention of fuel tax evasion — ORNL developed a system that makes fuel movements transparent for carriers and auditors. Researchers have equipped three Barger Transport trucks with custom-designed sensors and telematics devices. As part of an eight-month pilot phase, the trucks are being monitored in real time using an evidential reasoning software system to track fuel distribution from wholesaler to retailer.

Driver behavior study — ORNL is working with the FHWA to investigate links between driver behavior and safety through the Naturalistic Driving Study. Researchers are analyzing data obtained from onboard sensors and cameras in 3,000 vehicles. The data will be used to improve safety systems for infrastructure and vehicles.

Freight management tools — The US transportation system moves an average of more than 50 million tons of freight at an estimated value of $45 billion every day using all modes of transportation. ORNL's Freight Analysis Framework (FAF) is a robust database developed in collaboration with FHWA. It houses the most comprehensive, publically available database of freight movements and metrics. FAF serves as a critical tool for policy makers and transportation planners in the public and private sectors as they make strategic decisions about the planning, operation, investment, and asset management of America's freight system.

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Vehicle Inventory and Use Survey — VIUS provides comprehensive data about the physical and operational characteristics of the US truck fleet. This information—last collected in 2002—is essential to decision makers at the state and national levels. ORNL is working with industry partners and key stakeholders to spearhead the planning phase for a new VIUS to be conducted in 2018. This project receives additional funding from the DOT Bureau of Transportation Statistics.

National Household Travel Survey — ORNL provides hosting and maintenance of this widely-used information resource and conducts an NHTS Academy for users to educate and promote use. NHTS data will be used in an upcoming DOE-sponsored energy analysis of impacts from expanding the deployment of connected and automated vehicle platforms.

Intelligent Transportation Systems–Joint Program Office (ITS–JPO) projects

Intelligent transportation — ORNL developed the ITS Asset Viewer, an online application that uses visual mapping technology to identify the locations of ITS technologies such as message boards, cameras, and traffic sensors. Current research supports the ITS-JPO in expanding ITS deployment into rural areas.

National Highway Traffic Safety Administration (NHTSA) projects

Cyber security for connected vehicles — ORNL developed a concept of operations for vehicle-based credential generation, so the messages vehicles broadcast can be trusted and nearby vehicles can assess their safety status. ORNL performed a feasibility study for implementing this credential management system in what will be the largest public-key infrastructure deployment ever—affecting 250 million vehicles.

Researchers have also investigated the privacy issues that surround broadcasting high-fidelity position information. This information could facilitate an 80% reduction in accidents. For this work, ORNL developed an algorithm that helps ensure that the identities, vehicles, and movements of drivers remain anonymous in data used for studies and potentially for use in a real-world environment. These cyber security projects receive additional funding from the FHWA and ITS-JPO.

Safer batteries through simulation — For the NHTSA, researchers are applying ORNL's advanced simulation capabilities to better understand the mechanisms leading to short circuits and potentially explosive thermal runaway events in batteries that result from electric and hybrid vehicle crashes. These insights can be used to design batteries that are more resistant to abuse and to develop tests to detect flawed or damaged batteries.

Pipeline and Hazardous Materials Safety Administration (PHMSA) projects

Pipeline safety — The PHMSA utilizes ORNL field expertise in pipeline construction inspection (e.g. welds) in addressing key pipeline safety concerns such as the detection of leaks and the integrity of aging transmission and distribution lines carrying natural gas.