Preventing Accidents
Saving Fuel
Connecting Trucks
Peloton Technology: Our Company
Peloton Team

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Former US Sec. of Transportation

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Developer of first commercial GPS

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Managing Director Intel Capital

Company Background Technology Experience Benefits Partners
Background on Platooning
Platooning Explained

http://www.peloton-tech.com/platooningexplained
What is Platooning?

- **Two trucks** driving cooperatively at closer distances to save fuel

- Truck-to-truck wireless communication, radar-based collision mitigation systems, and cloud-based management are combined to allow for **safe following distances** closer than non-platooned trucks

- **Both drivers retain responsibility** for control and safe operation of their trucks at all times.

- **Both drivers steer** at all times. The **acceleration** and **braking** of the following truck is automatically matched to the lead truck via wireless link, maintaining a constant gap between trucks. The following driver is still able to brake independently at any time, dissolving the platoon.
Platooning trucks to improve efficiency has been extensively tested by government agencies and research institutions in the U.S. (PATH), Canada (PIT), Japan (ENERGY ITS), and across Europe (SARTRE, KONVOI).

Recent improvements in sensors, automated braking, and communications technology has made commercializing this concept cost-effective while maintaining safety.
Technology of Truck Platooning
Connecting Trucks

Real-time Cloud Supervision
- Platooning Only:
  - When Safe
  - Where Safe
  - Correctly Ordered
- Intelligent Pairing
- Dynamic Adjustment to Conditions

Active Braking
- Always On
- Cloud Hazard Alerts
- Cloud Optimizations

Platooning
- Active Braking Systems Linked
- Both Drivers Steer
- Both Trucks Save Fuel

Network Operations Center

V2V Wireless Link
Radar
Connected Braking

We improve safety using truck-to-truck Dedicated Short Range Communication (DSRC) to provide connected braking.

This technology ensures truck safety systems always have a reliable, fast, and secure channel of communication.
The Peloton Platoon

- DSRC provides closed-loop wireless control of the braking and acceleration (engine torque) of the following truck by the lead truck.
- Braking of **both** trucks can be triggered by the lead driver or the lead truck’s radar.
- Braking of the following truck can be triggered by the following driver or the following truck’s radar.
- An aerodynamic benefit accrues to **both trucks** from a decrease in drag on the lead truck and a decrease in wind resistance for the front truck.
Onboard Technology

- High-Accuracy GPS
- Cellular and WiFi Communication
- System Display and Live Video
- V2V DSRC Communication
- Driver-to-Driver Communication
- Forward-looking Camera
- Radar-Based Collision Mitigation System
- Automated Braking & Acceleration
Cybersecurity

Our philosophy:

1. We will always use the strongest available, well-audited, open source systems.

2. We will never trade high security for performance.

3. We will constantly assess the quality of our security, updating as-needed, when-needed, without delay.
The Platooning Experience
• Under ordinary conditions, proper following distance must allow for a following driver to perceive and react to the lead vehicle. This is in addition to the brake response lag in each braking system.
Platooning & Following Distance

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- With radar-based collision mitigation systems, driver perception and reaction are not necessary before the following truck brakes, but the following truck radar must detect the lead truck slowing before it can start to engage the following truck’s brakes.
Platooning & Following Distance

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- A platooning system creates a near-instantaneous link, allowing a following truck’s brakes to engage even before the lead truck begins to slow. This allows for a safe platooning following distance to be smaller than under ordinary conditions.
Driver Awareness

Live video from other driver’s view

- Look Ahead view of road ahead for rear driver
- Blind Spot view for front driver
- Both drivers in communication to share critical information
Enhanced Awareness

The Network Operations Center (NOC) provides drivers with over-the-horizon alerts to dangerous conditions, preventive maintenance warnings, and other data to enhance the driver’s awareness.
Enhanced Awareness

The NOC incorporates rich data from multiple sources to communicate crucial safety, maintenance, and efficiency information to drivers, highway operators, and fleet managers.

