Partial Automation for Truck Platooning

FHWA Exploratory Advanced Research Project

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Cooperative Adaptive Cruise Control (CACC) for Class-8 Trucks

- Start with commercially-available Volvo truck adaptive cruise control
- Add vehicle-vehicle (V2V) data communications to enhance performance
- Driver chooses following gap and controls steering
Project Goals/Objectives

• Research questions:
  – Performance achievable with truck CACC in mixed traffic?
  – Driver preferences for CACC time gaps?
  – Energy savings at preferred time gaps?
  – Benefits in truck lane capacity, energy and emissions?

• Public policy:
  – Deployment strategies for truck CACC
  – Synergy with I-710 truck lane development
  – Attractiveness to public and officials
Project Team

- FHWA - EARP
- Caltrans DRISI
- U.C. Berkeley PATH Program
- L.A. MTA (L.A. Metro)
- Gateway Cities COG
- Peloton Technology
- Volvo Technology Americas (VTA)
- Cambridge Systematics, Inc. (CSI)
Relevant PATH Experience

- Development and testing of truck automation systems on closed test sites since 1998
  - Wind-tunnel tests of drag reductions on scale model trucks at USC since 1995 – potential saving up to 25% by follower
- Two-truck platoon development and testing 2000-2003 for Caltrans (constant-spacing gaps 3 – 10 m)
  - Leader saved 10%, follower saved 12% fuel
- Three-truck platoon development and testing for FHWA, 2007-2011 (constant-spacing gaps 4 - 10 m)
  - Leader saved 4%, followers saved 10-14% fuel
  - At sea level and highway cruising speeds, could have saved 1.5X more
- CACC simulated, implemented and tested on cars and crossovers
System Description

- Cooperative ACC with constant time-gap vehicle following (not a close-coupled platoon)
  - For passenger cars, shortest gap was 0.6 s (58 ft gap at 65 mph)
- Based on production ACC system on Volvo trucks + Denso WSU DSRC radios
- DSRC provides enhanced and earlier information about motions of and commands issued to preceding trucks
- Three Class-8 tractors to be equipped and tested
Project Experimental Work Planned

- Develop truck CACC, starting from existing Volvo ACC (2014-15)
  - Tighter control of gaps
  - Option to choose shorter gaps
  - Driver interface based on simulator tests
- Test driver preferences for gap settings (2015)
  - Formal human factors experiment, with representative truck drivers
- Measure energy savings at preferred gaps (2016)
- Public demonstration in southern California (2016)