

DISRUPTER SERIES: DELIVERING TO CONSUMERS

HEARING

BEFORE THE

SUBCOMMITTEE ON DIGITAL COMMERCE AND
CONSUMER PROTECTION

OF THE

COMMITTEE ON ENERGY AND
COMMERCE

HOUSE OF REPRESENTATIVES

ONE HUNDRED FIFTEENTH CONGRESS

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DISRUPTER SERIES: DELIVERING TO CONSUMERS

TUESDAY, MAY 23, 2017

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON DIGITAL COMMERCE AND CONSUMER
PROTECTION,
COMMITTEE ON ENERGY AND COMMERCE,
Washington, DC.

The subcommittee met, pursuant to call, at 10:15 a.m., in room 2322 Rayburn House Office Building, Hon. Robert Latta (chairman of the subcommittee) presiding.

Members present: Representatives Latta, Harper, Lance, Guthrie, McKinley, Kinzinger, Bilirakis, Bucshon, Mullin, Walters, Costello, Schakowsky, Cárdenas, Dingell, Matsui, Welch, Kennedy, Green, and Pallone (ex officio).

Staff present: Mike Bloomquist, Deputy Staff Director; Blair Ellis, Digital Coordinator/Press Secretary; Melissa Froelich, Counsel, Digital Commerce and Consumer Protection; Adam Fromm, Director of Outreach and Coalitions; Giulia Giannangeli, Legislative Clerk, Digital Commerce and Consumer Protection/Communications and Technology; Bijan Koohmaraie, Counsel, Digital Commerce and Consumer Protection; Paul Nagle, Chief Counsel, Digital Commerce and Consumer Protection; Madeline Vey, Policy Coordinator, Digital Commerce and Consumer Protection; Everett Winnick, Director of Information Technology; Michelle Ash, Minority Chief Counsel, Digital Commerce and Consumer Protection; Jeff Carroll, Minority Staff Director; Lisa Goldman, Minority Counsel; Caroline Paris-Behr, Minority Policy Analyst; and Matt Schumacher, Minority Press Assistant.

OPENING STATEMENT OF HON. ROBERT E. LATTA, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF OHIO

Mr. LATTA. Well, good morning. I would like to call the Subcommittee on Digital Commerce and Consumer Protection to order, and the chair now recognizes himself for 5 minutes for an opening statement.

Good morning, and welcome again to the Digital Commerce and Consumer Protection Subcommittee hearing. Today's hearing is a continuation of our Disrupter Series in which our subcommittee explores emerging technology and all the ways innovation is reshaping industries. The focus of our hearing this morning is product and package delivery, and I am excited to learn about the new, innovative ways businesses are interacting with consumers and how

technology is being leveraged to deliver goods quickly and safely to consumers.

The U.S. e-commerce market is projected to reach \$500 billion by 2018 and is expected to see substantial growth by 2020. When we think of e-commerce rarely do we consider its physical footprint, the process of actually fulfilling the online order, and facilitating its delivery. However, my home State of Ohio has become somewhat of an e-commerce hub. Ohio offers favorable geographic location, a workable transportation network, a business-friendly regulatory framework, and skilled laborers. Because of these key items, Ohio is home to roughly 760 warehouse establishments including many e-commerce fulfillment operations.

In today's digital, on-demand economy, consumers have come to expect flexibility and quick delivery. In fact, a 2016 survey indicates that same-day delivery is a priority for consumers and that consumers want to have options for where their deliveries go, whether that be through their office or some other personalized pickup point. Technologies such as drones and other automated couriers offer innovative approaches to meeting these demands. For example, drones allow fast and efficient delivery because they have the ability to traverse difficult terrain, fly over bodies of water, and avoid the natural traffic congestion that slows traditional delivery.

I look forward to hearing more about the use of drones and other automated delivery systems from our witnesses today and how such technological advancements are being used to meet consumer demands and what the safety issues are. I also look forward to exploring how we as policymakers can promote innovation and address any regulatory barriers.

Again I want to thank our witnesses for being with us today as we have this discussion today. And I have a couple minutes left and I recognize the vice chairman from Mississippi.

[The prepared statement of Mr. Latta follows:]

PREPARED STATEMENT OF HON. ROBERT E. LATTA

Good morning and welcome to the Digital Commerce and Consumer Protection subcommittee hearing. Today's hearing is a continuation of the Disrupter Series in which our subcommittee explores emerging technology and all the ways innovation is reshaping industries. The focus of our hearing this morning is product and package delivery. I am excited to learn about some of the new innovative ways businesses are interacting with consumers and how technology is being leveraged to create faster, cheaper and more flexible delivery options.

The U.S. e-commerce market is projected to reach \$500 billion by 2018 and is expected to see substantial growth by 2020. When we think of e-commerce rarely do we consider its physical footprint- the process of actually fulfilling the online order and facilitating its delivery. However, my home state of Ohio has become somewhat of an e-commerce hub. Ohio offers favorable geographic location, a workable transportation network, a business friendly regulatory framework and skilled laborers. Because of these key items, Ohio is home to roughly 760¹ warehouse establishments, including e-commerce fulfillment operations for Amazon, J.C. Penny, Home Depot and many more.

In today's digital, on-demand economy, consumers have come to expect flexibility and quick delivery. In fact, a 2016 survey indicates that same-day delivery is a priority for consumers and that consumers want to have options for where their deliveries go- whether that be their office or some other personalized pickup point. Technology, such as drones and other automated couriers, offer innovative approaches to meeting these demands. For example, drones allow fast and efficient delivery be-

¹<http://www.cnbc.com/2016/04/08/this-is-why-ohio-is-becoming-the-e-commerce-capital.html>

cause they have the ability to traverse difficult terrain, fly over bodies of water and avoid the natural traffic congestion that slows traditional delivery.

I look forward to hearing more about the use of drones and other automated delivery systems from our witnesses today and how such technological advancements are being used to meet consumer demands. I also look forward to exploring how we, as policymakers, can promote innovation and address any regulatory barriers. Thank you all for joining us today for this important discussion.

Mr. HARPER. Thank you, Mr. Chairman, for calling today's hearing, the latest in the subcommittee's Disrupter Series, to examine the development and implementation of innovative delivery services for businesses and consumers. One aspect we will focus on is the potential commercial application of product delivery systems via unmanned aerial aircraft systems, also referred to as UAS or drones, and how to ensure the safe integration of these services into the national airspace system.

In May of 2015, Mississippi State University, which is in my congressional district, and the Alliance for Systems Safety of Unmanned Aircraft Systems through Research Excellence, or ASSURE for short, was selected by the Federal Aviation Administration to be the lead for the National Center of Excellence for Unmanned Aircraft Systems.

Mississippi State University's ASSURE is a consortium of academic institutions along with government and industry partners tasked with identifying and researching issues critical to the safe integration of UAS into the national airspace system, and developing policy recommendations on the expanding use of unmanned aircraft.

Although only 2 years old, ASSURE's UAS research is already influencing the FAA's thoughts regarding small UAS flight operation over people and property. Additionally, ASSURE is engaged in an aggressive research program to support beyond visual line of sight operations. Safety concerns regarding flights over populated areas and beyond visual line of sight must be resolved before safe and routine UAS delivery services are part of our daily lives. And a successful business case can be made after that for continued investment in this innovative idea.

The ASSURE UAS air to ground collision study released in April is challenging previous perceptions regarding human injury in the event of a small UAS impact. This project will be continuing as a second phase starting in June, testing numerous types of UAS and increasing the human impact component of the research. I think it is crucial that we continue that.

I am pleased to have this hearing and look forward to hearing what the witnesses have to say, and with that I yield back.

Mr. LATTA. Thank you very much. The gentleman yields back. I yield back the balance of my time, and the chair now recognizes for her opening statement the gentlelady from Illinois, the ranking member of the subcommittee.

OPENING STATEMENT OF HON. JANICE D. SCHAKOWSKY, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF ILLINOIS

Ms. SCHAKOWSKY. Thank you, Mr. Chairman. Many consumers today like to have their purchases delivered directly to their homes. The rise in online shopping and mobile purchases has meant more

business for the post office delivery workers, couriers, truckers, and anyone else involved in moving goods from the warehouse to the doorstep.

Given the rise in home delivery, it is no surprise that companies are involved in this space. Today we will hear about a few of those innovations, specifically drones and delivery robots. I have no shortage of basic questions about the technologies.

How does the delivery robot know when to cross the street? How worried should I be about these things running into me? One of my staffers saw this cooler-looking object with a flag on it next to him, and it startled him, on the sidewalk. And researchers and firms will continue to work through technological challenges as they work to improve automation. Meanwhile, Congress needs to work through the policy changes that technologies like this represent.

This is yet another hearing in our Disrupter Series, and disruption can be good or bad depending on how you like the current system and what it is being replaced with. In past hearings we have weighed concerns about safety, privacy, and other protections. One topic that I don't think we hit on enough is the impact on our workforce.

It is a simple reality disruptive technologies like automation will disrupt some American livelihoods. How would we adjust if in a few years we no longer need delivery workers? This is not a hypothetical question. Today there are many workers without college degrees who used to have good jobs with decent income but now struggle with long periods of unemployment and lower earning potential. The American economy as a whole might be growing, but Americans in certain sectors feel like they are falling further and further behind.

How do we address this? Clearly, blocking the adoption of new technology cannot be a long-term strategy or solution. We need to look carefully at our education system. Are today's students acquiring skills that will be still useful as automation progresses? For Americans currently in the workforce, how do we assist worker when their existing skills fit fewer and fewer available jobs?

We need a robust system of assistance and job training to ensure that Americans can maintain a decent standard of living. We must also ensure that protections keep up with new technology. Old safeguards don't go out the window when a new technology appears. Workers deserve dignity whether they work in conventional delivery or work on automated delivery systems. That means fair wages, a safe workplace, and the right to collective bargaining.

Consumers need assurances of privacy, safety, and fairness whether they are buying a product in a store and ordering home delivery by a drone or via mobile app. The challenge of adapting to technological changes is by no means unique to the delivery sector, but automation and delivery advances, I believe now is the time to wrestle with difficult policy questions. As the Subcommittee on Digital Commerce and Consumer Protection, our job is not to just marvel at cool new stuff, though it can be fun to see what is being developed, we must get beyond the novelty factor and determine the real policy issues at play and legislate accordingly.

I look forward to hearing our witnesses' perspectives on development and consumer delivery. I hope that you can provide some in-

sight as we determine how federal policy keeps up with the latest technology, and I yield back.

Mr. LATTI. Thank you very much. The gentlelady yields back. The chairman of the full committee, the gentleman from Oregon, will not be making an opening statement. Is there anyone on our side that would like to claim his time? If not, the chair would then recognize the gentleman from Massachusetts for 5 minutes.

OPENING STATEMENT OF HON. JOSEPH P. KENNEDY, III, A REPRESENTATIVE IN CONGRESS FROM THE COMMONWEALTH OF MASSACHUSETTS

Mr. KENNEDY. Thank you, Mr. Chairman, and I want to thank the ranking member Ms. Schakowsky as well for their continued commitment to this series and for encouraging this conversation. To the witnesses today, I greatly appreciate you taking the time to join us and I hope you will bear with us as we attempt to keep up with the rapid pace with which you innovate. Thank you for being here.

Technology is in its infancy and provides a rare opportunity for bipartisan agreement in supporting its growth and your companies. And with increased funding for our scientists and investments in STEM education, we can ensure that this critical R&D continues and ultimately consumers benefit in ways that we have yet to even imagine. That future is as bright as it is exciting.

But greater AI, machine learning, and automation can bring with it significant dislocation in our labor markets and with that job loss, as with it comes greater social responsibility to those who are left behind. That is part of the conversation that we need to be having in this subcommittee. As Congress defends our small businesses and traditional industries, we need to prepare for a future where drones may replace deliverymen, where computers replace cashiers, where even apps may replace doctors. And that is why we have to extend STEM education into every single school regardless of ZIP Code, why we need to begin investing in workforce programs for all ages, today not tomorrow.

But balancing our proud history and our bright future will require vigilance and engagement at all levels of government and the private sector and I would greatly appreciate hearing from our witnesses about how we prepare our working families for the role in which you view federal policy and helping to strike this balance in encouraging you to innovate and solve challenges that we have yet to even design or yet to imagine, while ensuring that we remain and retain a talented, dedicated, educated workforce that in fact is going to power that growth to begin with.

And with that I would reserve the balance of my time or yield it to the ranking member of the full committee if he is ready for it.

Mr. LATTI. Thank you very much. The ranking member of the full committee is recognized.

OPENING STATEMENT OF HON. FRANK PALLONE, JR., A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW JERSEY

Mr. PALLONE. Thank you, Mr. Chairman. I don't know if I can put this all in, in the time allotted, but if not I will just ask you to include it in the record.

This hearing will explore the new and innovative ways consumers will receive goods in the future and in some cases right now. Today, 2-day delivery of a package is commonplace and now we are seeing on-demand delivery in under an hour. These deliveries are not just being carried out by people, but now also by robots, and in the future drones.

As I have stated at past hearings regarding new technologies, privacy, data security, and cybersecurity must be baked into the devices and the software. We only need to look to the front pages to see that cyber attacks such as Russian hacking have become an everyday occurrence. Creators and manufacturers of internet-connected technology must take responsibility for mitigating this problem.

This committee has had more than ten hearings as part of the Disrupter Series. These hearings have given members a taste of the latest technologies that are changing how our economy works, and this exposure is important. However, I am hoping at today's hearing we can begin to discuss how these disruptions affect the American worker.

While no one is advocating for slowing down innovation and in fact we are continually pushing for more innovation, we should not forget that these new disrupters can bring challenges. As policymakers we should acknowledge that some of the ways industries mechanize and automate can also cause job loss or wage loss, so while the national economy benefits individual workers may suffer.

Disruption is nothing new. While the agriculture sector has become vastly more productive, it now is a smaller percentage of the overall workforce. And as this committee is well aware, the total number of manufacturing jobs has shrunk, in part, due to automation. The automation we are discussing today could, for example, have an impact on truck drivers and delivery services.

