



LYNX Autonomous Vehicle Initiative

State and Impacts of Transit Automation

Friday, October 26, 2018



IMAGINE



INNOVATE



CONNECT



ARRIVE

Central Florida Regional Transportation Authority

FORWARD

Levels of Automation

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE) AUTOMATION LEVELS

Full Automation



0

No Automation

Zero autonomy; the driver performs all driving tasks.

1

Driver Assistance

Vehicle is controlled by the driver, but some driving assist features may be included in the vehicle design.

2

Partial Automation

Vehicle has combined automated functions, like acceleration and steering, but the driver must remain engaged with the driving task and monitor the environment at all times.

3

Conditional Automation

Driver is a necessity, but is not required to monitor the environment. The driver must be ready to take control of the vehicle at all times with notice.

4

High Automation

The vehicle is capable of performing all driving functions under certain conditions. The driver may have the option to control the vehicle.

5

Full Automation

The vehicle is capable of performing all driving functions under all conditions. The driver may have the option to control the vehicle.



IMAGINE



INNOVATE



CONNECT



ARRIVE

Strategic Transit Automation Research

- Smooth Acceleration and Deceleration
- Emergency Braking and Pedestrian Avoidance
- Curb Avoidance
- Precision Docking
- Narrow Lane/Shoulder Operations
- Platooning

Transit Bus Advanced Driver Assistance System (ADAS) Levels 1 and 2

- Circulator Bus Service
- Feeder Bus Service

Automated Shuttle Level 4

- Precision Movement for Fueling, Service, Wash
- Automated Parking and Recall

Maintenance, Yard & Parking Level 4

- Automated First/Last Mile
- Automated ADA Paratransit
- On-Demand Shared Ride

Mobility-on-Demand Service Level 5

- Automated Bus Rapid Transit

Automated Bus Rapid Transit Level 4

Strategic Transit Automation Research

Integrated Demonstrations

- Transit operations and maintenance
- Fuel and emissions
- Service quality
- Safety
- Passenger experience, comfort
- Acceptance
- Accessibility
- Travel options and mode choice
- Fare collections
- Cost-effectiveness

FY 2018	FY 2019	FY 2020	FY 2021	FY2022
	Automated ADAS (L1, L2)			
	Automated Shuttles (L4)			
		Maintenance, Yard & Parking (L4)		
			Automated Paratransit (L5)	
			Automate First/Last Mile (L5)	
			On-demand Shared Ride (L5)	
			Automated Bus Rapid Transit (L4)	

Transit Automation

Level 0 None	Level 1 Driver Assist	Level 2 Partial	Level 3 Conditional	Level 4 High	Level 5 Full
-----------------	--------------------------	--------------------	------------------------	-----------------	-----------------



Automated vehicle technologies have significantly advanced

Level 3 automation technology is becoming available

We are beginning to understand the technology

We are preparing for the future



IMAGINE



INNOVATE



CONNECT



ARRIVE

Transit Automation – Adolescent Years

Level 0 None	Level 1 Driver Assist	Level 2 Partial	Level 3 Conditional	Level 4 High	Level 5 Full
-----------------	--------------------------	--------------------	------------------------	-----------------	-----------------



Automated vehicle technologies have significantly advanced, **but still have lessons to learn**

Level 3 automation technology is becoming available, **but is still in limited deployment**

We are beginning to understand the technology, **but still need to understand the implications**

We are preparing for the future, **but are not yet prepared**

We think we know more than we know, because we don't yet know what we don't know.

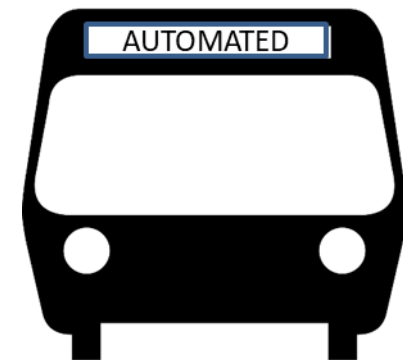


LYNX Automated Vehicle Initiative

LYNX and its partners at MetroPlan, the City of Orlando and the Florida Department of Transportation are interested in identifying and understanding the implications of autonomous vehicle technology and its application in the Orlando metropolitan area to support current and future transit service initiatives and investments.

Purpose is to outline

- Partnerships
- Policies
- Technical issues
- Financial implications
- Infrastructure requirements
- Workforce needs



LYNX Automated Vehicle Initiative

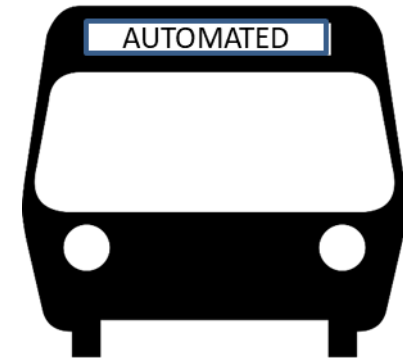
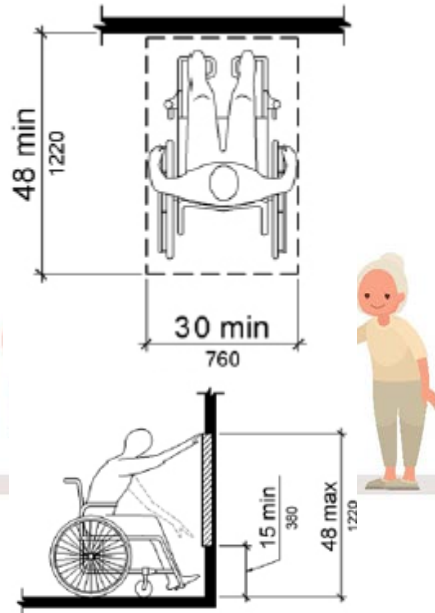


