Drag Force Analysis of Tractor-Trailer Aerodynamics

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EXTENDED ABSTRACT

An essential part of today's economy is the transportation of goods across the country. One of the major methods of shipping goods between locations has been through semi trucks and the iconic trailers they tow behind them. Although the price for the resources fueling these tractor trailers has risen, the demand for goods transportation has not. Prices across the economy as a whole have risen as the expenses for delivering shipments have increased.

Although these tractor trailers are fast ways of shipping large shipments, the fuel that takes to run them is very costly. In order to help find ways to minimize fuel cost and maximize fuel usage, experimentation will be done to test how different design parts added on to tractor trailers could reduce drag and thereby improve fuel economy.

Simple models of a tractor trailer will be developed through the use of Google SketchUp 3-D modeling. Physical models will be printed with3-D printers. Models will be tested in a wind tunnel where slip stream smoke will be used to help visualize how air flow affects the model. A Vernier Wireless Dynamics Sensor System (WDSS) will be used to calculate drag force. In order to determine the effect speed will have on drag force, measurements will be taken at varying wind speeds. All tests will be performed on a tractor, tractor-trailer, tractor-trailer with a cab cover, a tractor-trailer with a rear aerodynamic cone, a tractor trailer with trailer underbelly covers, and a tractor trailer with all aerodynamic components attached. Experimental results should indicate which aerodynamic components provide the largest reduction in drag force and associated increase in fuel economy.