# PATH's Truck Cooperative ACC System Development and Testing

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# PATH Background

- **Created by U.C. Berkeley Institute of Transportation Studies and Caltrans in 1986 to develop intelligent transportation systems (ITS) to apply information technology to improve road transport:**
  - **Congestion**
  - **Energy/environmental impacts**
  - **Safety**
  - **Economic impacts**
- **Major emphasis on driving automation systems since the start – over 600 person years of effort to date**
- **Automated highway system Demo ‘97 (many riders)**
- **Heavy truck and bus emphasis since 2000**
  - **Potential early adopters of technology**

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# Truck Cooperative ACC Development and Testing Project

- **FHWA Exploratory Advanced Research Program project, with Caltrans cost sharing, 2014-2017**
- **Developing and evaluating CACC system performance on 3 Class-8 trucks (SAE Level 1 automation, longitudinal control only)**
- **Goals:**
  - **Implement smooth, accurate cooperative vehicle following control**
  - **Measure achievable energy savings**
  - **Determine driver preferences among gaps**

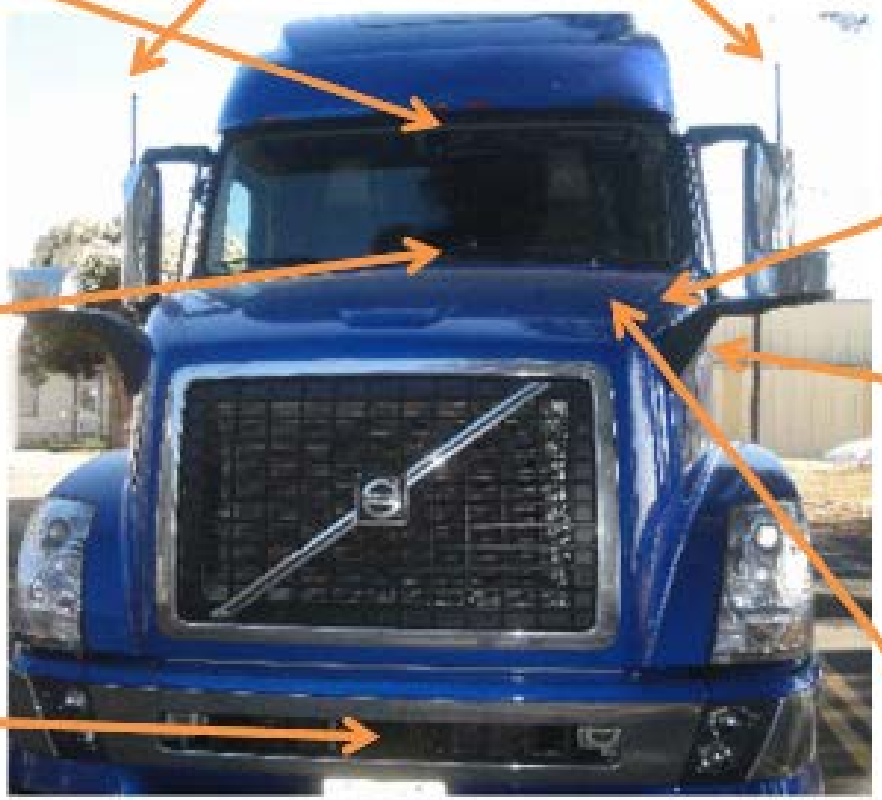
# Equipment on Each Truck

Video camera (production)

5 Hz GPS

ACC radar (Production)

Dual DSRC Antennas



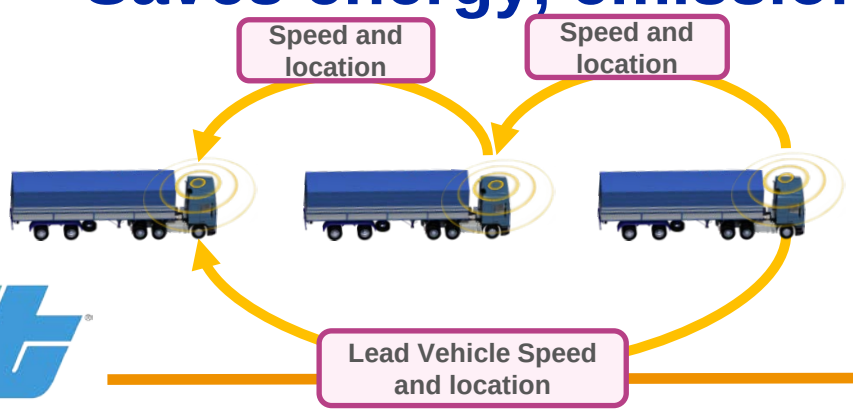

Supplementary display

PC-104 computer

Emergency disengage button by driver

# How Does it Work?

- **Starts with Volvo's adaptive cruise control (ACC) using radar/video sensing of forward vehicle**
- **Adds 5.9 GHz DSRC radio for V2V communication**
- **Enables faster response to speed changes, with more stable vehicle following**
  - **Driver-selectable time gaps of 1.5, 1.2, 0.9 or 0.6 s**
  - **Discourages cut-ins**
  - **Saves energy, emissions**

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# What are we doing?

- **Here: carefully-controlled testing of energy consumption under different conditions:**
  - **Baseline individual tractor-trailer rig**
  - **Tractor-trailers at 4 reduced CACC gaps**
  - **Variations in speed, loading, and aerodynamic trailer improvements**
- **In California: assessing 24 truck drivers' preferences among the 4 gap settings in public traffic:**
  - **Daytime and nighttime driving**
  - **Second and third truck positions**
- **Simulations: impacts based on market pen.**

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# What more needs to be done?

- **Definitive test results to show stakeholders realistic predictions of energy savings**
  - **Accounting for imperfections in real traffic (cut-ins)**
  - **Understanding how much drafting benefit is already gained from close manual following of trucks**
- **Efficient operational strategies for matching up with other trucks**
- **International standards on V2V messaging for CACC**
- **Change laws restricting close following**
- **Overcome perceptions of riskiness by general public**
- **Develop safety assurance methods for L4 or L5 automation without driver supervision**

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