Automated Vehicles and Advanced Driving Assistance Systems

February 5, 2020

ATRI American Transportation Research Institute

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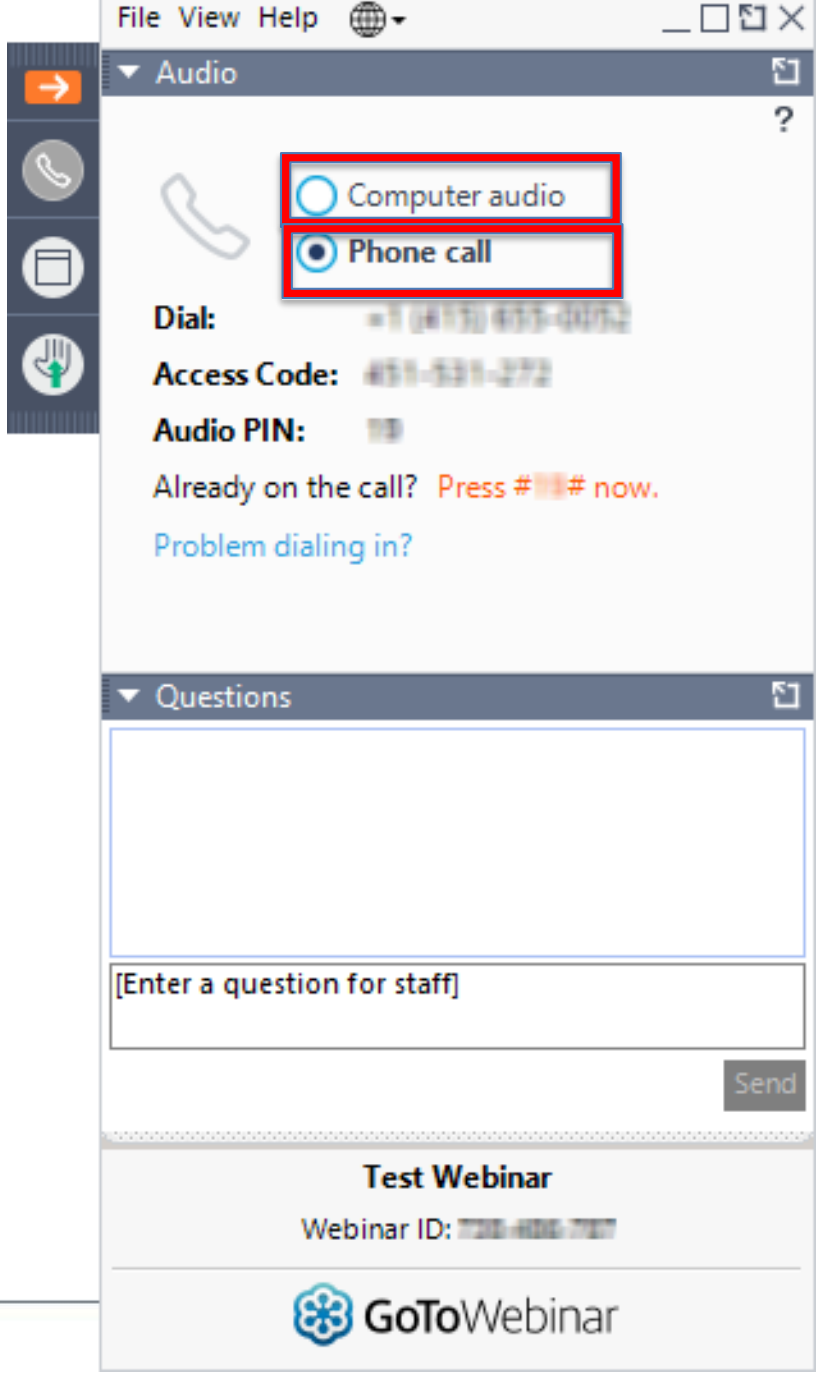
Audio Instructions

