Connected, Electric, Autonomous Vehicles (CEAV) Operational Concept, First Deployment & Procurement Development
SPEAKERS

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TODAY’S AGENDA

01 | PURPOSE OF THIS WEBINAR
   • Share concept development activities from Smart Columbus with stakeholders

02 | WEBINAR CONTENT
   • Smart City Challenge Overview
   • Smart Columbus Program Overview
   • CEAV Projects Goals and Objectives
   • Scioto Mile Deployment
     • Procurement
     • Pre-Deployment
     • Lessons Learned
   • Linden Deployment
     • Stakeholder Engagement
     • Route Development

03 | WEBINAR PROTOCOL
   • All participant lines have been muted during the webinar in order to reduce background noise
   • Questions are welcome via chatbox during the Q&A Section
   • The webinar recording and presentation materials will be posted on the Smart Columbus website
$40 MILLION
78 APPLIED • COLUMBUS WON
To empower our residents to live their best lives through responsive, innovative and safe mobility solutions.
MISSION

To demonstrate how an intelligent transportation system and equitable access to transportation can have positive impacts on every day challenges faced by cities.
OUTCOMES

SAFETY
MOBILITY
OPPORTUNITY
ENVIRONMENT
AGENCY EFFICIENCY
CUSTOMER SATISFACTION
PROJECT PHASES AND TIMELINE

WHERE WE ARE GOING

- SYSTEMS ENGINEERING
- DEVELOP AND PROCUREMENT
- DEPLOY, OPERATE AND MAINTAIN
- DATA COLLECTION/ANALYSIS
- SOLICIT/VALIDATE USER NEEDS
- ENGAGE STAKEHOLDERS/PUBLIC
- COMMUNICATE PROGRESS/PARTICIPATION OPPORTUNITIES

PROJECTS

Easton
Vision: 2017

Scioto Mile
Deployed: Dec 2018

Linden
Planned: Nov 2019

Next?
Beyond
• Describes the phased development of the CEAV project and summarizes a high-level view of the system

• Quick reference for project stakeholders to ensure a consistent understanding of:
  • User needs and requirements
  • Use cases for deployment
  • Goals and evaluation strategy

• Informed by RFI responses and released with second RFP
OPCON – OUTLINE

1. Introduction
2. System Concept
3. Operational and Organizational Impacts
4. System Analysis
5. User Requirements

Not intended to fulfill the purpose of a full traditional ConOps
**OPCON – MODES OF OPERATION**

<table>
<thead>
<tr>
<th>MODE</th>
<th>DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Operating</td>
<td>System operating as designed</td>
</tr>
<tr>
<td>Failure/Degraded</td>
<td>Situations that require the temporary shutdown of the system, such as “false” warnings and any “fail-safe” mode to which the system would revert</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Conditions where repair is done for an unscheduled breakdown of equipment functionality or for scheduled preventative maintenance</td>
</tr>
</tbody>
</table>
### OPCON – SAMPLE USER REQUIREMENTS

<table>
<thead>
<tr>
<th>USER</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CEAV</strong></td>
<td>- Needs to be able to transport passengers (stop at designated locations, open and close doors, deploy accessibility equipment, etc.)&lt;br&gt;- Needs to have Operations Staff onboard who have the ability to take manual control of the vehicle if deemed necessary</td>
</tr>
<tr>
<td><strong>CEAV Passenger</strong></td>
<td>- Needs a designated pick-up/drop-off location to, at a minimum, have proper markings&lt;br&gt;- Needs to be able to communicate that the CEAV should make an emergency stop</td>
</tr>
<tr>
<td><strong>CEAV System Operator</strong></td>
<td>- Needs to be able to program the operating routes into the CEAV, and make any changes as necessary&lt;br&gt;- Needs to be able to monitor the situation inside and directly outside the CEAV</td>
</tr>
<tr>
<td><strong>Operations Staff</strong></td>
<td>- Need to be able to take secure manual control of the CEAV while onboard if necessary</td>
</tr>
<tr>
<td><strong>City Data Users</strong></td>
<td>- Need access to accurate and timely data on the CEAV system</td>
</tr>
<tr>
<td><strong>3rd Party Data Users</strong></td>
<td>- Need access to accurate and timely data on the CEAV system</td>
</tr>
</tbody>
</table>
OPCON – POLICIES AND CONSTRAINTS