Economists have studied long haul truck driver jobs and believe these jobs are at risk as driving becomes more automated. And today, 1.7 million people are employed driving these routes. They are good wage jobs that will be displaced, and this hearing is mostly focused on short distance delivery services, which employs over one million workers, so some of these jobs are surely at risk too.

And finally, I don't want to be an alarmist and in fact I believe we as a society can meet the challenge, but we need to be thinking about the potential job impacts now so we can prepare for the future. We need to revisit whether our education systems are preparing the next generation for the shifting workplace, we need to ensure that retraining programs are effective, and we need to invest more in research and development to ensure that the United States continues to lead the world in innovation.

It is time we try to plan ahead instead of letting ourselves be caught off guard when it is too late. And I yield back.

Mr. Latta. Thank you very much. The gentleman yields back and that will conclude the member opening statements. The chair would like to remind all members that pursuant to the committee rules, all members' opening statements will be made part of the record.

Again I want to thank all of our witnesses for being with us today and taking time to testify before our subcommittee. Today's witnesses will have the opportunity to give opening statements followed by a round of questions from our members.

Our witness panel for today's hearing will include Mr. Bastian Lehmann, founder and CEO of Postmates; Mr. Brian Wynne, president and CEO at Association for Unmanned Vehicle Systems International; Dr. Harry Holzer is a John LaFarge Jr., S.J. Professor of Public Policy at the McCourt School of Public Policy at Georgetown University; and Mr. Shyam Chidamber, Chief Evangelist and Senior Advisor at Flirtey.

We appreciate you all being here with us today. And we will begin the panel discussion today with Mr. Lehmann and you will be recognized for 5 minutes to give your opening statement. And just pull that mic right up to you and thanks for being here with us today.

STATEMENTS OF BASTIAN LEHMANN, FOUNDER AND CEO, POSTMATES; BRIAN WYNNE, PRESIDENT AND CEO, ASSOCIATION FOR UNMANNED VEHICLE SYSTEMS INTERNATIONAL; HARRY J. HOLZER, JOHN LAFARGE, JR., S.J. PROFESSOR OF PUBLIC POLICY, MCCOURT SCHOOL OF PUBLIC POLICY, GEORGETOWN UNIVERSITY; AND, SHYAM CHIDAMBER, CHIEF EVANGELIST AND SENIOR ADVISOR, FLIRTEY

STATEMENT OF BASTIAN LEHMANN

Mr. LEHMANN. Chairman Latta, Ranking Member Schakowsky, and distinguished members of the Subcommittee of Digital Commerce and Consumer Protection, let me begin by stating that our thoughts and prayers are with the people of Manchester in the U.K. this morning.

As a co-founder and CEO of Postmates, we recognize the power of global networks to overcome intolerance and power opportunity, so it is a pleasure to join you and my distinguished co-panelists this morning for a discussion on how cutting edge technologies and innovation are transforming traditional logistics and delivery networks.

While advances made by on-demand platforms has certainly disrupted traditional models of how products and goods move across the country, it is important to start our discussion with an overview of how the nation's leading on-demand logistics provider, Postmates, the company I co-founded just 6 years ago, is disrupting the rate and pace at which commerce is flowing in your own backyards and districts.

When Postmates is described as a leader in on-demand delivery, we quite literally mean that. Through the tap of a button on your phone, the platform enables anyone to get anything from their neighborhoods delivered to their doorsteps in just a couple of minutes. Where some logistics companies try to build a warehouse out-

side of a city and funnel goods into it, we believe in a simple philosophy. Our cities, our towns, our communities, they are our warehouses. They are home to unique talents and creative expertise that craft and curate high quality products, food, and merchandise that power our economies.

We aim to understand the inventory available in each given town, index each of its product offerings, and connect you directly to that experience by having a fleet of couriers, which we refer to as Postmates, deliver this inventory. We allow you to find and order from any restaurant or store in your city.

That means in addition to delivering prepared food, the platform is also empowering everyone from public school teachers ordering supplies to their classrooms to helping families of the elderly ensure groceries or medicines are delivered to their doorsteps. And with over 65,000 active Postmates across 45 major metropolitan markets covering 200 U.S. cities, our platform facilitates more than two million deliveries per month. This year alone we are on track to facilitate \$1 billion worth of total goods sold on the Postmates platform. And since we started the platform, our Postmates have earned over \$300 million in income.

But this is just the beginning. The total sales of food and groceries last year in the United States alone was nearly \$1.4 trillion, but less than 1.5 percent of that was sold online or through cell phones. That includes ourselves, our competitors, even big pizza delivery companies.

With over 10,000 merchants throughout the country from major brands like Chipotle, Apple, and Starbucks to local pharmacies and corner bakeries, Postmates is able to strike both local and national partnerships that continue to power sales throughout local economies. That is the power of Postmates and the on-demand economy. With each delivery we generate critical sales for merchants in the towns each of you represent.

But that story of economic empowerment is also told through the lens of flexibility we offer our fleet of Postmates making each delivery. Currently, an independent contractor-based model provides on-demand platforms like Postmates and the couriers themselves optimal flexibility. By empowering our Postmates to control how and when they offer their service on our platform, we enable students to supplement their income between classes, aspiring entrepreneurs to save capital for new business opportunities, or parents to earn a little extra by completing deliveries after dropping their kids at school or soccer practice. All told, these sales and earnings are broadening the tax base which are being reinvested right back into our communities.

So we started asking ourselves a key question. Can we expand this base of earnings all while continuing to rev the engines of economic impact in your districts? How can we do right by our couriers in helping them earn higher incomes, and how can we manage the on-demand logistics in particular dense urban and suburban populations? One such way led us to an experiment with what I like to refer to as sidewalk class robotics.

As pointed out in a recent piece in the Harvard Business Review, executives have to cut through a lot of hype around automation and “leaders need a clear-eyed way to think about how these tech-

nologies will specifically affect their organizations.” The right question isn’t which jobs are going to be replaced, but rather what work will be refined, and how. And this does not need to be a terrifying exercise that evokes imagery of Terminator or a world where an entire labor force gets displaced.

So we started looking at the trend lines to begin with a clear-eyed assessment of our landscape. We have people who use cars, bikes, scooters, motorcycles, or walk to complete a delivery and each have a different strength and suitability for different deliveries.

But we also noticed that in particular dense or crowded clusters of downtown neighborhoods, the distance between popular delivery zones and popular restaurants or stores could often be quite short. While the Postmates platform is ready and equipped to make deliveries, sometimes these short distance stretches aren’t as financially advantageous to our couriers when compared to longer distance deliveries, and tips are often based on the distance traveled.

One way to ensure the continuity of short distance deliveries while reserving our hardworking Postmates for longer distance deliveries has been experiencing with robots. Through partnerships with robotic companies on both the east and west coasts, we have started to be able to measure how robots may be able to optimize delivery times when compared to current numbers. Most importantly, we can focus our fleet of Postmates to complete deliveries that are likely to connect them to incomes at a much higher rate.

Our thesis is then that with both human hand and robotic operators on the ground, commerce can move at even higher rates with more functional ways to make deliveries in each city. In the long term, this could ultimately help drive down the overall costs of delivery as the supply of couriers increases. We at Postmates do not see a role in which robotics will be the ultimately delivery mechanism, instead taking these incremental and responsible steps to test automation without shortchanging our human workforce provides us with three tangible gains.

Mr. LATTA. Pardon me, Mr. Lehmann. If you could just, we are running over right now on your time. If you want to just wrap up real quick we would appreciate that. Thank you.

Mr. LEHMANN. Absolutely. As I said, we don’t believe that just robots will be doing deliveries in the future, but we also agree that if that happens we have to be aware of a future in where we invest into STEM education, where we and Congress should and must work to advance a budget which prioritizes improving STEM teaching, expanding access to rigorous STEM courses, addresses bias for underrepresented students in STEM, and revitalizing apprenticeship programs in this country to skill up workers no matter their age.

[The statement of Mr. Lehmann follows:]

Congressional Testimony of Bastian Lehmann, Co-Founder & CEO of Postmates

U.S. HOUSE OF REPRESENTATIVES
ENERGY & COMMERCE COMMITTEE
SUBCOMMITTEE ON DIGITAL COMMERCE & CONSUMER PROTECTION
“DISRUPTING DELIVERY: AUTOMATION & ON-DEMAND PLATFORMS”
WRITTEN TESTIMONY OF POSTMATES CO-FOUNDER & CEO, BASTIAN LEHMANN

Chairman Latta, Ranking Member Schakowsky, And distinguished Members of the Subcommittee of Digital Commerce and Consumer Protection

As the Co-Founder and CEO of Postmates, it is a pleasure to join you and my distinguished co-panelists this morning for a discussion on how the landscape of traditional logistics and delivery networks are being transformed by cutting edge technologies and innovation.

While advances made by on-demand platforms have certainly “disrupted” traditional delivery models of how products and goods move across the country—it is important to start our discussion with an overview of how the nation’s premiere on-demand logistics provider—Postmates—is disrupting the rate and pace at which commerce is flowing in your own backyards and districts.

I. BACKGROUND & SCENE SETTING OF THE COMPANY

When Postmates is described as a leader in on-demand delivery – we quite literally mean that through the tap of a button on your phone – the platform enables anyone to get anything from their neighborhoods, delivered to their doorsteps within minutes.

While some logistics companies try to build a warehouse outside of a city and funnel goods into it – we believe in a simple philosophy our cities and our communities are our warehouses. They are home to the unique talents and creative expertise that craft and curate high-quality products and foods.

We aim to understand the inventory available in each given town, index each of its product offerings, and connect you directly to that local experience by having a fleet of couriers—which we refer to as *Postmates*—deliver this inventory.

Postmates allows you to find and order from *any* restaurant or store in the city. That means in addition to delivering prepared food – the platform is also empowering everyone from public school teachers ordering supplies to their classrooms, to helping families of the elderly ensure groceries or medicines are delivered to their doorstep.

And with more than **65,000** active Postmates, across **44** major metropolitan markets covering **300** U.S. cities, our platform facilitates more than **2 million** deliveries per month. This year alone

Congressional Testimony of Bastian Lehmann, Co-Founder & CEO of Postmates

we are on track to facilitate approximately **\$1 billion dollars** worth of total goods sold on the Postmates platform.

And since we first started the platform, our *Postmates* have earned over **\$300 million in income**. But that is just the beginning.

The total sales of food and groceries last year alone in the United States was nearly **\$1.4 trillion dollars**. But **less than 1.5%** of that was sold online. That includes ourselves, our competitors, even big pizza delivery companies. That means the opportunities to power local, on-demand logistics focused on fast deliveries from any type of merchant at scale are tremendous.

And with over **10,000 merchant partners** throughout the country – from major brands like Chipotle, Apple & Starbucks; to local pharmacies & corner bakeries – Postmates can strike both local and national partnerships that continue to power sales throughout local economies.

That's the power of Postmates and the on-demand economy. With each delivery we generate critical sales for merchants in the towns each of you represent; we put more time back in the ever-busy lives of our customers; and we build new bridges across vast metropolitan geographies by connecting the offerings of one neighborhood with another.

But that story of economic empowerment is also told through the lens of the flexibility we offer our fleet of Postmates making each delivery. Currently an independent contractor based model, provides on-demand platforms like Postmates and the couriers themselves optimal flexibility. These flexibilities not only improve economic outcomes for individuals and towns, but as a company, we ensure that they have the tools, resources, service support they need to get the job done efficiently. By offering supplemental insurance protections for incidents; to the ability to deduct a higher number of work related expenses on one's taxes while also working a separate full time job—Postmates is committed to investing in the success and growth of this network by retaining clear flexibilities for the Postmates on our platform.

Our Postmates can work how they want, when they want, which makes it possible to match supply & demand during the extremely busy peak times in our business. Through this model we enable students to supplement their income between classes, aspiring entrepreneurs to save capital for new business opportunities, or parents to earn a little extra by completing deliveries after dropping their kids at school or soccer practice.

All told, these sales and earnings are broadening the tax base which are being reinvested right back into our communities.

II. THE CASE FOR ROBOTICS IN THE POSTMATES SUPPLY CHAIN

So we started asking ourselves a key question. How can we expand this base of earnings, to continue revving our engines of economic impact in your districts? How can we do right by our couriers, in helping them reach even higher wages? All the while, how can we ensure merchants can keep expanding the base of sales? And how can we manage the demand logistics in particularly dense urban & suburban populations?

Congressional Testimony of Bastian Lehmann, Co-Founder & CEO of Postmates

One such way lead us to a grand experiment – with what we like to refer to as “sidewalk class” robotics. As pointed out in a recent piece in the Harvard Business Review, executives have to cut through a lot of hype around automation.

Leaders need a clear-eyed way to think about how these technologies will specifically affect their organizations. The right question isn't which jobs are going to be replaced, but rather, what work will be redefined, and how?

And this not need be a terrifying exercise that evokes imagery of the Terminator or a world in which an entire labor force gets displaced. So we started looking at the trend lines, to start with a clear-eyed assessment of our landscape. We have people who use cars, bikes, scooters, motorcycles or walk to complete a delivery. And each has a different strength and suitability for different deliveries.

But we also noticed that in particularly dense or crowded clusters of downtown neighborhoods – the distance between popular delivery zones and popular restaurants or stores could often be quite short. Often less than a mile or two between busy downtown office-parks, and a popular lunch stop, for example.

While the Postmates platform is ready and equipped to make that delivery, sometimes those short-distance stretches aren't as financially advantageous to a member of our Postmates fleet, when compared to longer distance deliveries—since tips and charges are often based off the distance traveled.

One way to ensure the continuity of short-distance deliveries, while reserving our hard working Postmates for longer-distance deliveries – has been through experimenting with robots.

Through partnerships with robotics companies on both the east and west coast – we have started to be able to measure qualitative and quantitative data, around how robots may be able to achieve delivery times when compared to current numbers.

