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# MIKE KUGLITSCH

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STATE REPRESENTATIVE • 84<sup>TH</sup> ASSEMBLY DISTRICT

DATE: April 19, 2017  
RE: **Support for 2017 Assembly Bill 191**  
TO: Assembly Committee on Science & Technology  
FROM: Representative Mike Kuglitsch  
SUBJECT: Personal Delivery Devices

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Thank you Mr. Chair and Committee Members for today's hearing on Assembly Bill 191—which will permit the use of personal delivery devices on Wisconsin's sidewalks and crosswalks.

This is my first time testifying in front of the Science and Technology Committee, which is charged with “considering legislation that addresses emergent technologies, technological innovations, and matters related to scientific research.”

This appears to be the correct committee to discuss the pros and cons of autonomous delivery devices designed for the delivery of parcels, groceries, and food to customers within a 15-30 minute delivery radius.

Starship Technologies is transforming the delivery industry with a fleet of personal delivery devices that are roughly the size of a cooler on wheels and holds up to three bags of groceries, or 22 pounds and is monitored by a human being at all times.

Wisconsin has the opportunity to be the first state in the Midwest to open its markets to Personal Delivery Devices, which are already operating in Washington DC, Redwood City, CA and statewide in Virginia, Florida and Idaho.

The support for personal delivery devices has been overwhelming in other states:

Virginia –	Senate = 39-0	House = 92-1
Idaho –	Senate = 34-0 (2 absent)	House = 65-3 (1 absent)
Florida –	Senate = currently being debated	House = 115-0

Assembly Bill 191 will allow the operation of these autonomous delivery vehicles on Wisconsin sidewalks as long as the vehicle weighs less than 80 pounds, travels less than 10 miles per hour, and obeys all the rules pedestrians are subject to.

PDDs use a proprietary mapping, navigation and obstacle avoiding software that defers to pedestrians through the use of nine cameras, a sensor suite and a remote operator.

Wisconsin may seem an odd choice due to harsh winters, but it's because of the snow and ice that Starship is prioritizing Wisconsin. If Personal Delivery Devices function capably during wintertime, Starship can introduce the robots anywhere in the United States.

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The devices will reduce theft of delivered packages by locking merchandise in the PDD and opening only when the recipient unlocks the device using their phone.

PDDs will improve accessibility of food and goods to individuals with mobility issues, including seniors, and persons with disabilities.

Starship predicts increased efficiency of parcel delivery services from the current average of 120 packages per day to as many as 400 packages per day through the use of PDDs.

AB 191 will identify Wisconsin as a technology leader in the Midwest and will provide a free market solution to the last mile delivery dilemma, which accounts for 20-40% of delivery costs using vehicles and drivers.

Please support AB 191 and I am happy to answer any questions you may have. Thank you for your time.

(over)



# CHRIS KAPENGA

WISCONSIN STATE SENATOR

**Testimony on Assembly Bill 191**  
*Assembly Committee on Science and Technology*  
April 19, 2017

Thank you, Chairman Quinn and committee members, for holding a hearing today on Assembly Bill 191. Thank you also Representative Kuglitsch for co-authoring the bill and appearing to testify.

The entrepreneurs who own and operate small businesses in Wisconsin are major drivers of our state's economy. This bill enables our Wisconsin entrepreneurs to employ an innovative solution to one of the most expensive portions of the product supply chain, while also identifying Wisconsin as the technology leader of the Midwest.

The "last mile" of delivery services poses the largest hurdle to supply chains. The closer to its destination a product moves, the more challenges are presented and the more rapidly costs accumulate. Personal Delivery Devices (PDD's) present an innovative and cost-effective solution to the last mile dilemma. This bill enables entrepreneurs to utilize PDD's in Wisconsin to expand their delivery reach while cutting down on the costliest component of delivery.

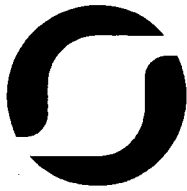
I will let the experts explain the technical details of these devices. Briefly though, PDD's are 99% autonomous devices that operate on sidewalks and crosswalks, have a 2-3 mile range, weigh less than 80 pounds, and move no faster than 10 mph. Human operators oversee the movements of each PDD and retain the ability to take control of the device at any time.

