

**Personal Delivery Devices
Pilot Program
(Senate Bill 726, Chapter 351, Acts of 2021)**

**A Report to the Maryland General Assembly
Senate Judicial Proceedings Committee
and
House Environment and Transportation Committee**

December 2021

MSAR# 13310

Maryland Department of Transportation
Motor Vehicle Administration

Introduction

The Maryland Department of Transportation Motor Vehicle Administration (MDOT MVA) offers this report in response to language contained in Senate Bill 726, Chapter 351, Acts of 2021. The language states:

In accordance with § 2–1257 of the State Government Article, report to the House Environment and Transportation Committee and the Senate Judicial Proceedings Committee by December 31, 2021, on the status and findings of the pilot process required under this section.

As part of its *Connected and Automated Vehicle (CAV) Working Group*¹ (CAV WG), Maryland monitors emerging and innovative technologies such as personal delivery devices (PDDs) to adapt to, and take advantage of, technologies reshaping mobility choices. PDDs have emerged as an innovative technology promising to improve the efficiency of deliveries.

The MDOT MVA has implemented a collaborative, constructive, and expedient process for the operation of PDDs in Maryland. As of November 2021, no applications have been received to operate PDDs in Maryland. However, industry was consulted and engaged in the development of the pilot process and several queries have been made from manufacturers and academia.

Examples of Currently Available PDDs

The American Association of Motor Vehicle Administrators (AAMVA) published guidance² in May 2021 on Automated Delivery Devices (ADD) and Vehicles to assist member agencies like the MDOT MVA in understanding and working with this emerging technology. AAMVA defines a PDD as a “ground-based delivery device that is manufactured for transporting cargo or goods, does not meet the definition of a motor vehicle, and is operated by a driving system that allows for automated and/or remote operations.”³ It is not a motor vehicle as defined in Maryland law, and it does not carry people.

According to Maryland Law⁴, a PDD is a powered device that:

- a) Is operated primarily on shoulders, sidewalks, and crosswalks;
- b) Is intended for the transport of property on public rights-of-way;

¹Maryland CAV Website <https://mva.maryland.gov/safety/Pages/MarylandCAV.aspx>



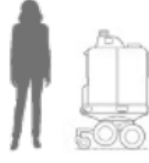

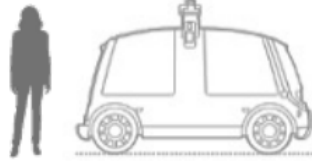
²AAMVA May 2021, “Automated Delivery Devices and Vehicles White Paper”
<https://www.aamva.org/AutomatedDeliveryVehiclesAndDevicesWhitepaper-May2021/>

³AAMVA May 2021, “Automated Delivery Devices and Vehicles White Paper”
<https://www.aamva.org/AutomatedDeliveryVehiclesAndDevicesWhitepaper-May2021/> page 3

⁴2021 Regular Session - Senate Bill 726 Chapter (maryland.gov);
https://mgaleg.maryland.gov/2021RS/chapters_noln/Ch_351_sb0726E.pdf

- c) Weighs no more than 550 pounds, excluding cargo; and
- d) Is capable of navigating with or without the active control or monitoring of an individual.

The following table includes examples of currently available PDDs⁵.

PDD Examples	Size Comparison
<p><input checked="" type="checkbox"/> Small, wheeled, slow-moving sidewalk robot</p> <p>A wheeled delivery robot that is less than 4 ft tall and weighs less than 100 lbs unloaded, that operates on sidewalks at pedestrian speeds (~1 to 3.5 mph) with or without an operator. This describes the majority of PDDs in use.</p> <p><i>e.g., Amazon Scout, Starship Delivery Robot</i></p>	
<p><input checked="" type="checkbox"/> Fast-moving robot that operates in bike lanes</p> <p>A wheeled delivery robot capable of traveling at higher speeds than a pedestrian (~10 to 20 mph), which may behave more like a bicycle (e.g., travelling on the roadway in bike lanes).</p> <p><i>e.g., Refraction REV-1, TeleRetail Pulse 1</i></p>	
<p><input checked="" type="checkbox"/> Larger, heavier sidewalk robot</p> <p>A larger, heavier delivery robot (taller than 4 ft and more than 100 lbs) that operates on sidewalks at pedestrian speeds (less than 10 mph) and can carry larger and heavier loads than smaller sidewalk robots.</p> <p><i>e.g., FedEx Roxo</i></p>	
<p><input checked="" type="checkbox"/> Robot without wheels</p> <p>A delivery robot that uses non-wheeled locomotion (e.g., legs) and operates on sidewalks at pedestrian speeds.</p> <p><i>e.g., Ford Digit</i></p>	
<p><input type="checkbox"/> Autonomous delivery/retail vehicle</p> <p>A large roving kiosk or mobile store that operates in roadways as a vehicle. This is not a PDD.</p> <p><i>e.g., Nuro R2, Robomart</i></p>	