Most importantly we can focus our fleet of Postmates to complete deliveries that are likely to connect them to incomes at a **much higher rate**. This also means that businesses -- located in those downtown clusters, are still able to push goods. And aren't discriminated against simply because them happen to be within those short-mile radiuses.

Our thesis then, is that since both human hands, and robotic operators now on the ground, commerce across a given town is able to move at even higher rates, with more functional ways to make deliveries in a given city. In the long term, this could ultimately help drive down the overall cost of delivery, as the supply of couriers increases.

We at Postmates do not see a world in which robotics would be the ultimately delivery mechanism – instead taking these incremental and responsible steps to test automation provides us with 3 tangible gains: First, a quantitative assessment of whether robotics are able to achieve optimal delivery times. Second, a qualitative understanding of comfort levels and the overall

Congressional Testimony of Bastian Lehmann, Co-Founder & CEO of Postmates

psychology our customers & business partners interacting with these robotics -- and whether that impacts the overall psychology of the experience in any way. And third, a firm set of data -- which for the sake of better understanding the impact of automation -- will be an important bedrock of insights as we weigh scaling robotics efforts within the company, or as a society.

Ultimately, such efforts help society and technology companies explore automated integrations – while deconstructing and then reconfiguring the components which could reveal the sweet spot of human-automation combinations that are more efficient, effective, and impactful.

And while concerns may persist around the use and integration of robotics each of our partner companies take steps to prioritize the safety of their key components. From perceptive, next-generation LiDar camera technologies to ultrasonic sensors to see everything from pets to people around them – the robots travel at a safe speed of approximately 4 miles per hour on busy sidewalks, and can haul just over 40 pounds within a two-mile radius in real world scenarios. Moreover, sidewalk class robots don't fly overhead, minimizing the risk of collisions or payload damage.

A smartphone app unlocks the shiny black lid to access the hollow, insulated holding area, and then automatically locks back into place. And the bot's cameras recognize a lot — including walk signals and traffic lights, crosswalks and stop signs, getting smarter the more they drive, learning more about the sidewalks and traffic patterns of busy streets with every trip they take.

III. THOUGHT LEADERSHIP: AUTOMATION'S IMPACT ON THE SOCIAL FABRIC

Automation is an idea that has inspired science fiction writers and futurists for more than a century. Today we all know that it is no longer fiction, as companies increasingly use robots on production lines or algorithms to optimize their logistics, manage inventory, and carry out other core business functions. The process of automating tasks done by humans has been under way for centuries.

What has perhaps changed is the pace and scope of what can be automated. Even 130 years ago, streets were not yet divided into lanes for traffic, parked cars, pedestrians and bikes, and that the introduction of robots to the streetscape might require a reimagining of the available space, possibly with a designated lane for robots.

It is a prospect that raises more questions than it answers. How will automation transform the workplace? What will be the implications for employment? These are the questions that this Committee and this country are aiming to better understand each day. But I come here from Silicon Valley to deliver a simple message: The only way to determine whether there is a responsible, measured, and incremental way in which automated robotics can be leveraged—to both boost productivity, and enable a workforce to earn even more – is to experiment.

In pursuit of more data, we can build a nuanced body of knowledge around how a particular technology could be complementary to a human function.

Congressional Testimony of Bastian Lehmann, Co-Founder & CEO of Postmates

And that helps zero-in on whether it's possible to deconstruct the "future of work" into discrete & separate elements. And as we stand up to fight the challenges of the 21st century...and seek to bolster U.S. competitiveness when nations around the world are also competing to win the future we have a duty to experiment.

The right level of detail at which to analyze the potential impact of automation is that of individual activities rather than entire occupations. According to a 2017 McKinsey report, citing currently demonstrated technologies, "very few occupations—less than 5 percent—are candidates for full automation. However, almost every occupation has partial automation potential, as a proportion of its activities could be automated. The activities most susceptible to automation are physical ones in highly structured and predictable environments, as well as data collection and processing. But it's not just low-skill, low-wage work that could be automated; middle-skill and high-paying, high-skill occupations, too, have a degree of automation potential. As processes are transformed by the automation of individual activities, people will perform activities that complement the work that machines do, and vice versa."

IV. INVESTING IN STEM TO WIN THE FUTURE

But as we experiment with these transformation, our focus as leaders in both the public and private sector must be on how to invest in the training and STEM education needed to provide workers with the skills they need to keep up with the jobs of tomorrow.

We look forward to a national dialogue around a smart and balanced way to regulate automation. And we applaud states that have been swift to pass legislation enabling us and our peers to operate and test within their hometowns. We even look forward to spirited dialogues around calls for potential tax-structures that could build a pool of capital to invest in worker-retraining efforts.

But all that aside one simple creed must be reflected in the nation, and the budgetary considerations of Congress, moving forward:

To win the future, we must create an all-hands-on-deck approach to science, technology, engineering, and math. We need to make this a priority to train an army of new teachers in these subject areas, and to make sure that all of us as a country are lifting these subjects for the respect that they deserve. And Congress, and the Administration, must work to advance a budget which prioritizes improving STEM teaching and supporting active learning; expanding access to rigorous STEM courses; addressing bias and expanding opportunities for underrepresented students in STEM.

Because as automation and technology tools disrupt logistics or other sectors, we are going to need to deepen the bench of talent that can guide there. To address the complex challenges confronting the world today we must engage all the available brainpower, creativity, and talent in the STEM enterprise. We cannot afford to squander the opportunity.

That's how we ensure this disruption can keep us grounded.

Mr. Latta. Thank you very much. And Mr. Wynne, you are now recognized for 5 minutes for your opening statement. Thanks very much.

STATEMENT OF BRIAN WYNNE

Mr. WYNNE. Chairman Latta, Ranking Member Schakowsky, and members of the subcommittee, thank you very much for the opportunity to participate in today's hearing to discuss innovative delivery systems. I am speaking on behalf of the Association for Unmanned Vehicle Systems International which represents unmanned systems in all domains. Today I will be focusing my remarks on unmanned aircraft systems, or UAS.

From inspecting pipelines to news gathering to mapping flood zones, UAS help us save time, save money, and, most importantly, save lives. It is no wonder why thousands of businesses, small and large, have already embraced this technology and many more are considering integrating it into their future operations, including for delivery.

The FAA implemented the small UAS rule, also known as Part 107, last August. It was the result of years of collaboration between industry and government that established a flexible, risk-based approach to regulating UAS. These regulations have been in effect for more than 8 months and there is strong evidence the commercial UAS market is poised for significant growth. As of this month, there are more than 120,000 UAS registrations with the FAA, the vast majority of which are hobbyists; of those, 62,000 platforms have been registered for commercial use. The FAA expects more than 400,000 UAS could be flying for commercial purposes over the next 5 years, a more than six-fold increase from today.

An economic analysis by AUVSI projects that the expansion of UAS technology will create more than 100,000 jobs and generate more than \$82 billion to the economy in the first decade following full integration into the national airspace. After witnessing the growth of the industry over the last few years, under the right conditions we believe these numbers could go higher.

Many of our members are exploring ways UAS can transport goods such as household items, medical supplies, food, maybe even people in the not-too-distant future. Companies such as Amazon, Google, and UPS are among the major players who hope to eventually launch UAS delivery services. Several companies are already testing the delivery capabilities of UAS both domestically and abroad, including at Mississippi State, sir.

We are at the dawn of a new American renaissance in technology, one that deserves government attention and support. In the past, government invested heavily in physical infrastructure, from the nation's air traffic control system to the Interstate Highway System, which ultimately had a tremendous impact on commerce. The benefits, however, did not stop there. Over time, the safety, security, and efficiency gains we achieved as a nation have vastly outweighed those costs, and the unmanned systems industry will be no different.

We need a new national imperative in unmanned systems that, like the air traffic control system and the Interstate Highway System before it, create greater capacity, reduce road congestion, fulfill

consumer demands, and facilitate the future of commerce. Industry is bringing the technology; government needs to do more to support it and advance innovations such as delivery services.

The vital prerequisite for advancing UAS is an appropriately funded FAA that can meet the IT, employment, and staffing needs required for the future. The FAA needs, first and foremost, to automate its UAS procedures. Automation will also be important beyond Part 107 for more complex operations such as delivery services. Many of its important management tools and processes which facilitate safer and more seamless UAS operations currently operate by manual data input or processing. The FAA also needs more employees who are dedicated to future UAS rulemakings to move us beyond the current regulations.

Industry is not relying on the FAA and government alone to advance UAS. It is currently shouldering many of the R&D costs to spur innovation, finding solutions to make UAS fly higher and further more safely and efficiently. Industry has also been a close partner with government in advancing a UAS traffic management system known as UTM and in developing standards for remotely identifying operators and owners of UAS.

The UAS industry is primed for incredible growth thanks to industry representatives and government regulators nurturing innovation that helps business be competitive in the marketplace. We hope that these efforts can be sustained and that we continue to reach new historic milestones in integrating this technology into the national airspace and pave the way for regular and widespread UAS deliveries.

Thank you again for the opportunity. I look forward to questions from the panel.

[The statement of Mr. Wynne follows:]



**PREPARED STATEMENT OF BRIAN WYNNE
PRESIDENT AND CEO, ASSOCIATION FOR UNMANNED VEHICLE SYSTEMS INTERNATIONAL**

**U.S. House of Representatives
Energy and Commerce Committee
Subcommittee on Digital Commerce and Consumer Protection
“Disrupter Series: Delivering to Consumers”
May 23, 2017**

Chairman Latta, Ranking Member Schakowski, and members of the subcommittee, thank you very much for the opportunity to participate in today’s hearing on unmanned aircraft systems. I’m speaking on behalf of the Association for Unmanned Vehicle Systems International, the world’s largest non-profit organization devoted exclusively to advancing the unmanned systems and robotics community. AUVSI has been the voice of unmanned systems for more than 40 years, and currently we have more than 7,500 members, including many small businesses that support and supply this innovative industry.

Many of our members are exploring ways unmanned systems – whether in the water, on the ground or in the skies – can transport goods such as household items, medical supplies, and food, to even transporting people in the not too distant future. My comments today will focus on unmanned aircraft systems, or UAS, which are increasingly being used by a range of American businesses.

From inspecting pipelines to newsgathering to mapping flood zones, UAS help save time, save money and, most importantly, save lives. It is no wonder why thousands of businesses – small and large – have already embraced this technology, and many more are considering integrating it into their future operations.

When it comes to transporting goods, many companies have been testing the capabilities of UAS both domestically and abroad. Amazon, Google and UPS are among the major players who hope to eventually launch UAS delivery services. Industry and government have already taken several steps in the right direction to open the airspace to commercial UAS. Let me explain.

We now have initial regulations governing civil and commercial UAS operations. On August 29, 2016, the FAA implemented the small UAS rule, also known as Part 107. The rule was the result of years of collaboration between government and industry that established a flexible, risk-based approach to regulating UAS. This new regulatory framework helped reduce many barriers to low-risk civil and commercial UAS operations, allowing businesses and innovators to harness the tremendous potential of UAS and unlock the many economic and societal benefits the technology offers.

The demand for commercial UAS has since exploded. As of this month, there are more than 820,000 UAS registrations with the FAA, the vast majority of which are hobbyists. Of those, about 62,000 platforms have been registered for commercial use. The FAA expects more than 400,000 UAS could be flying for commercial purposes over the next five years—a more than six-fold increase from today.

Part 107 allows anyone who follows the rules to fly for commercial purposes. Generally speaking, operators need to fly under 400 feet, within visual line of sight and only during daylight hours. However, recognizing the need for the rule to be flexible in order to foster innovation, the FAA created a waiver process under Part 107 that allows for expanded types of operations with the approval of the agency.

To date, the FAA has granted more than 800 waivers to Part 107. An AUVSI analysis of the first 300 found that companies in 44 states were already taking advantage of the process. Most of these companies are small businesses with fewer than 10 employees. Many companies are requesting waivers to operate at night, beyond light of sight and over people. High profile use of these waivers includes the most recent Super Bowl halftime show, which featured an aerial light show made possible by Intel's waivers to operate multiple UAS at night. BNSF Railway received a waiver to conduct inspections of its sprawling rail network beyond line of sight.

Part 107 and its waiver process were just the first steps in creating a regulatory framework for full UAS integration. An economic analysis by AUVSI projects that the expansion of UAS technology will create more than 100,000 jobs and generate more than \$82 billion to the economy in the first decade following full integration in to the national airspace. After witnessing the growth of the industry over the last few years and now with Part 107 in place, these figures will likely go higher under the right conditions and once we achieve full integration.

Specifically with regard to delivery, many companies are already testing and discovering the possibilities of UAS. For example:

- A^3, which is the Silicon Valley arm of Airbus, is building an aircraft that “doesn’t need a runway, is self-piloted, and can automatically detect and avoid obstacles and other aircraft. Designed to carry a single passenger or cargo, they are aiming to make it the first certified passenger aircraft without a pilot. Their goal is to fly a full-size prototype before the end of 2017.”¹
- UPS recently tested a drone that launches from the top of a UPS package car, autonomously delivers a package to a home and then returns to the vehicle while the delivery driver continues along the route to make a separate delivery. UPS conducted the test with Workhorse Group, an Ohio-based battery-electric truck and drone developer. Workhorse built the drone and the electric UPS package car used in the test.²
- Amazon Prime Air is a delivery system designed to safely get packages to customers in 30 minutes or less using UAS. Prime Air has great potential to enhance the services Amazon already provides to millions of their customers by providing rapid parcel delivery that will also increase the overall safety and efficiency of the transportation system.

