

THE DISRUPTER SERIES: THE FAST-EVOLVING USES AND ECONOMIC IMPACTS OF DRONES

HEARING BEFORE THE SUBCOMMITTEE ON COMMERCE, MANUFACTURING, AND TRADE OF THE COMMITTEE ON ENERGY AND COMMERCE HOUSE OF REPRESENTATIVES ONE HUNDRED FOURTEENTH CONGRESS FIRST SESSION

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THURSDAY, NOVEMBER 19, 2015

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON COMMERCE, MANUFACTURING, AND
TRADE,
COMMITTEE ON ENERGY AND COMMERCE,
Washington, DC.

The subcommittee met, pursuant to call, at 10:15 a.m., in room 2123 Rayburn House Office Building, Hon. Michael Burgess (chairman of the subcommittee) presiding.

Members present: Representatives Burgess, Lance, Blackburn, Harper, Bilirakis, Brooks, Mullin, Schakowsky, Welch, and Pallone (ex officio).

Staff present: Leighton Brown, Press Assistant; Rebecca Card, Assistant Press Secretary; James Decker, Policy Coordinator, Commerce, Manufacturing, and Trade; Andy Duberstein, Deputy Press Secretary; Graham Dufault, Counsel, Commerce, Manufacturing, and Trade; Melissa Froelich, Counsel, Commerce, Manufacturing, and Trade; Paul Nagle, Chief Counsel, Commerce, Manufacturing, and Trade; Dan Schneider, Press Secretary; Olivia Trusty, Professional Staff, Commerce, Manufacturing, and Trade; Dylan Vorbach, Legislative Clerk, Commerce, Manufacturing, and Trade; Michelle Ash, Minority Chief Counsel, Commerce, Manufacturing, and Trade; Christine Brennan, Minority Press Secretary; Jeff Carroll, Minority Staff Director; Lisa Goldman, Minority Counsel, Commerce, Manufacturing, and Trade; and Diana Rudd, Minority Legal Fellow.

OPENING STATEMENT OF HON. MICHAEL C. BURGESS, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF TEXAS

Mr. BURGESS. The subcommittee on Commerce, Manufacturing and Trade will now come to order and the chair recognizes himself for 5 minutes for an opening statement and, again, good morning to all and welcome to our hearing on examining unmanned aerial systems, or drones.

These are poised to up-end the status quo in many sectors across the country.

This hearing is the latest installment of our Disrupter Series covering a variety of disruptive technologies that are literally redefining our lives and improving our economic condition.

This hearing is timely. Tomorrow, the National Telecommunications and Information Administration will hold an important gathering in its series of multi stakeholder meetings to develop privacy best practices for drones, and the Federal Aviation Authority has also set tomorrow as the deadline for recommendations from the Drone Registry Task Force.

Drones promise to make life easier, make life safer, make life less costly for workers in a wide variety of industries. The American Farm Bureau has forecast that farmers will be using drone services to monitor their crops and could see significant return on investment.

The technology now exists for telecommunications and utility employees to send up drones up to inspect telephone poles and monitor their findings from the truck.

Insurance adjusters sent out to inspect a claimant's home for hail damage could use a drone to conduct the examination without needing a ladder to walk around on the roof. And everyone from movie studios to broadcasters have interests. With nearly a million units expected to be sold, consumer drones are predicted to be the next wave in holiday purchases in just a few weeks.

I'm sure many of us here today have noticed that trend as we start our holiday shopping. Check your gutters or a leak on your roof without leaving the ground, no problem.

The sector-specific benefits of drones add up to a massive economic impact. According to one study by the Association for Unmanned Vehicles Systems International—one of our witnesses today—drones will produce about \$82 billion in growth during the next 10 years as they are integrated into our National Airspace System.

The study also predicts the addition of 100,000 jobs over those 10 years, which encompasses drone makers, software engineers, suppliers, researchers and other workers that would support expanded drone production and use.

To realize these benefits, the Federal Aviation Administration is working with stakeholders to safely integrate drones into the American airspace.

Simultaneously, the National Telecommunications and Information Administration is holding multi stakeholder meetings with the goal of producing industry best practices.

There are important questions around privacy laws and safety and United States companies like Intel are working to develop solutions that would enhance safety automatically, which no regulator could produce.

In fact, I would be more worried that overregulation on safety could prevent the investment, testing and research needed to develop market-driven solutions.

With the advent of drones, many have expressed concerns that they present novel privacy issues. Certainly, drones can go where people can't.

A neighbor can fly a drone over your fence and pester you and invade your privacy, and there have been disputes ending in drones being shot out of the air by an annoyed citizen.

There are interesting questions around whether how and when and under what circumstances a drone owner can be identified and held to account for his or her behavior.

Those questions are now being addressed at the FAA as part of the development of its registry. I should note that I share the concerns of many with requiring small recreational drones to be registered with the federal government.

Such an approach would involve casual users in a major government bureaucracy with seemingly little benefit. As regulators prepare to integrate drones into the airspace, it is clear that safety has to be the number-one priority.

But cutting-edge drone testing and evaluation is occurring overseas because the current process to approve commercial drone use is both restrictive and cumbersome in the United States.

I do want to thank our witnesses for being here this morning. I'm going to yield the balance of my time to Mr. Lance.

Mr. LANCE. Thank you, Chairman Burgess, for holding this hearing and welcome to the distinguished panel.

Earlier this week, a drone crashed into a car while flying over an oil refinery in Linden, New Jersey. I used to represent a portion of Linden before the reconfiguration of the congressional districts. Linden is one of the major refining locations in the United States.

The FBI is currently investigating whether or not this was an accident and is tracking down the operator who fled the scene. This is the second time in two months that a drone has crashed in Linden, which is located 10 minutes from Newark Liberty International Airport, one of the three major airports serving the New York metropolitan region.

While so far there is no evidence of ill intent in either case, these incidents bring up important concerns regarding the safety of recreational drones and the possibility for bad actors to repurpose them to cause harm to others.

I look forward to discussing these concerns and possible solutions as well as the potential benefits of UAVs with this distinguished panel.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Burgess follows:]

PREPARED STATEMENT OF HON. MICHAEL C. BURGESS

Good morning and welcome to our hearing examining unmanned aerial systems or drones, which are poised to upend the status quo in sectors across our economy.

