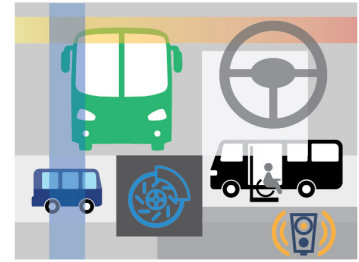




U.S. Department of Transportation
Federal Transit Administration



Transit Bus Automation Market Assessment

Background

To support the development and deployment of automated bus transit services, the Federal Transit Administration (FTA) has developed a five-year Strategic Transit Automation Research (STAR) Plan that outlines FTA's research agenda on automation technologies. The plan proposes research, development, and demonstration projects conducted by FTA and transit industry research and development teams consisting of diverse stakeholders. This report supports these activities by providing context on the state of the market for transit bus automation technologies.

Objectives

The emerging automated transit bus market has received enthusiastic media coverage, but stakeholders may not clearly understand the difference between conceptual ideas, prototype systems, and available products. This market assessment is intended to help appropriately manage expectations and to communicate a realistic depiction of the current state of the industry with respect to the availability, capabilities, and limitations of automated transit bus technologies. It aims to inform FTA staff, transit agency stakeholders, and others interested in understanding the market. This market assessment considers automation at all levels and a broad definition of transit buses, including a range of passenger capacities and both traditional and novel vehicle designs. This report references company and product names, but they are included only for illustrative purposes and do not represent an endorsement.

Findings and Conclusions

Numerous findings were indicated from the research in the areas of market environment, technical challenges, research and outreach needs, and others.

Key findings from the report include the following:

- **Media coverage related to new transit bus automation products or capabilities is often ahead of actual technology development.** Relatively few automation features are available for transit buses, although smaller automated shuttles are becoming increasingly available. At this point, the transit bus automation systems that have been developed are in the pilot testing stage or earlier stages of development. Systems are not broadly available for revenue service, and it will likely be years before systems are available in the quantities and with the capabilities needed to support broader deployment.
- **Technology costs are unknown at this point.** Given that automation systems SAE Level 1 or higher exist only as prototypes (if they exist at all), pricing is typically not available. Even for low-speed automated shuttles, prices are not firmly established and are subject to change.

- **Current automation technology for other vehicle types addresses use cases that may have limited applicability for transit service.** Many of the lower-level automation systems currently available for heavy-duty vehicles are intended to operate at high speeds on divided highways, whereas most transit buses operate at low speeds on urban roads. In addition, current sensing technology has too many false positives to be implemented in transit operations.
- **Bringing automation technology into buses is difficult due to the relatively low volumes and high level of customization in the current domestic bus market, as well as a perceived lack of interest from transit agency customers.** The relatively small market and high level of customization from transit agency to transit agency reduces the number of vehicles that R&D, testing, and validation costs can be spread over, resulting in high costs on a per unit basis, disincentivizing investment in new products and technologies and limiting commercialization.
- **Bus manufacturers are working with suppliers to understand the development timelines for new features and have high-level roadmaps for their introduction.** These roadmaps are internal and may not contain firm dates due to uncertainty surrounding key aspects of technology development. Conversations between bus manufacturers and suppliers are ongoing, and in some cases they are working together to enable new technologies.
- **There is a high degree of uncertainty regarding other issues, including pedestrian and occupant behavior and safety, insurance and liability, operator acceptance, and new service models; there are additional needs in the areas of communication and education.** More research may be needed to resolve some of these issues, and outreach activities may be needed to ensure that all relevant stakeholders understand the capabilities and limitations of any new system implemented.
- **Industry representatives noted that demonstration and pilot programs are essential to making technological progress and answering questions on the feasibility of automation systems for transit buses.** Multiple interviewees noted that the high cost of pilots and demonstrations is prohibitive, and Federal grants and programs help enable research, demonstration, and implementation.

Benefits

This market assessment is intended to communicate the current state of the industry with respect to the availability, capabilities, and limitations of automated transit bus technologies. The report may be used as a resource for identifying commercially available automation technologies and provide context related to automated transit bus prototype research. Multiple audiences may benefit, including transit agencies, state and local transportation departments, academic and research institutions, and other organizations interested in procurements related to automated transit bus technologies.

Project Information

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This research project was conducted by the John A. Volpe National Transportation Systems Center. For more information, contact FTA Project Manager Steven Mortensen at 202-493-0459 or Steven.Mortensen@dot.gov. All research reports can be found at <https://www.transit.dot.gov/about/research-innovation>.