Truck Fuel and Emissions Reduction Program

The NRC Institute for Aerospace Research has started a new round of aerodynamic development of heavy trucks in partnership with Natural Resources Canada (NRCan), the Canadian Trucking Alliance (CTA) and the U.S. Department of Energy. The purpose of the program is to reduce fuel consumption and greenhouse gas emissions by taking second-generation, add-on technology from the wind tunnel to the fleet. Everyone benefits, both government and industry, because the fuel reductions pay truckers to improve vehicle emissions. The economics are such that the devices will pay for themselves within the first two years and make a profit from then on.

The program has involved the trucking industry from the outset. The NRC wind tunnel can accurately demonstrate the aerodynamic effectiveness of any treatment and NRC experts can tell you what works aerodynamically, but we do not know if it will be operationally acceptable. We need help from the trucking industry because only road and fleet trials can identify operational problems with the new equipment and lead to their successful introduction and use. Working together we have an opportunity to make truck operations more profitable and at the same time improve the environment.

Multiple smoke streams show how a cab-mounted deflector protects the trailer and saves 13,000 litres per year at 105 km/h

Full-scale tractor-trailer in the NRC 9 m x 9 m wind tunnel (speed: 200 km/h). Trailer was cut in two to bring it into the tunnel

The first phase of the program started in March 2005 with 1:10-scale model tests in the NRC 2 m x 3 m wind tunnel. This preparatory test is being followed up by several full-scale tests on a Navistar 9100 Day Cab with 40-foot trailer in the NRC 9 m x 9 m wind tunnel. The tests are looking at previously unused concepts, new concepts, and new production and pre-production hardware that includes trailer skirts, gap closure, under-trailer treatment, trailer boat-tails and other commercially-available hardware. Additional entries in the large wind tunnel will take place as new drag-reducing equipment becomes available.

Engineering road tests and fleet trials, organised under the auspices of the CTA, will follow in 2006/7. All components of the program are open to observation by, and input from, the trucking industry.

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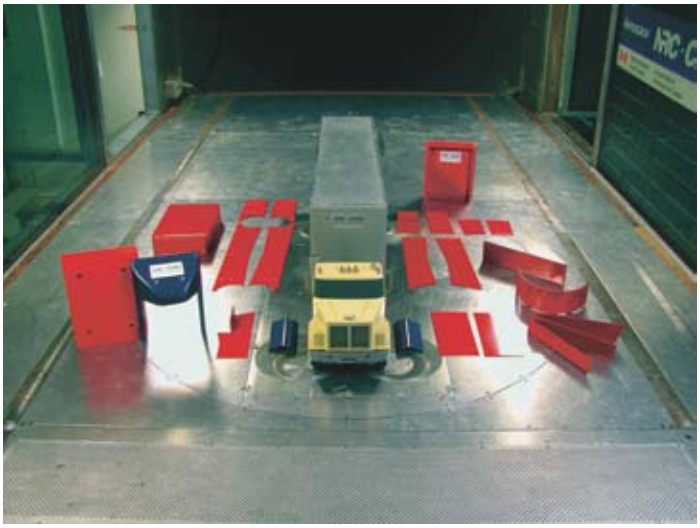
Some of the new hardware under consideration can be seen in the following photographs. They consist of increased gap closure, trailer under-body modification, and trailer rear-end treatment. In total, all three modifications can produce an aerodynamic benefit that is a major fraction of the current cab-mounted aerodynamic package. The new modifications were derived from previous NRC research into truck aerodynamic drag reduction dating from the mid 1970s.

The bare truck has a drag coefficient of 0.80. By comparison, a new corvette is about 0.29. With the current aero package, the drag coefficient drops to 0.64 and the new hardware brings it down to 0.53. The new hardware provides 4.8 litres/100 km fuel savings at 105 km/h. This represents 9,600 litres at 200,000 km annually, or $ 9,600 at $1.00 per litre. This should be a big incentive.

The final designs need to be proved on the road, and we need the trucking industry to help us with this. Call us to become a part of the program.



1:10-scale standard truck with new hardware in the NRC 0 .9 m x 0.9 m model-scale wind tunnel (speed: 300 km/h). Standard aero package (in blue): tank fairings, deflector and cab extenders; new parts (in red): boat-tails, trailer side skirts, trailer bogie fairings and gap sealing panels

Today's aero package

New parts are in red

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