



## Heavy Truck Safety Research Program

Center for Transportation Analysis  
(CTA) Research Areas

- Aviation Safety
- Air Traffic Management Analysis
- Data, Statistical Analysis
- Geo-Spatial Information Tools
- Defense Transportation
- Energy Policy Analysis
- Environmental Policy Analysis
- Highway Safety
- Intelligent Transportation Systems
- Logistics Management
- Supply Chain Management
- Modeling and Simulation
- Transportation Operations
- Planning and Systems Analysis
- Transportation Security

**T**he Oak Ridge National Laboratory (ORNL) has been conducting research in the Heavy Truck Safety Area for more than five years. Goals of the research are to contribute to reducing the fatalities and injuries associated with truck crashes on our nation's highways, contribute to the economic viability of the U.S. Trucking Industry and doing so without negatively impacting air quality. Research is conducted in six research domains They are:

- Field and test track testing,
- Modeling and simulation,
- Data and information analyses,
- Laboratory testing,
- Demonstration projects, and
- National program support.

vehicles and cargo is time-consuming, labor-intensive, and most importantly is prone to human error. The WIM program leverages several complementary technology demonstration and development efforts underway in the U.S. Army, U.S. Air Force, and ORNL with the goal of reducing the manual processes, and mitigates the safety and operational concerns.



### **Field and Test Track Testing**

Truck Rollover Characterization: This research examines the use of new-generation single tires and a wider-slider suspension on the trailer for various rollover catalytic maneuvers. Results for a single-lane change maneuver improved the roll-stability index (angular displacement per maximum lateral acceleration) by nearly 46%.



Brake Performance Correlation: Field, test-track, and lab studies of original equipment and after-market brake lining performance are being conducted on vocational vehicles. A validated correlation will allow less costly laboratory testing as opposed to field testing to predict real-world performance.



Heavy Vehicle Duty Cycle: Collect real-world duty cycle data and information to support development of U.S. DOE's PSAT Class-8 Module, and to assist the U.S. DOE in technology investment decisions.



A paper entitled "Heavy Truck Rollover Characterization: New Generation Single Tires vs. Standard Duals" was elected as outstanding paper at the 2005 Truck & Bus Safety & Security Symposium, November 2005.

Advanced High-Speed Weigh-in-Motion (WIM) Technologies: The process of manually weighing and measuring all

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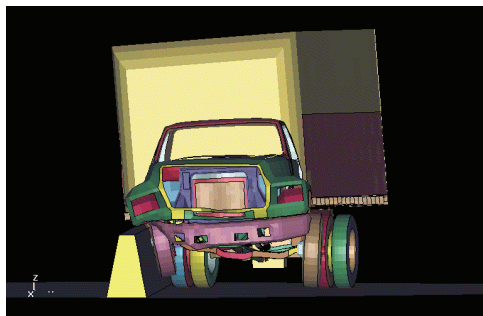
**Roadside Testing Laboratory:** This laboratory conducts tests to improve the safety and security of commercial vehicles. Testing is being done in the following areas: performance-based brake testing with artificial axle loading; non-intrusive optical identification of carriers, vehicles and drivers (*scanning study*); radio frequency-tag/reader interoperability (*scanning study*); testing of remote vehicle disabling technologies; evaluation of the benefits of wireless PDA in truck inspections; and evaluation of wireless vehicle-roadside technologies for truck inspections (future).

### **Data and Information Analyses**

ORNL assists in data and information analyses such as content development for FMCSA's Safety Technology Website which will reflect input from over 200 private industry contributors (expected to come on-line in FY-2006). ORNL has also evaluated the FMCSA's SafeStat Program, and contributed to the Large Truck Crash Causation Study data and the Commercial Vehicle Driver Risk Factors Study.

### **Modeling and Simulation**

ORNL develops Finite Element Models for Single Unit Truck and Infrastructure Crashes to support infrastructure designs which enhance safety.



Other projects areas include:

DynaSmart-P Modeling of the Effects of Truck Traffic in Emergency Evacuations to study the effect of trucks in mixed traffic evacuation and selected strategies for evacuations using separated truck traffic flows.

Enhancement of the Braking Module of TruckSim to account for fade, humidity and braking torque.

ORNL has also developed the GeoFreight Modeling Software that graphically displays geographic relationships between freight movements and infrastructure, assists freight policymakers and planners in identifying the flows of domestic and international freight across the nation, and assists in identifying current and potential major freight bottlenecks in the U.S. transportation system.

### **National Program Support**

ORNL supports the 21st Century Truck Partnership (21CTP), led by U.S. DOE and supported by U.S. DOT, U.S. EPA and U.S. DoD. The 21CTP goals include efficiency improvements for Class-8, Class-6 and Class-2B trucks while enhancing safety and environmentally friendliness. ORNL led the preparation of the 21CTP Technology Roadmap. ORNL also had the lead laboratory role in preparing the 21CTP Safety white paper with goals of:

- Reducing stopping distance by 30%,
- Eliminating blind spots, and
- Enhancing survivability in a 35mph closing crash.

### **Laboratory Testing**

ORNL developed an aftermarket brake material classification system and conducted studies on long-persistence phosphors in highway paint striping. ORNL also studied truck conspicuity enhancements and development of a prototype pulsed U-V headlight system for application to truck safety. ORNL's sub-scale brake-material coupon tester is being used to test brake performance in the Lab.

### **Heavy Truck Safety Research Partnerships**

ORNL's heavy truck safety research involves significant federal, industry and academia partnering. Such partners include:

- U.S. DOT's
  - Federal Motor Carrier Safety Administration
  - Federal Highway Administration
  - National Highway Traffic Safety Administration
- U.S. DOE
  - Office of FreedomCar and Vehicle Technologies
- U.S. DoD
- National Transportation Research Center, Inc.
- Dana Corporation
- Michelin American Research and Development Corporation
- Volvo Trucks of North America
- Battelle Memorial Institute
- The University of Tennessee
- Clemson University
- International Truck and Engine Corporation
- Petro Stopping Centers
- Travel America
- Link Engineering
- Waste Management
- TRC, Inc.
- USXpress
- Laurens Proving Grounds
- Walker Trucking
- BrakePro, Ltd.
- George Washington University
- University of California Berkeley

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