2015 FLORIDA AUTOMATED VEHICLES
Creating the Framework for Implementation

Florida’s Automated Vehicle Initiative
AGENDA

• Florida’s Interest in Automated Vehicles
• Overview of Autonomous Vehicles and Connected Vehicles
• Florida’s Automated Vehicle Initiative
Automated Vehicles?
Moore’s Law

is the observation that, over the history of computing hardware, the number of transistors on integrated circuits doubles approximately every two years.
Technology Adoption Rate

100% - Universal Adoption

0% 25% 50% 75%
Evolution of the Automobile
Evolution of the Automobile
NHTSA’s Impact on Safety

1933
vehicle design standards

1966
seatbelts

1989
supplemental restraint system

2008
V2V (2017) ?
electronic stability control

1909

1958

1973

cruise control

1998
dofi airbags

2015
Why Automated Vehicles?

32,000 people killed in the US annually in traffic-related accidents

2,400 people killed in Florida
Distracted Driving

A person texting while driving is 6 times more likely to cause an accident than a drunk driver.

Driving has become the distraction.
Potential of Automated Vehicles

- Vastly Improve Safety
- Greatly Reduce Congestion

No other set of technologies have been able to offer double-percentage improvements in congestion and/or improvements in safety.
FDOT’s Vision

SERVING THE PEOPLE OF FLORIDA BY DELIVERING A TRANSPORTATION SYSTEM THAT IS FATALITY AND CONGESTION FREE.
Legislation for Testing Automated Vehicles
Florida is a Prime Location for Testing

Top Rate Infrastructure
Florida is a Prime Location for Testing

Extensive ITS systems deployed statewide
Florida is a Prime Location for Testing

Political and Government Support
FDOT’s Role in Planning for Automated Vehicles

Policies (new or amend)

Infrastructure
- Roadway improvements
- Roadside devices
- Design standards
- Engineering standards
- Infrastructure investment
- Location for transit, freight, ports
FDOT’s Role in Planning for Automated Vehicles

Policies (new or amend)

Infrastructure
• Roadway improvements
• Roadside devices
• Design standards
• Engineering standards
• Infrastructure investment
• Application for transit, freight, ports
FDOT’s Role in Planning for Automated Vehicles

Policies (new or amend)

Infrastructure
  • Roadway improvements
  • Roadside devices
  • Design standards
  • Engineering standards
  • Infrastructure investment

Application for transit, freight, ports
Automated Vehicles

**CONNECTED VEHICLES**

Technology
- Direct short range communications (DSRC) (5.9 GHz designated to transportation by FCC)
- Cellular network (safety critical data excluded)
- Satellite communications (limited applications)

Data gathering/information exchange
- Vehicle-to-infrastructure (V2I)
- Vehicle-to-vehicle (V2V)

Safety critical functions of the vehicle (steering/throttle) **not affected** (operator is in control at all times)

**AUTONOMOUS VEHICLES**

Technology
- Sensors: Lidar, Radar, Cameras, GPS
- Advanced computing and algorithms

Various levels of automation (defined by NHTSA and SAE)

Connected Vehicle technology is **not required**

Safety critical functions of the vehicle (steering/throttle) **are affected** without direct driver input
Technology

- Direct short range communications (DSRC) (5.9 GHz designated to transportation by FCC)
- Cellular network (safety critical data excluded)
- Satellite communications (limited applications)

Data gathering/information exchange

- Vehicle-to-infrastructure (V2I)
- Vehicle-to-vehicle (V2V)

Safety critical functions of the vehicle (steering/throttle) not affected (operator is in control at all times)
Telecommunication providers and automobile manufacturers have begun to offer vehicles that serve as mobile 'hot spots'.

These convenience features are for entertainment and informative purposes (non-safety critical functions).

Connected Vehicles as referenced by the transportation community (USDOT, state DOTs, etc.) include the transmission of safety critical data and information exchanged from vehicle to publicly owned infrastructure and/or between vehicles.
**Connected Vehicles**

**ARE**
- Vehicle to Vehicle (V2V)
- Vehicle to Infrastructure (V2I)
- Data on vehicle speed, velocity, heading, path intent (turn signal)
- Information provided by a Traffic Management Center
- Data that supports transportation planning and operations (safety, mobility, environment)

**NOT**
- OnStar (or similar services)
- ‘Wi-Fi’ enabled vehicle for consumer convenience
- Pandora/Waze/other apps ‘embedded’ in vehicle infotainment systems
- Vehicle with a cell phone plan
Connected Vehicles

However...

Cellular network *may* be utilized for some non-safety critical data exchange (state DOT and/or TMC provided traveler information)

7 minute video produced by USDOT “PowerPoint cannot insert a video from this embed code.”

https://www.youtube.com/watch?v=YxmLkqVrg4c&feature=player_embedded
Autonomous Vehicles

Technology
- Sensors: Lidar, Radar, Cameras, GPS
- Advanced computing and algorithms

Various levels of automation
(defined by NHTSA and SAE)

Connected Vehicle technology is *not required*

Safety critical functions of the vehicle (steering/throttle) *are affected* without direct driver input
Levels of Automation (abridged from NHTSA)

0. NO AUTOMATION
Forward collision warning, lane departure warning, blind spot monitoring.

1. FUNCTION SPECIFIC AUTOMATION
Temporarily cede control of either forward (speed) or lateral (side-to-side) movements, but not at the same time. Dynamic brake support, electronic stability control, adaptive cruise control.