These are, of course, just a handful of cases. And while we’ve seen most excitement around the prospects of UAS deliveries, unmanned systems are also transforming deliveries over water and on the ground. Maersk has tested ship-to-ship deliveries³ in the North Sea, while just a few weeks ago in Dallas at AUVSI’s XPONENTIAL, Intel showcased Loomo Go, an autonomous delivery robot created by Segway Robotics that incorporates Intel’s RealSense camera. The robot can be operated like an actual Segway, but by using RealSense, “Loomo is able to perceive the world around it and operate through it, doing so as part of an overall delivery process to bring humans objects.”⁴

These advancements make it clear that we are at the dawn of a new American renaissance in technology,

¹ <https://vahana.aero/welcome-to-vahana-edfa689f2b75>

² <https://pressroom.ups.com/pressroom/ContentDetailsViewer.page?ConceptType=PressReleases&id=1487687844847-162>

³ <http://www.maersk.com/en/hardware/2016/03/flown-out-by-drone>

⁴ <http://www.geeky-gadgets.com/loomo-go-delivery-robot-15-05-2017/>

one that deserves government attention and support. In the past, government invested heavily in physical infrastructure – from the nation’s air traffic control system to its interstate highway system – which ultimately had a tremendous impact on commerce. The benefits, however, did not stop there. Over time, the safety, security and efficiency gains we achieved as a nation have vastly outweighed the costs, and the unmanned systems industry will be no different.

In the 1930s, the U.S. airline industry experienced significant growth, with the number of annual passengers on U.S. domestic flights more than quadrupling between 1934 and 1939. In order to enhance the safety of the skies and provide the necessary conditions to support the fledgling industry, the Department of Commerce began to operate airway traffic stations – some of the earliest air traffic control facilities – starting in 1936. Congressional funding supported the Department of Commerce and, by 1941, the federal government fully funded and operated the nation’s air traffic control system. As a result of these early investments, today the U.S. airlines generate more than \$160 billion in annual operating revenue, employ nearly 700,000 people and safely transport two million passengers every day.

In the 1950s, President Eisenhower had a vision for more easily moving goods and people across the country. Decades earlier, he had participated in the first transcontinental Army motor convoy, which traveled from Washington, D.C., to San Francisco. It took 62 days. While he was the Supreme Allied Commander during World War II, Eisenhower saw the Autobahn system in Germany and a faster way to transport troops. Later when he was president, Eisenhower championed the Interstate Highway System and, in 1956, Congress authorized \$25 billion for its construction – the largest public works project in American history at the time. In the decades that followed, costs fell sharply across dozens of industries due to easier and cheaper transportation. Today, millions of vehicles on average use this system daily.⁵

Beyond physical infrastructure, government has also made significant investments in technology that has become ubiquitous in our daily lives, from the Global Positioning System (GPS) to the Internet.

These examples illustrate how the government has seized on the opportunity before it to positively impact commerce and our daily lives. Facilitating interstate commerce is the responsibility of the federal government, but these investments didn’t originate solely from a sense of obligation; they came from

⁵ <https://www.fhwa.dot.gov/policyinformation/tables/02.cfm>
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necessity coupled with vision and an embrace of what's possible. Today, we stand at the dawn of another such moment in history. Technology is advancing at lightning speed, especially in the realm of UAS. Our industry stands to create enormous economic value for the country. UAS deliveries are not held back by innovation, imagination or technology, but by a lack of regulatory clarity.

We need a new national imperative in unmanned systems that, like the air traffic control system, and interstate highway system before it, provides the resources to advance and support this growing industry. Industry is bringing the technology; government needs to do more to support it and advance innovations such as delivery services.

A vital prerequisite for advancing UAS is an appropriately-funded FAA that can meet the employment and staffing needs required for the future, including the federal rulemaking processes to achieve full UAS integration. Equally as important, is additional federal investment to update the FAA's IT infrastructure. This will allow them to automate its UAS processes in collaboration with industry in order to meet the growing demand for UAS services and enhance the safety and security of the national airspace.

Of course, the industry is not relying on the FAA and government alone to advance UAS. Industry is currently shouldering many of the research and development costs to spur innovation, finding solutions to make UAS fly higher and farther, more safely and efficiently.

Industry has partnered with government to advance UAS Traffic Management (UTM) concepts, beginning with Low Altitude Authorization and Notification Capability (LAANC). It has also been a partner in helping to develop standards for remotely identifying operators and owners of UAS, building on earlier registration efforts with real-time tracking of UAS operators. AUVSI recently collected papers on remote identification solutions for UAS from industry stakeholders to help the FAA meet its congressional directive under the 2016 FAA reauthorization extension to develop consensus for such standards.

Another key example of collaboration is the Drone Advisory Committee (DAC), of which I am a member. RTCA is the supporting organization for this Federal Advisory Committee and it "was formed to provide an open venue for the FAA and key decision-makers supporting the safe introduction of UAS into the National Airspace System. Members of the committee work in partnership with the FAA to identify and propose actions to the FAA on how best to facilitate the resolution of issues affecting the efficiency and

safety of integrating UAS into the NAS.”⁶ Through its Drone Advisory Subcommittee and three task Groups, the DAC is working on providing consensus-based recommendations to the FAA on roles and responsibilities for federal, state and local governments. It is also working on providing recommendations on access to airspace and short-term FAA funding. These important collaborative measures will continue to be important to the growth and security of the UAS industry.

Industry and government will continue to collaborate on outstanding issues as required to facilitate more complex operations, such as developing a cohesive spectrum strategy. This will require dialogue between industry stakeholders and all federal agencies involved in spectrum, such as the Federal Communications Commission, the National Telecommunications and Information Administration and NASA, and will help ensure that spectrum is available for UAS without inefficiencies or constraints.

The UAS industry is primed for incredible growth, thanks to industry representatives and government regulators nurturing innovation that helps businesses be competitive in the marketplace. We hope that these efforts can be sustained and that we continue to reach new historic milestones in integrating this technology into the national airspace and pave the way for regular and widespread UAS deliveries.

Thank you, again, for the opportunity to speak today. I look forward to answering any questions the committee might have.

⁶ <https://www.rtca.org/content/drone-advisory-committee>

Mr. LATTA. Thank you very much. And Dr. Holzer, you are recognized for 5 minutes.

STATEMENT OF HARRY HOLZER

Mr. HOLZER. Chairman Latta, Ranking Member Schakowsky and committee members, thank you for inviting me today to share my thoughts on the new digital technologies and how they affect the labor market and the economy. I will tell you up front that I know nothing about drones, so I defer completely to my other colleagues at the table. But I know a little bit about labor markets and technology and that is mostly what I will focus on.

So I would like to make five broad points today. Point number 1, employment in trucking, courier services, and warehousing has actually been growing quite rapidly recently and relatively good jobs are being created, all of this because of growing e-commerce. A hundred thousand jobs were created just in the past year in these sectors. I believe that trend will continue for years to come as e-commerce spreads. Since the loss of delivery jobs associated with drones or even autonomous vehicles remains at least somewhat speculative in terms of its timing and magnitudes, I don't expect the employment gains in these sectors to disappear anytime soon.

Point number 2, broadly, disruptive technologies tend to raise our labor market productivity and therefore our living standards. Given how flat productivity growth has been in recent years in the overall economy, the development of technologies that enhance productivity should be welcomed. And I will say very clearly it is difficult if not impossible to have strong earnings growth over time for our workers if productivity growth remains so weak.

Point number 3, periodically we have these panics in the U.S. and elsewhere over mass displacements in unemployment associated with new technologies—remember the Luddites in Britain in the 19th century? But maybe more relevant for us, there was a large automation scare in the U.S. in the late '50s and early '60s because of fear that computers would take everyone's jobs. These fears are almost always overblown.

New jobs are created when automation causes others to disappear, and workers with skills that complement the new technologies actually face a better labor market for their skills. And what are these complementary skills? Of course, technicians and engineers, but almost anyone with creative skills or social and communicative skills, those workers all do better. Of course, some workers are substitutes for technology, not complements; they do worse.

Therefore, point number 4, many millions of workers in the U.S. and especially less educated men have been hurt by digital technologies in the past 4 decades in manufacturing and in other industries as well, either when they are directly displaced by these technologies or because the labor market overall has grown less hospitable to them. Those displaced by technologies often experience lengthy unemployment, and when they become re-employed on average they take jobs with wages 25 percent lower, and that is on average.

But more broadly, the real earnings of men with only high school diplomas or less have stagnated or even fallen over the past 4 decades, again depending on how you measure that and they have fallen behind in real terms relatively of every other major group in the labor force. And in response to these stagnating and declining wages, millions of prime-age men have left the workforce and that is a terrible problem because their disappearance in the workforce hurts themselves, their families and communities, and the U.S. economy overall.

Therefore, point number 5, a range of important policies should be adopted and strengthened to help workers. The ones hurt by the new technologies, help them make adjustments in this new labor market. We need policies to ensure that workers share in whatever productivity growth is generated by these new technologies over time. And I think of those technologies broadly as falling into three buckets.

From my point of view, the most important is education and workforce development in addition to STEM education, other kinds of education in the K-12 years—critical thinking, communication skills, et cetera—but really helping more people get the post-secondary credentials that the labor market finds valuable. We need a lot more help there.

Secondly, I think it is very important to maintain a robust system of unemployment insurance, but perhaps one with some reforms to encourage workers to build new skills and get jobs more rapidly and as soon as possible. I also believe it is important to talk more about wage insurance where displaced workers if they take new jobs at lower wages have part of their wage loss compensated, and we can talk about that.

And finally, the third bucket, we need to ensure that workers share in the productivity gains generated. That includes protections for the right to collectively bargain in the private and public sectors as well as limits on anti-competitive practices by employers such as the growth of noncompete clauses in their contracts with worker, and happy to discuss all of this further. Thank you very much.

[The statement of Mr. Holzer follows:]

Testimony of Harry J. Holzer Before the Subcommittee on Digital Commerce and Consumer Protection, Committee on Energy and Commerce, US House of Representatives – May 23, 2017

Chairman Latta, Ranking Member Schakowsky, and Committee members:

Thank you for inviting me today to share my thoughts on how new digital technologies can affect employment in business delivery services, and on how new digital technologies can affect the labor market more broadly.

I'd like to make the following points:

1. *Employment in trucking, courier services and warehousing has recently been growing quite rapidly, with relatively good jobs being created, because of growing e-commerce. Any potential loss of delivery jobs caused by drone technologies remains very speculative (in terms of its timing and magnitude) and will likely not reverse most of these employment gains.*

Employment in these services has grown by nearly 100,000 jobs over the past year, and average wages in these jobs generally exceed those in general retail.¹ This trend will likely continue for years to come, as e-commerce continues to grow. The development of drone technology to deliver products and its adoption by employers remain very uncertain right now and are unlikely to halt or reverse such growth over the next several years.

2. *More broadly, disruptive technologies tend to raise our labor market productivity and living standards. Given how flat productivity growth has been in recent years, the development of technologies by employers that will enhance productivity should be welcomed.*

As economist Jason Furman (2016) has pointed out, digital technologies that can raise our productivity growth should be welcomed into the workforce. Productivity has been fairly flat for over a decade (Baily and Bosworth, 2015), and it is very difficult to have strong real earnings growth for workers over time if productivity growth remains so weak.²

3. *Historically, the fears of mass displacements and unemployment that might be caused by new technologies in the workplace have almost always been overblown. New jobs are generally created when automation causes others to disappear, and workers whose skills "complement" the new technologies fare better in the job market afterwards (while those for whom the technologies are "substitutes" fare worse).*

Fears of mass worker displacement due to automation are historically associated with the Luddites in 19th century Britain. We have periodically had automation scares in the US as well – such as in the late 1950s and early 1960s. Fears of technologically based offshoring about a decade ago were also

¹ See Mandel (2017). Employment in trucking, courier services and warehousing rose from 2.986 million in April 2016 to 3.080 in April 2017 (Bureau of Labor Statistics, 2016 and 2017).

² Baily and Bosworth show that annual productivity growth since 2005 has averaged only about 1.5 percent, well below our historical average. It is also clear that the real earnings growth of workers tends to be correlated with productivity growth over time. It is possible that our measurement of productivity growth is flawed, leading us to understate it, though it is not clear that such biases now are greater than they have been in earlier decades.

overblown.³ This is true because the magnitudes and speed of such developments are often overstated in advance; and also because, when implemented, a variety of market-based adjustments in jobs occur.

Specifically, new technologies reduce the costs and prices of producing goods and services, thereby raising the real earnings of consumers. In turn, new spending by them creates more jobs. Workers whose skills enable them to “complement” technologies – such as technicians and engineers, as well as those with important creative or social skills – tend to find more employment and higher wages afterwards. In contrast, workers whose skills cause them to be “substitutes” for such technologies – like unskilled assembly line or clerical workers to date – are often hurt. Workers and their employers have incentives to turn more of them into technology “complements.”

4. *Still, many millions of workers – particularly less-educated men – have been hurt by technological change in the past four decades – either because they have been directly displaced from good-paying jobs or the labor market more broadly has become less rewarding to them.*

Those specifically displaced by new technologies often experience a period of lengthy unemployment and lower wages if/when they become reemployed.⁴ But, more broadly, the real earnings of men with high school diplomas or less have stagnated or fallen over the past four decades, and they have certainly fallen relative to every other major group in the labor force. Though economists disagree somewhat on exactly what have been the causes of these earnings declines, most believe that technological change has been a primary cause. And, in response to stagnating or declining wages, millions of prime-age men have left the workforce. This hurts themselves, their families and communities, as well as the US economy overall.⁵

5. *A range of public policies should therefore be adopted and strengthened to help to workers hurt by new technology make adjustments to the new labor market. And policies to ensure that workers share in whatever productivity growth is generated over time are essential as well.*

The most important set of policies to pursue in response to rapid technological change are in education and workforce development, to help workers adjust to new labor market realities. Helping workers attain postsecondary credentials with strong labor market value must be our top goal; giving them a broad skill set that will help them adjust to unanticipated labor demand shifts in the future, as a result of automation and other forces, is a crucial part of that process. Helping displaced workers retrain for new jobs (through “lifelong learning”) is also critical, as are strong labor market information and services to help them find new jobs.⁶

For workers displaced by technology, a robust system of Unemployment Insurance remains critical, though perhaps with some reforms to encourage those out of work to build new skills and regain

³ See, for instance, Blinder (2006).

⁴ Jacobson et al. (1993) show that, workers displaced from jobs who had accumulated some significant tenure (or seniority) on the job lose, on average, about 25% of their earnings when they become reemployed.