This is the latest installment of our Disrupter Series covering a variety of disruptive technologies that are redefining our lives and improving our economic condition.

This hearing is timely. Tomorrow, the National Telecommunications and Information Administration will hold an important gathering in its series of multistakeholder meetings to develop privacy best practices for drones.

And the FAA has also set tomorrow as the deadline for recommendations from the Drone Registry Task Force.

Drones promise to make life easier, safer, and less costly for workers in a wide array of industries.

The American Farm Bureau has forecast that farmers using drone services to monitor their crops could see a return on investment of \$12 per acre for corn, \$2.60 for an acre of soybeans, and \$2.30 per acre of wheat.

The technology now exists for telecommunications and utility employees to send drones up to inspect telephone poles, monitoring their findings from the truck.

Insurance adjusters sent out to inspect a claimant's home for hail damage could use drones to conduct the examination without needing to climb a ladder and walk

around a slippery roof. And everyone from movie studios to broadcasters have interests too. And with nearly a million units expected to be sold, consumer drones are predicted to be the next wave in holiday purchases this year. I'm sure many of us here today have noticed that trend as we start gift shopping.

Check your gutters or a leak on your roof without leaving the ground, no problem.

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The study also predicts the addition of 100,000 jobs over those ten years, which encompasses drone makers, software engineers, suppliers, researchers, and other workers that would support expanded drone production and use.

To realize these benefits, the Federal Aviation Administration is working with stakeholders to safely integrate drones into American airspace.

Simultaneously, the National Telecommunications and Information Administration is holding multistakeholder meetings with the goal of producing industry best practices around privacy.

There are important questions around privacy laws and safety. U.S. companies like Intel are working hard to develop solutions that would enhance safety automatically, which no regulator could produce.

In fact, I would be more worried that overregulation on safety could prevent the investment, testing, and research needed to develop these market-driven solutions.

With the advent of drones, many have expressed concerns that they present novel privacy issues.

Certainly drones go where people can't. A neighbor can fly a drone over your fence to pester you and invade your privacy—and there have been disputes ending in drones being shot out of the air by annoyed citizens.

There are interesting questions around whether, how, and under what circumstances a drone owner can be identified and held to account for his or her behavior. Those questions are now being addressed at the FAA as part of the development of its registry. I should note that I share the concerns of many with requiring small recreational drones to be registered with the federal government. Such an approach would involve casual users in a major government bureaucracy with seemingly little benefit.

As regulators prepare to integrate drones into the airspace, it is clear that safety is the number one priority. But cutting-edge drone testing and evaluation is occurring overseas because the current process to approve commercial drone use is both restrictive and cumbersome in the U.S.

I join many in the drone development space in calling for quick but flexible regulatory solutions that allow for future innovation. The speed of innovation can't remain at the speed of regulation for long.

Mr. BURGESS. The chair thanks the gentleman.

The chair recognizes the subcommittee ranking member, Jan Schakowsky, for 5 minutes for an opening statement, please.

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

Ms. SCHAKOWSKY. I thank you, Mr. Chairman, for holding today's hearing on the evolution and the future of drones. I look forward to delving into this important issue.

Drones are increasingly common in our communities and it is predicted that 1 million drones will be given as gifts over this holiday and drone usage will, clearly, rise in 2016.

It is important to understand what this technology can do and how we can adequately ensure their safe and ethical usage.

As the subcommittee of jurisdiction over the Consumer Product Safety Commission and the Federal Trade Commission, I am particularly interested today in the impacts of drone usage and public safety and privacy—the two issues that the chairman raised as well.

The FAA has received over 1,000 reports of unsafe drone activity by pilots already this year, double the number of such reports from 2014. With their capacity to reach protected and secure areas including the White House lawn, which happened earlier this year, drones can pose a serious national security threat as well.

We must ensure that drones are adequately regulated to maintain safety both for the public and for the country. The other important area for us to consider, as mentioned, is the privacy implications of the increased use of drones.

Drones can and have been equipped with invasive technologies including cameras, infrared devices, even high-powered microphones.

This new method of collecting information does not entitle individuals, corporations or government entities to violate privacy rights and we must ensure that our laws and regulations reflect that fact.

So I look forward to hearing from our witnesses to gain from their perspectives this emerging technology and I yield back my time.

Mr. BURGESS. The gentlelady yields back. The chair thanks the gentlelady.

The chair recognizes the vice chairwoman of the full committee, Mrs. Blackburn from Tennessee, for an opening statement for 5 minutes.

OPENING STATEMENT OF HON. MARSHA BLACKBURN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF TENNESSEE

Mrs. BLACKBURN. Thank you, Mr. Chairman, and I want to thank each of you for being here before us today and for the information that you're going to share with us and work with us.

I appreciate this series that the chairman has put in place, the Disruptor Series, because we do live in a time when you're going to see the Internet of things, if you will, begin to move forward and become more enmeshed with our daily lives—how we do business, how our military protects ourselves, how consumers use a product in recreation.

All of those are components that we are going to be tasked with dealing with the issues and the implications.

Now, we're looking at privacy. We're looking at safety, the utilizations and also we want to look at the mechanism—the drone itself—and then what you put on the drone, which is where you get into the privacy concerns and utilization of technology that can be a little bit invasive, if you will.

But we do know that there is an enormous curiosity about these and such a desire to have a drone and play with a drone. I say I have a family full of big kids ranging from age 60 on down to age 6, all male, by the way.

And they love all of these gadgets and toys and the next new thing and they so like—yes, I hear you all chuckling. I do think that my husband is still a big kid and but there is such a fascination with this and the policy implications of that come to us—how do you encourage that curiosity, how do you allow consumer use, how do you allow commercial use and still look at the safety and

security. And, of course, as we have found out with our airplanes and with air travel make certain that we are securing that space.

So thank you for your information and your wisdom. We appreciate having you here. Yield back.

Mr. BURGESS. The gentlelady yields back.

The chair recognizes the ranking member of the full committee, Mr. Pallone of New Jersey, 5 minutes for an opening statement, please.

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

Mr. PALLONE. Thank you, Mr. Chairman.

As part of our ongoing Disruptor Series today we have the opportunity to discuss one of our fastest growing and most exciting industries.

It seems there are drones for just about everything. Photographers can attach powerful cameras to drones to get shots from high in the air. Nature lovers can take footage of wildlife in hard to reach places.

