Transit Bus Automation Overview

What is an Automated Bus?

The Federal Transit Administration (FTA) is exploring the use of automation technologies in transit bus operations. These technologies enable systems in which at least one element of vehicle control (e.g. steering or speed control) occurs without direct driver input. This could enable driver assistance features like lane-keeping, precision docking and Automatic Emergency Braking. In the future, we may see more flexible and dynamic transit services through fully automated buses.

Benefits

Potential benefits of transit bus automation include:

- **Safety and Reduced Liability**: Automation may increase safety by reducing the severity and frequency of collisions, thereby reducing agencies' liability and other collision costs.

- **Operations and Maintenance**: Agencies may realize operations and maintenance savings from changes in workforce needs, decreased vehicle wear, and increased efficiencies (e.g. bus yard operations).

- **Environmental Impact**: Fuel savings from better routing and smoother acceleration and deceleration may reduce a vehicle's environmental impact.

- **Service Availability and Operational Efficiency**: New transit services, such as circulators or late-night service, or operations in low-density areas, may become cost effective, improving transit access.

- **Passenger Experience**: Automation may improve service reliability and delivery, enhancing rider experience.

- **Driver Stress and Workload**: Driver assistance systems may reduce driver stress and workload, resulting in safer systems and more satisfied drivers.

Mcity Navya Arma Shuttle

May Mobility Polaris GEM e6 Shuttle

Challenges

Potential challenges to transit bus automation may include:

- **Public Acceptance**: Whether the public accepts transit bus automation remains uncertain. Lack of significant public acceptance could delay the deployment of automated services across the transit industry.

- **Agency Acceptance**: Transit agencies may be reluctant to implement automation technology until they are certain it will meet the needs of all agency stakeholders (e.g. riders, workforce, etc.)

- **Labor Impacts**: Automation technology may impact agency workforces, which may result in shifting duties away from vehicle operation.

- **Capital Investment**: Without additional funding, agencies may not be able to purchase or retrofit facilities and equipment that support automation. Procurement requirements may present an additional challenge.

- **Research and Technology Availability**: Many products are underdeveloped or untested, or may not fully meet the needs of transit agencies. Further research and demonstration of products and technologies may be required.

- **Safety and Security**: Agencies may be reluctant to deploy automated systems until clear procedures for ensuring safety and security are developed.

Enabling Technologies for Bus Transit Automation

COMMUNICATIONS AND AGENCY INTERFACE
These technologies enable the vehicle to interface with agency systems and communicate with stakeholders, whether they are on or around the transit vehicle.

ACTUATION
These technologies enable vehicle control like acceleration, braking, and steering. In combination with sensing, these also enable lane keeping assistance and precision docking.

EXTERIOR SENSING
These technologies enable the vehicle to sense surroundings and other road users. These also enable automated emergency braking and other safety technologies.

INTERIOR SENSING
These technologies sense occupants and conditions inside the vehicle. They enable and assist agency response to emergency situations, vehicle actions such as smooth acceleration and deceleration, and other features.
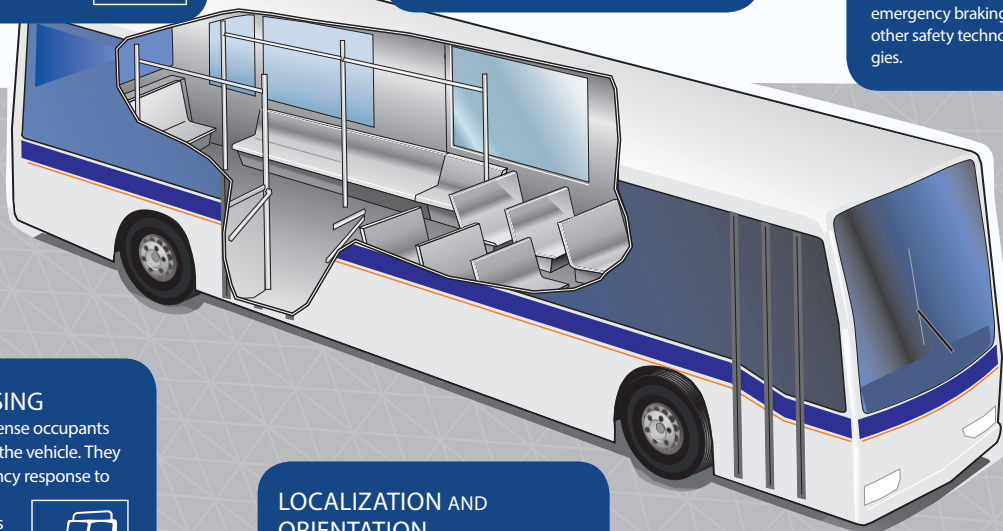
LOCALIZATION AND ORIENTATION
These technologies enable the vehicle to orient itself within the environment, including understanding routing and destination.

HUMAN INTERFACE AND FARE PAYMENT
These technologies will link people with the automated vehicle, whether through technology or other servicing.

FTA Strategic Transit Automation Research Plan

To facilitate automation in bus transit and mitigate the challenges, FTA has developed a Strategic Transit Automation Research Plan that identifies a research agenda and outlines a strategy leveraging the strengths of the public sector, private sector, and academia. The plan emphasizes the following interrelated work areas.

Enabling Research

to accelerate the entry of manufacturers, suppliers, and transit providers into automation by building common understanding of and solutions for foundational challenges.

Integrated Demonstrations

to grow industry and expand knowledge base by demonstrating market-ready technologies in real-world settings. These demonstrations also will develop, test, demonstrate, and evaluate new automation capabilities.

Strategic Partnerships

to improve quality of research by others and disseminate findings to the broad community, expanding participation of providers and suppliers.

Contact
For more information, visit https://www.transit.dot.gov/research-innovation/transit-automation-research
or contact FTA's Office of Research, Demonstration, and Innovation:
- Danyell Diggs, danyell.diggs@dot.gov
- Steve Mortensen, steven.mortensen@dot.gov