Yale New Haven Hospital Inter-Campus AV Routes

Fully Autonomous Vehicle Testing Pilot Program

Stantec
## Agenda

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Goals for meeting

For Traffic Authority stakeholders to:

• Gain understanding of technology and project objectives; and

• Consider and define roles/ responsibilities in an autonomous vehicle pilot program for the City of New Haven.
Goals for project

Design a concept plan that allows project stakeholders (NHPA, YNHH, Yale) to:

• Provide greater access to YNHH campuses and parking facilities such as Air Rights Garage;

• Observe how an AV performs under real-world conditions and meets user needs in comparison to legacy vehicles; and

• Gain AV operations experience to create short- and long-term AV strategy.
Stantec's Recent Smart Mobility Projects

- Okotoks, AB
- Tempe, AZ
- New Haven, CT
- Chamblee, GA
- Clearwater, FL
Fully Autonomous Vehicle Overview - Examples

**Easy Mile EZ10**

- **Self-Driving Shuttle Specifics**
  - 25 mph top speed
  - 8-16 people maximum capacity
  - 3-10 hours amount of time on a single battery charge
  - 16’x7’x9’ typical size

**Local Motors olli**

**Navya Arma**

**Shuttle Details**

- **Notable Features:**
  - Tight enough of a turning radius (13-15 feet) to drive on existing streets
  - Operates in both directions, eliminates the need to turn around
  - Works with a mobile app for on-demand calls and real-time monitoring
  - Wheelchair accessible and working to offer more accessibility features and compliance with Americans with Disabilities Act (ADA) regulations
  - Redundant breaking mechanisms
  - Emergency stop button on-board
  - Direct telecom connection to central command hub for passengers

Manufacturers and Self-Driving Shuttles in the process of testing and launching pilot programs.
Overview Cont. - Safety Measures

• Onboard operator/ambassador
• Geofenced operations
• 2-way communication with remote supervisor (human in the loop)
• Low-speed (<25 mph; avg. 12 mph)
• Redundant sensors (lidar, radar, ultrasonic, 3D camera, IMU)
• Redundant communications (Wi-Fi, LTE, 4G/5G)
• Redundant braking (electric and mechanical)
• V2X if required
Hospital Connector Routes

Legend
- Proposed Route 1
- Proposed Route 1A
- Proposed Route 2
- Proposed Route 2A
- Proposed Route 3
- Proposed Route 4
- Proposed Route 5
- 1/4 Mile Walkshed
## Route Comparison

<table>
<thead>
<tr>
<th></th>
<th>Route 2</th>
<th>Route 2A</th>
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</thead>
<tbody>
<tr>
<td>Route Length (mi)</td>
<td>1.7</td>
<td>1.7</td>
</tr>
<tr>
<td>Avg. Route Speed (mph)</td>
<td>5.3</td>
<td>5.6</td>
</tr>
<tr>
<td>Headway with One Shuttle (min)</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td>Speed limit &lt;= 25 miles/hour</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Viable Storage Location</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Number Traffic Signals</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>Number of Stops at Stop Signs</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Number of Pedestrian Crossings</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Number of Lane Changes</td>
<td>3</td>
<td>3</td>
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Preliminary Operational Details

Hours of Operation: 8am – 6pm, Monday through Friday

Challenges:
• Lane changes
• Left hand turns

Storage/Charging:
• Current options include surface lots along Legion/Frontage and parking garage on Crown and College or Frontage and Howe.
Safety Strategy

• State of Connecticut Compliance
  – Public Act 17-69
  – OPM's minimum requirements framework

• Risk Assessment and Mitigation
  – NHTSA VSSA and approval documentation

• Safety Operations Plan
  – Operations tools and training for key roles

• Emergency Response Protocols
  – Protocol documentation and training for EMS (work with chosen vehicle provider)
Questions for Traffic Authority

• Level of involvement
  – Awareness to hands-on

• Future coordination
  – Updates at monthly Traffic Authority meeting?
  – Safety Committee creation?
  – Other?
Next Steps

• Record comments/questions from Traffic Authority (email by 4/19)
  – Return responses by 5/3
• Complete concept plan
• Provide overview to CT DOT on 5/1
• Finalize application to OPM and submit by end of May
• If successful, choose vehicle provider and begin protocol documentation and training
Stantec Contact Information

Jonathan Garrett – Primary contact
Jonathan.Garrett@stantec.com

Steve Abendschein
Steven.Abendschein@stantec.com

John Eberle
John.Eberle@stantec.com