While the uses for PDD's are extensive, today entrepreneurs cannot utilize this technology. This bill provides access to the technology by authorizing PDD's to operate on sidewalks and crosswalks and by establishing standards of accountability and liability. Without this bill, Wisconsin entrepreneurs will continue to be unable to utilize this technology.

In areas across the nation, PDD's have begun to prove their worth. Pilot programs in Redwood, California and Washington, D.C., have proven their reliability and capability of navigating busy sidewalks without incident. In statehouses, authorization of PDD's have received near-unanimous support. In Virginia, authorizing legislation passed 39-0 in the Senate and 92-1 in the House, and in Idaho, the vote was 34-0 in the Senate and 65-3 in the House.

In conclusion, this bill enables entrepreneurs to utilize a forward thinking technology in the form of PDD's, and it establishes accountability for their use; all while identifying Wisconsin as the technology leader of the Midwest.

Thank you, Mr. Chairman and committee members, for your time and consideration of this bill.



**STARSHIP**

## **STARSHIP TECHNOLOGIES**

### **Frequently Asked Questions (“FAQ”)**

**1. What are the benefits of Starship Technologies’ Personal Delivery Devices (“PDD”)?**

PDDs will revolutionize the local delivery of products for businesses and consumers. Rather than relying on car-based shopping trips or delivery trucks, PDDs offer the promise of low-cost *and* convenient delivery – all while using less energy and emitting zero CO<sub>2</sub>.

Moreover, for many consumers who are transit dependent, non-ambulatory or live in neighborhoods with limited shopping choices, PDDs represent a new and cost-effective option.

**2. How will a potential customer obtain services from a PDD?**

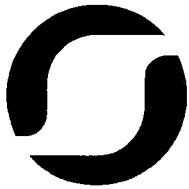
The process is very simple. Customers will order their items using the existing websites of their preferred restaurants, retailers, and parcel delivery companies. For participating businesses, “Starship Delivery” will be offered in the checkout area of the websites. If the customer selects “Starship Delivery” as an option, they will be notified through the Starship mobile app when their parcel is ready for delivery. The customer will then choose an exact time for delivery, and can track the movement of the PDD through Starship’s mobile app. Once the PDD arrives at its destination, the customer is notified. The customer can then retrieve their parcel by unlocking the lid of the PDD by pressing the unique ‘unlock’ button on the Starship mobile app.

**3. What types of items will a PDD deliver?**

Starship’s PDD technology has many possible applications including: (1) restaurant delivery, (2) grocery and retail delivery, and (3) parcel delivery. The nature of our partner’s business will dictate the usage of the PDDs.

**4. Are the PDDs safe for pedestrians?**

Absolutely! PDDs are low mass (approx. 50 lbs. without cargo), low speed (4 mph) devices that travel on sidewalks, using proprietary mapping, navigation and sophisticated obstacle



## **STARSHIP**

avoidance technology. PDDs are equipped with nine cameras, a sensor suite, and are constantly monitored by a remote operator. PDDs are capable of identifying objects within 15 feet of their vicinity and making the necessary course corrections to avoid the object. When an object is adjacent to the PDD, but not in front of it, the PDD reduces its speed. When an object is in front of the PDD, the PDD will come to a complete stop.

Starship's PDDs have now travelled nearly 25,000 miles in 16 countries and 59 cities, encountering over 4.2 million people.

**5. Do Starship's PDDs ever exceed 4 mph?**

No.

**6. How will Starship Technologies prevent PDDs from being used for unauthorized purposes and/or from being vandalized?**

The cargo bay of each PDD is locked and secured during transport. Only individuals, who are known to the company, will be able to receive, open, and return PDDs with the use of their mobile technology. As mentioned above, PDDs are constantly monitored and equipped with nine cameras and two-way audio communication systems. Any improper conduct will be detected immediately.

Moreover, because consumers will decide when to have their packages delivered, PDDs will substantially reduce incidents of stolen packages. According to a December 2015 study by insuranceQuotes.com, an astounding 23 million Americans have had packages stolen from their homes following a traditional delivery.