- **Internet Data**
  - Traffic (WAZE, Inrix)
  - Weather
  - Danger Zones

- **Vehicle Data**
  - Engine
  - Drivetrain
  - Braking

- **Platooning Sensors**
  - Radar
  - Video
  - GPS

- **With Drivers**
  - Link Finding
  - Safety Approvals
  - Platoon Ordering
  - Alerts/Warnings

- **With Hwy Operators**
  - Granular Weather
  - Hwy Condition
  - Accident Patterns
  - Congestion Monitoring

- **With Fleet Managers**
  - Analytics
  - Diagnostics
  - Predictive Maintenance
Fleet Behavior

Many Trucks Travel in Groups Today...

LTL (Less than TruckLoad) Fleets:
Trucks travel hub-hub in groups by nature of operations

Private fleets:
Trucks travel in groups on high density corridors

Truck Load fleets:
Growing trend toward relay style operations w/ trucks in groups

...and could adopt platooning
with few or no changes to dispatching
Platooning Benefits
Facts on the Ground

- US Freight Trucking: $650 Billion in Revenues
  - Accident Cost: $90+ Billion
  - Fuel Cost: $100+ Billion
    - 20%+ Operating Costs
  - Industry Net Profit: 3%

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*Platooning accelerates the payback period for collision mitigation and advanced safety technology*
Fuel Savings

- Independently verified fuel savings at ~65mph have been determined at a variety of distances.

- Platooning distance is always customized with safety as the top priority for each pair of trucks based on load, braking ability, environmental conditions, and other considerations.
# A New Approach to Data

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<th>More Data</th>
<th>More Complete</th>
<th>Constant Improvement</th>
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<td>Trucks &amp; Cars</td>
<td>Reduce data expenses</td>
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<td>Radar</td>
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<td>Microtraffic</td>
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<td>Frontal</td>
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Partners & Engagement
Government Engagement

Federal (USDOT: NHTSA, FMCSA)
- No federal limitations to platooning
- Two USDOT projects + more coming → encouraging progress

States (State DOTs)
- No numeric following distance limitation in majority of States: “reasonable and prudent” standard
- Working with growing number of States to hold trials via administrative approval or legislation

Funded Projects with:

- U.S. Department of Transportation
- Federal Highway Administration
- FMCSA
- NHTSA
- U.S. Department of Energy
USDOT/FHWA Projects

- Projects demonstrating truck platooning and helping establish best practices and pathways for deployment:
  - Auburn University, Peloton, Peterbilt, Meritor-WABCO, ATRI, Alabama DOT
  - Caltrans, PATH, Volvo, CamSys, Gateway Cities, K

- FHWA has involved NHTSA and FMCSA for input and dialogue

- Peloton heavily involved in Auburn project and assisting Caltrans project
Collaboration

- Industry Standards & Best Practices: ATA/TMC, SAE, etc.
- AASHTO and CVSA: dialogue, best practices, harmonization
- Collaboration on Demonstrations
  - UT (Nov’13), NV (May’14), MI (Sept’14), FL (private test) (Apr’15)
- Setting stage for Fleet Trials in 2016
  - Administrative approval: TX, NV, MI, AL, NM
  - Legislation passed or in process: UT (passed), CA, FL
  - High interest & discussions: MO, IA, AZ, WI, AR, TN, OK, others
System Validation

- Extensive track and on-road testing
- Independent fuel economy test by NACFE
- Demos with States of Nevada, Michigan
- Demos w/ Bendix & Meritor Wabco
- USDOT (FHWA, FMCSA, NHTSA) project
  - with Peterbilt, Auburn University, Meritor Wabco, American Trucking Association
- USDOT project with Caltrans, PATH, Volvo
System Validation

Michigan
Meritor-Wabco
Volvo
Freightliner

CA, NV, UT, AZ, NM, TX
Meritor-Wabco
Peterbilt

OH, FL
Bendix
Peterbilt
Kenworth
Thank You

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