Surveyors use them to create more accurate maps. Both children and adults fly drones just for the fun of making something fly.

If you want, you can buy a drone shaped like the Millennium Falcon from Star Wars and you could say that drones are the next generation of kites if kites were Bluetooth capable and had a thousand possible uses and companies are looking into how drones can improve business.

Retail giants are exploring delivery by drone, which will get orders to consumers faster than ever. Farms use drones to oversee crop conditions and dozens of small startup companies are innovating new ways to use drones to protect the environment.

One company has designed a drone that can sense water pollution from the air. Commercial and consumer drones are attracting a huge amount of interest in investment.

The Federal Aviation Administration estimates that a million drones will be given out as gifts this holiday season, and according to one industry report investments in drone technology from January to May 2015 totaled \$172 million, more than in the previous 5 years combined.

These investments are not limited to one industry or source. They come from government, venture capitalists, environmental groups and huge technology firms, among many others.

So it's exciting when technology leaps forward the way it has with drones. But as the industry develops, so do the risks. As more drones take to the air, safety becomes more of a concern. Pilots have raised concerns about sharing airspace with drones.

Drones have been seen in sports arenas and pilot sightings of drones doubled since last year, and there has also been an increase in the number of safety accidents including a man who was killed after losing control of his drone.

Also, many people are concerned that drones could enable new invasions of personal privacy. Drones can be equipped with cameras and recording devices and can be flown into people's back yards or next to their bedroom windows.

States are beginning to pass laws to restrict drone use. Many of these laws are focused on protecting personal privacy. But some people are taking matters into their own hands by shooting down drones hovering over their homes.

Innovation and growth are vital to the American economy but that innovation must also come with basic protections no matter which disruptor we're talking about.

So consumer protections are needed for those who use drones and for those who come into contact with them. By addressing these issues, businesses and consumers can have the certainty they need to continue growing and enjoying this exciting new space.

I am confident that we can encourage innovation in the drone industry and ensure that there are strong protections in place for consumers and I look forward to hearing from our witnesses how we can do just that.

I don't know if Mr.—would you like some time? Fine. I yield back, Mr. Chairman.

Mr. BURGESS. The gentleman yields back. The chair thanks the gentleman and this does conclude member opening statements. The chair would remind members that pursuant to committee rules all members' opening statements will be made part of the record.

We do want to thank our witnesses for being here today, for taking the time to testify before the subcommittee. Our witness panel for today's hearing will include Mr. Joshua Walden, the senior vice president and general manager of the New Technology Group at Intel; Mr. John Villasenor, professor of public policy, electrical engineering and management at UCLA's Luskin School of Public Affairs; Ms. Margot Kaminski, assistant professor at the Moritz School of Law at Ohio State University; and Mr. Brian Wynne, president and CEO of the Association for Unmanned Vehicle Systems International.

We appreciate all of you being here today. We are going to begin the panel with Mr. Walden. Just an editorial note—we are going to have votes on the floor soon. So I would ask that you each adhere to the 5 minutes for your opening statement. You will see the lights down below.

Again, we appreciate all of you being here. We will begin with you, Mr. Walden. You are recognized for 5 minutes for an opening statement.

We have technical assistance on the way. You would think in the major congressional committee that deals with technology we wouldn't have wires running all over the place. We'd have a series of drones picking up every hiccup and cough from the witness table.

Mr. Walden, I am going to blame the press for probably dislodging a cable as they were taking pictures of your aircraft, and our apologies.

Are we there yet? I don't think any of the microphones are working. Mr. Wynne, does your microphone appear to be on?

Mr. WYNNE. Testing. There we go.

Mr. BURGESS. Whoever's is working please proceed 5 minutes.

STATEMENTS OF JOSHUA M. WALDEN, SENIOR VICE PRESIDENT, GENERAL MANAGER, NEW TECHNOLOGY GROUP, INTEL CORPORATION; JOHN VILLASENOR, PROFESSOR OF PUBLIC POLICY, ELECTRICAL ENGINEERING AND MANAGEMENT, LUSKIN SCHOOL OF PUBLIC AFFAIRS, UNIVERSITY OF CALIFORNIA, LOS ANGELES; BRIAN WYNNE, PRESIDENT AND CEO, ASSOCIATION FOR UNMANNED VEHICLE SYSTEMS INTERNATIONAL; MARGOT KAMINSKI, ASSISTANT PROFESSOR, MORITZ SCHOOL OF LAW, OHIO STATE UNIVERSITY

STATEMENT OF JOSHUA M. WALDEN

Mr. WALDEN. Chairman Burgess, Ranking Member Schakowsky and distinguished members of the subcommittee, thank you for the opportunity to testify on behalf of Intel Corporation.

We appreciate the invitation to appear before the subcommittee to discuss the continuously and rapidly evolving uses of unmanned aerial vehicles, UAVs or drones, and the vast economic potential of this growing industry.

Innovation has been at the heart of Intel's business since we were founded close to half a century ago. To quote our co-founder, Robert Noyce, innovation is everything.

While we are a recognized leader with 80 percent of sales coming from outside the United States, Intel is viewed as a leading American technology company for good reason. We conduct approximately three-quarters of our advanced manufacturing in research and development in the United States at facilities located throughout the country.

We invest billions of dollars annually in research and development and employ more than 50,000 people nationwide. Intel's declared mission is to utilize the power of Moore's Law to bring smart and connective devices to every person on the planet.

With the help of Moore's Law, we have driven computing innovation to the highest performing servers that speed discoveries in science and medicine to low-powered computing sensors that are always on and connected that make devices, homes and cities smarter.

It has become increasingly clear to us that UAVs like cars and watches are a computing platform of the future. Applications and services by this new connected UAV ecosystem will spur significant economic growth and will be driven by innovations in UAV technology.

From infrastructure inspection to delivery of goods, millions of Americans are on the cusp and enjoying the benefits of this continually developing technology.

UAVs are being used to inspect bridges safely and efficiently, allow for real time repairs. Mobile carriers aim to keep workers on the ground by using UAVs for cell tower inspection, an application with potential lifesaving ramifications. From 2004 to 2013, there were 95 fatalities associated with cell tower inspections.

Another up and coming usage will be having multiple drones working in conjunction with a single operator used for either surveillance, safety, agriculture and even entertainment.

