Reducing Aerodynamic Drag on Heavy Trucks

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Background

Class 8 tractor-trailers consume 11 to 12 percent of total U.S. petroleum use. As much as 65 percent of the fuel goes to overcoming air resistance, or aerodynamic drag. Making heavy trucks more aerodynamic and reducing air resistance will greatly increase fuel efficiency. However, trucks are much more complicated than cars and planes, which are integrated and streamlined. The two challenges are the gap between the truck and the trailer as well as the trailer's shape. That box-like configuration, so excellent for maximizing cargo space, is highly unstreamlined. Fairings, which smooth a vehicle's shape and reduce drag, are common on airplanes and motorcycles but are used less frequently on trucks because they may interfere with loading and unloading.

Description

Livermore scientists, and researchers from other members of a Department of Energy collaboration, have developed several new fairings and other drag-reduction devices. The goal is to reduce drag by at least 25 percent, which would represent a 12 percent improvement in fuel economy at highway speeds, equivalent to the oil in 130 midsize tanker ships per year. Devices that Livermore has developed include:

- underbody fairings,
- wheel fairings,
- trailer skirts,
- boat-tail plates,
- gap plates, and
- vortex fans.

These devices have been examined in wind-tunnel testing, track tests, and computational fluid-dynamics modeling on supercomputers.

Advantages

Installation of drag-reduction devices significantly increases fuel efficiency**.** The least expensive approach is to install them after purchasing the vehicle—during aftermarket detailing.

Potential Applications

Any combination of these devices can be installed on any big-rig tractor-trailer.

Development and IP Status

LLNL has four issued patents and two patents pending that cover drag-reduction devices.