West Rouge

Automated Shuttle

TORONTO

West Rouge Automated Shuttle Trial Case Study

TORONTO

METROLINX

Funding provided by:

Transports Canada

Transport Canada

OVERVIEW

IMPORTANT THEMES
- First-Mile/Last-Mile
- Mixed Traffic
- On-Road Testing
- Automated Vehicles

PROJECT VENDORS
- Local Motors Olli 2.0
- AutoGuardian by SmartCone
- Robotics Research

STANDARDS AND GUIDELINES
- ISO 22737:2021
- Transport Canada Guidelines for Testing Automated Driving Systems in Canada
- Ontario Highway Traffic Act O.Reg.306/15

The City of Toronto, Toronto Transit Commission (TTC) and Metrolinx partnered to trial an automated shuttle for a first-mile/last-mile rapid transit connection. The project's goals included increasing understanding of a) technical and administrative requirements to operate an automated shuttle; b) how automated shuttles operate in mixed traffic and inclement weather; and c) how an AV-based service could influence modal choice when connecting to transit. The trial would also enable hands-on experience with the limitations of automated shuttle technology to better understand the gap in capabilities and to inform future work of integrating into road and transit operations.

The project included a market scan of the state of technology, a competitive and negotiated RFP process for vendor selection, followed by on-road trials of a single vehicle. Evaluation was conducted in partnership with local universities.

The selected vehicle was the Olli 2.0 by Local Motors with operator AutoGuardian by SmartCone. Olli 2.0's automated driving system utilized a pre-programmed map that defined a digital path along which the vehicle would travel. The map instructed the shuttle's use of turn signals, where to turn and stop and what speed to travel along each segment of route. A signal from a remote, real-time kinematic (RTK) device enhanced the precision of its travel path. Lidar and radar were used to detect dynamic elements such as other road users, with a human attendant on board at all times to assist when the vehicle needed instruction. Olli carried up to eight passengers and could travel up to 20km/h in automated mode or 40km/h when operated manually. Internal and external cameras recorded the vehicle's movements but did not contribute to the automated driving system.

The shuttle's four kilometre route connected the residential community of West Rouge in southeast Scarborough to the Rouge Hill GO Station with seven fixed stops and a fixed schedule aligned to meet trains during peak hours. All streets were two lane, with some having on-street parking. Posted speed limits were 40km/h to 50km/h and all intersections were signage controlled. On-road testing with no public passengers began in October 2021 following a 30-day period of mapping and validation. Testing continued through November and provided valuable information about the Olli's automated capabilities. A third-party safety engineer was included as part of the project team to review and document opportunities and constraints as well as measures for risk mitigation that can all contribute to trials of automated vehicles in future.

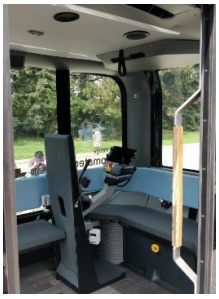
In January 2022, the project partners jointly agreed to conclude the trial due to several reasons outside the control of the project which were expected to delay launch of service to the public past the planned end date of February 2022.

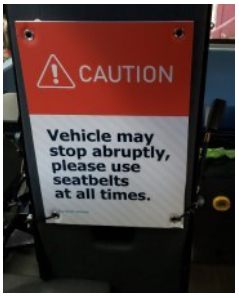
KEY PROJECT ELEMENTS

- Collaborative effort to deliver by multi-agency partnership enhanced learning
- Community engagement and consultation in route design, surveys of experience and a "meet the shuttle" event
- Request for Information (RFI) made RFP scope of work more likely to attract appropriate vendors
- Negotiated RFP process enabled competition with ability to compare variety of non-standard vehicles and operating technologies available
- Contracted turnkey service kept responsibility for maintenance and operations with vendor and focused learning on the technology until it is ready for reliable service integration
- Engaged first responders in risk-management planning and training on details of vehicle
- Review by safety engineer of vehicle design, manufacture and performance, route and operating procedures
- Connection to key destinations for both commuters and tourists
- On-line booking system developed as COVID-19 public health precaution also helped mitigate risks tied to service disruptions and limited passenger capacity

LESSONS LEARNED

- In the absence of universal standards for AVs, it is challenging to assess all aspects of operation without embedding closed-environment and stage-gated testing into the project plan
- Route and vehicle selection are linked; project teams must clearly understand the operational design domain of vehicle selected and seek to match those capabilities with the selected route
- Infrastructure supporting the route is technology- and vendor-specific and must be understood and considered in tandem with route selection (e.g. vehicle storage location and internet upload connection)
- Operational-side planning and risk management unique to AVs are as important as the technology itself
- Automated shuttle technology needs further development to become a feasible alternative for long-term service in truly mixed traffic environments
- AV technology is evolving quickly; any project lead should conduct due diligence on products in the market
- Procuring multiple vehicles from a single vendor mitigates risk of manufacturing deficiencies in individual vehicles
- Deliberate mixed use of manual and automated modes of driving may be appropriate if vehicle cannot accommodate all design domains



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In partnership with SIEMENS

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