Computing technology is what will help drive and manage this capability with more precision, safety and accuracy than manual control.

Technology can and will improve drone safety. We are actively creating silicon architecture and computing power that will create onboard drone platforms that will have outstanding speed, performance, and functionality.

And our most important contribution to date involves critical safety technology that will address real concerns expressed by regulators and consumers alike. Real Sense is an onboard sensor application that represents a key ingredient for best in class collision avoidance.

It features several attributes for collision avoidance with real-time onboard computing. It is intuitive, self-aware, adaptable and self-guided. It will provide real-time depth-sensing capability for a flying drone and complying with GPS, altitude, and other on-board sensors can also avoid no-fly areas and comply within regulatory limits.

I'd like to demonstrate the capability, if we could, please. So what you see Jan doing is he's no longer utilizing the controller and what the 3D Real Sense camera technology is doing is essentially sensing using infrared and moving and making sure that nobody can run into the drone. So this is real-time collision avoidance utilizing 360 degrees of freedom. Thank you, Jan.

So I think we're going to demonstrate the sense and avoid of what the drone is actually seeing. If you could please look to the video screens, hopefully. There we go.

So what you're seeing is the ring sense, or the IR picture, of what the drone is seeing. Note this is not being seen by the pilot. None of these images are saved, from a privacy perspective.

This is an IR image the drone is seeing and if someone gets closer to the camera you'll actually see the image get darker and as they move away get lighter.

So this is actually the depth that you're seeing of what the drone is seeing which enables it to avoid people and objects.

Thank you.

Society, consumers, businesses, and overall worldwide economies stand to benefit in profound ways if the nascent drone ecosystem can develop safely, quickly, and in a manner where governments and private sector work cooperatively and expeditiously across a range of statutory, regulatory, and policy matters.

We believe that it is critical for the United States to develop a regulatory framework for UAVs that role models innovation for the rest of the world. This framework should allow U.S. companies not only to compete in the global market but also lead and drive global UAV innovation.

It is possible to both improve safety and promote American innovation involving advances in drone technology. However, a federal government approach that is overly prescriptive regarding the deployment of new hardware and software will deter the private sector's ability to invent and compete in the marketplace.

In addition, privacy is of paramount importance for the public's acceptance in understanding the widespread UAV operations in all environments.

Protection of privacy has always been built into the fabric of Intel. Intel has embraced the Fair Information Practices Principles, FIPPs, as the Global Foundation for Privacy Protection to foster technology innovation. With respect to drones, the FIPPs can be applied to the drone platform in the collection, usage and distribution of data.

As Intel and others innovate and then integrate those innovations into UAV platforms it will be critical to have a seamless and effective regulatory structure in place that supports such innovation.

Approval processes that can stretch close to a year should be dramatically streamlined. Many commercial uses of small UAVs should be allowed without filing requirements just as hobbyists' use is permitted today.

Without the right regulatory balance, we risk delaying the social and societal benefits and U.S. economic opportunities. A recent study estimates over a 10-year span UAV integration with national airspace will count for \$82 billion in job creation and growth.

Thank you for conducting this hearing and for giving Intel the opportunity to testify in this exciting field of drone technology which, with modern regulations in place, will transform our society into a safe and responsible fashion.

Thank you very much.

[The prepared statement of Mr. Walden follows:]



PREPARED STATEMENT OF INTEL CORPORATION

For the

**COMMITTEE ON ENERGY AND COMMERCE
OF THE U.S. HOUSE OF REPRESENTATIVES
SUBCOMMITTEE ON COMMERCE, MANUFACTURING, AND
TRADE**

On

**THE DISRUPTER SERIES:
THE FAST-EVOLVING USES AND ECONOMIC IMPACTS OF
DRONES**

**Joshua M. Walden
Senior Vice President and General Manager
New Technology Group
Intel Corporation**

November 19, 2015

Prepared Statement of Joshua M. Walden

Chairman Burgess, Ranking Member Schakowsky, and distinguished members of the Subcommittee, thank you for the opportunity to testify on behalf of Intel Corporation. We appreciate the invitation to appear before the Subcommittee to discuss the continuously and rapidly evolving uses of unmanned aerial vehicles (UAVs), or drones, and the vast economic potential of this growing industry. The Subcommittee's interest in the topic demonstrates its strong commitment to ensuring that the United States maintains its competitive edge in this developing market through public policy that fosters the growth of American manufacturing and innovation.

Innovation has been at the heart of Intel's business since we were founded close to half a century ago. To quote our co-founder, Robert Noyce, "innovation is everything." This sentiment has guided Intel for decades and paved the way for our Fortune 50 Company to become a global technology leader. We are proud to have developed the universal serial bus (USB), the world's first microprocessor (sometimes called a CPU), the first commercially dynamic random access memory (DRAM) chips, the first electrically programmable read-only memory (EPROM) chips, and many other products that are essential to today's digital economy.

While we are a recognized global leader with 80% of sales coming from outside the United States, Intel is viewed as a leading American technology company for good

reason. We conduct approximately three-quarters of our advanced manufacturing and R&D in the United States at facilities located across the country, from Oregon to Arizona and New Mexico to Texas. We invest billions of dollars annually in research and development and employ more than 50,000 people nationwide. Our commitment to the US economy is reflected in a strong, consistent history of capital investment and the fact that we consistently rank in the top ten recipients of U.S. patents.

Intel's declared mission statement is to utilize the power of Moore's Law to bring smart and connected devices to every person on Earth. With the help of Moore's Law, we have driven computing innovation to the highest performing servers that speed discoveries in science and medicine, to low power computing sensors that are always on and connected that make devices, homes and cities smarter in future.

It has become increasingly clear to us that UAVs, like cars and watches, are a computing platform of the future. Applications and services enabled by this new connected UAV ecosystem will spur significant economic growth and will be driven by innovations in UAV technology. We are optimistic that Intel has the engineering prowess in computing and sensor technology to help the United States lead the way: delighting consumers and building commercial products that expand the worldwide digital economy.