Select “Computer audio” to use your computer’s sound

OR

Select “Phone call” to dial in



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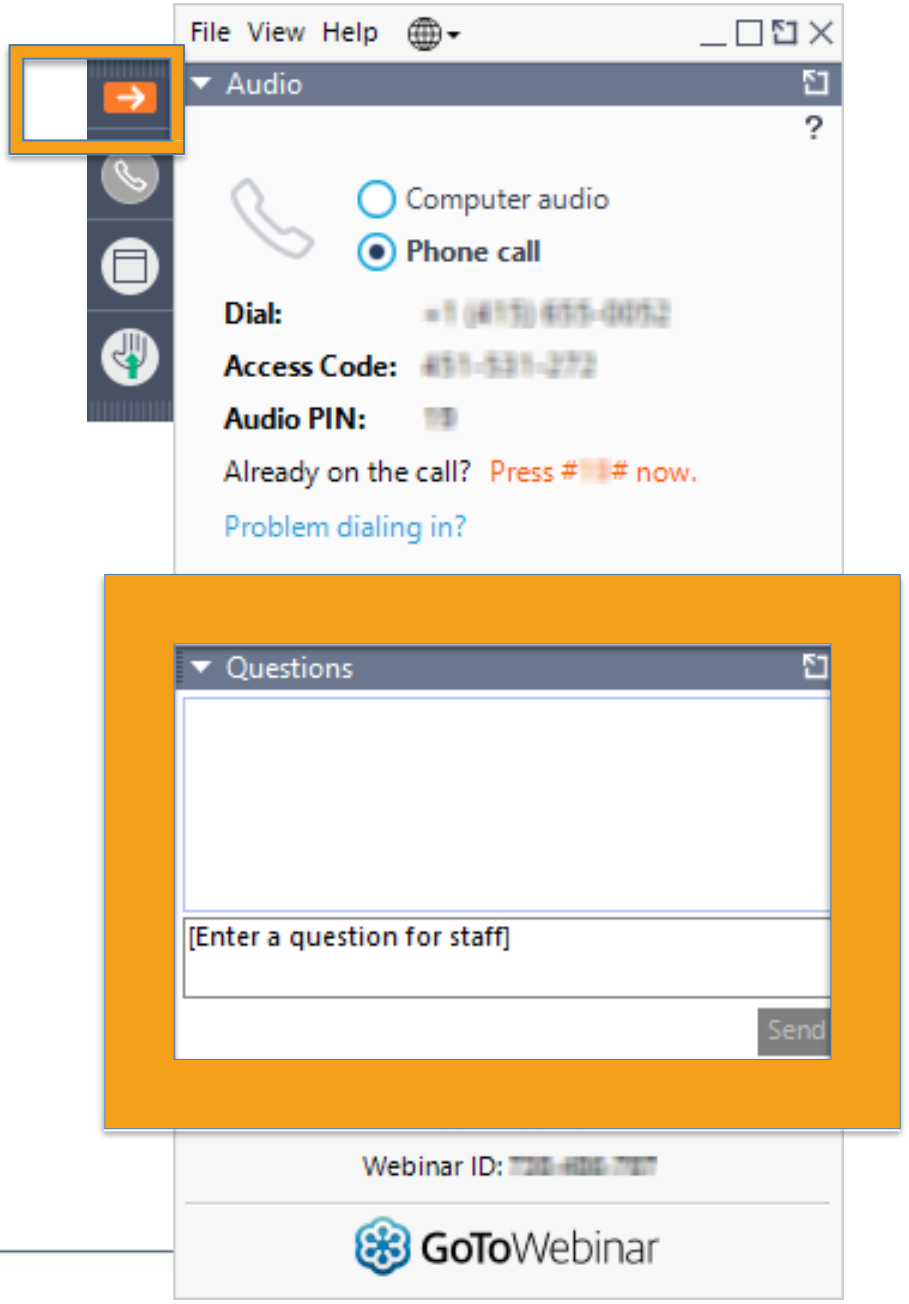
Asking questions

Click on “Questions” to expand the Questions pane

THEN

Type your question to the moderator



ROAD SAFETY AT WORK

Dan Murray
Senior Vice President

ATRI American Transportation Research Institute

ATRI's primary mission is to conduct transportation research, with an emphasis on the trucking industry's essential role in a safe, efficient and viable transportation system.

