

# The Future of Transit and Autonomous Vehicle Technology

APTA Emerging Leaders Program

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# APTA Emerging Leaders Program – Team 3

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# Automation Levels

Level		Features	Market
0	No Automation	No autonomy	Most cars
1	Driver Assistance	Night vision Blind spot detection Surround view parking	Around 20,000 cars
2	Partial Automation	Steering Acceleration Braking in highway conditions Avoiding collision impacts	Luxury cars
3	Conditional Automation	Cameras Radar Lidar	Possibly in 5 years
4	High Automation	Artificial intelligence is capable of handling most functions, but may require human assistance	Possibly in 5 years
5	Full Automation	Artificial intelligence is capable of handling all driving functions	10 or more years

# Why Autonomous Vehicles?

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- Automobiles are parked 95% of the time<sup>1</sup>
- Eliminate most critical cause of crashes<sup>2</sup>
- 94% of crashes are due to driver<sup>2</sup>  
*2% vehicle equipment, 2% environment, 2% unknown*
- 1.25 million vehicle related deaths annually<sup>3</sup>
- 1,175,000 deaths potentially prevented

Source:

1. "Want to Know Why Uber and Automation Really Matter? Here's Your Answer." *Fortune*, [fortune.com/2016/03/13/cars-parked-95-percent-of-time/](http://fortune.com/2016/03/13/cars-parked-95-percent-of-time/).
2. "Critical Reasons for Crashes Investigated in the National Motor Vehicle Crash Causation Survey." *Traffic Safety Facts*, USDOT, Feb. 2015, [crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812115](http://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812115).
3. "Global Status Report on Road Safety 2015." World Health Organization, World Health Organization, 2015, [www.who.int/violence\\_injury\\_prevention/road\\_safety\\_status/2015/en/](http://www.who.int/violence_injury_prevention/road_safety_status/2015/en/).

# Impact of Autonomous Vehicles

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## Crash Fatalities in the USA

	Fatal Crashes	Fatalities
2016	34,439	37,461
2015	32,539	35,485
2014	30,056	32,744

## Economic and Comprehensive Costs (in Billions) to Society by Type of Crash - 2010

Crash type	Economic Cost	Comprehensive Cost
All	\$242	\$836
Alcohol-Impaired	\$44	\$201
Speeding	\$52	\$203

Source: "Automated Vehicles for Safety." *Automated Vehicles for Safety*, National Highway Traffic Safety Administration, 12 Sept. 2017, [www.nhtsa.gov/](http://www.nhtsa.gov/).





# 3 Case Studies

## SMART City: Columbus, OH

\$40M grant from USDOT SMART city challenge June 2016

Connected Vehicles: traffic light preemption, transit priority, pedestrian detection

## 7 Keolis: Shuttle in Las Vegas, NV

Fully autonomous pilot program

Operates 7 hours/day, carries 8 passengers, 250 boardings/day





# Safety and Security

- Fare enforcement
- Perception of personal security
- Collisions/Vehicle Safety
- Passenger Injuries/Emergencies
- Vehicle Breakdowns
- Hacking/Terrorism



# Infrastructure

## America's Roads - Grade D (ASCE)

### ■ Costs

- *Sensors and cameras - \$50k per mile*
- *Resurfacing and pavement markings - \$1M per mile*

### ■ Benefits

- *Transit ↔ Roadway ↔ Other*



# Accessibility

- 18.7% of Americans have a disability<sup>1</sup>
- Vehicle/Device interaction
- Door-to-door path
- Paratransit dependence to independence

Source:

1. United States, Congress, Economics and Statistics Administration, and Matthew Brault. "Americans With Disabilities: 2010 ." *Americans With Disabilities: 2010* , 2012.