Because drones represent a significant growth opportunity we at Intel have developed some foundational principles that help us define this new marketplace for computing as part of our innovation strategy. It may also be beneficial for lawmakers, US regulators and policy officials to understand a private sector perspective in how we foster innovation and economic progress through technology. Our goals and outlook are centered as follows:

- *Collision Avoidance Technology Spurs Drone Safety & Innovation*
- *Drones Benefit Consumers and Businesses*
- *Intel Technology Lifts the Drone Economy*
- *Intel's Technology Enhances Individual Privacy*
- *Modernizing Regulations establishes United States as the Leader and Drives Global Innovation in UAV space*

Intel Technology Spurs Drone Safety and Innovation

Technology can improve drone safety. In 1965, our co-founder Gordon Moore observed that computing would dramatically increase in performance, while simultaneously decreasing in relative cost, at an exponential pace, a principle that became a pillar of the electronics industry and a driving force of innovation known as Moore's Law. Today, we are applying Moore's Law to UAV safety and innovation with our computing platforms and RealSense depth sensing camera. We are actively creating the

silicon architecture and computing power that will create onboard drone platform that has outstanding speed, performance and functionality. We anticipate introducing those exciting capabilities in the very near future.

At the same time, Intel has been actively investing in impressive drone companies, such as AirWare, Precision Hawk, Yuneec, and Ascending Technologies, and partnering our computing technology with the ingenuity being created by these early industry leaders.

Our most important contribution to date involves critical safety technology that will address real concerns expressed by regulators, consumers and others. RealSense is an onboard sensor application that represents a key ingredient for best-in-class collision avoidance. It features several attributes for collision avoidance with real-time on board computing: it is intuitive, self-aware, adaptable and self-guided. It provides real time depth sensing capability for a flying drone and combined with GPS, altitude and other onboard sensors, can also avoid no-fly area and comply with regulatory limits.

This year at CES, our CEO Brian Krzanich introduced RealSense applications for a multitude of sectors and uses to make devices smarter. Intel's RealSense camera module, which weighs as little as 8 grams and is less than 4 mm thick, brings depth perception to drones both indoors and outdoors with minimal impact to payload and

flight times. A live indoor demonstration was shown at CES 2015 on how a drone can sense and avoid objects in its path.

Intel has visited with Administrator Huerta and FAA officials on a number of occasions to explain how Intel RealSense technology can enhance drone safety technology and are pleased to assist in the ongoing effort to reduce the near miss rate of drones down to zero. With an estimated 700,000 UAVs in the hands of consumers currently, and expected holiday sales of a million more drones to the public, the safe integration of drones into the national space is critical. The FAA's list of 764 pilot reports of encounters with and sightings of drones in a ten month timeframe (11/14 to 8/15) is clear evidence that improvement is required. It is important to note that there is a distinction between consumer hobbyists who tend to be novice operators who may not be aware of rules and regulations versus commercial drone operators who are using it for providing a service that has economic value and gives them monetary benefits.

It is possible to both improve safety and promote American innovation involving advances in drone technology. However, a federal government approach that is overly prescriptive regarding the deployment of new hardware and software will deter the private sector's ability to invent and compete in the marketplace. Worse, it will drive us to relocate our business planning and R&D overseas, where we are being welcomed by foreign countries eager for investment in this new technology area.

Along with RealSense, Intel is working with our Intel Capital portfolio companies such as Precision Hawk to create other safety technologies. Earlier this week we learned about the FAA's plan to test related technology in North Carolina, near to where the Wright Brothers originally flew planes for the first time. A *Popular Science* magazine article described the FAA Pathfinder research as follows:

Specifically, the tests focus on first-person-vision flights, where a pilot steers the drone beyond their line of sight using video streamed from the drone itself to either a screen or headset. The FAA's draft drone rules prohibit flights beyond line of sight, which limits drone use to where a pilot can be. The goal is to keep drones from crashing into other objects. The rules also in effect constrain how far drones can fly. So on Monday, the FAA will work with Precision Hawk drones to see if technology that avoids obstacles can allow an alternative solution.

Technology Review writes: Precision Hawk was chosen by the FAA because it is developing such a technology. It can have a drone automatically take action such as landing or turning around if it gets too close to a forbidden area such as an airport, or if a conventional aircraft suddenly appears. The company's system, called LATAS, for low-altitude tracking and avoidance system, can use the Verizon cellular network, satellite links, or standard aircraft location beacons to monitor and communicate with drones.

To test the LATAS system a paraglider pilot will fly at piloted drones, seeing how long it takes for the drone pilot to break contact. After that human baseline, they'll test the software to see if it can move the drones out of a collision course faster. If the tests work, the FAA's Pathfinder program may prove well named indeed, as it clears an avenue for long range commercial drone flights in the future.

Drones Benefit Consumers and Businesses

From infrastructure inspection to delivery of goods, millions of Americans are on the cusp of enjoying the benefits of this continually developing technology. UAVs are being used to inspect bridges safely and efficiently, allowing for real-time repairs. Mobile

carriers aim to keep workers on the ground by using UAVs for cell tower inspection, an application with potential life-saving ramifications; from 2004-2013, there were 95 fatalities associated with cell tower inspections¹.

Utility companies are embracing UAVs as a means of inspecting hard-to-reach assets in a safer, more efficient manner, keeping employees on the ground and out of harm's way and providing for maintenance that reduces service disruptions. In the event of weather-related power outages, UAVs permit utilities to quickly assess and repair damage, allowing them to restore service more quickly and at less cost than traditional inspection and repair methods.

Intel works across the information and communications technology ecosystem to make technology impactful for consumers. There are few developing areas of business and technology with more potential benefits for consumers than the UAV industry. The upside potential is extraordinary and the federal government has assessed potentially hundreds of future applications for drones over time.

Another up and coming usage will be in having multiple drones flying in a swarm formation - simultaneous, aware of each other and being able to work in conjunction with one another. They can be used for surveillance, safety, agriculture and even

¹ Martyn Williams, *FAA Seen Ready to Open Skies to Commercial Drones*, (Feb. 14, 2015), <http://www.pcworld.com/article/2884672/faa-seen-ready-to-open-skies-to-commercial-drones.html>.

entertainment. Computing technology is what will help drive and manage this capability with more precision, safety and accuracy than manual control.

Society, consumers, business and the overall worldwide economy stand to benefit in profound ways if the nascent drone ecosystem can develop safely, quickly, and in a manner where governments and the private sector work cooperatively and expeditiously across a range of statutory, regulatory and policy matters.