• Federal, state, and local regulations and guidance
• Limits in current vehicle capabilities
• Best practices for transit operations
Opcon – Vision and Roadmap

• Procure a turn-key first/last/only mile AV transit service

• Operate on routes designed in consideration of current vehicle capabilities and limitations

• Collect and evaluate passenger feedback and other operational data
SMART CIRCUIT
DEPLOYMENT PARTNERSHIP

• Funding
  • The Columbus Partnership
  • DriveOhio

• Deployment Resources
  • City of Columbus

• Research and Data Assistance
  • The Ohio State University
SMART CIRCUIT

• Serves public educational purpose and deployment learning for project team
  • Develop lessons learned
  • Use experience for other deployments in Columbus and Ohio
  • Connect educational and cultural resources
PROCUREMENT PROCESS

- Developed RFP for Turn-key AV Shuttle Operations
- One-year contract
  - Mobilize and deploy
  - 10 months of service
  - Two 1-year options
- Evaluated on past performance, proposed approach, and price
SELECTED PROVIDER

- May Mobility

- Ann Arbor, MI start-up

- Provided service to Bedrock in Detroit
Unlocking a better life today through self-driving transportation
MAY’S LEADERSHIP

Dr. Edwin Olson  
Chief Executive Officer

Alisyn Malek, MBA  
Chief Operations Officer

Dr. Steve Vozar  
Chief Technology Officer
**MAY’S TIMELINE**

- **Founded**
  - January 2017

- **Y-Combinator**
  - June-Aug 2017

- **Detroit Pilot**
  - October 2017

- **Tampa Pilot**
  - Feb 2018

- **Detroit Deployment**
  - June 2018

- **Columbus Deployment**
  - December 2018
We provide a turn-key, self-driving microtransit service
Sensors

The vehicle has a proprietary sensor suite that provides a 360-degree view around the vehicle. This is added extra redundancy and allows a more efficient, safer operation.

Vehicle

May Mobility's Cube on the Polaris GEM electric platform vehicle is a Low-speed Electric Vehicle that can move at up to 25mph and legal on roads up to 25mph.

Software

Our software interfacing with the sensors and other data streams on the vehicle allows for real-time monitoring to ensure the best experience for riders with the ability to throttle constantly to improve efficiency.
“Firsts” for May:

• Deployment #1
• Gaining trust from riders
“Firsts” for May:

- Working with a municipality
- Public ridership
Where we are now:
4,929 miles driven
3,862 riders
74 NPS
TESTING

• Factory Acceptance
  • At May Mobility and Detroit

• Preliminary Acceptance
  • Completed on Columbus streets

• Final Acceptance
  • Completed on the route
• Safety Management Plan
• Standard Operating Procedures
• Planned Events Playbook
• Emergency Responder Tabletop
November 14, 2018

Key Stakeholders:
- CoC Dept. of Public Service
- CoC Dept. of Public Safety
- May Mobility
- COTA
- Smart Columbus
- DriveOhio

Used to validate Standard Operating Procedures
- Induced seven scenarios for attendees to respond
- Input from all parties
- Positive takeaway and minor revisions made to SOPs
GO-LIVE!

- Partner Previews – Dec 3-4
- Media Launch Day – Dec 4
- Passenger Service – Dec 10
- First AV deployment in Ohio
DATA

- Passenger survey
  - Expectations for the service
  - Origin and destination
  - Mode of first/last mile transportation
  - Frequency of transit use
  - Positive and negative experiences
  - Suggestions for improvement

- AVL
- Passenger counts
- Battery performance
- Distance traveled
• 87% had never ridden in a self-driving vehicle before

• 52% maintained trust level and 45% increased trust

• 75% were more comfortable with an operator on-board
LESSONS LEARNED

• Evaluate stop locations and traffic control

• May need to modify existing striping or signage

• Monitor other vehicle interactions with the AV Shuttle to ensure all interactions are legal
LESSONS LEARNED

• Find a way to communicate service interruptions

• Ensure message is clear and concise so general public doesn’t raise questions

• Design the signage to be easily stood up and taken down
• Be clear about terminology and requirements

• Ask specific questions about infrastructure needs, including power and attachments
LESSONS LEARNED

• Registering the vehicles may align with standard policies

• You may be able to set the dates

• Our team aligned the registration expiration with the end of the first year of the contract
LINDEN DEPLOYMENT
DEFINING THE PURPOSE