2. COMBINED FUNCTION AUTOMATION
At least two primary control functions designed to work in unison. Adaptive cruise control in combination with lane centering.

3. LIMITED SELF-DRIVING AUTOMATION
Enable the driver to cede full control of all safety-critical functions. Designed so that the driver is not expected to constantly monitor the roadway while driving.

4. FULL SELF-DRIVING AUTOMATION
Designed to perform all safety-critical driving functions and monitor roadway conditions for an entire trip.
GM Announced ‘Super Cruise’ at ITS World Congress (9/8/2014)

- Semi-automated driving technology
  (1st available on 2016 Cadillac CTS)

- Hands free, feet free (not mind free) driving
- Highway cruising speeds
- Stop-and-go congestion

"Through technology and innovation, we will make driving safer."
—Mary Barra, GM CEO
Active FDOT Initiatives

- Traffic Operations (ITS) Office Implemented the Connected Vehicle Test Bed on State Roadway in Orlando, FL (40 Roadside Units)
- Florida Automated Vehicles Summits
  - 2013 – Tampa
  - 2014 – Orlando
  - 2015 – TBD
- Stakeholder Working Groups
- University Research Partnerships
- Public Outreach & Education
- Pilot Projects
2nd Annual Florida Automated Vehicles Summit
December 15, 2014
WDW’s Coronado Springs Resort

- Over 350 attendees from 8 countries and 22 states
- Over 8 hours of plenary session speakers
- Keynote Address from Senator Brandes (R-FL, District 22)
- David Strickland (former Administrator, NHTSA)
- Dr. Larry Burns (retired VP of GM R&D)
- AV Stakeholder Working Group Progress
- Freight/Transit/Maritime/Aerial Applications of AV/CV
2nd Annual
Florida Automated Vehicles Summit
December 16, 2014
WDW Speedway

• Over 25 demonstrations of both autonomous and connected vehicles
  • Automobiles
  • Off-road vehicles
• Surface water vehicles (boats)
• Aerial vehicles (static)
• Alternative fuel vehicles
• ADAS-equipped vehicles
Stakeholder Working Groups

- Identify potential challenges and opportunities
- Recommend ways to leverage opportunities and mitigate challenges
- Provide recommendations to FDOT (and other state agencies as identified) regarding AV/CV technology in policies, standards, and infrastructure investments
Universities in Florida have been conducting research on AV/CV technologies for >10 years.

**Research Topics**

- Environmental impacts (sustainability)
- Policy implications (planning)
- Behavioral relationship between operator and vehicle (psychology)

- Autonomous technology (engineering)
- Effects of AV/CV technology on roads (transportation modeling)
Public Outreach & Education

www.automatedFL.com

- Resources
  - News articles
  - Legislation
  - Blogs
  - Reports/presentations/videos
- Events Calendar
  - FDOT National Public Forum
Pilot Projects Overview

Currently, legislation is not needed to allow for the FDOT-sponsored pilot projects that are underway.

- Data will provide justification for necessary changes in policy and/or engineering & design standards.

Initial test beds:
- Managed lanes (commuter vehicles & transit)
- ‘Last mile’ solutions near ports/downtowns (freight/transit)
- Closed course (level 4 automation)
Pilot Project Goals

• Leverage existing infrastructure to maximize benefits
• Develop rich dataset that demonstrates quantitative safety and efficiency gains
• Performance measures
• Comparative analysis before/after AV/CV technologies are deployed

“If you can not measure it, you can not improve it.”
— Lord Kelvin
50 vehicles with MobilEye + GeoTab installed

50 vehicles with only GeoTab (telematics device) serves for comparison of study vehicles

Participating Agencies

• FDOT District 7
• Hillsborough Area Regional Transit
• Tampa Bay Area Regional Transit Agency
• Pinellas County Transit Agency
• Pasco County Public Transportation
Advanced Driver Assistance Systems

Driver alert warnings:
forward collision, cross traffic,
lane departure, bike/ped
detection, speed limit detection

Classifies as Level 0
automation by NHTSA

Technology/sensors serve
as building blocks for higher
levels of autonomy

Readily available as features by
automobile manufacturers and
as aftermarket devices

[Logos: Geotab, Mobileye]
Automating Florida’s Freight

Assessing Automated Vehicle Technology for Miami’s Perishable Freight Industry

Perishable freight industry identified as potential early adopter

- Floral industry is #1 perishable import through Miami International Airport
- Multi-billion dollar industry
- 2/3 of all flowers consumed in U.S. imported through MIA
- Any increase in efficiency results in increased commerce through Florida
Automating Florida’s Freight

Assessing Automated Vehicle Technology for Miami’s Perishable Freight Industry

Preliminary efforts are underway
• Coordinated with public partners
• Engaging private stakeholders
• Identify and measure repetitive transport routes
• Understand existing transportation operations
3 Phase Approach (12-18 months per phase)

1) Measure existing operations

2) Deploy CV technology & prioritize

3) Install AV technology & automate

Automating Florida’s Freight
Assessing Automated Vehicle Technology for Miami’s Perishable Freight Industry
Questions?

FDOT Intermodal Systems Development oversees the automated vehicle initiative.

www.automatedFL.com

Email questions/comments to: automatedFL@dot.state.fl.us