More importantly, UAVs have immense humanitarian applications. UAVs can deliver medicine and diagnostics to remote or rural areas faster and more efficiently than any other means. They may be able to access individuals in remote locations who are lost, stranded or trapped in buildings.

Across the world, UAVs are being used to map areas affected by natural disasters, allowing first responders to quickly and safely locate survivors, inspect damaged structures, track fires, and survey damage. UAVs also protect innocent people from landmines and endangered wildlife from the threat of poachers. The myriad uses of drones – to help people first and foremost – is heartening and exciting.

Intel Technology Lifts the Drone Economy

The essential attributes of Intel technology inside drones are its utility, ubiquity, ease of operation, and cost-effectiveness. Drones are becoming the computing platforms

for the near future, and Intel is poised to play a leading role in developing this computing technology.

Intel hardware powers the present and future cloud, where unmanned air traffic management systems being designed by NASA in partnership with several leading UAV companies are likely to be sited. Intel also brings its data analytics, communications platforms, vision and depth based computing technology to UAV software and to the data that such software will create. Drones in the future will have sense and avoid with auto landing and re-charge capability and provide real time communication and data links to ground stations and cloud infrastructures securely.

To properly take advantage of the advanced technology that will be available on the UAV platform, there will be an increased need for computing power Intel is known for bringing to the home, office, the datacenter and the internet of things. UAVs with Intel Inside are part of the future of computing that we are inventing. Intel powered UAVs will be known as the most reliable, safest and highest performing computing platforms available.

Along with the technology we develop for Intel Inside UAVs will come investment in the software and services ecosystem to take advantage of this computing power. For over forty years, Intel has invested to help other companies bring new business ideas to the market to build on top of our hardware and software. We expect

this will also be true in UAVs and this investment will compound the positive economic impact on the broader US economy.

Intel's Technology Enhances Individual Privacy

Respecting individual privacy is of paramount importance for the public's acceptance and understanding of widespread UAV operations in all environments. Protection of privacy has always been built into the fabric of Intel. Intel has embraced Fair Information Privacy Principles (FIPPs) as the global foundation for privacy protection to foster technological innovation.

Intel is committed to consumer privacy as it continues to innovate and as lower cost/higher yield technological solutions become ubiquitous across every sector of the economy. Privacy is part of what Intel does every day and it is an integral part of our product development life cycle.

Intel has long supported comprehensive technology neutral privacy legislation based on the FIPPs. With respect to drones, the FIPPs can be applied to the drone platform and the collection, usage, and distribution of data. Intel's technology can enable UAV operators to meet their privacy commitments to consumers and the general public. One example of this application of the FIPPs is Intel's decision to only have the RealSense sensor collect the minimum data necessary for collision avoidance collected

by RealSense sensors, instead of using the sensors for other purposes. Over time, there may be other uses for these sensors, and the FIPPs will guide how to implement those uses and to make their data collection practices transparent to consumers, regulators and the general public.

We support the Department of Commerce's efforts, through the National Telecommunications Infrastructure Agency, to recommend best practices for the protection of privacy while operating UAVs. We have been participating in the working group discussions on this topic, with another one occurring tomorrow. These best practices can be consistent with existing Federal Trade Commission and State Attorney General Enforcement of existing privacy laws. Intel has recently issued a white paper on how to apply the FIPPs to new technology such as UAVs. We will be active within the industry and with the NTIA to ensure we help lead privacy solutions as well as innovating at pace with demand.

Modernizing the US Regulatory Framework Helps Lead and Drive Global Innovation

Intel believes that it is critical for the United States to develop a regulatory framework for UAVs that role models innovation for the rest of the world. This framework should allow US companies not only to compete in the global market, but also lead and drive global UAV innovation. As a respected US technology leader and manufacturer, Intel stands ready to provide private sector leadership for innovation that

can enhance regulations and serve as a trusted US resource as foreign firms strive for market growth.

Intel supports a regulatory framework that is risk-based and flexible enough to change as technology evolves so that it does not hinder innovation and economic growth. This flexibility can be achieved through adopting a streamlined certification and approval process, and through exemptions and waivers under existing FAA authority.

Simultaneously, regulations should encourage the use of computing to meet the key challenges to safe integration of UAVs in the National Airspace System: sense and avoid, collision avoidance, secure geo fencing and command and control technology. Adoption of such a flexible regulatory system for UAVs will sustain US industry leadership.

This flexible regulatory framework should recognize that there are a wide variety of devices that fall under the definition of UAVs. A hobbyist's small quad copter should not necessarily be governed by the same regulations as plane size platforms. One of the benefits of Moore's Law is that technology gets smaller and more powerful.

As Intel and others innovate and then integrate those innovations onto UAV platforms, it will be critical to have a seamless and effective regulatory structure in places that supports such innovation. For example, there ought to be multiple categories of

UAV categories considered by the FAA based on their size and functionality. Commercial micro UAVs that you can hold in the palm of your hand certainly should receive a different level of regulatory scrutiny compared to larger devices.

Bottom line, governments should strive to substantially decrease administrative burdens on innovators. Approval processes that can stretch close to a year should be dramatically streamlined. Many commercial uses of small UAVs should be allowed without filing requirements, just as hobbyist use is permitted today.

Regulations that prohibits our company from demonstrating a small quad copter at less than 50 fifty feet of altitude, without an effective exemption process, simply impedes American innovation and compels companies like Intel to test their ideas abroad. Given lack of FAA permissions, we have been actively flying cutting edge drones overseas. Our preference is to do so in the United States, to help spur American ingenuity. But the FAA's current 333 exemption process has been exceedingly slow and difficult for us to navigate. The FAA has issued over 2000 exemptions to date and that represents an improvement. But many of the approvals do not present unique or new ideas. Our efforts to break the mold through the exemption process has been painstaking. Meanwhile, Intel's development drone work will continue abroad at a rapid pace.

Regulators know that extensive delays in rolling out a new regulatory structure for UAVs, as called for by Congress, risks US economic opportunity. The economic

implications for commercial drone use are undeniable. A recent study estimates over the 10 year span from 2015 to 2025 UAV integration with the national airspace will account for \$82.1 billion in job creation and growth.

On a macroeconomic scale, integration of UAVs is expected to create over 100,000 jobs. Over a ten year span, job creation from commercial drone use will consist primarily of manufacturing jobs. Likewise, states will benefit from increased economic activity.

