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Autonomous Vehicle Testing in Pittsburgh 2020 Annual Report

December 14, 2020

Background

On March 1, 2019, Mayor William Peduto issued his Executive Order on Self-Driving Vehicle Testing and Operations in the City of Pittsburgh. That Order identified the Department of Mobility and Infrastructure (DOMI) as the lead department for overseeing such testing and directed DOMI to publish guidelines for the submission of information on testing in the City.

DOMI released testing submission guidelines concurrent with the issuance of the Executive Order, also on March 1, 2019. Building on existing requirements from the Pennsylvania Department of Transportation (PennDOT), the City's guidelines require new testers to submit information no less than ten days prior to the commencement of any on-street autonomous vehicle (AV) testing.

In October 2020, DOMI required the five entities currently testing on Pittsburgh's public streets to confirm that there were no significant deviations from their 2019 submissions and to update their general information including:

- Company name
- Corporate address
- Principal point of contact
- Number of employees in Pittsburgh in increments of 100
- Make and model of autonomous vehicle(s) being used for on-street testing in Pittsburgh
- Total number of autonomous vehicles the entity is operating on public streets in Pittsburgh in increments of 10
- List of Pittsburgh neighborhoods in which the entity is testing

This annual report contains the updated information submitted by the five testers. In addition, the report provides an update on policy, engagement, and developments surrounding autonomous technology in Pittsburgh. For more information on autonomous technology in Pittsburgh, visit <https://pittsburghpa.gov/domi/autonomous> or email av@pittsburghpa.gov.

Highlights since the 2019 Annual Report (April 22, 2019)

- All autonomous vehicle testing was suspended from mid-March 2020 through early May 2020 due to the COVID-19 pandemic. Testing resumed with safety precautions in place to protect the two required safety operators.
- Despite the pandemic, Pittsburgh’s AV testers reported an increase in the number of AVs being tested and vehicle miles traveled on public streets, as well as in the number of neighborhoods where testing occurred.
- The AV testers did not report any crashes in Pittsburgh.
- Public stakeholders have provided mixed feedback regarding AV testing in Pittsburgh.
- A new AV tester, Nvidia, was authorized by PennDOT to test in Allegheny County. Nvidia has not yet signaled an intention to test within Pittsburgh’s city limits.
- Aptiv entered into a joint venture with Hyundai and now operates under the name and branding, Motional. This entity continues testing in Pittsburgh.
- Starship Technologies piloted personal delivery devices on the University of Pittsburgh’s campus in Oakland from October 2019 to March 2020. Starship suspended operations in March 2020 due to Covid-19. Starship has informed DOMI that it plans to relaunch in January 2021.
- Senate Bill 1199 became law, regulating personal delivery devices, including those capable of autonomy, defining them as pedestrians, and preempting municipal regulation.

Entities Conducting On-Street Testing in Pittsburgh

The same five¹ entities (together “AV Testers” or “Testers”) that were testing in Pittsburgh in 2019 continued to test their technology on Pittsburgh’s public streets in 2020. These entities are:

- Argo AI
- Aurora
- Carnegie Mellon University (CMU)
- Motional (formerly Aptiv)
- UATC, LLC (Uber)

Impact on Local Employment

The AV Testers employ more than 1,600 people locally.

¹ In June 2020, PennDOT authorized Nvidia to test its autonomous vehicles in Allegheny County. As of the date of this report, Nvidia has not established a presence in Pittsburgh, nor begun testing here.

Testing Fleet

The AV Testers operate 85-130 vehicles equipped with automated driving systems (ADS) for on-street testing in Pittsburgh. This compares to 55 vehicles reported in 2019.

The AV Testers use a number of different vehicles from Original Equipment Manufacturers (OEMs). The vehicles being tested include:

- Argo AI – Ford Fusion Hybrid
- Aurora – Chrysler Pacifica
- CMU – Cadillac SRX
- Motional – Chrysler Pacifica PHEV; BMW 540
- Uber - Volvo XC90

Level of Automation

All AV Testers currently develop and test Level 4 self-driving systems, as defined by standards established by the Society of Automotive Engineers (SAE). SAE Level 4 automation means that a vehicle is capable of performing all driving functions under certain conditions. A human operator may need to control the vehicle outside of these conditions. This is consistent with the level of automation undergoing testing in 2019.

Location of Testing

The AV Testers have reported that testing currently occurs in the following 53 Pittsburgh neighborhoods. The number in parentheses indicates the number of AV Testers operating in the neighborhood. Asterisks (*) indicate new neighborhoods reported since the 2019 report.