Assessing Autonomous Vehicles & Related Issues

Dan Murray

Vice President

American Transportation Research Institute

ATRI

Trucking industry's NFP research organization

- Safety
- Mobility
- Economic Analysis
- Technology
- Environment

www.TruckingResearch.org

ATRI American Transportation Research Institute

Board of Directors

Research Advisory Committee

Technologies…

- RADAR
- LIDAR
- Video Optics
- D-GPS / Digitized Mapping

- ????


TROOPER

AV/AT Definitions

At SAE **Level 0**, the human driver does everything;
At SAE **Level 1**, an automated system on the vehicle can sometimes assist the human driver conduct some parts of the driving task;
At SAE **Level 2**, an automated system on the vehicle can actually conduct some parts of the driving task, while the human continues to monitor the driving environment and performs the rest of the driving task;
At SAE **Level 3**, an automated system can both actually conduct some parts of the driving task and monitor the driving environment in some instances, but the human driver must be ready to take back control when the automated system requests;
At SAE **Level 4**, an automated system can conduct the driving task and monitor the driving environment, and the human need not take back control, but the automated system can operate only in certain environments and under certain conditions; and
At SAE **Level 5**, the automated system can perform all driving tasks, under all conditions that a human driver could perform them.

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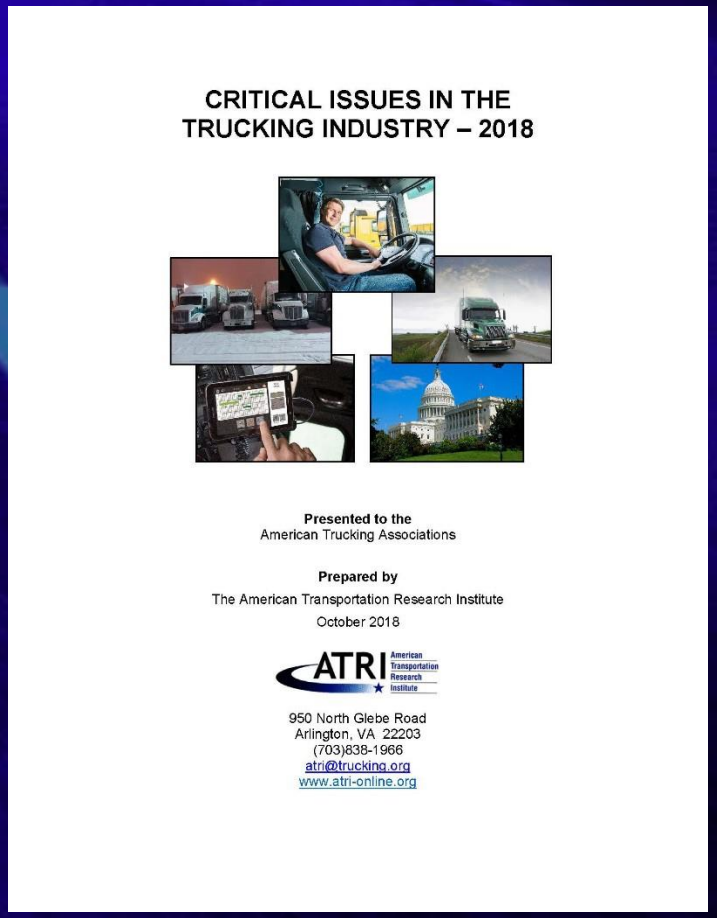
Driver-Determined Levels?

2018 Top Industry Issues

1. Driver Shortage (1)
2. Hours-of-Service (3)
3. Driver Retention (5)
4. ELD Mandate (2)
5. Truck Parking (4)
6. CSA (6)
7. Driver Distraction (8)
8. Transportation Infrastructure /Congestion/ Funding (9)
9. Driver Health and Wellness (10)
10. Economy (11)



CRITICAL ISSUES IN THE TRUCKING INDUSTRY – 2018

Presented to the
American Trucking Associations

Prepared by
The American Transportation Research Institute
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ATRI American Transportation Research Institute