Transit Automation – Issues to Explore

Compliance

Americans with Disabilities Act (ADA): Federally funded transit services must provide assistance for ADA

- Visual impairment
- Mobility impairment
 - Firm stable surface at least 48” by 30”
 - Minimum height 15” and maximum height of 48” with maximum set back of 20 inches
- Senior Citizens
- Cognitive impairment



Transit Automation – Issues to Explore

Compliance

Title VI: Deployment of AV services must be equitable

- Who gets AV and who doesn't?
- Rotation of fleet



IMAGINE



INNOVATE



CONNECT





ARRIVE

Transit Automation – Issues to Explore

Facilities, Operations & Staffing

- Electric vehicle charging stations: Siting and location of charging stations are needed for LYNX span of service
 - Where do we charge and how often?
 - How much power does it take to charge a fleet of buses?
- Maintenance requirements: AV will require new facilities, equipment, hardware and software to support new propulsion
 - Where do we get these skill sets?
 - Are future mechanics being trained for AV technology?
- Staff Training: New technology and operating platform will necessitate training and wholesale system integration with conventional fleets/services
 - Is AV in our job descriptions?
 - Does Human Resources understand how to recruit for employees in an AV environment?

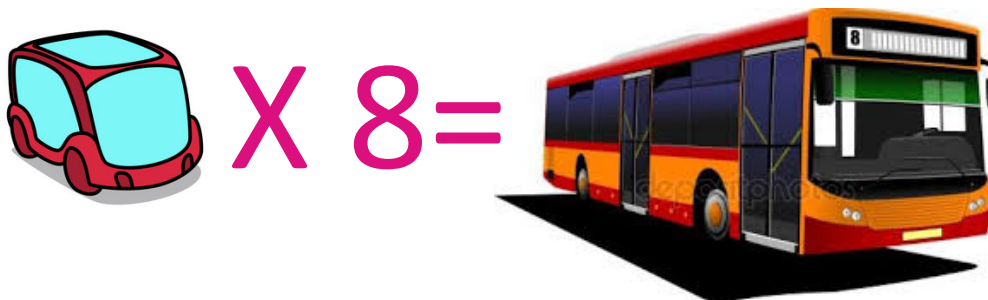


	
Job Classification Description	
Classification Title: Technician A – Engine Rebuild	Department: Operations
Job Status: Union	Division: Maintenance
FLSA: Non-exempt	Job Code: 909
EEO Code: 6	
Approved By: 	Joe Cheney, Deputy Chief of Operations - Maintenance
Approval Date: 7/23/18	
Reports To: Maintenance Supervisor	Supervises: None
Description of Work	
This position independently performs engine/transmission assembly swap outs, Engine in-frame repairs, cylinder head replacements, all sub-assembly replacements and is able to diagnose and tune engines/transmissions using proper diagnostic equipment	
Work Environment	
Our vision is to be recognized as a world-class leader for providing and coordinating a full array of mobility and community services. LYNX mission is to link our community by providing quality mobility options with innovation, integrity and teamwork.	
LYNX Ambassadors (our employees) are committed to the LYNX Service Philosophy: "We enhance people's lives everyday through passion, pride and performance."	
In order to achieve our organizational goals in support of our mission, LYNX Ambassadors are held accountable for service excellence by continuously practicing and demonstrating the following service standards:	
Safety – Safety is everyone's business and our first priority here at LYNX.	
Courtesy – We present ourselves in a professional manner and treat everyone with the utmost respect.	
Efficiency – We take pride in knowing our jobs and doing things right the first time.	
Cleanliness – We take pride in our personal appearance and work environment.	
Page 1 of 3	Technician A – Engine Rebuild

Strategic Transit Automation Research

Customer Experience

- Vehicle Capacity: Recent tests were completed in vehicles with capacity <12 passengers
- How many attendants equal one driver?
- Customer Information: Who answer's questions about where the bus goes, where to get off, or if return bus service will be available?
- How do customers use reduced fare?
- Who cleans the vehicle during the day?



Transit Automation – Adolescent Years



We think we know more than we know, because we don't yet know what we don't know.

What are the things we aren't yet thinking about?

Doug Jamison

Senior ITS Developer
Central Florida Regional Transportation Authority

Email: DJamison@golynx.com

Direct: (407) 254-6071
www.golynx.com

LYNXFORWARD.COM



IMAGINE



INNOVATE



CONNECT



ARRIVE