# Vehicle Functionality

- Retrofitting and brand new vehicles
- Smaller vehicles
- Increased efficiency and sustainability

*Forward/backward movements*

- Vehicle miles travelled will increase
- Technology on board

*Location and live updates*



# Did you know...

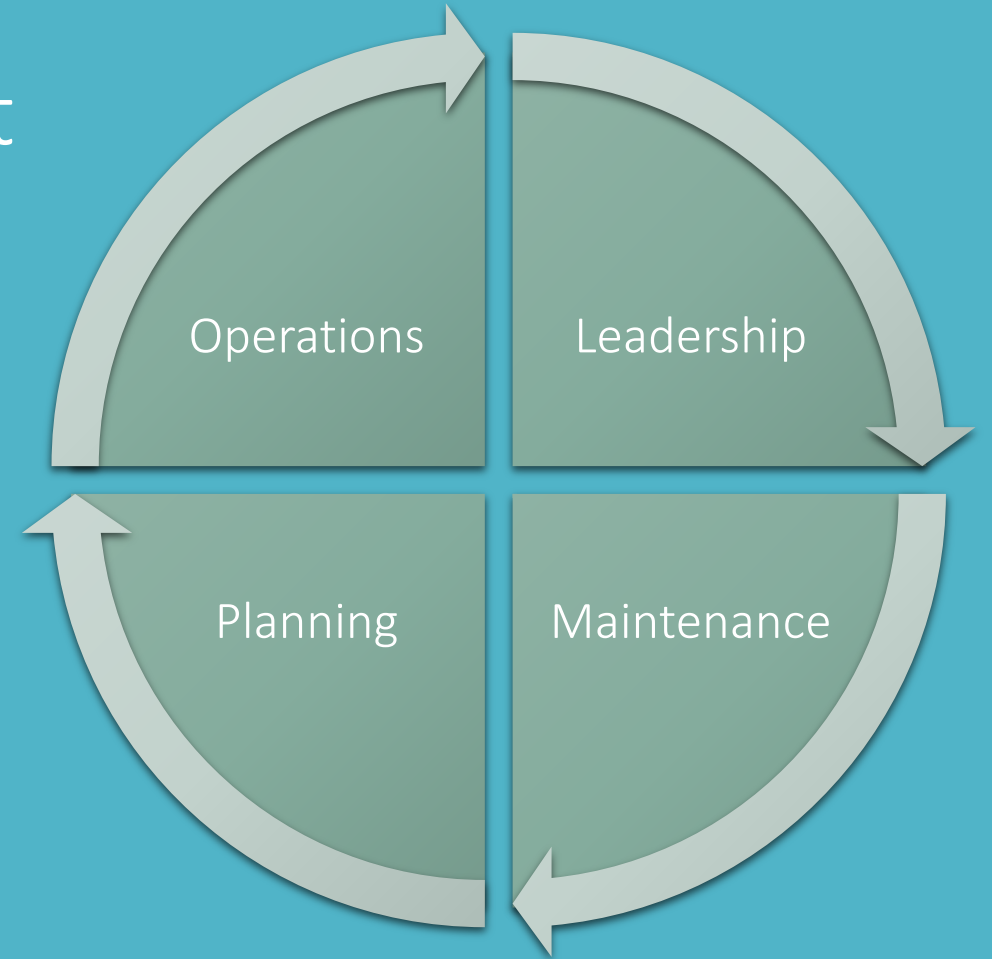
“In 2015, 15.5 million U.S. workers were employed in occupations that could be affected (to varying degrees) by the introduction of automated vehicles. This represents about **one in nine workers.**”



# Workforce Impacts

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- Elevator operator vs. ticket agent
- *New technical skills and retraining*  
*Mechanical, operations, technology, dispatch, road supervisors, bus operators etc.*
- *Labor unions*
- *Partnering opportunities*



# Next Steps

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- Legislation/Policy
  - 22 states have passed legislation, 9 Governors issued executive orders*
- Scalable Implementation
- Controlled guideways
  - Airport Shuttles*
  - Campus Shuttles*
- Utilizing existing infrastructure



# Autonomous Technology and Your Agency

1. What is the vision for AV and transit mobility in your city?
2. Have you begun conversations with policy makers?
3. Have you talked to your labor union?