The government can also promote the development of the UAV industry by continuing to invest in research and development. We support the efforts now underway at the six test sites, the newly created Center for Excellence, the FAA's Technical Center and, as mentioned, NASA's UTM work. We urge Congress to provide sufficient funding and direction to these R&D projects.

Conclusion

Thank you for conducting this hearing and for giving Intel the opportunity to testify on the continuously developing uses of UAVs and the great economic potential of the industry as a whole. At Intel we like to say "Look Inside" – because, in fact, it is what's inside that counts. This could not be more true than in the exciting field of drone technology which – with modernized regulations in place – will transform our society in

a safe and responsible fashion. Take a look: Intel will be at the center of this fast-changing market and we appreciate the Subcommittee's commitment to fostering and protecting American innovation.

Mr. BURGESS. Chair thanks the gentleman.
Professor Villaseñor, your 5 minutes, please.

STATEMENT OF JOHN VILLASEÑOR

Mr. VILLASEÑOR. Good morning, Chairman Burgess, Ranking Member Schakowsky and members of the subcommittee. I thank you very much for the opportunity to testify today.

The views I'm expressing here are my own and do not necessarily represent those of any of the organizations I am affiliated with.

Today, an unmanned aircraft can refer to everything from a small toy helicopter that might cost only \$10 to a jet-powered Global Hawk which can weigh 15,000 pounds and cost over \$100 million.

There are solar-powered unmanned aircraft that can stay aloft in the stratosphere for weeks at a time and hobbyist quad copters that may only weigh only a pound or two and have flight durations measured in minutes.

The Nano Hummingbird, developed by California-based AeroVironment under DARPA funding, weighs only two-thirds of an ounce including an onboard video camera, and that is technology that is now almost half a decade old.

In 2013, a team of Harvard researchers reported the successful flight of the RoboBee, a robotic insect that weighs less than one-three-hundredth of an ounce.

These examples underscore the incredible variety in unmanned aircraft and the near impossibility of predicting how this technology will evolve in the future.

An additional complicating factor is the same unmanned aircraft platform can play many different roles. For example, a small quad copter weighing one or two pounds in the hands of a professional videographer would be considered a professional platform.

That same unmanned aircraft in the hands of a hobbyist is a hobbyist platform and that same platform in the hands of a 10-year-old child might be considered a toy.

Another issue and one that falls squarely under the jurisdiction of this committee is that far more than in the past unmanned aircraft are becoming consumer products.

In the event of a defect creating a safety hazard, this creates some complex potential overlaps between agencies such as the FAA on the one hand and the Consumer Products Safety Commission on the other hand.

For unmanned aircraft that are marketed as consumer products there is certainly a role for consumer protection. I believe the Consumer Products Safety Commission recognizes this. In fact, a search of recalls on the CPSC Web site shows that they have been very active in issuing recalls related to consumer unmanned aircraft products.

Of course, no one would suggest the CPSC should have jurisdiction over a Global Hawk or that they should be involved in developing regulations governing flight operations.

But precedent makes it clear that with respect to product safety the CPSC will be in the mix and in fact has already been in the mix for quite a few years when it comes to consumer unmanned aircraft.

As consumer unmanned aircraft offerings continue to grow, there will be an increased need for coordination between the CPSC and the FAA.

For example, there will be some UAS products that serve both consumer and nonconsumer markets. The safety issue with one of those products might be initially reported to the FAA and not the CPSC or vice versa.

The good news is that the CPSC has proven adept at addressing an extremely broad range of products in the past and there is every reason to believe it will be capable of addressing the growing number of consumer unmanned aircraft product offerings that fall within its jurisdiction.

In closing, I would like to express my appreciation to the subcommittee for holding this series of hearings on disruptive technologies including the unmanned aircraft being discussed today.

With rapidly changing technologies there can sometimes be a tendency to over regulate and in doing so to inadvertently stifle innovation, impede future growth or infringe civil liberties.

To ensure a balanced approach when contemplating new policy solutions addressing these technologies, I think it is important to take a full accounting of existing frameworks, some of which can be more applicable than might initially be apparent.

Integrating unmanned aircraft into the national airspace system will open up a host of socially and economically beneficial applications.

In addition, that integration will help ensure continued American leadership not only in aviation but also in related sectors such as robotics.

I am confident that with the proper mix of education, self regulation and government oversight the overwhelming majority of commercial and hobbyist unmanned aircraft operators will fly safely and in a manner respectful of privacy and property rights.

Thank you again for the opportunity to testify on this important topic.

[The prepared statement of Mr. Villasenor follows:]

The Fast-Evolving Uses and Economic Impacts of Drones

Written Testimony of John Villasenor

**Professor of Electrical Engineering, Public Policy, and Management
University of California, Los Angeles**

before the

**House Committee on Energy and Commerce
Subcommittee on Commerce, Manufacturing, and Trade**

November 19, 2015

Good morning Chair Burgess, Ranking Member Schakowsky, and members of the subcommittee. Thank you very much for the opportunity to testify today on the important topic of domestic unmanned aircraft systems (UAS), often referred to as “drones.”

I am a professor at UCLA, where I hold faculty appointments in the Electrical Engineering Department, the Department of Public Policy, and the School of Management. In addition, during the current academic year I am a visiting professor at the UCLA School of Law. I also have several academic affiliations outside of UCLA, including an appointment as a National Fellow at the Hoover Institution at Stanford. The views I am expressing here are my own, and do not necessarily represent those of any of the organizations with which I am affiliated.

In my testimony today I am focusing on UAS used by private entities such as companies or hobbyists. I am not addressing UAS operation by government entities such as law enforcement agencies, although that of course raises its own set of important policy issues.

The testimony that follows provides an overview of UAS technology, a review of some aspects of the current legislative landscape, and a discussion of consumer protection, which is an aspect of UAS that I expect to be particularly relevant to this subcommittee.

Unmanned Aircraft Technology: A Wide Variety of Platforms

Today's hearing is part of a series the Subcommittee on Commerce, Manufacturing, and Trade is holding on disruptive technologies, a term that certainly applies to UAS. UAS actually have a much longer history than is widely known, with work dating back to before the Wright Brothers' 1903 demonstration of sustained, powered, heavier-than-air flight, and that continued through essentially the entirety of the 20th century. Thus, the concept of unmanned aircraft is anything but new.