⁵ The real wages of men with high school or less education in the US have clearly fallen since 1980 (Holzer and Hlavac, 2012), though measures of compensation (that include the value of health insurance and other benefits) show stagnation rather than clear declines. But, by all measures, their earnings have declined relative to those of every other major demographic group. For a discussion of declining labor force activity among less-educated men see Doar et al. (2017).

⁶ See Holzer (2017).

employment soon. Wage insurance, which replaces some portion of the wages that workers lose when they become reemployed at new jobs, should be expanded.⁷

Finally, policies that help ensure that workers share in whatever productivity gains are generated by new technologies are important as well. These include protections for the right to collectively bargain in the public or private sectors, as well as limits on anticompetitive practices by employers (such as “noncompete clauses” in their contracts with workers).⁸

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⁷ Potential reforms to the Unemployment Insurance system to encourage faster reemployment are discussed by Kugler (2015). The document by the Employment and Training Administration (2009) indicates reforms of Unemployment Insurance that make it easier for workers to also receive Pell grants for higher education and training while being unemployed.

⁸ See Dougherty (2017) for a discussion of “noncompete clauses” and how to they potential wage growth for up to a fifth of US workers.

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Mr. Latta. Well, thank you very much. And Mr. Chidamber, you are recognized for 5 minutes for your opening statement. Thank you very much for being here.

Could you—there we go.

STATEMENT OF SHYAM CHIDAMBER

Mr. CHIDAMBER. All right, let me begin again if I don't mind. Thank you, Chairman Latta. And thank you, members of the committee, to invite me to this hearing. My name is Shyam Chidamber. I am a senior advisor and chief evangelist at Flirtey, a leading drone delivery service company.

In my allotted time I would like to do two things: give you a very brief history of our remarkable company and share with you our perspective on drone technology and where it is going. Flirtey is a startup company that has its roots in Sydney, Australia. In 2013, we began testing textbook delivery at the University of Sydney. Our goal was for students to place the orders using a smart phone app and receive their books within minutes at their current GPS location anywhere on campus.

We are now an American company headquartered in Reno, Nevada. We were chosen by Y-Combinator, the famous Silicon Valley business incubator; have collaborated at NASA; the University of Reno; Virginia Tech; The Johns Hopkins Medical Center. We have been funded by venture capitalists like Menlo Park Venture, Qualcomm Ventures, and several others. About a quarter of our workforce are U.S. veterans and we employ young graduates from engineering schools who want to change the world through innovation.

Over the last 24 months we have achieved several major milestones in U.S. aviation history. Here are a few. In July 2015, we made the first FAA approved drone delivery on U.S. soil. We delivered essential medicines to patients at a free medical clinic in southwestern Virginia in collaboration with NASA Langley, which our CEO Matthew Sweeny referred to as our Kitty Hawk Moment.

In June 2016, we conducted the first Ever Ship to Shore to Ship transport of medical supplies, simulating the applicability of drones to emergency medical situations in the aftermath of a natural disaster. Appropriately enough, this was conducted in Cape May, New Jersey, a few miles from the bullseye of Hurricane Sandy.

I have a short video to play. If we can play that I think you will appreciate the small example.

[Video shown.]

Mr. CHIDAMBER. Hopefully that gives you a little idea.

In 2016, we made the first FAA approved delivery to a suburban home in Reno, Nevada. Partnering with 7-Eleven, we delivered over-the-counter medicine, food, and drinks to wonderstruck customers. Most of all we are delighted that our historic drone delivery in Wise, Virginia, has been recognized by the Smithsonian Air and Space Museum with an exhibit that will be opening soon. We are a genuine American success story.

Most people are no doubt familiar with the military applications of drone technology. But I am here to suggest to you that drones are a game changing commercial and civilian technology, one I be-

lieve can save lives and enhance lifestyles. Let me share two examples.

Imagine an elderly woman who lives by herself homebound during a snowstorm. She finds to her dismay that she just ran out of her insulin medication. The snowstorm has raged all night, her driveway is not clear, and the roads are impassable. She can pull out her cell phone and order her insulin refill from a pharmacy and have it delivered by a Flirtey drone that takes off from the pharmacy, flies using GPS and hovers close to her front stoop and delivers a packet of lifesaving insulin. As Doc says in *Back to the Future*, “Roads? Where we are going we don’t need roads.”

Think of the handyman who fixes roofs for a living. Instead of climbing a rickety ladder placed against a mossy gutter, he pilots a drone over your roof, takes vivid HD pictures that you can both see on an iPad. It is quick, easy, efficient, safe, and more reliable. You have firsthand proof of the damage of your roof, the handyman has to carry less hazard insurance, he can inspect more roofs, and earn more money.

Mr. Latta. Pardon me, if you could also wrap up. We are over about a minute on your time there.

Mr. Chidamber. Sure.

Mr. Latta. Thank you.

Mr. Chidamber. This future has been made possible by simultaneous advances in multiple technologies—GPS, batteries, avionics, materials, smart phones, 3-D printing, just to name a few. The age of fast, efficient, safe, low cost, last mile delivery using drones is at hand. There are some technical challenges in drone design, battery capacity, and safety systems that remain but these are being addressed. It is only a question of time before we solve them.

So we at Flirtey ask you to imagine a future where in the event of a natural disaster like Hurricane Katrina, drones deliver urgent medical supplies, food, and water to those in need. Imagine a future where you can order anything you like online and have it reliably delivered to you within a few minutes if not a few hours. Imagine a future where you can order food and have it delivered directly to your location within minutes. That future is at hand. Thank you.

[The statement of Mr. Chidamber follows:]

**Testimony before the House of Representatives Committee on Energy and
Commerce**

Sub-Committee on Digital Commerce and Consumer Protection

Hearing on “Disruptor Series: Delivering to Consumers”

May 23, 2017, 10:15 AM

Rayburn House Office Building, Room 2322

Written testimony by: Shyam R. Chidamber, Ph.D.

Senior Advisor and Chief Evangelist, Flirtey Inc.

Summary:

Unmanned Aerial Vehicle or “drone” based delivery is a game-changing commercial and consumer technology that is rapidly becoming technologically and economically feasible in the United States.

Flirtey Inc. is a leading drone delivery service that has created many firsts in the use of this technology – in humanitarian relief operations and commercial delivery. The mission of the company is to “save lives and enhance lifestyles.”

Widespread adoption of drone delivery services requires speedier approvals from the Federal Aviation Administration (FAA) using a risk-based approach to granting waivers and permissions. The FAA has made a remarkable job of maintaining the safety of US air space, but needs to move faster to encourage air commerce using drones.

With sensible regulation and co-operation between business and government commercial drone delivery services can create jobs, improve productivity and enhance consumer welfare.

Thank you to the Sub-Committee on Digital Commerce and Consumer Protection to invite me to this hearing. My name is Shyam Chidamber, I am a Senior Advisor at Flirtey –the leading drone delivery service. Our mission is to save lives and change lifestyles by making delivery instant. In my allotted time, I would like to do two things: a) Give a brief history of our remarkable company and b) Share with you our perspective on drone technology and where it is going.

Flirtey is a start-up company that has its roots in Sydney, Australia. In 2013, we began testing textbook delivery at the University of Sydney – our goal was for students to place their orders using a smart phone app and receive it within minutes at their current GPS location on campus.

We are now an American company headquartered in Reno, Nevada. We were chosen by Y-Combinator the famous Silicon Valley business incubator, have collaborated with NASA, the University of Reno, Virginia Tech and The Johns Hopkins Medical Center. We have been funded by venture capitalists – like Menlo Park, Qualcomm Ventures and several others. About a quarter of our current employees are US Veterans and we employ young graduates from engineering schools who want to change the world through innovation. Over the last 24 months we have achieved some major milestones in US Aviation history. Here are a few:

- a) In July 2015 – we made the first FAA approved drone delivery on US soil. We delivered essential medicines to patients at a free medical clinic in South West Virginia in collaboration with NASA Langley, which CEO Matthew Sweeny referred to as our “Kitty Hawk Moment”.
- b) In June 2016, we conducted the first ever Ship to Shore to Ship transport of medical samples – simulating the applicability of drones to emergency medical situations in the aftermath of a natural disaster. Appropriately this was conducted in Cape May, NJ – a few miles from the bull eye of Hurricane Sandy.

- c) Again in 2016 we made the first FAA approved delivery to a suburban home in Reno, Nevada. Partnering with 7 11 we delivered over the counter medicine, food and drinks to wonderstruck customers.

Most of all we are delighted that our historic drone delivery in Wise, Virginia has been recognized by the Smithsonian Air and Space Museum with an exhibit that will be opening soon. We ARE a genuine American success story.

Most people are no doubt familiar with the military applications of drone technology. But I am here to suggest to you that drones are a game changing commercial and civilian technology – one, we believe can save lives and enhance lifestyles. Let me share 2 examples:

Imagine an elderly woman who lives by herself home bound during a snow storm. She finds to her dismay that she just ran out of her insulin medication. The snow storm has raged all night, her driveway is not clear and the roads are impassable. She can pull out her cell phone and order her insulin refill from a pharmacy and have it delivered by a Flirtey drone that takes off from the pharmacy, flies using GPS and hovers close to her front stoop and lowers a packet of live-saving insulin. As Doc says in *Back to the Future* – “Roads? Where we are going, we don’t need roads!”

Think of a handy man who fixes roofs for a living. Instead of climbing a rickety ladder placed against a mossy gutter, he pilots a drone over your roof and takes vivid HD pictures that you can both see on an iPad. Its’s quick, easy, efficient, safe and more reliable. You have first-hand proof of the damage to your roof, the handy man has to carry less hazard insurance, can inspect more roofs and earns more money.

This brings me to the larger point, that drones save lives, increase blue collar productivity, create new jobs, enhance worker and community safety.

This future is being made possible by simultaneous advances in a range of technologies from GPS, batteries, avionics, materials, smart phones and 3-D printing – to name just a few. The age of fast, efficient, safe, low cost last mile delivery using drones is at hand. There are technical challenges in drone design, battery capacity and safety systems that remain. These are being addressed and in it is only a question of time before we solve them.

Simultaneously in order for the economics of delivery to scale several regulatory changes will be required.

Let's take a look at the regulatory question. In the early days of aviation there was no FAA. Then, as a result of the 1956 Grand Canyon mid-air collision, in 1958 we passed the Federal Aviation Act of 1958 (interestingly, the same year as NASA).

Section 102 of The Federal Aviation Act of 1958 states that FAA's responsibility includes "The promotion of safety in air commerce". The FAA has done a very good job in this regard.

However, Section 102 also states that FAA's responsibility includes the encouragement and development of an air-transportation system properly adapted to the present and future needs of the foreign and domestic commerce of the United States. In other words, the "Fostering of Air Commerce"

The FAA has done a great job on safety, but has not kept pace with pace and diffusion of drone technology.

- One interesting quote that came from FAA just a few years ago was "30,000 UAVs will fill the skies in less than 20 years"
- This reminds us of a famous quote, commonly attributed to Thomas Watson, "I think there is world market for maybe 5 computers".
- There are now more than 3 times more registered drones in the US

than aircraft (800,000 registered drones in the US; 260,000 registered aircraft)

- And, over 1 million drones were sold last Christmas in the United States. Almost all of them were manufactured in China. There is a huge risk here that if regulations stifle the emergence of this industry, the market leaders will start elsewhere. If regulations stifled the use of routers in the 1980s, we would have no Silicon Valley today. If regulations stifle the emergence of drone delivery, we may lose our lead in drone delivery technology and the \$ multi-billion business that it is likely to become.

Industry needs 3 things, and they are very simple –

- For FAA to accept risk-based approvals to do drone delivery (i) over populated areas (ii) beyond visual line of sight; and (iii) with multiple drones per pilot.
- Industry has spent millions of dollars on the technology to build the above capabilities. We just need regulators to let them do it safely, sooner.

There is some urgency on this matter – several other countries are moving ahead faster than we are. The FAA has made many, substantial forward-thinking changes and we applaud them for it. We would like to work more closely with them so that we can continue to maintain the safety and security of US airspace while bringing the immense benefits of drone-based delivery services to a wide swathe of American consumers.

Let me close with a story from the 1840s – Michael Faraday – the father of electricity – was giving a public lecture and demonstrating the effects of electric current using a magnet and a coil. After the lecture was over a member of the audience came up to him and asked “Mr. Faraday – what is the practical use of this electricity?” Michael Faraday answered “Sir, may I ask you – what is the practical use of a new born baby?”

We at Flirtey ask you to imagine a future where in the event of a natural

disaster like Hurricane Katrina, drones deliver urgent medical supplies, food and water to those in need. Imagine a future where you can order anything you like online and have it reliably delivered to you within hours. Imagine a future where you can order food and have it delivered directly to your location within minutes. This future is here, if you let it be.

Submitted by:

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Mr. LATTA. Well, thank you very much. And again, thank you to all of our witnesses for your testimony today. We will proceed to the question and answer portion of the hearing. I will begin the questions by recognizing myself for 5 minutes.

And Mr. Wynne, in your testimony you touched on how commercial drones offer societal and economic benefits. Would you please explain the benefits and how commercial drone use provides them?

Mr. WYNNE. Well, we are starting today under Part 107 regulations with largely vertical infrastructure inspections. That is because under the rule we have to keep drones within visual line of sight. That is offering tremendous safety benefits right away in industries such as cell towers, the mobile cellular industry cell tower inspections and wind tower inspections and so forth. People used to climb up on these towers. Now they don't have to. They can execute their jobs with this technology standing on the ground. Lots of different public safety applications for the search and rescue is very large among them, et cetera.

As we get permission to fly having demonstrated the safety of the technology in use in the national airspace system, as we have the ability to fly more complex operations, we will be able to do more things and create even greater value. And that is a progressive process. I think we have picked probably the most challenging and most complex operation of all, delivery of something in a congested airspace in an urban area, for example, but we will get there.

Mr. LATTA. Let me ask you if I can follow up with you, when you are talking about the visual line of sight how far are you talking then that you are in that visual line of sight, the distance?