950 North Glebe Road
Arlington, VA 22203
(703)838-1966
atri@trucking.org
www.atri-online.org

Top Issues Drivers vs. Carriers

Commercial Drivers

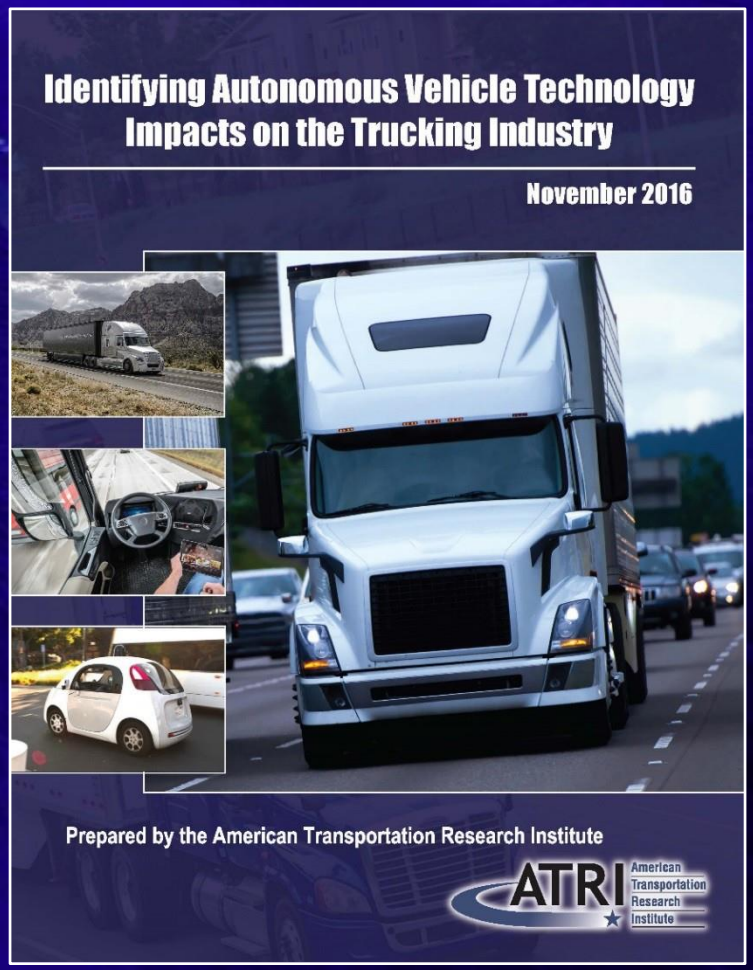
1. Hours-of-Service
2. Truck Parking
3. ELD Mandate
4. Driver Distraction
5. Driver Retention
6. CSA
7. Driver Health/Wellness
8. Transportation Infrastructure /Congestion/ Funding
9. Driver Shortage
10. Automated Truck Technology

Motor Carrier Execs

1. Driver Shortage
2. Driver Retention
3. Hours-of-Service
4. Transportation Infrastructure /Congestion/ Funding
5. ELD Mandate
6. CSA
7. Driver Distraction
8. Tort Reform
9. Truck Parking
10. Federal Preemption of State Regulation of Interstate Trucking (F4A)

Autonomous Vehicle Technology Impacts

- RAC-identified top research priority for 2016
- Maps AV impacts to trucking industry's top concerns
  - HOS
  - CSA
  - Driver H/W
  - Congestion



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Top Issues	Key Autonomous Truck Benefit
Hours-of-Service	Allows for driver rest and productivity to occur simultaneously.
Compliance, Safety, Accountability	Will decrease raw SMS scores, though percentile scoring needs to change.
Driver Shortage	Driving more attractive with higher productivity, less time away from home, and additional logistics tasks; fewer drivers may be needed.
Driver Retention	Companies with autonomous technology may attract and retain drivers.
Truck Parking	If "productive rest" is taken in the cab during operations, less time will be required away from home at truck parking facilities and fewer facilities will be needed.
Electronic Logging Device Mandate	Modifications will be necessary depending on level of autonomy.
Driver Health and Wellness	Driver could be less sedentary; injuries could be reduced.
The Economy	Carriers that use AT may see productivity and cost benefits.
Infrastructure / Congestion / Funding	Urban congestion could be mitigated through widespread use of autonomous vehicles (including cars).
Driver Distraction	Drivers will not be distracted from driving if vehicle in autonomous mode.