**7. Will PDD deliveries be affordable?**

Once fully scaled, the company expects PDD deliveries to cost the consumer less than \$1 per delivery, which is a fraction of the cost of alternatives.



## **STARSHIP**

### **8. How does Starship protect customer information and the privacy of the general public?**

Starship never shares customer information and does not store such information on its PDDs. Although the PDDs are equipped with 9 cameras, Starship minimizes the amount of information that it collects. First, when the PDD is operated by a human operator, the images are transmitted exclusively via a lower resolution feed, which is further obfuscated to conceal individual identities. Second, high resolution images, which are collected while the PDD is in autonomous mode, generally remain on the PDD for a very short duration and are then discarded. There are two exceptions: (i) safety and security, e.g. emergencies, vandalism, etc. and (ii) PDD system improvement, e.g. machine learning. In both instance, the information is transmitted in an encrypted form to Starship, where it resides on a segregated system with restricted employee access. Starship maintains an audit trail of those employees who review these images and the reasons for this review. In all cases, the images stored are brief snapshots and human images are obfuscated, except those involved in safety or security matters.

### **9. What is the anticipated impact of PDDs on existing employment in the delivery business?**

In 2016, online sales in the U.S. totaled \$394.9 billion, a 15.1 percent increase over 2015. At the same time, the demand for package delivery services is growing exponentially. The company anticipates that PDDs will supplement the growing logistics industry and offer additional employment opportunities associated with managing and maintaining the PDDs. In addition, the company expects that most PDD deliveries will simply supplant individual car-based shopping trips and, therefore, have only a positive impact on employment.

### **10. When can a community expect to receive services from PDDs?**

Starship Technologies is currently engaged in commercial delivery pilot programs in the United States, United Kingdom, Germany, Switzerland, and Estonia with partners like Just Eat (food delivery), Hermes (package delivery), Metro Group (retail), Swiss Post (Swiss postal system), Wolt (food delivery), DoorDash (food delivery), Postmates (food delivery), and others offering PDD delivery in the food, grocery, and parcel industries.



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The company is constantly exploring additional opportunities and expects to continue its rapid expansion in jurisdictions with accommodating legal and regulatory frameworks.

**11. Are there other companies engaged in the development and use of personal delivery devices?**

Yes. There are other technology companies developing and deploying ground-based personal delivery devices, including Dispatch and Marble.

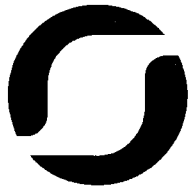
**12. Will the legislation, which is before this legislature, permit competition?**

Yes. Starship's current devices weigh approximately 50 lbs. and travel at approximately 4 mph. The legislation permits any device to operate in our state, provided the device weight less than 80 lbs. and travel at 10 mph or less. These limitations, and those included in the legislation, are intended to permit the growth of the technology and at the same time establish minimum safety parameters.

**13. How does Starship prevent the PDDs from being used for improper purposes?**

Starship's PDDs are always under the control of a Starship PDD operator. Starship's PDDs cannot be used without the consent and knowledge of the company. In fact, only businesses, which have a contractual relationship with Starship, will be able to offer PDD services. Importantly, even these businesses have no operational control over the PDDs.

In practice, the following is a description of how Starship maintains control over its PDDs. Initially, Starship enters into a contract with a business partner to locate a certain number of PDDs at the business. The business then offers Starship as a "delivery option" for its customers when the customer "checks out" online. If Starship is selected, the business's employees will load the PDD with the customer's item(s). The PDD will then be dispatched to arrive at the customer's home at the time requested. At all times, the point of origin and destination of the device is known, as are the individual(s) sending and requesting the PDDs, which are locked during transit. Starship's software and PDD operators guide the devices – no one else!



## **STARSHIP**

Individuals will not “own” or “control” their own PDD. As such, individuals will not be able to send the PDD to any destination other than that of Starship’s business partner. In fact, this process is activated automatically after the customer retrieves his or her item(s) from the PDD.

### **14. Where is Starship Technologies currently operating?**

In addition to the UK, Germany, Switzerland and Estonia, Starship Technologies is operating in Washington, DC, Redwood City, California and Fayetteville, Arkansas.