Mr. WYNNE. Well, with my eyes or yours, sir? It depends on the size of the drone if I am not wearing my glasses.

Mr. LATTA. Or binoculars.

Mr. WYNNE. We have to keep the drones under 400 feet, or 400 feet vertical of whatever it is we are inspecting either laterally or above the structure, so we will call it under 400 feet.

Mr. LATTA. All right. Well, thank you very much.

Mr. Lehmann, if I could turn to you, could you explain how your platform Postmates chooses to complete deliveries? And one of the things, or some of the questions, the technology we talked about a little bit earlier about being able to cross the street when it gets to its delivery point, if you could kind of go into that, explain how that all works and functions?

Mr. LEHMANN. Yes. There we go, sorry for that. First of all, our humans probably do it just like we all do, so they watch the traffic lights. And maybe it is surprising to hear, but the sidewalk class robots do it in a very similar way. They are equipped with sensors, ultrasonic sensors, LiDAR sensors. They can be connected to the smart grid of a city, but by the sensors alone they are able to read traffic lights. They see humans walking on the street, they see other objects, and they behave accordingly. They travel at roughly 4 miles an hour.

Mr. LATTA. And how many do you have out right now that you are testing?

Mr. LEHMANN. There are a few dozen that we are testing with on the east coast and on the west coast, and slightly more on the

west coast. We are partnering, in total, with four companies and we are working on our own solution in-house as well.

Mr. LATTA. Thank you.

Mr. Chidamber, if I can turn to you, in your testimony you mentioned about Flirtey's FFA approved delivery of medicine to a clinic in Virginia. Would you explain again how the medicine delivery for your FAA approved drone was made? Again, was that line of sight or how did you get that to that delivery?

Mr. CHIDAMBER. Yes. We did do the line of sight kind of delivery at Wise, Virginia. It was under controlled conditions obviously. There was complete line of sight during the time of travel. The Flirtey drone took off from Lonesome Pine Airport, which is a small county airport, and the medical camp was in a fairgrounds which is about a mile and a half away. So there is a clear line of sight standing on top of the roof to see the entire flight as it progressed, so there was somebody watching the drone the entire time.

Mr. LATTA. And so as you said it was, you say, about a mile and a half that—

Mr. CHIDAMBER. Yes.

Mr. LATTA. OK, and then also how high did the drone go then?

Mr. CHIDAMBER. It is about 3-400 feet.

Mr. LATTA. Three to four hundred feet.

Mr. CHIDAMBER. Yes, exactly.

Mr. LATTA. Well, thank you very much. And I will yield back the balance of my time and will recognize the gentlelady from Illinois, the ranking member of the subcommittee, for 5 minutes.

Ms. SCHAKOWSKY. Thank you so much. As we have heard from our witnesses today, automated delivery has the potential to create new jobs for some people. For example, it is likely there will be more jobs for people who work in engineering and customer service, and new business opportunities could be created if delivery services become cheaper and faster and more widely accessible.

But with automation as with other shifts in the job market there are winners and losers. So Dr. Holzer, you wrote in your testimony and you said it today that millions of workers have already been hurt by technological change in the past 4 decades. I wonder if you could expand on that a little bit.

Mr. HOLZER. In the last 4 decades we have had two very powerful forces affecting the U.S. labor market, technology as well as globalization. On average, the technology has done more to substitute for less educated workers especially in old fashioned production jobs on assembly lines as well as clerical workers in offices. And since that is a fairly routine kind of work historically done by less educated workers, the machines could do that more efficiently in globalization as well.

But this has been a good period for people that have post-secondary education. As I said before, anyone with communication skills, problem solving skills, et cetera, comes out better in this process. The other thing to remember is that as you suggested all of these technologies lower costs, therefore lower prices to consumers. They have more money to spend. They spend more sometimes in those sectors and elsewhere and new jobs get created that way as well. But there is no guarantee that everybody's wages will go up instead of down. It is usually a mix.

Ms. SCHAKOWSKY. Let me ask you a real-world question. Will workers who have gone to community colleges or universities be affected differently than those who have not? Are we going to have to expand educational opportunities?

Mr. HOLZER. No one knows for sure, but our best guess is that it will because artificial intelligence will enable these machines to do more and more. Not just the routine work on assembly lines, but work that professionals have done, everything from finance and accounting to law and medicine.

So it will likely expand up the ladder. What happens is that we will need to invest more in training people in those complementary skills that the machines don't do. And so in all these sectors there will have to be adjustments made and students will have to invest in different kinds of education than they did in the past.

Ms. SCHAKOWSKY. Let me ask you about geography a little bit. Some experts have pointed out that the benefits of technological change accrue disproportionately on our country's coasts; meanwhile, jobs in rural areas and Middle America are being lost to automation. I am wondering if you have done new research on that.

Mr. HOLZER. I have. I would put it slightly differently. I think that workers in large metropolitan areas, even those internally like Chicago and Cincinnati, have done very well. When they have lost manufacturing jobs or similar, they have often gained in health jobs, education jobs, et cetera. I think it is more in the smaller metro areas and smaller towns—Allentown, Pennsylvania; Dayton, Ohio; places like that—that you haven't seen the new jobs replace the ones that have been lost.

So there we have two choices. Number one, we can help workers relocate from those locations to where the jobs are, but not everybody is going to relocate; and number two, there are things we can probably do to help generate more economic activity in those locations. And I think we should be thinking about some of those kinds of strategies.

Ms. SCHAKOWSKY. Well, that is really where I wanted to go. How can we help assure that new opportunities are created by automation and that they are accessible to all workers across the country?

Mr. HOLZER. So as I indicated in my comments I see three broad strategies here essentially: education, unemployment insurance/wage insurance, and also making sure the workers share. When you are talking about these smaller towns in rural areas internally, jobs aren't there at all. But even here, e-commerce for instance has the potential to bring more jobs to those areas, right. People can do coding and other kinds of e-commerce work even when the physical product and locations aren't there, or warehouses and trucking if these products are going to be delivered to these smaller towns in rural areas at least on the short term.

Before the drones and the autonomous vehicles there can be some new job creation there as well. So I think we need to think creatively about what kinds of jobs can be encouraged in some of these locations and at what kinds of wages, again while we help people have the mobility, some of them, to move to where the job growth is.

Ms. SCHAKOWSKY. Thank you very much. I yield back.

Mr. LATTA. Thank you very much. The gentlelady yields back and the chair now recognizes the gentleman from Mississippi, the vice chairman of the subcommittee, for 5 minutes.

Mr. HARPER. Thank you, Mr. Chairman, and thanks to each of you being here today on this very important and interesting topic.

And Mr. Wynne, it is good to have you back. The last time that you testified during the subcommittee's hearing on the evolving use of drones, we talked about the UAS Center of Excellence, its research, and FAA's road map for integrating UAS in the national airspace system. Following up on that discussion, what areas of research do you believe that the ASSURE program should be focusing on to more rapidly implement routine UAS package delivery system?

Mr. WYNNE. The ASSURE program is very broad in its scope doing a lot of different work that is really important to get to more complex operations. I think that one of the biggest challenges we need to solve is detect and avoid technologies. Pilots today, myself included, if we are not in the clouds, it is our responsibility to see and avoid other aircraft. That is harder to do when you are not on the aircraft.

So we are developing technologies for see and avoid, well clear standards, et cetera, et cetera, all of that work is being led by the Center of Excellence. It is being distributed through some of the best minds in the country and a lot of collaboration going on. So I would choose that as probably one of the seminal technologies that is being developed today.

Mr. HARPER. OK. And obviously those that are flying private aircraft, commercial, they have to know that something is in that space, and then I guess the drones themselves need to be able to realize that they are both in the same zone; is that what you are referring to?

Mr. WYNNE. That is exactly right, sir. We are talking about smalls, today under 55 pounds, small UAS. Ultimately, there will be aircraft of all sizes and there are aircraft of all sizes already that fly in all areas of the airspace. So, there are different kinds of rules above 18,000 feet in Class A airspace than we would need below 400 feet where there is very little traffic.

But the drones themselves need to be able to automatically adjust to one another and they need to be able to adjust to anything not performing in the system, or not participating in the system such as an EMS helicopter or potentially an air applicator for agricultural purposes.

Mr. HARPER. We certainly know that the drone delivery business idea is not just limited to the United States and we have been advised that the ASSURE program has been contacted by other countries asking for information on its research. How important is regulatory, cross-border harmonization to the drone delivery business?

Mr. WYNNE. It is very important. The UTM system, unmanned aircraft system traffic management that ultimately we are developing and I think the United States has, through NASA and the FAA, has been leading on, ICAO, the International Civil Aviation authority or organization in Montreal, recently launched an initiative with NASA. They recognize many member states. The ICAO recognized that they don't want to do this all themselves. So I

think U.S. leadership is going to be critical in getting this done, but clearly there will be contributions from all over the world. This is a global phenomenon, this technology, but I think we are now in a place where we can lead.

Mr. HARPER. Mr. Chidamber, do you see differences between how the United States treats commercial drone delivery and how drone deliveries are treated in other countries, and with that is the U.S. ahead or behind other countries in the drone marketplace?

Mr. CHIDAMBER. On the regulation side, I think the FAA has been slower than their equivalent authorities in other parts of the world. I am thinking particularly of New Zealand where we actually deliver Domino's Pizza in New Zealand, in Auckland, actually. Approvals came faster. It was based on risk assessment. Not just the aircraft, but who is running the aircraft, what controls are there and so on.

So a risk-based analysis of approvals is probably what we would require and I think the FAA is heading in that direction. We would like to see them go faster towards that goal and I think we will get there.

Mr. HARPER. And you think the risk assessment is key to this?

Mr. CHIDAMBER. Absolutely, yes. I think the threat from perhaps a hobbyist is greater than a legitimate operator who is running a business and making deliveries for medicine or pizza or whatever it might be. That person is going to be carrying insurance, it is their brand. They have got to protect all of that.

So a legitimate business which is operating under the confines of the rules of the land are going to be quite cognizant of all of these things and safety is a big issue for them.

Mr. HARPER. Thank you very much. My time has expired. I yield back.

Mr. LATTI. The gentleman yields back. The chair now recognizes the gentleman from Texas for 5 minutes.

Mr. GREEN. Thank you, Mr. Chairman. I didn't know I was coming up that quick. I want to thank both Chairman Latta and Ranking Member Schakowsky for having this hearing today.

Ensuring the safety of our constituents has and will continue to be our top priority. Although automation technology has potential for massive benefits to society including the disabled and elderly, like all groundbreaking technology there are risks to some parts of society that need to be considered and I look forward to talking about this with our experts.

Automated delivery of goods has been talked about as a way to help mitigate the last mile problem, the inefficiency of carrier trucks delivering goods short distances and individual consumers. However, in cities like I represent in Houston, part of which I represent, distance frequently can be quite long. My first question I would like to ask the panel, do you see this affecting the use of automated delivery technology and if so, how? Any response? No?

Mr. LEHMANN. I can take it. From Postmates' perspective we believe that the short range deliveries are what we can conquer first and where we can experiment first with our delivery robots. They are predominantly designed for sidewalks.

Mr. GREEN. OK. Dr. Holzer, in your testimony you talk about how disruptive technology has the potential to affect the labor mar-

ket, especially the trucking and delivery courier industry. I would like to ask the whole panel their thoughts about what industries would be disrupted by this technology and where they see new labor trends developing as a result.

And let me just say, in the Houston area I have watched in the last 4 years Amazon come in and build a huge warehouse near our intercontinental airport because of air transport, but they still have to get those packages out. And how would that disrupt these labor trends? It seems like it would just expand it unless they send out those drones from their warehouse, using Amazon as an example.

Mr. LEHMANN. I think there are two trends that are important to distinguish here. On the one side you have clearly a company like Amazon that gets more sophisticated with their delivery infrastructure and they want to optimize for their hub and spoke model that works very well for them, centralized warehouses, fast delivery from these warehouses into metropolitan areas.

But I believe it is important to recognize and I would like the panel to recognize that there are companies out there that specifically work on providing local retailers with technologies to compete with these sorts of infrastructure. Postmates for example allows local retailers to offer Amazon-like services and deliveries right from their retail stores.

So we are envisioning a role that is a lot more decentralized where you have a thriving local community. It is a different approach than that of Amazon, but we believe in thriving local economies and we believe in a healthy local economy in communities.

Mr. CHIDAMBER. May I add to that?

Mr. GREEN. Yes.

Mr. CHIDAMBER. I completely agree with that statement, because a small business area with a drone delivery capability can compete more effectively with the large chains. So there is a whole competitiveness issue here that new technology brings to small players in the market.

The second point I want to make is about productivity, which I think the good professor on my right hand side said that earlier. Drones particularly can increase blue collar productivity and a roofer, a delivery person can make more deliveries per day doing those sorts of things. Their pay will go up. It is the productivity problem that these things will address and that is the important thing to remember.

Mr. GREEN. OK. Thank you, Mr. Chairman. I will yield back.

Mr. LATTI. Thank you very much. The gentleman yields back and the chair now recognizes the gentleman from New Jersey for 5 minutes.

Mr. LANCE. Thank you very much, Mr. Chairman, and good morning to the distinguished panel.

Mr. Lehmann, you state in your testimony with more than 65,000 active Postmates across 44 metropolitan markets covering 300 U.S. cities, our platform facilitates more than two million deliveries per month. Does that mean you are currently in major cities or are you in rural areas as well?

Mr. LEHMANN. Both. We are in major metropolitan areas. We would consider Los Angeles a major metropolitan area and then we have suburbs that we cover as well. We are in the OC, yes.

Mr. LANCE. Are you located throughout New Jersey, the state I represent in Congress?

Mr. LEHMANN. We are, yes.

Mr. LANCE. Thank you.

To Flirtey, I am interested in your testimony. I was very interested to hear that you conducted the first ever Shore to Ship to Shore transport in New Jersey, and I appreciate your highlighting the significance of the location considering what occurred in 2012 regarding Superstorm Sandy, a devastating event for the region of the country, part of which I represent.