According to AAMVA’s definition, a PDD is not an ADD. An ADD is a vehicle operated by an automated driving system that is designed for delivering goods or cargo. An example of an ADD is the Nuro⁶. Nuro is not a PDD given its size, operating system, and where it operates (roadways).

Pilot Process Development

⁵ Sharing Spaces with Robots: The Basics of Personal Delivery Devices
https://www.pedbikeinfo.org/cms/downloads/PBIC_InfoBrief_SharingSpaceswithRobots.pdf

⁶Nuro AI <https://www.nuro.ai/>

The MDOT MVA was charged with developing a pilot process for authorizing the operation of PDDs. Prior to developing the pilot process, the MDOT MVA reviewed national guidance⁷ and research on PDDs⁸ and consulted with experts to understand the status of PDDs in testing and deployment throughout the United States.

As part of developing and implementing the pilot process for authorizing the operation of PDDs, the MDOT MVA was requested to actively engage stakeholders and consider their input. Information was shared and discussed in several forums during the summer of 2021, including:

- CAV Coordinating Team;
- CAV Freight Subgroup;
- CAV Policy Subgroup;
- CAV Emergency Responder Sub; and
- MDOT's State Freight Advisory Committee.

In addition to considering the input from these groups, the draft pilot process was shared for review and comment with many groups, ranging from industry, local government, and others. Information was shared with the full CAV WG at the meeting on August 10, 2021. This meeting included over 150 participants. The CAV WG serves as a central point of coordination and information for Maryland CAV activities. The group includes a diverse membership of transportation stakeholders, including elected officials, State and local agency representatives, highway safety organizations, representatives from the private sector, and the automotive industry. The group evaluates the latest research, tracks federal and State laws, policies and programs, and coordinates with other agencies, organizations, and businesses to set the course for the future of automated and connected vehicles in Maryland.

Industry representatives were contacted directly for review and comment. Many provided comments and some engaged in dialogue in brief meetings to discuss their status of operations and thoughts on Maryland's process. The industry representatives included Amazon, Daxbot, FedEx, Kiwibot, Refraction AI, and Starship.

Many local government agencies provided review and comments, including Baltimore City, Howard County, Prince George's County, the City of Garrett Park, and the City of Salisbury. Several agencies engaged in dialogue with brief meetings to discuss their thoughts on Maryland's process.

All comments and all dialogue were considered in developing the pilot process.

Status of PDD Pilot Process

⁷ AAMVA May 2021, "Automated Delivery Devices and Vehicles White Paper"

<https://www.aamva.org/AutomatedDeliveryVehiclesAndDevicesWhitepaper-May2021/>

⁸ Sharing Spaces with Robots: The Basics of Personal Delivery Devices

https://www.pedbikeinfo.org/cms/downloads/PBIC_InfoBrief_SharingSpaceswithRobots.pdf

After collaboration with industry, local government agencies, and traffic safety specialists, a [pilot process for PDD operation](#)⁹ was developed. The intent of the PDD process is to create a forum for a collaborative, constructive, and expedient pathway to operate PDDs in Maryland, while maintaining a safe environment for all who use Maryland's transportation systems and facilities.

Each use case is intended to be handled according to its unique circumstances through dialogue between the entity requesting authorization, the State and local agencies responsible for the infrastructure in that geographic area requested for operation, and emergency responders responsible for that particular jurisdiction. In this process, the MDOT MVA acts as the central point of collaboration to respond to queries, receive submittals for operation, bring together necessary review and dialogue, and maintain approvals and documentation.

As it stands, this pilot process provides the flexibility necessary to accommodate many different scenarios and encourage the use of PDDs to further mobility, equity, and safety in Maryland's transportation ecospace. It is intended to be a living document that will be reviewed and amended as necessary to remain consistent with federal and national guidance, with the needs of the State, and to be used as long as it is authorized under Maryland law.