Most Issues Not Technology-Related

- Where is Federal Oversight?
- Tort issues will destroy the best of ideas
  - Negligence vs liability
  - Drivers/carriers to OEMs/suppliers
- Insurance is king
- Public perceptions…
- Good Infrastructure!

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Most Issues Not Technology-Related

- ROIs and BCAs are completely unknown
  - Smaller folks delay AV adoption

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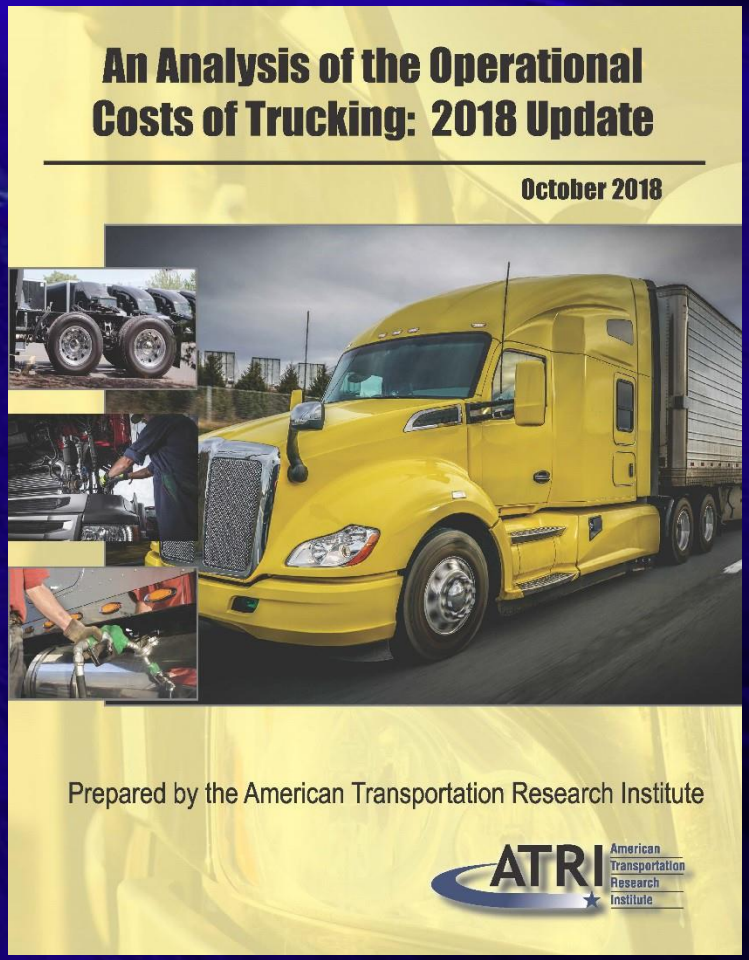
Operational Costs of Trucking