Many lost electricity for between 1 and 2 weeks. Many of the roads were impassable with fallen trees, power lines, and debris. Had this technology been available then, how do you think it would have helped to mitigate the prolonged hardships many in New Jersey and in New York and Connecticut faced?

Mr. CHIDAMBER. Thank you for that question. I think it would have been invaluable if you had drones by the shore which could, the roads were impassable, as you remember, to get to the spot, but there were first responders who were already there. And if there were people who required medical assistance and they required medication of some sort, it would be tough for them to get that medication bussed in or trucked in from somewhere. Similarly, even simple things like potassium permanganate to just keep the water clean or anything like that, those things could have been brought from a boat alongside, the waterway and a drone could have shipped it over.

So a number of things like that would have been possible, so absolutely. I think drones would have been very, very helpful if you had it deployed against Sandy, and I am so sorry that we were not able to do it.

Mr. LANCE. Thank you. Let's hope that this type of natural disaster does not occur again, but obviously natural disasters will occur and we are always interested in advanced technology.

Mr. Lehmann, in your testimony you mentioned sidewalk class robotics. Can you please explain to me at least what you mean by that?

Mr. LEHMANN. Literally it is I would say everything under the size of a refrigerator robot that is driving itself on the sidewalks and streets of a city.

Mr. LANCE. Thank you. This is a fascinating topic and I am sure that as we progress the work of the distinguished members of the panel will lead to greater protection and greater service for the American people. I yield back the balance of my time.

Mr. LATTA. Thank you. The gentleman yields back and the chair now recognizes for 5 minutes the gentleman from Vermont.

Mr. WELCH. Thank you, Mr. Chairman. I thank the panel. I want to ask your thoughts about privacy concerns. With all these drones flying around they have a mission to do, maybe a deliver a package, but they are also capable obviously of collecting data. They are also capable of taking photographs. They are also capable of doing things that some people may regard as an invasion of their personal privacy.

Mr. Wynne, is that at all a concern in your organization?

Mr. WYNNE. Of course, sir. Everyone is in favor of privacy. The organization that I represent worked very, very hard in the NTIA process for civil liberties groups under the initiative from President Obama to discuss privacy to come up with guidelines. Those guidelines are in effect for the industry.

I would say that in terms of delivery, the amount of data that is required just to conduct that operation is probably already, I would say creating opportunities for large chip manufacturers to try and figure out how to process that data. And so collecting additional data that is not related to the mission is probably less of a concern, but all of the companies involved are sensitive to the fact that they need to be focused on whatever it is that they are doing.

Mr. WELCH. So tell me, what do you think should be the heart of guidelines to protect privacy? And this would be from companies that are utilizing drones to be more productive, but also private individuals using drones.

Mr. WYNNE. Well, I think it pertains to the way we collect data in general, and I use, in that process there were many ubiquitous technologies that we are already looking at such as facial readers, license plate readers, facial recognition technology, et cetera, where the question is what are you doing with that data; how is that data stored for what length of time, et cetera, et cetera; how is it protected, so all of those questions pertain.

As it relates to individual use of drones, clearly that is, I think we are focusing on trying to educate people about safe and responsible flight. Responsible flight means you are not annoying people, you are not doing things that are already against the law, or utilizing this technology to break the law that pertain to the use of any other data collection.

Mr. WELCH. OK. Mr. Lehmann, how about you? Do you see privacy as a legitimate concern among the public as to needing some regulation and guidelines that are required of folks using drones for otherwise legitimate purposes?

Mr. LEHMANN. Thank you for the question, Representative Welch. We do not use drones currently, but on the platform, on the Postmates platform itself, we obviously take data privacy very seriously. I can give you an example. The entire communication between you and the Postmate who would do the delivery on his behalf is anonymous. The data, even the phone numbers and the addresses of the addressee, for example, are disguised so that no party can see the other party's private information.

Mr. WELCH. OK. Dr. Holzer, or Mr. Holzer?

Mr. HOLZER. I am sorry, what question?

Mr. WELCH. Well, your thoughts on privacy. That is a concern that a lot of people contact a lot of us about. People like the opportunities that drones can provide, but it also can be an invasion of privacy if done improperly.

Mr. HOLZER. In all honesty I haven't thought a lot about the privacy implications so I will pass on that and defer to my colleagues.

Mr. WELCH. OK.

Mr. CHIDAMBER. Privacy is a legitimate concern. Most people don't want their privacy invaded. Drones and particularly companies like ours which have drone delivery services recognize that completely and regard the information, we keep it only for the pur-

poses of flight planning and those sorts of things and it is completely encrypted. It is just another set of files on a computer which are protected by encryption algorithms and the usual things that go with it.

Mr. WELCH. OK, thank you very much. I yield back.

Mr. LATTA. The gentleman yields back and the chair now recognizes the gentleman from Kentucky for 5 minutes.

Mr. GUTHRIE. Thank you. Thank you, Mr. Chairman, and I thank the witnesses for being here.

There is a recently joined with Congressman Aguilar to form a commercial e-commerce committee or caucus, and our districts are centers for e-commerce. With UPS World Port next to my district, a lot of people in my district are involved in e-commerce. Amazon is a big player in Kentucky as well, among others, so there is lots going on and it is exciting times.

Mr. WYNNE, when we talk about package delivery with unmanned vehicle systems, what areas of the country or where particularly are these being really tested or do you see them working? And there are actually some of them in progress right now and working. Where do you see most of the commercial testing being done and why do you think that is?

Mr. WYNNE. Well, of course there are the test centers that are around the country. I think, really, there are six test centers where some of that is being done. There is a lot of beyond visual line of sight being done in some of the test centers because they are specifically set up to not only conduct those missions, but also to collect the data that we need in order to demonstrate that this can be done safely and effectively.

I think where the initial deliveries will probably occur will be in less risky airspace, less congested airspace. There are some delivery companies already that are doing last mile types of operations out in rural areas that save a little bit of wear and tear on their trucks. So it is not just from a warehouse to a delivery site, it might be from a truck to a delivery site as well.

And again in those instances we might be out in very uncongested airspace where again we are able to learn in that environment and then ultimately bring the data that we have collected to the FAA and demonstrate this can be done in more complex airspace.

Mr. GUTHRIE. That is interesting, because you do think of it being urban or suburban, but you could take it to parts of my district that have a town or a city and deliver out from there to—you are right. There are a lot of miles traveled to get to certain areas of my district that are less populated. I appreciate that.

So Mr. Lehmann, when we think about delivery service do we think of food or product, or we talked about pharmaceuticals. You indicate in your testimony that your platform offers much more than that. Can you explain how your platform has helped everyone from teachers to the elderly?

Mr. LEHMANN. Thank you. It does that on both sides of the platform. I will give you an example. We are delivering each month from roughly 60,000 local merchants throughout the United States. Around 70 percent of the platform is prepared food, but you will find 30 percent of the two million deliveries across a wide range

of retail categories—supermarkets, hardware stores, electronics, so customers really use the Postmates app for a wide range of access to goods.

On the other hand, you have a very vibrant fleet of Postmates. Everyone from an artist—you can be a Postmates in a couple of minutes. If you had a postmates.com/fleet, you can sign up. As long as you pass the background check you are good to go. And that is how we enable additional income in this country.

Mr. GUTHRIE. Well, thank you very much.

And Dr. Holzer, my other role in Congress I am the chairman of the Subcommittee on Higher Ed and Workforce, and it is so interesting some of the things you are talking about. What you see over time is that automation has replaced routine work, but now when I visit companies and move forth they are using automation because they can't find work. So self-ordering at a restaurant—you just see it all the time—unmanned, a lot of trucking companies are interested in unmanned vehicles because they can't find truck drivers.

And in areas that, maybe in restaurants it is lower income, but I know in one area where I am starts in the mid-40s and it is not like you have to go to school 2 years to get a degree. It is a 4- or 5-week truck driving school. So you said the policies need to be adopted on trainings there and that is what we focus on.

What kind of things do we need to get the market working where we have jobs that actually pay pretty well, but we can't get people to get to the retraining to get into the workforce? It is a big question, I know, in 48 seconds.

Mr. HOLZER. OK. I think we need to make our higher ed institutions, and here community colleges are very important, make them more responsive to the labor market. As you know, right now many community colleges, the public institutions, if they get the same subsidy from the state no matter what, they don't really have to worry about the labor market very much.

A lot of states are moving toward making that money more conditional on outcomes. I would like to make them more conditional on employment outcomes of the students there, along with some extra resources to make sure that these institutions for instance can cover the equipment costs, which are very high, and all the support services you need like the career counseling, labor market information, to sort of reduce the gap between those institutions and the jobs.

Of course the other important strategy here is work-based learning like apprenticeship, and I think we can do a lot more to encourage, to help and assist and financially incentivize more employers to create apprenticeships and other modes of work-based learning for workers. But this way you are bringing the labor market and the education closer together.

Mr. GUTHRIE. OK, thank you. My time has expired. I would love to go further, but my time has expired.

Mr. LATTA. Well, thank you very much. The gentleman's time has expired and the chair now recognizes the gentleman from California for 5 minutes.

Mr. CÁRDENAS. OK. Thank you for not taking some of my time away since Mr. Guthrie went over on his time. Thank you, Mr. Chairman.

My first question is for Mr. Wynne. In your prepared statement you cite an economic analysis by AUVSI that projects that the expansion of UAS technology will create more than a hundred thousand jobs—it is good to hear—and generate more than \$82 billion to the economy. Again, good news. Could you describe some of the types of jobs that might be created?

Mr. WYNNE. Well, let's start with the remote pilots. We have certificated 40,000 of those since August of last year. That is probably double the number of manned pilots that we have certificated under Part 61, so we have a lot of people coming to the workforce. Some of them are 4,000-hour pilots from the military. Some of them are people that are straight out of community college that are getting their training through community colleges. So they are out there now flying under Part 107. That is very, very good news.

The design elements of the solutions that are coming to market through the air side alone, although we represent all things unmanned, are just many, many of the different technologies that my colleague from Flirtey mentioned are converging here in a very, very explosive way, a very positively explosively way. So there is engineering of course, but there is an entire market that developed in a cell phone arena that is worth \$4 billion now for cell phone repair.

Imagine that you know with millions of drones what kind of a market we are going to create for drone repair, for example, for more expansive platforms. So there are many, many different jobs out there that will essentially enable this technology solution going forward.

Mr. CÁRDENAS. Thank you. And when it comes to the pilots, how long is the training roughly? What kind of training required for them to be licensed to do this job?

Mr. WYNNE. The only requirement for flying Part 107 today is a knowledge-based test that is administered by the FAA. As a Part 61 pilot and existing pilot, there is a slightly different route that also involved demonstrating a certain amount of knowledge.

What is happening in the marketplace is that groups that are standing up their own training programs to give pilots stick and rudder experience. Some of that is being done in our test centers, for example. Some of our organizations that want to fly over people recognize that there is additional risk associated with that.

It can be done under waiver, in Part 107 under a waiver, but they need to bring people to the table who know what to do in certain circumstances where there is additional risk and how to mitigate that risk, so those training programs are actually being developed based on the operations that are required.

And in some instances, I will take a utility company. That utility company might want to see additional training before they are going to let someone fly near and do inspections of one of their substations, for example. So we are in the process in AUVSI of getting those remote pilots together and looking at how do we develop that process of training pilots.

Mr. CÁRDENAS. OK, thank you. Well, this next question goes to all of you, whoever would like to answer it. Many national infrastructure and transportation technology achievements have been made possible in the past by a government investment, for example, Congress's \$25 billion authorization to construct an Interstate Highway System.

So what is the role of government investment in the advancement of automated technology, any kind of partnership going on? Our university grants, I mean can we take credit for something?

Mr. HOLZER. I will only talk about the employment side.

Mr. CÁRDENAS. OK.

Mr. HOLZER. And all of the jobs that you mentioned will require some new training and the jobs created actually are much broader. And Mr. Wynne talked about the jobs directly associated with this technology, but as prices and costs come down the entire retail sector could expand. And as I said, consumers will have more income to spend so they can spend that economy wide.

So the whole range of jobs will require skilled workers and public investments. We have got to make sure those public investments are efficient and done well, but there is already a large public role in higher education and workforce development, and I think it was very important that that role continue as we make those services more effective as well.

Mr. WYNNE. And I will specifically say UTM is extremely important, unmanned aircraft system, traffic management system. That is going to require, it is going to require R&D. That R&D is largely being done, initiated inside of NASA. It is now being done in conjunction with the FAA and in collaboration with industry.

But that requires some investment on the part of the government. And it is much like when we established the air traffic control system in the mid-'30s and late '30s, it is going to require some leaning in by the government.

Mr. CHIDAMBER. If I may, and I have two examples. Flirtey was given space in the engineering lab at the University of Reno when we couldn't afford rent and that was possible because the people in the university and the people in the government made that possible. And now we recruit people from a graduate program and an undergraduate program in drone engineering from that very school, so we have repaid it many times over already.

Similar situation in Virginia Tech, without Virginia Tech we could not have done the first drone delivery in Wise County in Virginia 2 years ago, and that is because Virginia Tech supported us, helped us; helped us in testing. It was part of the UAV test facilities that had been set up by the FAA and because of all of that we were able to do what we did and grown from there.

Mr. CÁRDENAS. Thank you, Mr. Chairman.

Mr. LATTA. Thank you very much. The gentleman's time has expired. The chair now recognizes the gentleman from West Virginia for 5 minutes.

Mr. MCKINLEY. Thank you, Mr. Chairman, and thank you again for another very interesting panel and discussion. You are never short of vision on where you want to take this.

I am intrigued with it because I get, Mr. Lehmann, I can remember 60 years ago we used to have couriers deliver groceries in our

small community, so it is not something new. It is just you are apparently doing it in a more proficient way. It didn't last very long, but it was an interesting concept to have groceries delivered 60 years ago.

But I want to focus more on the consumer protection part of this. I am curious from the panel what regulations or rules are out there now to control what can be delivered using a drone or a courier for that matter? Because I am interested in liability with it and also for consumer protection because we have got a drug problem in this country that is pretty severe. Not pretty severe, it is severe.