On February 24, 2017, Virginia approved a statute permitting the use of PDDs in the Commonwealth. In addition, on March 24, 2017, the State of Idaho approved a similar statute. Finally, Starship is currently seeking statewide legislative authorization in Florida, Wisconsin, Ohio and Massachusetts.





**STARSHIP**

## **STARSHIP TECHNOLOGIES**

### **Personal Delivery Device – Fact Sheet**

- Starship Technologies is introducing an entirely new personal delivery device (“PDD”), which will transform the “last mile” of local delivery
- The company was launched by Skype co-founders Ahti Heinla and Janus Friis in 2014. The founders have successfully transformed two major industries before – the telecom industry with Skype and the record industry with KaZaA
- Starship’s PDDs:
  - Travel safely on sidewalks, delivering parcels, groceries and food to customers for approximately \$1 in 15-30 minutes
  - Are far cheaper, more efficient and use less energy than current delivery options
  - Permit customers to request deliveries when convenient to them, and track the PDD’s progress using their mobile phone in real time
  - Can carry the equivalent of 3 bags of groceries
  - Have an optimal delivery range of 2-3 miles
  - Are locked and secure during transport. The lid is opened using the customer’s mobile app
  - Operate autonomously up to 99% of the time. However, a remote human operator can assume control at any time
  - Are electrically-powered and emit zero CO<sub>2</sub>
  - Use proprietary mapping, navigation and obstacle avoidance technology
  - Operate from specially built hubs or from local businesses
  - Are low mass (less than 50 lbs. without cargo) and slow speed (4 mph)
  - Can communicate with people using inbuilt speakers and microphones
- Starship Technologies is currently engaged in commercial delivery pilot programs in the United States, United Kingdom, Germany, Switzerland, and Estonia with partners like Just Eat, Hermes, Metro Group, Swiss Post, Wolt, DoorDash, Postmates, and others offering PDD delivery in the food, grocery, and parcel industries
- Starship’s PDDs have now travelled nearly 25,000 miles in 16 countries and 59 cities, encountering over 4.2 million people



## Wisconsin Technology Council

**April 19, 2017**

**TO: Assembly Committee on Science and Technology**

**FROM: Tom Still, president, Wisconsin Technology Council**

**RE: SB 148 Personal Delivery Devices**

The Wisconsin Technology Council wants the state of Wisconsin to be a leader in the testing, development and use of autonomous vehicles of all types. It is a position long held by the Tech Council and reflected in our public events, communications and policy reports in recent years.

One such opportunity is Senate Bill 148, which would authorize the operation of personal delivery vehicles on sidewalks and crosswalks in Wisconsin.

While passage of this bill might seem like a small step toward the day when autonomous vehicles are put into broader use, it's important because it begins the process of familiarizing people with the concept.

Adoption of the bill would underscore that Wisconsin is truly open to new technologies, can be an "early adopter" of such technologies, and help foster the image of a state that is becoming a force in technology jobs and companies.

It would do so without posing a public safety risk, as these vehicles would travel only on sidewalks and crosswalks at speeds of no more than 10 miles per hour.

They can help set apart those small businesses that buy them and become something of a curiosity, even a bit of an attraction, in those cities that approve their use. Who wouldn't be amused to see one of R2D2's distant cousins approaching them on a sidewalk on its way to deliver a pizza?

The bill does not appear to "fence in" any company and shouldn't pose serious enforcement issues – until someone fails to get their sandwich delivered on time.

The real prize, of course, will be legislation or an administrative order to advance the testing, development and use of self-driving vehicles in Wisconsin. Our main hope is that Wisconsin becomes one of a relative handful of states where autonomous vehicle innovation is advancing without regard to a particular technology, design or pre-supposed conditions about what works and what doesn't.

The road to technological innovation is strewn with the wreckage of ideas that were declared "the best" or "irreplaceable" by their inventors, only to be surpassed by better ideas that came along later. Wisconsin should be agnostic as to what types of autonomous vehicle technology will win the race.



## Wisconsin Technology Council

We simply hope part of that race takes place here ... in Wisconsin.

