



# Heavy Overweight Vehicle Brake Testing (HOVBT)

## Research Areas

Freight Flows

Passenger Flows

Supply Chain Efficiency

Transportation: Energy Environment

Safety Security

Vehicle Technologies

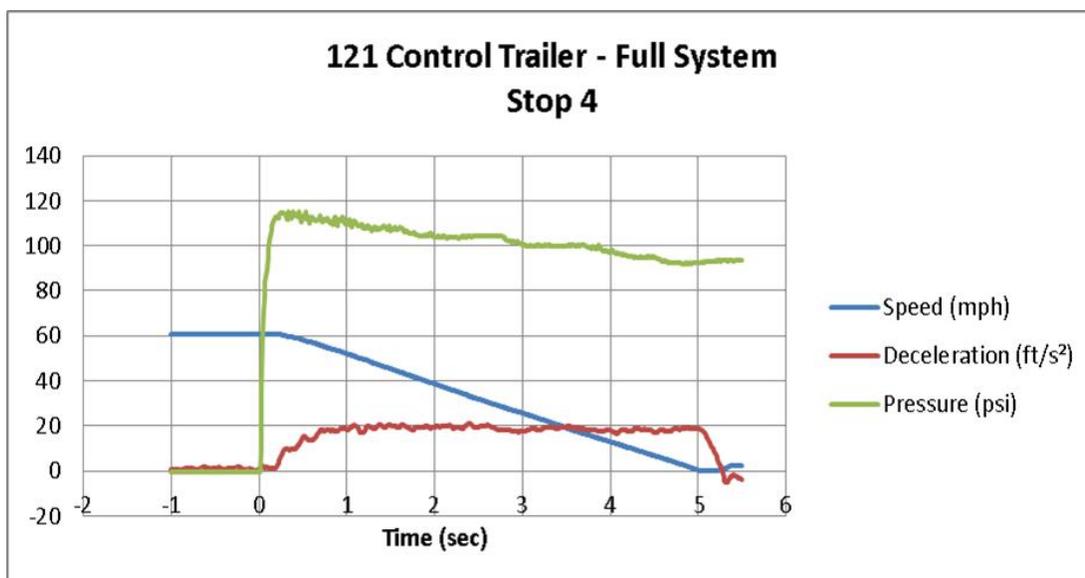
**F**ive-axle tractor/trailers are typically allowed to be loaded up to a gross vehicle weight (GVW) of 80,000 lbs. on roadways. However, these vehicles are able in many cases to haul overweight loads on certain routes, provided an overweight permit is obtained for the load. Federal Motor Carrier Safety Regulations place requirements on the condition of all over-the-road vehicles, including braking system condition. Because braking system problems pose a significant threat to highway safety, the Federal Highway Safety Administration has funded this research to determine how the presence of braking defects in overweight vehicles affects braking system performance. This research will also examine the relationship between brake application pressure and deceleration, informing the development of an algorithm for a real-time on-board brake assessment tool.

### Test Overview

A combination tractor-trailer will be given a complete brake rebuild prior to several tests performed at fully-laden and several overweight loading conditions. A

standard FMVSS-121 stopping distance test will be performed prior to the set of braking tests to ensure that the tractor meets minimum safety requirements. Several tests will be performed at 75%, 100%, 115%, and 145% GVW loading conditions. Testing will be performed at three different braking conditions: fully functional, one pair of tractor brakes disabled, and one pair of trailer brakes disconnected. Data will be collected for four types of tests.

- Panic stops will be performed by bringing the test vehicle up to slightly above the target speed (20 or 60 mph) applying the full braking capacity of the vehicle (full treadle application) until the vehicle comes to a complete stop. The procedure follows that specified for the stopping tests in FMVSS-121, following a straight-line path. This test will be performed for all vehicle loading/brake conditions.
- Constant-pressure stops will be performed by bringing the test vehicle up to slightly above the target speed (20 or 60 mph) and applying the target constant pressure (15, 25, 35, 45, or 55



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psi) until the vehicle comes to a complete stop. An in-line pressure regulator (with driver override capability, for safety) will be used to apply a constant brake system pressure during constant-pressure stops. These tests will be performed for all brake conditions for 75% and 100% load capacity.

- Performance-Based Brake Tester (PBBT) tests will be performed with an FMCSA-certified PBBT, with wheel-end air pressure information obtained for each axle using pressure transducers. The PBBT will provide information regarding overall and wheel-end brake efficiency, a value corresponding to deceleration as calculated from weight and brake force.
- Vehicle weight tickets will also be obtained for each loading condition, showing weight by axle group.

Braking tests will be performed for several loading conditions (fully laden, overweight, and unbalanced loads), and braking system conditions (system fully enabled, one pair of tractor brakes disabled, and one pair of trailer brakes disabled). The test routine will consist of performance-based brake tests, panic stops (full brake application pressure), and constant-pressure

stops performed at various brake application pressures and speeds.

#### **Expected Outcomes**

- Information gained from this research will be used in several areas related to an improved understanding of braking systems and loading.
- Inform state and federal highway and safety organizations regarding safety implications of overweight loads on the roadways.
- Note how stopping distances are affected by overweight loads (both illegal and legally permitted).
- Determine how braking performance is affected by inoperative brakes in different positions.
- Gain new insights into the brake application pressure-deceleration curve at various speeds and loading conditions.

This research began in October 2011, with testing to be performed in April 2012. Data analysis will be presented in a final report, with public distribution anticipated for the August 2012 timeframe.