• Connect the community to services with FMLM connections
• Grow COTA ridership
• Establish a common data exchange interface
• Establish a set of procurement guidelines
• Develop a set of AV operational testing and evaluation guidelines to benchmark AVs
• Develop a methodology for evaluating the operational safety
• Validate and ensure equitable and accessible options
• Summarize lessons learned
STAKEHOLDER MEETINGS

- Multiple meetings held to identify and refine routes
- Provide input into RFI
- Reconvene to review RFI responses
- Final input on route and scoring
ROUTES CONSIDERED

• Developed and evaluated 14 routes
• Multiple neighborhoods in Columbus
  • Linden
  • Northland
  • Hilltop
  • Merion Village
  • Children’s Hospital
  • Medical East
• Narrowed down to 4 for RFI
• 5 vendor responses
<table>
<thead>
<tr>
<th>Criterion</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart Mobility Hub</td>
<td>The route provides a connection to a proposed Smart Mobility Hub as part of the Smart Columbus initiative.</td>
</tr>
<tr>
<td>Food and Service Access</td>
<td>The route connects to food and services needed within a community. The list includes: grocery store, bank, pharmacy, and food bank/pantry.</td>
</tr>
<tr>
<td>Ladders of Opportunity</td>
<td>The route connects residents with job or opportunity centers for enhanced placement access. The list includes an Opportunity Center and Ohio Means Jobs.</td>
</tr>
<tr>
<td>COTA</td>
<td>The route connects to a COTA stop and acts as a FMLM connection to expand the reach of a traveler.</td>
</tr>
<tr>
<td>Alignment Considerations</td>
<td>The route serves more as a missing link than a duplicate of an existing COTA route.</td>
</tr>
<tr>
<td>Safety and Accessibility</td>
<td>The route has lighting and sidewalks in the vicinity of anticipated stops.</td>
</tr>
<tr>
<td>Prenatal Support</td>
<td>The route connects pregnant women with services that can aid in a healthy pregnancy.</td>
</tr>
<tr>
<td>Neighborhood</td>
<td>The route connects to an opportunity neighborhood for increased mobility.</td>
</tr>
<tr>
<td>Storage</td>
<td>The route provides a nearby facility for storage and charging of vehicles.</td>
</tr>
<tr>
<td>Route navigation</td>
<td>The technology at the time of deployment will allow the route to be traveled.</td>
</tr>
<tr>
<td>Recs and Parks</td>
<td>The route connects to a City recreation center or park.</td>
</tr>
</tbody>
</table>
SELECTED ROUTE

- Access to 2 Smart Mobility Hubs
  - Linden Transit Center
  - St. Stephen’s
- Access to Services
- FMLM Connection
- Fills Transit Gap
PROCUREMENT

- RFP published 1/17/19
- Responses due 2/14/19
- Seeking turn-key shuttle service
- Notice to Proceed June 2019
- Testing September and October 2019
- Begin Operations November 2019
PERFORMANCE MEASURES

• Test hypotheses under mobility, opportunity, and customer satisfaction.

  • CEAV will increase the number of FMLM trips
  • CEAV will increase COTA ridership
  • CEAV will improve the user experience
HOW TO STAY CONNECTED

USDOT SMART CITY CHALLENGE PROGRAM INQUIRES:
Kate Hartman, Chief - Research, Evaluation and Program Management
Intelligent Transportation Systems Joint Program Office
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SMART COLUMBUS INQUIRES:
Alyssa Chenault, Communications Project Manager
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Webinar recording and materials will be available at itsa.org and smart.columbus.gov
Public comment period open for the CEAV OpCon and Lessons Learned:

• February 13th to February 27th

• Where to find it:
  • View the OpCon and Lessons Learned at: https://smart.columbus.gov/projects
  • Click CONNECTED ELECTRIC AUTONOMOUS VEHICLE (CEAV)
  • Direct link to file (Lessons Learned): https://smart.columbus.gov/uploadedFiles/Projects/Lessons%20Learned%20for%20AV%20Shuttle%20Deployment%20DRAFT.pdf

• How to comment:
  • Please email comments to: kdepenhart@columbus.gov
    • Subject line: CEAV Comments
      • Include your contact information
  • State whether or not you represent a vendor interest
QUESTIONS?
SIGN UP FOR OUR E-NEWSLETTER

Contact:
SmartColumbus@columbus.gov

Columbus.gov/smartcolumbus

@SmartCbus
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