Allegheny Center (3)	Fineview (1)*	Point Breeze (1)
Allegheny West (1)	Friendship (3)	Polish Hill (1)
Allentown (1)*	Garfield (3)	Regent Square (1)*
Arlington (1)*	Greenfield (2)	Shadyside (5)
Arlington Heights (1)*	Hazelwood (3)	South Oakland (5)
Banksville (1)*	Highland Park (2)	Southside Flats (2)
Bedford Dwellings (1)*	Larimer (1)	Southside Slopes (2)*
Beltzhoover (1)*	Lincoln-Lemington-Belmar (1)*	Spring Hill-City View (1)
Bloomfield (3)	Lower Lawrenceville (3)	Squirrel Hill North (4)
Bluff (1)*	Middle Hill (2)	Squirrel Hill South (3)
Central Business District (4)	Morningside (3)	Stanton Heights (2)
Central Lawrenceville (3)	Mount Oliver (1)*	Strip District (3)
Central Oakland (5)	Mount Washington (2)*	Summer Hill (1)*
Crawford-Roberts (1)*	North Oakland (4)	Terrace Village (1)*
Duquesne Heights (2)*	North Shore (3)	Troy Hill (1)
East Allegheny (1)	Northview Heights (1)	Upper Hill (2)
East Liberty (5)	Perry North (1)*	Upper Lawrenceville (3)
	Perry South (1)*	West Oakland (4)

Testing Conditions

For the most part, on-street testing only occurs on weekdays (Monday to Friday) with occasional testing on weekends. Testing occurs during both daytime and nighttime. Testing generally occurs during favorable weather conditions. Occasionally, testing occurs in rain, snow, and other adverse conditions. Testers do pause operations or disengage the autonomous technology in weather conditions that result in, or contribute to, loss of traction, low visibility, or conditions that do not support safe, controlled driving.

Vehicle Miles Traveled

Under Pittsburgh’s Autonomous Testing Guidelines and Submission Process, the AV Testers must semiannually report total fleet autonomous vehicle miles traveled (VMT) in Pittsburgh in increments of 100 miles (by month) and total fleet VMT in Pittsburgh in increments of 1,000 miles (by month). “Total fleet autonomous vehicle miles traveled” means the total number of miles an entity’s vehicles traveled in self-driving mode on city streets. “Total fleet vehicle miles traveled” means the total number of miles an entity’s vehicles traveled on city streets both human-operated and in self-driving mode.

The AV Testers report this information to a mutually agreed upon third party, which aggregates the VMT data across all the AV Testers and reports that data to DOMI as a composite total.

Month	Total Fleet Vehicle Miles Driven Within the City	Total fleet Autonomous Vehicles Miles Driven Within the City
January 2019	19000	7400
February 2019	13000	5100
March 2019	17100	5500
April 2019	17100	4800
May 2019	15200	5700
June 2019	12100	3900
July 2019	12000	4400
August 2019	16000	6100
September 2019	15000	4400
October 2019	15000	4700
November 2019	12000	4100
December 2019	10000	3700
January 2020	11000	5400
February 2020	12000	5700
March 2020	8000	4600
April 2020	0	0
May 2020	3000	1400
June 2020	15000	10200

Crash Information

Under Pittsburgh's Autonomous Testing Guideline and Submission Process, the AV Testers must report relevant details of any crash experienced on public streets that 1) results in damage to property other than to a vehicle, or damage of \$5000 or more to a vehicle; 2) results in injury of any degree; or 3) involves the autonomous vehicle violating any traffic law.

Between the dates of the 2019 report and this 2020 report, there have been no crashes involving an autonomous vehicle reported to DOMI.

Autonomous Vehicle Work Groups

In spring 2019, DOMI formed three work groups that focus on automated technology in Pittsburgh:

1. Shared and Autonomous Mobility Advisory Group ("Advisory Group") - comprised of representatives from various community groups, business improvement districts, and advocacy organizations
2. Autonomous Vehicle Policy Partners Group ("Policy Partners") - comprised of City, County, and State representatives
3. Autonomous Vehicle Testers Group - comprised of representatives from the five AV Testers currently operating in Pittsburgh

Each group meets bimonthly with DOMI staff. The Advisory Group and Policy Partners generally discuss how the City can continue to ensure AV testing is done safely, the potential risks and benefits of widespread deployment of AVs, and how the City can prepare for and manage the testing and deployment of AVs in light of state or federal preemption. These discussions also include ways the City can engage and educate the public on autonomous technology in order to collect feedback to understand public opinion on the potential benefits and risks autonomous technology could bring to Pittsburgh.