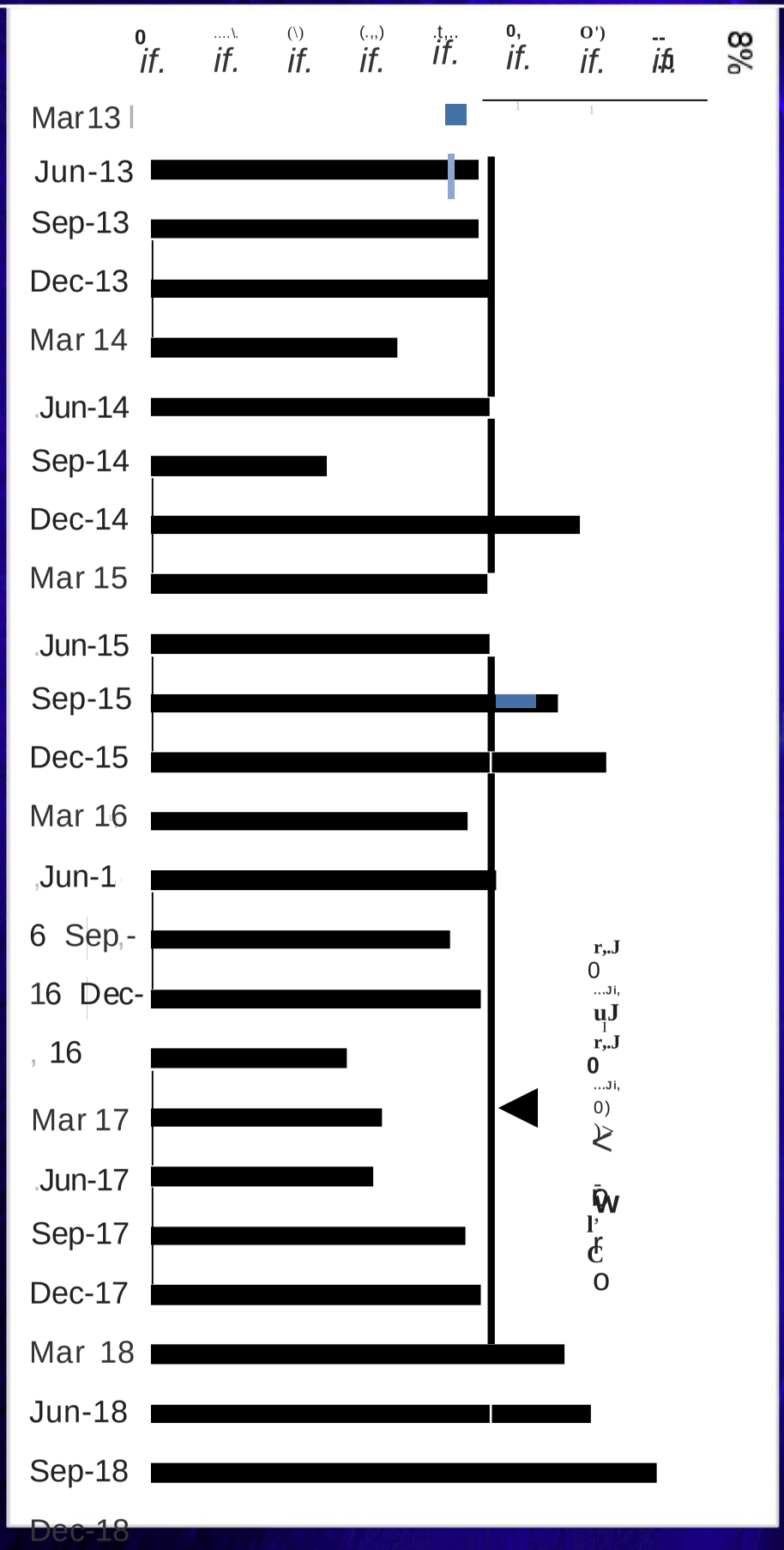
- Collects and analyzes real-world motor carrier operational data
- Covers data from 2008-2017
- Calculates costs by mile and by hour
- Sector, regional analyses included