Wisconsin has always been in the driver's seat when it comes to innovation around machines that move on roads, waterways and farm fields.

Wisconsin "firsts" include the steam-powered automobile (1871), the automobile race (1878), the motorcycle (1880s), the gasoline-powered automobile (1889), the steel automobile frame (1899); the gasoline-powered tractor (1901); the four-wheel drive automobile (1908); a commercially successful outboard gasoline engine for boats (1910); the speedometer (1912) and robotic welding for vehicle frames (1963).

A century or more ago, however, there were plenty of people in Wisconsin who cringed at the thought of all those horseless carriages, motorized bicycles and boats buzzing about. And yet, it was precisely that kind of innovation that built a signature part of Wisconsin's modern economy – and which can be repeated today with an aggressive welcome to autonomous vehicles.

Self-driving or autonomous vehicles have been under development for years. They're essentially "smart" vehicles that sense the environment around them and navigate without human input through use of radar, laser technology (Lidar), global positioning systems and other computer visioning. Benefits include lower accident and injury rates, greater energy efficiency, reduced infrastructure investment and improved mobility for people who otherwise can't – or shouldn't – drive.

From buses to farm equipment, and from trucks to passenger cars, virtually every manufacturer is developing self-driving vehicles knowing it's only a matter of time before they become commonplace. The opportunity for Wisconsin exists through several avenues:

- Despite the loss of major auto assembly plants, the state is home to many automotive suppliers and more specialized manufacturers, such as Harley-Davidson, Johnson Controls, Rockwell Automation, ABB, Oshkosh Corp. and Pierce Manufacturing.
- The insurance industry in Wisconsin, with American Family Insurance being a notable example, is already closely monitoring and even investing in the future of connected or autonomous vehicles.
- Wisconsin is a state heavily engaged in trucking, both to move goods and as a home for major carriers. With the trucking industry scrambling to find enough drivers, it may make the move to autonomous vehicles sooner than most. The reasons involve interstate trucking routes and the payback for economic investment.
- Wisconsin researchers already have expertise and skin in the game. The UW-Madison Department of Civil and Environmental Engineering, home to the traffic safety lab, has noted that autonomous vehicles "have significant potential to improve the quality of life and meet the goals of shared prosperity." Those same



## Wisconsin Technology Council

researchers said an open door to autonomous vehicle testing “could bring significant new research opportunities... and new businesses, including startups and tech companies, to Wisconsin.”

- The potential for such vehicles has been hailed by advocates for the elderly and disabled, by Mothers Against Drunk Driving and by many highway safety groups. It could become a tool in the effort to maintain Wisconsin’s road system within budgets.

The release of the new Federal Automated Vehicles Policy in late September makes it clear that Washington will keep a “hands-off” attitude when it comes to telling automakers and others how to proceed with the development of autonomous vehicles.

That’s good news in this sense: Industry and technology will continue to take the lead in developing these vehicles and related systems, not the federal bureaucracy.

It also means state governments can expect latitude to promote innovation around such vehicles and the supporting infrastructure while ensuring driver and public safety.

Today’s hearing is a sign that policymakers in Wisconsin recognize the opportunity presented by the advent of autonomous vehicles. The Tech Council stands ready to assist as this important development unfolds. Let’s start by bringing R2D2 to Wisconsin!

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## **INPUT INTO 2017 ASSEMBLY BILL 191**

Bilge Mutlu, *PhD*

Associate Professor of Computer Science and Industrial Engineering

University of Wisconsin--Madison

[bilge@cs.wisc.edu](mailto:bilge@cs.wisc.edu) | <http://pages.cs.wisc.edu/~bilge>

### **Summary**

The Bill defines Personal Delivery Devices (PDDs) as a new form of electrically powered, autonomous or remotely operated device to be used to transport property on sidewalks and crosswalks and authorizes its use under the outlined rules and regulations. At a high level, the Bill treats PDDs similar to other occupants of sidewalks and crosswalks, including pedestrians and other human-operated carriages, such as bicycles, wheelchairs, strollers, and so on, and requires PDDs to abide by the same rules and expectations. While this approach offers an appropriate framework for the introduction of PDDs into public settings and their operation in these settings, there are a number of open issues that stem from inherent differences between PDDs and other humans/human-operated carriages that require further consideration. Specifically, the role of PDD operator must be more clearly outlined; due consideration must be given to appropriate signaling mechanisms in the design of PDDs; and how PDDs should be operated under exceptions such as emergencies requires further consideration. These points are outlined in greater detail below.