Outline of Pilot Process

1. Entities interested in operating PDDs in Maryland will first complete the form, *Application for Authorization to Operate Personal Delivery Devices in Maryland*. Entities must email the completed and signed form to CAVMaryland@mdot.maryland.gov
2. The application shall include the PDD Operator's information and primary point of contact (POC), including emergency (24/7) contact information, and self-certifications that the PDD Operator has met the requirements of all applicable Maryland laws governing operations for PDDs.
3. In addition to the application, the PDD Operator will also submit an Operational Plan as described in Section V, an Emergency Response Plan as described in Section V, and proof of insurance as referenced in Section VI.
4. On successful submission of an application, the MDOT MVA will contact the PDD Operator within seven (7) business days to acknowledge receipt and begin a dialogue to assure an understanding of the Operational Plan and timeline needs of the PDD Operator.
5. An internal MDOT process will be initiated to engage a small team of multi-disciplinary specialists to assist in evaluating the entity's application. This team will include appropriate representatives from the business units of the MDOT, the CAV Coordinating Team, and local agencies and organizations that provide public safety to manage the infrastructure on the potential routes.
6. An expedient, yet thorough, review to understand the basic technology premises and safety redundancies for operation will be possible with a collaborative posture by all parties. A specific POC from the MDOT will serve the PDD Operator for ease in

⁹ Pilot Process for Authorizing the Operation of Personal Delivery Devices in Maryland
<https://mva.maryland.gov/Documents/Pilot-Process-for-Authorizing-the-Operation-of-PDD.pdf>

navigating through the process and will also lead the team in review of the entity's application and Operational Plan.

7. The expedient review will include evaluating: the proposed route(s) and infrastructure accessibility; safety considerations with respect to the PDD interaction with vehicular traffic, pedestrians, cyclists, and other devices; any regulatory or local permitting applicability; public outreach plans; and all other applicable items listed in Section V. Dialogue with the PDD Operator during this time may be necessary to address questions and considerations. Also, it may be necessary for the team to experience an in-person demo of the PDD and a physical site visit of the proposed route(s). Any specific restrictions and requirements requested by the infrastructure owner operator (IOO) that are in addition to those laid out explicitly herein, will be discussed during this review.
8. Prior to authorizing operations, the MDOT MVA will consult with all appropriate agencies and organizations and will consider all recommendations of the team. PDD operations will not be approved by the MDOT MVA unless the representatives for the agencies and organizations responsible for public safety and infrastructure management for the area intended for PDD operation have provided approval in writing on the Operational Plan to include any agreed-upon additional restrictions and requirements.
9. The MDOT MVA will provide a written response to the applying entity within 30 business days of submitting the application and Operational Plan. If approved, the MDOT MVA will issue an approval to authorize the PDD operation by the entity. Once in receipt of the written authorization, the entity can begin approved operations. Prior to receiving this response, the applying entity cannot move forward with the requested PDD operation.

Further information can be found on the [PDD Webpage](#).¹⁰

Findings of Pilot Process

Hundreds of specific comments on the draft pilot process were received from stakeholders during the review. This section summarizes those comments made by local government agencies, industry, and other stakeholders during the development of the pilot process for operation of PDDs. This also includes brief discussion of additional requirements included in the pilot process that are not explicitly mentioned in the new law. Lastly, this section provides several items to be addressed as the pilot phase ends and full implementation of the new law takes effect on July 1, 2022.

Physical Characteristics / Requirements

1. Lighting Requirements

The new law explicitly requires consultation with industry on the lighting requirements. Recommendations from AAMVA suggest lighting that is visible for at least 300 feet. Industry commented that existing design meets, and likely exceeds, this threshold. With that, the pilot process includes a requirement for self-certifications from the PDD operators that the PDD will have appropriate equipment for visibility and awareness during operations, including lights on

¹⁰ Personal Delivery Devices - Pilot - Pages <https://mva.maryland.gov/Pages/pdd.aspx>

both the front and rear of the PDD that are visible on all sides from a distance of at least 300 feet, no bright projecting strobe, and reflective material as necessary, if being operated between sunset and sunrise. Moving forward with the long term in mind, and effective July 1, 2022, the MDOT MVA will consult with industry and any national guidance to develop and adopt policies for appropriate lighting necessary for PDDs.

2. Markings

The new law requires identification markings to be in braille. Some of the industry representatives said this was possible but questioned the functionality of this requirement's use. Several comments from stakeholders reference appropriate "notice" to those with vision deficiencies, which could be specific font size of identification markings and a certain caliber noise to emit. It was also suggested that some smaller PDDs may need a visual indication, such as a flag, to be in the line of sight for normal human height. AAMVA also suggest a slow-moving emblem may be necessary when a PDD is operated on a roadway. With that, the pilot process requires consideration of slow-moving emblems, audible alerts, and flags. Industry stakeholders commented that these requirements can be accommodated.

