The objective of this work is to evaluate the potential for aerodynamic and electronic coupling to reduce fuel consumptions and 
emissions from Class 8 Tractor Trailers in platoons. The opportunity is the result of creating a 
continuous chain of trucks in which the aerodynamic-induced pressure differences between the 
trailing and lead vehicles, and underlying electronic coupling (which is present in all modern 
vehicles), combine to increase aerodynamic drag and reduce fuel consumption. The work is being 
undertaken under the leadership of the National Renewable Energy Laboratory (NREL) and involves 
cooperation with several other organizations.

**Project Objectives**

- Evaluation of aerodynamic drag reductions from electronic coupling and 
aerodynamic devices in platooning.
- Identification of potential fuel savings and 
environmental benefits.
- Development of a methodology for 
assessing the impact of platooning on 
vehicle emissions.

**Platooning Test Comparisons – Fuel Savings**

- **Indipendent planning availability**
  - 2015 NREL track testing conducted in CA and TX
  - 2013 NREL track testing conducted in CA and TX

- **Large vehicle aggregate geospatial analysis**
  - Observed "dither" in torque command control was significantly reduced.

- **Volpe report**
  - The best evaluation of driver following behavior available.
  - Answer goes against perception that "background platooning" is prevalent.

- **Aerodynamic device design**
  - May be able to counteract loss of aerodynamic drag by grouping vehicles together.

- **Engine temperatures**
  - (intake air, coolant, and exhaust) and engine 
  - temperature at intervals.

- **IVBSS and Safety Pilot**
  - Data tables show total time in bins of following speed and distance.

- **Volpe, the U.S. Department of Transportation’s National Transportation Systems Center,**
  - Naturalistic study shows that existing "background platooning" is
  - less than 0.2% fuel savings.

- **1/50th scale wind tunnel testing conducted in 2015 in California**
  - Lawrence Livermore National Laboratory (LLNL)

- **Wind tunnel results**
  - At less than 0.5%.
  - Lead vehicle trends match well for different speeds and following distances.

- **SAE J1321 track testing conducted in 2015 in Ohio**
  - Auburn University, Transportation Research Center (TRC)

- **Current testing shows**
  - Engine cooling airflow is adequate in platoon formation, except at
  - right-front firing distance.

- **Significant fuel savings**
  - For the

- **Raw grams of NOx reduced over baseline test configuration**

- **Identify optimum platooning aerodynamic package**

- **Define maximum possible fuel savings** from the case in which
  - Engine emissions are reduced.

- **Brake specific g/bhp-hr NOx emissions lower than baseline at
  - Lead vehicle trends match well for different speeds and following distances.

- **5% improvement in fuel savings**

- **Distance Behind Lead Vehicle**

- **NOx Emissions follow-on studies – planned and/or underway**

- **2014 NREL track testing detected an increase in NOx emissions for
  - Reduced from 2014 baseline.

- **Correlated with magnitude of NOx increase**
  - Reduced

- **Map explanations ruled out**

**Follow-on Studies - Planned and/or Underway**

- **Peer-reviewed microambient device map**
  - 10% Fuel savings achievable even in heavy-duty applications

- **Engine emissions are reduced**
  - For the

- **Improve microambient device map**
  - 10% Fuel savings achievable even in heavy-duty applications

**Key Takeaways**

- Independent data show significant fuel and emissions savings for platooning.

- In the longer term, platooning will enable more efficient operation of truck fleets, 
  - and therefore reduce overall fuel consumption and emissions.

- Significant opportunities are available to accelerate deployment of platooning technology,
  - and to achieve significant fuel savings and reductions in emissions.

- Deployment of platooning technology is expected to have a significant impact on 
  - the transportation industry and the environment.

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**References**

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