



## Crash Facts Scenario 4

### Treaded Tires v. Slick Tires - August 2006

#### Comments/Questions

*Thank you for your contribution to the OCAA newsletter. I found your articles thought provoking, and helpful. I do have a question. Please forgive me if I am just not paying attention.*

*In Crash Facts Scenario 3, weight v. speed, I am understanding that given equal tires and pavement, vehicles of different weights are going to skid the same distance. Then, why do trucks take so much longer to stop than cars? I thought it was the weight. Is it the tire size, then?*

*Help! I am confused... — Spunky Gray*

Spunky. Thanks for the kind comments. I was beginning to wonder if anyone actually read Crash Facts!

Your question is an excellent one!

Trucks (with air brakes) take longer to stop because of a phenomenon known as *brake lag*. Air brakes do work the same way hydraulic brakes do. It takes from .5 to 1 second for air brakes to become fully engaged. Additionally, a loaded truck weighing 80,000 pounds usually cannot create enough braking force to lock-up all eighteen wheels. Add to that, most long haulers adjust their steering axle brakes so that they can not lock-up on wet pavement for steering control and you have a much longer stopping distance for a given speed on the same surface.

Stopping distance and skidding (maximum braking) are not the same thing. If a truck, at a given speed, could lock-up all eighteen wheels, the skidding distance of **center mass** would be the same for the truck and a four-wheeled vehicle. Most investigators measure the entire length of skidmarks mistaken them for the distance the truck skidded and do not subtract the rear trailer "over skid." I have never investigated a large loaded truck accident where all eighteen wheels locked up at the same time. Generally speaking, a good air braking system will give you about 80% of the coefficient of friction of the road surface, i.e. .6 (.75 x .8) where a four wheeler gets the full .75.

## Crash Facts Scenario 5

### Speed v. Energy

The relation between speed and energy is important for an investigator to understand. Let us take the 80,000-pound tractor-trailer and compare it with a 3500-pound Buick at 65 mph. Yes, the both have the same speed, but they do not have the same energy – *kinetic energy*. Any object that is in motion has kinetic energy (*KE*) due to its weight (mass) and its speed (velocity). The formula for kinetic energy is:

$$\frac{1}{2} \cdot V^2 \cdot \frac{W}{g}$$

V = mph x 1.47 (feet per second)

W = weigh in pounds

G = gravity constant (32.2 fps<sup>2</sup>)

The kinetic energy for the truck is 11,341,370 ft-lbs and the Buick is 354,418 ft-lbs. The truck has approximately 32 times the *KE* as the Buick at the same speed. The greatest impact on *KE*, is not the weight, it is the speed. If you double the weight of a vehicle at a given speed, you double the *KE*. However, if you double the speed of the vehicle, you increase the *KE* by a factor of four.

I hope that this has been beneficial to your understanding of kinetic energy.

Please email me with any questions or comments that you have. I need feedback. If it wasn't for Spunky Gray's email, I would have pulled the plug on Crash Facts this edition.

**Email your questions and/or comments to [donwebb@crashspeed.com](mailto:donwebb@crashspeed.com)**