The AV Testers discuss ways in which the testing and deployment of autonomous technology could support the City's effort to improve road safety, reduce greenhouse gas emissions, reduce traffic congestion and VMT, encourage efficient land use, and increase access to mobility and economic opportunities for all Pittsburghers. The AV Testers also provide forums and trainings for Pittsburgh first responders.

PennDOT Autonomous Vehicle Testing Guidance Update

In September 2020, PennDOT released updated *Autonomous Vehicle Testing Guidance* ([link](#)).

Personal Delivery Devices

Starship Technologies

Beginning October 1, 2019, DOMI permitted Starship Technologies (Starship) to deploy personal delivery devices (PDDs) in Pittsburgh's public right-of-way. Starship's PDDs are electric ground delivery devices that operate on sidewalks and crosswalks. Starship's PDDs weigh 45 pounds without cargo and operate at speeds up to 4 miles per hour. The PDDs can carry up to 20 pounds of cargo, or about three shopping bags.

DOMI issued Starship a permit for a period of three months and allowed Starship to operate a maximum of 30 PDDs in a designated section of the Oakland neighborhood. The renewal of Starship's permit was contingent upon a determination by DOMI that the company conducted itself appropriately during its operations. Appropriate conduct means that the operation of the PDDs did not cause harm nor compromise the ability for all users of the right-of-way to navigate the public realm in a safe and reliable manner during the three-month pilot period.

During the initial pilot period, a Pittsburgh resident who uses a power wheelchair raised concern that one of Starship's PDDs was stopped on a curb ramp at an intersection. Because the resident was unfamiliar with the devices and the device could not communicate its intention, the resident felt restricted from accessing the sidewalk. Roughly an hour after the resident raised the concern, Starship ceased operations of all PDDs in Pittsburgh to investigate the situation and review the technology. The following day, Starship and the University of Pittsburgh met with the resident and discussed what had occurred, the steps taken to update the PDDs programming, and the future of the university's involvement in the program. Starship also released a statement of commitment to the disability community.

DOMI continues to work closely with Starship, University of Pittsburgh, and Oakland-based partners to identify unanticipated situations involving the PDDs and to collaborate on resolving those issues.

In December 2019, DOMI issued a one-month extension to Starship's permit, during which time DOMI reviewed Starship's operations and considered a longer permit renewal. In reviewing Starship's operations, DOMI convened Oakland-based partners including University of Pittsburgh, Oakland Transportation Management Association, and Oakland Planning and Development Corporation to review a report submitted by Starship. The report contained statistics from Starship's first 75 days of operation (10/1/2019 – 12/17/2019).

- There were a maximum of 23 PDDs in operation at a given moment.
- The PDDs made 588 deliveries and traversed 708 miles of sidewalks and crosswalks.
- Assuming these deliveries replaced car delivery trips, the PDDs reduced carbon dioxide emissions by an estimated 205 kilograms.
- There were no reported instances of injuries to people or damage to property.

After reviewing Starship's operations and report, DOMI determined that the company conducted itself appropriately during the pilot period and renewed Starship's permit until May 1, 2020. However, due to COVID-19 related setbacks, Starship ceased operations in Oakland in April 2020 and has not operated in Pittsburgh since that time. However, Starship informed DOMI that it intends to relaunch in January 2021 and will apply for a permit renewal.

Senate Bill 1199

On October 20, 2020, the Pennsylvania Legislature passed Senate Bill 1199, authorizing and defining personal delivery devices. On November 1, 2020, the bill became law without the Governor's signature.

SB 1199 includes PDDs under the definition of "pedestrian" and defines a PDD as a ground delivery device manufactured for transporting cargo or goods, is operated by a driving system that allows remote or autonomous operation, or both, and weighs less than 550 pounds without cargo. The bill provides PennDOT with general and sole authority over PDDs and preempts local authority over PDDs except in instances where

the local authority determines, after consultation with the PDD operator, that operation of the PDD constitutes a hazard.

This law severely limits the City's ability to oversee or regulate PDDs on our public streets and sidewalks. However, DOMI will continue working with operators, like Starship, to set local expectations around the operation of PDDs. DOMI will also work closely with PennDOT as the department works to adopt policies governing the authorization of PDDs.