Operational Costs of Trucking

Average Carrier Costs per Mile

Motor Carrier Costs	2013	2014	2015	2016	2017
Vehicle-based					
Fuel Costs	$0.645	$0.583	$0.403	$0.336	$0.368
Truck/Trailer Lease or Purchase Payments	$0.163	$0.215	$0.230	$0.255	$0.264
Repair & Maintenance	$0.148	$0.158	$0.156	$0.166	$0.167
Truck Insurance Premiums	$0.064	$0.071	$0.074	$0.075	$0.075
Permits and Licenses	$0.026	$0.019	$0.019	$0.022	$0.023
Tires	$0.041	$0.044	$0.043	$0.035	$0.038
Tolls	$0.019	$0.023	$0.020	$0.024	$0.027
Driver-based					
Driver Wages	$0.440	$0.462	$0.499	$0.523	$0.557
Driver Benefits	$0.129	$0.129	$0.131	$0.155	$0.172
TOTAL	**$1.676**	**$1.703**	**$1.575**	**$1.592**	**$1.691**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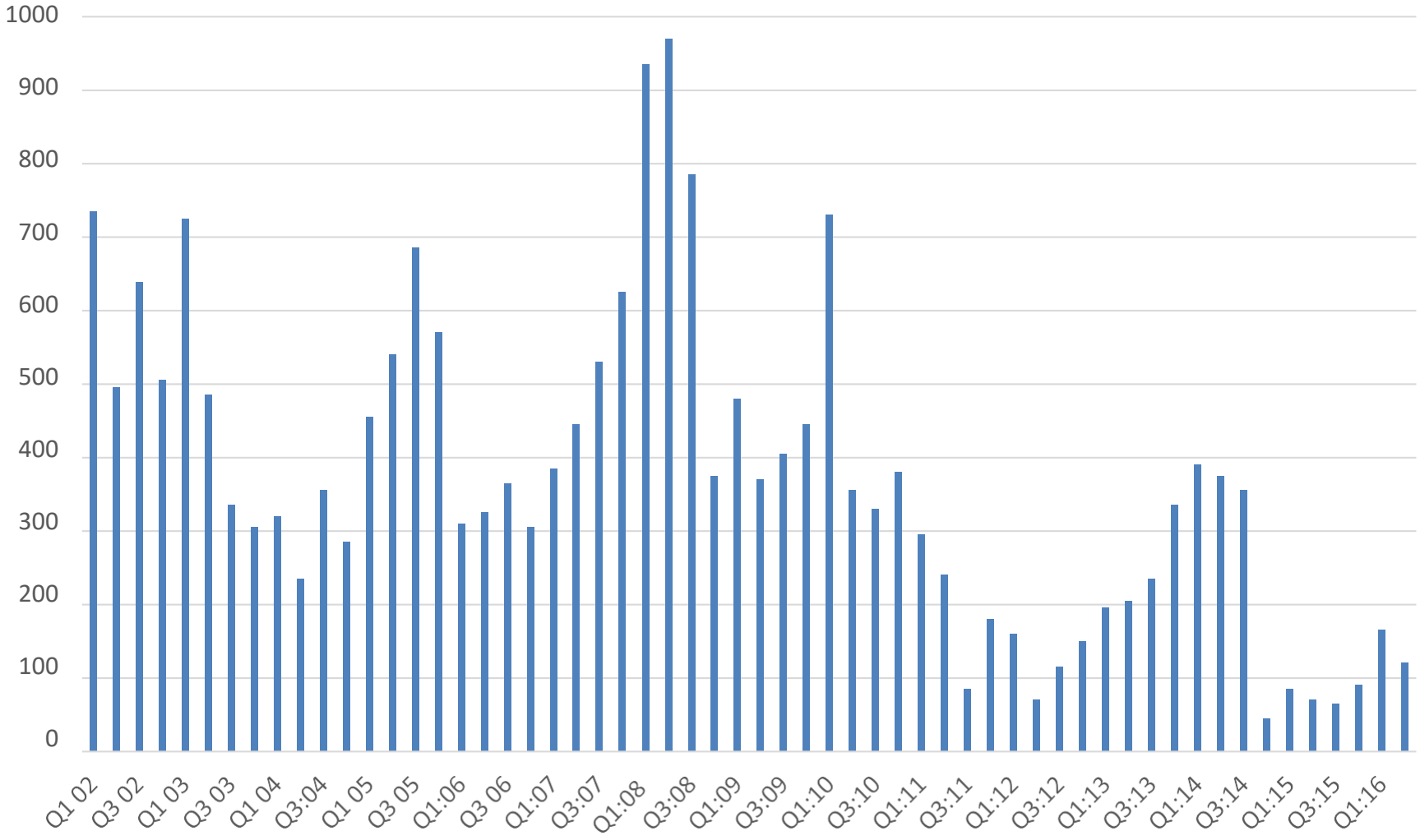
Trucking Failures Per Quarter



Source: Avondale Partners

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Common Issues That Need to Be Addressed…

- Should a human operator be physically present in the driver's seat and ready to take over if need be?
- Should special training and certifications for AV operators be required?
- Should states identify AV corridors?
- How to address liability issues?
- Should local governments be able to ban AVs on public roads?