Industry also commented on the unique identifier components that are required in the law. They stated the need for flexibility on placement with the differing sizes and shapes of PDDs and voiced unease on any additional verbiage and markings on the "top" side of the PDD. Some are using QR codes to accommodate detailed information that is available to the public and emergency responders to identify the vehicle.

3. Size and Weight

Several comments were made from the local agencies that the allowed weight (up to 550lbs, not including the weight of any cargo) is high for interaction with people on the sidewalks. These comments on the weight of the PDDs also questioned the comparison of these with allowed weights for scooters and e-bicycles. Some suggested that wide variance in size and weight may require more clear and delineated review; PDDs on the smaller end (and more likely to be on sidewalks) may be a more appropriate decision to be made by local governments, while PDDs on the larger end (and more likely on roadways and shoulders) might be more naturally under the State's review. The pilot process provides the State as the entry point and coordinator, but no approvals are to be given without the approval of the agency that controls the infrastructure on which the PDDs will be operated.

While the law prohibits any hazardous material cargo on PDDs, it does not address total weight of cargo or cargo load effects on design and stability. Comments from local agencies suggest that cargo weight and gross "vehicle" weight be considered for accommodating both infrastructure design and removal by emergency responders without specialized equipment, if necessary.

Operating Requirements

1. Speed

Speed differential was mentioned in several comments – between PDDs and pedestrians, bicyclists, scooters, and other vehicles. Some jurisdictions have legalized scooters and suggest speed limits of PDDs should be consistent. Some concerns were stated regarding PDDs in the roadway, or along the shoulder of a roadway, and suggest the PDDs should be capable of travelling at speeds aligned for that roadway. Some concerns were stated regarding PDDs on the sidewalks; they suggested that normal walking speed is 2mph to 4mph, which could create a wide speed differential with PDDs travelling up to 7mph on sidewalks. With that, the pilot process is designed to allow for specific dialogue – and restrictions if necessary – on the particular routes requested by the PDD operators. Without further action by the General Assembly, these requirements will not be addressed after July 1, 2022.

2. Geographic Limitations

Many commented that roadway geometrics, lane width, sidewalk width, speed, traffic volume, pedestrian volume, crash rates, lane markings, and intersection traffic controls are important to evaluate to ensure the safe and practical use of PDDs. Some suggested PDDs should travel only on sidewalks, crosswalks, bike lanes, and shoulders to avoid on-coming traffic. Some suggested that certain PDDs are intended for use along the roadway and on shoulders to allow for higher speeds and avoid interaction with pedestrians. With that, the pilot process is designed to allow for specific dialogue – and restrictions if necessary – on the particular routes requested by the PDD operators. Without further action by the General Assembly, these requirements will not be addressed after July 1, 2022.

3. Public v. Private Right-of-Way

Questions were posed during review regarding private infrastructure in the public realm and how this affects operation of PDDs. These areas could be roadways and other property owned by a homeowner's association, private sidewalks in a neighborhood, and private walks or county-maintained pathways on private land where there are public easements. It's unclear how PDDs are to be governed in these areas or if PDD operators have the right to access these areas for operation.

4. Insurance

Insurance requirements included are for each PDD in operation to be covered by a general liability policy of at least \$100,000. This is consistent with a review of other states' laws, but it's unclear how insurance companies will evidence specific devices under a general liability policy. The new law includes an option to substitute another form of security, such as self-insurance, but this option was not feasible for the pilot phase as it will require an extensive new process and new regulations to be promulgated by the MDOT MVA.

Technology Characteristics / Base Capabilities

Specific technology requirements are included in the pilot process to address operational design domain and base capabilities included in national guidance and in other states' PDD policies. The PDD operator must self-certify they have addressed:

- Inspecting, testing, and maintaining sensors on PDDs;
- Testing, certifying, and verifying software upgrades used to operate PDDs;
- Expectations and considerations for disengagements;
- Monitoring system health and cybersecurity threats; and
- Privacy considerations and protections of the data collected by PDDs

Without further action by the General Assembly, these requirements will not be addressed after July 1, 2022.

Reports and Notifications

1. Public Outreach

Specific requirements are included in the pilot process to address the need to provide notice to the community and to local emergency responders prior to operation of PDDs. These are based on national guidance and other states' PDD policies, and comments from industry and other stakeholders supported these requirements. Without further action by the General Assembly, these requirements will not be addressed after July 1, 2022.