Are you able now, under your rules are you able to deliver products from one household to another using a courier or using a drone? Is there a rule on that?

Mr. LEHMANN. On the Postmates platform currently that is not possible. The use of the couriers is tied to a purchase in a retail store that we enable on our platform. But just as a broader question, I believe that there are many better ways to disguise the delivery of drugs, for example, than to do it on platforms that use a lot of technology where it is difficult to disguise the identities of everyone involved.

Mr. MCKINLEY. But if this is the advent of what we are going to see more of, do we have a role here for government on consumer protection to develop some standards or things that you cannot whether it is drugs, shipping across state lines that maybe would be inappropriate, weapons that could be shipped from it could be a retail store to a home and not being under control; is that possible now that that could happen that you could ship a weapon?

Mr. LEHMANN. Not on the Postmates platform, our terms in services wouldn't allow that. But we operate under the federal and the state laws of each of the states, municipalities, and communities that we are operating in.

Mr. MCKINLEY. Are there any standards by which you ship or is that just something you all set? Are there standards set by the government about what can be shipped by courier or by a drone? Are there any standards out there by the government?

Mr. CHIDAMBER. I do not believe there are any special, I don't think there are any special new guidelines that have been issued by the government, but I think the rules that apply to all couriers, all other transportation mechanisms like FedEx or UPS, all those things still apply.

Mr. MCKINLEY. Let me find out more about that because I am curious about that. I think the concept is very interesting. It has been around for a long time, but with the advent of some of the other activities that have been going on, the bad actors out there, I am just concerned about it.

Now from also a standpoint of intrusion, would drones into a community maybe per acre perhaps, is having access to five drones in an acre that is acceptable? Is that something or is it 20 drones per acre that come in? Where does it stop and where do we intrude on people's privacy of sound, because these things aren't necessarily quiet. So if we reach that point that we have this proliferation, are we starting to have a problem for people and their privacy in their residential area?

Mr. CHIDAMBER. Would you like to take that first?

Mr. MCKINLEY. What is the appropriate level of drone activity in a community? Is it 10 per acre, 1 per acre?

Mr. WYNNE. I think you are raising a very interesting question, sir. I don't have an answer to that question because we are nowhere near that level of adoption and I think it is appropriate that we think about that. I will tell you this, that you know as the driver of an electric vehicle that makes zero noise, which I thought was good for my neighborhood, there are people in the neighborhood who are concerned about me running over their children because they won't hear it coming. I haven't done that yet. I am not aware of that ever happening with an electric vehicle.

And I can tell you that you know the noise that a drone makes is largely a function of what the quality of its propellers. So I look at this from the standpoint of I represent an industry that is dedicated to getting this technology into the mainstream and creating value for society as well as economic business, economic opportunity for that society, so I think you know that can't be done without it being done sustainably. We have to consider the kinds of questions that you are raising and I think it is very appropriate that we do that.

Mr. MCKINLEY. Well, thank you very much. I yield back.

Mr. LATTA. Thank you. The gentleman yields back and the chair now recognizes the gentleman from Florida for 5 minutes.

Mr. BILIRAKIS. Thank you. Thank you, Mr. Chairman. I appreciate it.

Mr. Chidamber, in your testimony you mentioned the two-prong mission of the FAA to promote safety in air commerce and also to foster air commerce in the United States. So do you believe the FAA is fulfilling its full mission?

Mr. CHIDAMBER. I believe the FAA is doing remarkably well in its safety mission, for sure. We have the safest, most crowded airspace in the world, no question about that. Thanks to the FAA they are making sure it is the safest place on the planet to fly aircraft. On the part of air commerce, I think that has not been of equal emphasis at this point. Certainly with respect to unmanned air vehicles they are making clear steps in that direction.

Mr. BILIRAKIS. What do they need to be doing, in your opinion?

Mr. CHIDAMBER. There are three basic areas where we would like to see speedier approvals for trials and for eventual dissemination of this sort of technology. We need to be able to fly beyond visual line of sight. We need to be able to fly over people. And we need to be able to have one operator control multiple drones. Right now those three things are not in the cards yet.

So gradually we have to get there in terms of allowing for experimentation, proving, data gathering, and then eventual release of those things as a standard operating procedure. So those things need to happen.

Mr. BILIRAKIS. OK. You also mention in your testimony that in June of 2016, Flirtey highlighted other benefits of its commercial delivery system with the delivery of medical supplies. Can you discuss the extent of the demonstration like how many deliveries in how many hours, the maximum weight they can handle, et cetera? If you can elaborate on that I would appreciate it very much. It is very interesting, yes.

Mr. CHIDAMBER. Sure. You are referring to the one in Cape May, New Jersey, I take it?

Mr. BILIRAKIS. Yes, yes, yes.

Mr. CHIDAMBER. What was happening was there was a boat off on the water and from there a drone took off and landed on land. There was a doctor who was collecting biological samples, so the weight of it was not that much. We can carry up to about 7 or 8 pounds in terms of payload, so it was well underneath that.

So the drone that takes off, goes back to the boat where—it was a simulation, mind you. So presumably on the other side tests can be performed, let's say, is somebody affected with malaria and things of that nature and you could then ship back medication which the doctor could then administer to the patient and people like that. That was the simulation that was done.

There are a few things here that were significant. Dr. Amukele from Johns Hopkins, who conducted the medical practice of it, he is interested in looking at blood samples and what happens to blood samples if you ferry them by drone. Do they spoil, do they change, is it affected? And we have been doing tests on all of these sorts of things and we are happy to report that a lot of medical samples can indeed be delivered using drone without any detriment to their medical condition.

Mr. BILIRAKIS. Well, that is good news. What other ways in examples could this benefit the public when natural disasters or terrorist attacks may happen? Give me some other examples how this would benefit the public.

Mr. CHIDAMBER. Food, medicine, water, cell phones, any number of things of that sort. The heartrending scenes that we saw from Katrina when there were signs being painted on top of roofs saying I need medicine, I don't have it and there is water everywhere, nobody can get to that person. That sort of stuff can be avoided. Whatever that person needs, if they are in contact with someone a drone can bring it over to them exactly where they are which is remarkable. I think we could have saved lives in Hurricane Katrina for sure if you had drones deployed there.

Mr. BILIRAKIS. And you said they could carry up to 7 to 8 pounds; is that right?

Mr. CHIDAMBER. Yes, and the payloads are increasing every day as the technology gets better.

Mr. BILIRAKIS. OK, so fascinating, thank you very much. Well, let's see, I have 22 seconds, quickly, Mr. Chairman. Mr. Wynne, can you please provide us with some example of what the companies are doing as far as testing with regard to the delivery, please?

Mr. WYNNE. I mentioned that some of the delivery companies are already doing deliveries from their trucks in rural areas, so that is already happening. There are places in Africa where medical supplies have been delivered. I don't remember if it was Flirtey or not.

Mr. CHIDAMBER. No, it wasn't.

Mr. WYNNE. But a number of companies—

Mr. CHIDAMBER. It was a competitor.

Mr. WYNNE [continuing]. Have been doing that. I beg your pardon.

[Laughter.]

Mr. CHIDAMBER. A nameless competitor.

Mr. WYNNE. I am in the unenviable position of being able to root for everyone to win.

Mr. BILIRAKIS. It is always good to have competition to bring the prices down.

Mr. WYNNE. Yes, and I think right now those are the most obvious. Probably the one that captures my attention is that we have Global Hawk, which is a fairly sizeable platform that does early detection of hurricanes off the east coast of Africa, 36-hour endurance that literally flies out of Wallops and for NOAA. So that is beyond visual line of sight and that is the kind of work that can be done that quite literally, the Jim Cantores of the world are really excited about.

Mr. BILIRAKIS. Very good. Thank you, Mr. Chairman. This is a great hearing, I appreciate it. I yield back.

Mr. LATTA. The gentleman's time has expired and he yields back. The chair now recognizes the gentleman from Pennsylvania for 5 minutes.

Mr. COSTELLO. Thank you, Mr. Chairman.

Last session in Congress I had the distinction of serving on the Transportation Committee, specifically the Aviation Subcommittee, and paid close attention to the FAA regulations as well as what I would say is a bit of a hands-off approach to UAVs. And it has been very interesting to see just how rapidly this sector of the economy has embraced UAVs as a delivery system and I think very clearly that is going to continue. It obviously raises questions related to jurisdiction and what kind of regulatory framework we need, how much more intense it might need to be or how light it should remain. So my questions relate to the waivers granted by FAA for commercial use of unmanned systems.

Mr. Wynne, I would ask you, related to the waiting line for waivers, do you think it is still too long? Obviously you would like to get same-day approval, but share with me your experience there as well as how we might be able to streamline authorizations, develop best practices—which I think is emerging—and ensure that the FAA's designated test sites are used effectively.

Mr. WYNNE. We recently launched the Remote Pilots Council to gather those pilots that are starting to fly under Part 107, have been for the last 8 months. In nine cities around the country we met with folks. The FAA participated in all of those meetings which was a sign of their collaborative attitude.

And the biggest complaint of course, and that is what pilots do when we get together and we complain about the FAA, the biggest complaint, discussion point was how long it takes to get a waiver. No one was surprised by that and the FAA is, I think, making good efforts to try and reduce those times.

And sir, you will recall that we had the same problem with 333 exemptions back when that was the only way to fly commercially, but what happened over time was the swim lanes as it were what was required in order to get a waiver, what was required to get a 333 exemption became clearer and clearer and that process got almost batch processed after a while.

As I indicated in my written testimony, we really need to automate this process. The FAA agrees we need to automate this process and they are making best efforts to do that. The waiver process

should be much faster than it is today and as we go forward I think we will be.

Mr. COSTELLO. Do you want to compare that to other countries? And Mr. Chidamber and anyone else, if you want to weigh in after Mr. Wynne sort of comparatively looks at how other countries address the issue.

Mr. WYNNE. Anecdotally, there are places where it is less restrictive in—but I think generally speaking that it not necessarily in urban areas or congested airspace. So I think we are doing fine under Part 107. I think if we have got the ability to get the ability to do more things under waivers and ultimately we can fly over people, which is the next stage in the regulatory process we are going to continue to lead in this country.

Mr. CHIDAMBER. I agree with Mr. Wynne completely. The FAA has made huge strides. When we did our first thing in 2015, we placed our requirements with the FAA. I think it was in February of 2015, it was only in June or July that we got the waiver. Now it is much faster, all of these things are faster.

To address your question about how it is in other places, I think Australia and New Zealand are the two countries which have really been further ahead than everybody else in this matter. When we did our test with Domino's in Auckland, I think the waivers were gotten within 24 to 48 hours which is a lot faster than what it is here, but so we should get faster as well.

Mr. COSTELLO. Help me understand, Mr. Wynne, major companies have begun testing the capabilities of unmanned systems to deliver products and packages, how big would the products be or packages be? Look ahead 10 years, 20 years, at some point in time, logically, it will manifest itself to the maximum physical size. What do you think that looks like? What do you think the future holds?

Mr. WYNNE. I don't have a good way to answer that question because Uber Elevate just came out with a platform that you could get in and fly autonomously and they are wanting to operationalize that in 5 years, which is taking this technology and super-sizing it in some respects.

But I think I backup from an economics point of view and say the vast majority, an astonishingly high percentage of packages delivered in this country are under 5 pounds. Congressman Price, when I was testifying before Appropriations Committee on Transportation last week, asked me to speak to congestion and capacity. We have enormous amounts of capacity below 400 feet, whereas we have very little capacity on the roads today.

Mr. COSTELLO. Right.

Mr. WYNNE. And with e-commerce continuing to advance there will be more and more trucks on the road delivering 5 pounds or less packages, which I think we could deliver when the airspace is empty at night for noise abatement reasons. So I think that it balances out at some point, but I think there is an enormous opportunity just up to 5 pounds.

Mr. COSTELLO. Thank you. I yield back.

Mr. LATTI. Well, thank you very much. The gentleman yields back the balance of his time. And seeing that there are no other witnesses, or members asking questions to our panel today, I want

to thank you again for being with us today, again very, very insightful.

And pursuant to committee rules, I remind all members that they have 10 business days to submit additional questions for the record and I ask that witnesses submit their response within 10 business days upon receipt of those questions. And, without objection, the subcommittee stands adjourned.

[Whereupon, at 11:55 a.m., the subcommittee was adjourned.]

[Material submitted for inclusion in the record follows:]

PREPARED STATEMENT OF HON. GREG WALDEN

Consumer demand drives businesses decisions all across the country every single day. Consumers want everything faster, cheaper, and on time. This is no small feat. Finding safe, reliable, and efficient solutions will require the best and brightest minds to marry cutting-edge technology, like sidewalk delivery robots, with a service that families have been using for decades to get pizza for game night. This hearing is a chance to hear directly from companies building their business plans around delivering the best product, service, and experience to consumers.

Consumer safety is also top of mind as we hear about delivery drones, robots, and even self-driving delivery cars. Companies should be taking safety into account as part of their brand, and there should be reasonable oversight for new technologies. Creating an environment for safe new technologies to flourish improves consumer choice.

In this hypercompetitive global marketplace, the consumer is king. Regulators in Washington, D.C. do not know what the next unicorn startup will be. It may be in the delivery space, it may be in commercial trips to space. We do not know. But we do know that if we do not allow for companies to responsibly put their services to the ultimate test, the consumer, we are guaranteeing failure for American innovators.

As we continue to highlight industries and promote policies that will boost our economy and create more jobs here at home, we will need to continue examining policies that may be holding some of these business models back. The logistics behind these demands are daunting for American businesses. I look forward to hearing from the witnesses what challenges and obstacles their businesses face in today's regulatory environment. I am also interested in hearing from the witnesses about the competitive position of the U.S. marketplace in the global economy with respect to these emerging delivery technologies.

The innovation agenda for this subcommittee sits on the cutting edge of our economy. There will be challenges, but we must keep our eyes on the horizon and open to the possibilities. Thank you all for being here.