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Federal Tax Payers: 140 Million

U.S. Vehicles Registered: 263 Million

ADAS = Tech-Celerate Now

- New FMCSA initiative to speed and expand adoption of promising active safety technologies
- Program includes technology benefit calculators
- New printed and video outreach materials
- Comprehensive adoption trend analysis

ADAS — Braking

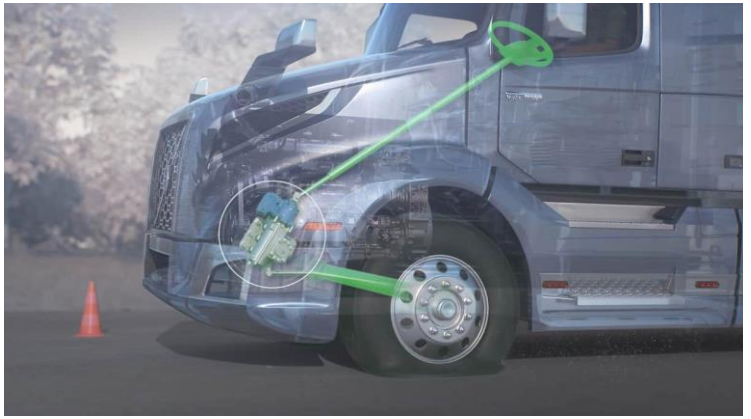
- This performance category includes air disc brakes (ADB), automatic emergency braking (AEB), and adaptive cruise control (ACC) systems. AEB systems detect when a truck is in danger of striking the vehicle in front of it and braking automatically if needed. ADB are foundation brake systems that use calipers to squeeze pairs of pads against a disc or rotor (instead of using shoes to apply pressure against a drum in traditional drum brakes) to create friction needed to stop the vehicle. Other ADB benefits include greater apply/release timing. ACC assists with acceleration and/or braking to maintain a prescribed distance between it and the vehicle in front. Some systems can come to a stop and continue.

Automatic Emergency Braking

Air Disc Brakes

ADAS — Steering

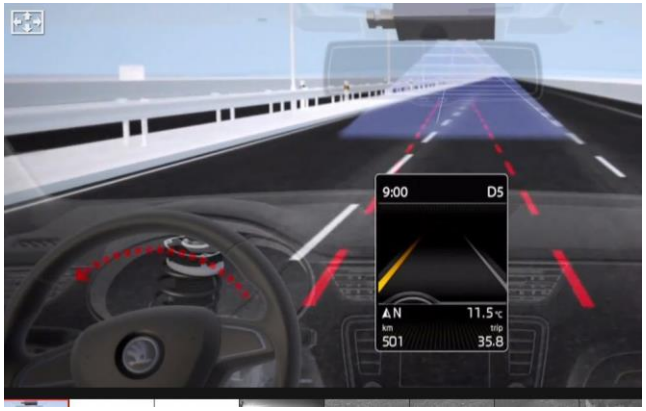
- This performance category includes lane keep assist, lane centering, and adaptive steering control, all of which help drivers maintain proper vehicle control and traffic spacing.



Adaptive Steering

ADAS — Warning

- This performance category includes lane departure, forward collision, and blind spot detection. These systems detect when the vehicle unintentionally moves or drifts out of its lane and warns the driver accordingly, and provide additional information to detect objects encroaching in the space surrounding the vehicle.



Lane Departure Warning Systems

ADAS — Monitoring

- This performance category includes in-cab facing driver training, forward-facing event recording and 360° direct vision. These systems use in-vehicle video cameras and other sensors to monitor the driver's behavior and performance, enhance 360° field-of-view, and help employers provide driver feedback and improve driver performance.

Video-Based Onboard Safety Monitoring Systems

Questions and Discussion

Contact us with your questions

Dan Murray (American Transportation Research Institute):

dmurray@trucking.org

Rick Walters (Road Safety at Work):

rwalters@roadsafetyatwork.ca

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Visit our websites for more tools and resources

roadsafetyatwork.ca

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Thank You!

See next slide for a list of links to resources mentioned in this webinar

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Links to various resources mentioned in this webinar

- Driver Assist Technologies Explained
- Critical Issues in the Trucking Industry
- Redefining the Role of Government Activities in Automated Trucking
- Identifying Autonomous Vehicle Technology Impacts on the Trucking Industry
- An Analysis of the Operational Costs of Trucking: 2019 Update

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