2. Emergency Response Plan

Specific items required to be addressed by the PDD operators during the pilot phase include:

- appropriate response to audio or visual emergency equipment (lights, sirens) and to signals or directions from a traffic control officer or flagger;
- procedures to disable the PDD, if necessary to maintain public safety; and
- any special firefighting needs.

Longer term, and to be effective July 1, 2022, the MDOT MVA must consult with industry to develop and adopt policies on what needs to be included in a PDD operator's Emergency Response Plan (ER Plan). Prior to beginning operations, PDD operators are required to submit an emergency response plan to the MDOT MVA. The ER Plan must include information on the PDD equipment and attributes and on how to deal with the device when it is encountered on public rights-of-way.

Now and after the pilot phase is complete, the MDOT MVA is responsible for making each ER Plan available to the appropriate first responder agencies for them to keep on file and use as needed. During the pilot phase, the applicable emergency responder agencies are explicitly included in the review and approval of the plans to operate PDDs in their jurisdiction.

3. Reporting of Data and Incidents

Specific items required to be addressed by the PDD operators during the pilot phase, include:

- Request of approval for any changes in the operational design domain or the approved operational plan prior to these changes being made;

- Regular reporting (likely monthly) as agreed on data such as areas of operation, miles traveled, number of deliveries, average speed, any vehicle status changes, any complaints reported to the company, any issues pertaining to public safety; and
- Immediate reporting of any incident involving personal or property damage involving the PDDs

These are based on national guidance and other states' PDD policies, and comments from industry and other stakeholders supported these requirements. Without further action by the General Assembly, these requirements will not be addressed after July 1, 2022.

Process of Approval for Operation

1. Timelines

Many comments from industry stakeholders strongly encourage definitive rules of engagement and definitive timelines for processes in order to accommodate business decisions and planning. With that, the pilot process clearly outlines what is needed from PDD operators and holds specific timeframes for review and processing.

2. Agencies Involved in Approval

Review by the appropriate IOO of the sidewalk, pathway, bicycle trail, shoulder, crosswalk, and roadway is an essential component of the process. Many recommended that a local permitting process may be necessary to review all issues of traffic and pedestrian safety on interaction with PDD operation. Some mentioned the levels of government review that could be necessary for municipalities that may or may not manage their own roadways and may or may not have their own public safety agencies.

By design, the pilot process creates opportunity for review and dialogue of all appropriate agencies and organizations. The considerations along the proposed route of traffic safety and infrastructure design can be properly evaluated by the State or local government agency stakeholders to ensure the safe and practical use of PDDs. The pilot process provides the State as the entry point and coordinator, but no approvals for PDD operation without the approval of the agency that controls the infrastructure on which the PDDs will be operated, and no approvals for PDD operation without the approval of the emergency responders that provide public safety agency for that jurisdiction.

After full implementation of the new law on July 1, 2022, notification of local jurisdictions is required along with meeting any county or municipal permitting requirements.

Conclusion

PDDs have the potential to reshape mobility and freight by bringing goods to consumers who may not have the ability or means to travel for groceries, packages, prescriptions, or other items that could be transported through a community.

Due to the lack of participation in the Pilot Process since it became law and the writing of this status report, the MDOT MVA is not able to ascertain full interest in operating PDDs in Maryland. However, industry stakeholders have made it clear that they prefer simple, straightforward rules in the states they are looking to operate in. Emerging technology is constantly changing, and any process should be reviewed as updates in the industry appear on the landscape.

Any changes to Maryland Law should consider the safety impact on pedestrians, cyclists, vehicles, and passengers. The General Assembly should take into consideration the ambiguities within the law that will exist after the end of the pilot phase in July 2022. There is some uncertainty over how some of the pilot functions will be executed after July 2022. Further, local governments have expressed confusion over whether they will be the only regulating entities for PDDs after July 2022. The General Assembly may want to monitor and clarify some of these policy issues in the future.

PDDs play a part in Maryland's transportation future, and the MDOT MVA will continue to work towards Maryland's Vision¹¹ for CAVs: to uphold and enhance a Safe, Efficient, and Equitable transportation future by delivering collaborative and leading-edge CAV solutions.

¹¹ Maryland Connected & Automated Vehicle Strategic Framework, December 2020
<https://mva.maryland.gov/safety/Documents/Maryland-CAV-Strategic-Framework.pdf>