### **Key Points of Consideration**

1. There is lack of clarity on the PDD operator's role. The statement "The device is capable of operating with and without the active control or monitoring by an individual" suggests that the device may be operating without the monitoring of an individual, which the technology permits to a limited extent, although various amendments in the Bill assumes the control or monitoring of an operator. Can the "operator" be a computer program? Or does the operator have to be a human capable of operating the vehicle? The current technology is such that

autonomous operation (requiring no control or monitoring by a human operator and instead involving control by an algorithm) is possible to a great extent (not requiring human intervention 95-99% of the time in controlled, indoor environments), and an operator's assistance is required when autonomous operation is no longer possible (e.g., when an obstacle is encountered or the stretch of the sidewalk ends). The long-term vision for PDDs involves 100% autonomous operation, although when this vision can be realized is not clear and dependent on technological progress. The Bill should more clearly outline the role of human operators in the operation of PDDs.

2. The Bill treats PDDs similar to pedestrians and other human-operated carriages, such as bicycles, wheelchairs, strollers, etc., although these entities implicitly have the appropriate signaling mechanisms for navigation. For example, research shows that eye contact between pedestrians and drivers at a crosswalk is essential for safe and efficient coordination of movement (Guéguen et al., 2015). While legislation that outlines traffic rules and regulations does not discuss or require that humans or human-operated carriages operated on sidewalks or crosswalks have signaling mechanism, they are assumed present as a natural consequence of human operation. This assumption should not be made for PDDs, as they do not have the signaling mechanisms drivers, pedestrians, and operators of other carriages expect to see and use to facilitate coordination. Research on the indoor use of PDDs show that the lack of signaling causes breakdowns in coordination and dissatisfaction among inhabitants of the environment (Mutlu & Forlizzi, 2008). While what kinds of explicit signals might best work for PDDs is currently unknown and should be left to manufacturers to determine, the requirements outlined by the Bill for visibility in the dark could be extended to include appropriate signaling mechanisms to facilitate coordination between PDDs and drivers, pedestrians, or other human-operated carriages.
3. The Bill does not address exceptions, such as coordinating right-of-way with emergency vehicles, disabled PDDs, and negotiating right-of-way with pedestrians or other human-operated carriages. Prior research shows that remotely operated or autonomous vehicles that occupy human environments taking precedence over compromised individuals or emergency situations, such as a delivery device functioning in a hospital taking precedence over a patient carried on a gurney, results in organizational conflict and dissatisfaction among the occupants of the environment (Mutlu and Forlizzi, 2008). Treating PDDs as

similar to pedestrians and other human-operated carriages makes the assumption that PDDs will have equal right-of-way privileges as these entities, and prior research highlights the need for arbitration between PDDs and humans or human-operated carriages under compromised circumstances. Additionally, the capacity of PDDs or their operators to recognize compromised situations, such as a blind pedestrian navigating with a cane or an emergency vehicle approaching a crosswalk, may be limited due to technical or practical limitations. Similarly, the Bill does not outline what PDD operators or other stakeholders must do if a PDD is disabled, for example while crossing a crosswalk, due to technical issues or acts of vandalism, in a way that compromises safety or efficient movement in the environment. Due consideration must be given to such compromised situations.

## REFERENCES

- Mutlu, B., & Forlizzi, J. (2008, March). Robots in organizations: the role of workflow, social, and environmental factors in human-robot interaction. In *Proceedings of the 2008 3rd ACM/IEEE International Conference on Human-Robot Interaction (HRI'08)* (pp. 287–294).
- Guéguen, N., Meineri, S., & Eyssartier, C. (2015). A pedestrian's stare and drivers' stopping behavior: A field experiment at the pedestrian crossing. *Safety science*, 75, 87–89.