Yet in recent years UAS have proliferated, spurred by a combination of technology advances in airframe design, integrated circuits, wireless communications, and very lightweight, small-form-factor imaging systems. Due to these advances, it is now possible to acquire amazingly capable platforms at remarkably low costs.

Unsurprisingly, this is creating both opportunities and challenges. The opportunities lie in the many economically beneficial applications that UAS can enable. The challenges lie in accessing those benefits while ensuring that UAS are operated safely and in a manner protecting privacy.

In discussing UAS policy issues, it is helpful to keep in mind the enormous variety of platforms involved. Today a UAS can include everything from a small toy helicopter that might cost only \$10 to a jet-powered Global Hawk, which can weigh 15,000 pounds and cost \$100 million. There are solar-powered aircraft that can stay aloft in the stratosphere for weeks¹ at a time, and hobbyist "quadcopters" that may weigh only a pound or two and that have flight durations measured in minutes.

Some unmanned aircraft are amazingly small. The Nano Hummingbird developed by California-based AeroVironment weighs only two-thirds of an ounce, including an on-board video camera.² And that is technology that is now almost half a decade old. In 2013, a team of Harvard researchers reported the successful flight of the RoboBee, a robotic insect powered by electricity delivered through a thin wire attached to an external power source. The RoboBee weighs less than one three-hundredth of an ounce.³ As these examples make clear, a term like "drone" or "UAS" can refer to many different things.

¹ Andrew Chuter, *Solar UAV Lands After Record 2 Weeks Aloft*, DEFENSENEWS, July 23, 2010, <http://www.defensenews.com/article/20100723/DEFSECT01/7230304/Solar-UAV-Lands-After-Record-2-Weeks-Aloft>.

² Press Release, AeroVironment Inc., *AeroVironment Develops World's First Fully Operational Life-Size Hummingbird-Like Unmanned Aircraft for DARPA*, Feb. 17, 2011, *available at* http://www.avinc.com/resources/press_release/%20aerovironment_develops_worlds_first_fully_operational_life-size_hummingbird.

³ Press Release, Wyss Institute for Biologically Inspired Engineering at Harvard University, *Robotic insects make first controlled flight*, May 2, 2013, *available at* <http://wyss.harvard.edu/viewpressrelease/110/>.

A Complex and Evolving Legal and Regulatory Landscape

As the members of this subcommittee are well aware, unmanned aircraft have received significant attention in recent years from Congress, the White House, the FAA, state legislatures, and the public. Much of the growth in attention has occurred since 2012, when the FAA Modernization and Reform Act of 2012 (FMRA)⁴ was signed into law. The FMRA laid out a schedule for integration of UAS into the National Airspace System (NAS), and spurred strong interest in UAS from manufacturers, potential UAS users, and the general public.

The legislative and regulatory attention since the 2012 enactment of the FMRA has primarily been directed to two issues: safety and privacy. With respect to safety, the key goals are to 1) ensure that UAS can share the National Airspace System (NAS) without putting manned aircraft at risk, and 2) ensure the safety of people on the ground in the vicinity of UAS operations.

Airspace safety, of course, falls under the purview of the FAA, which has a mission “to provide the safest, most efficient aerospace system in the world.”⁵ In February 2015, the FAA released a long-awaited Notice of Proposed Rulemaking (NPRM) for commercial “small” UAS (sometimes referred to as “sUAS”), defined as those weighing under 55 pounds. Recognizing that the safety issues raised by sUAS depend in large part how large they are and the manner and location in which they are operated, the proposed rules create, within sUAS, a separate subcategory of “micro” (weighing 4.4 pounds or less) UAS. As explained in the NPRM, “a very light (micro) UAS operating at lower altitudes and at lower speeds, that is made up of materials that break or yield easily upon impact, may pose a much lower risk to persons, property, and other NAS users than a UAS that does not operate within these parameters.”⁶

It is important to note that the FAA’s rulemaking efforts described above are primarily directed towards UAS operations by *commercial* entities. UAS hobbyists, by contrast, provided that they meet several criteria,⁷ including operating “in accordance with a community-based set of safety guidelines and within the programming of a nationwide community-based organization,”⁸ are explicitly *not* covered by the FAA’s recently proposed sUAS rules. This is due to a “Special Rule for Model Aircraft” included with the FMRA stating that, provided that those criteria are met, the FAA “may not promulgate any rule or regulation regarding a model aircraft.”⁹ However, the FAA still maintains the right to pursue enforcement actions against hobbyist UAS operators who fly in an unsafe manner.

⁴ Pub. L. No. 112-95, § 331, 126 Stat. 11, 72 (2012).

⁵ *About FAA*, FAA.GOV, <http://www.faa.gov/about/> (last visited Nov. 16, 2015).

⁶ FAA Notice of Proposed Rulemaking, *Operation and Certification of Small Unmanned Aircraft Systems*, Dkt No.: FAA-2015-0150; Notice No. 15-01 (Feb. 15, 2015) at 57-58, available at https://www.faa.gov/regulations_policies/rulemaking/recently_published/media/2120-AJ60_NPRM_2-15-2015_joint_signature.pdf.

⁷ Pub. L. No. 112-95, § 336, 126 Stat. 11, 77 (2012).

⁸ *Id.*

⁹ *Id.*

Despite this statutory exception to the FAA rulemaking, the landscape regarding the specific regulatory framework that will apply to hobbyists remains in flux. In October 2015, U.S. Transportation Secretary Anthony Foxx and FAA Administrator Michael Huerta announced that UAS hobbyists would be required to register their aircraft.¹⁰ In an announcement describing the decision, Transportation Secretary Anthony Foxx said that “[r]egistering unmanned aircraft will help build a culture of accountability and responsibility” and will “help protect public safety in the air and on the ground.”¹¹ In November 2015 a task force is due to issue a report on this issue that will include recommendations regarding which toy and small hobbyist UAS to exempt from registration.

I would also like to emphasize the valuable role that self-regulation can play—and in fact, due to the number of UAS operators and aircraft platforms involved, will have to play—as UAS use continues to increase. Congress has already recognized the value of self-regulation when promulgating the “Special Rule for Model Aircraft” in the FMRA. As noted above, that rule leaves authority to develop safety guidelines to nationwide community-based organizations. In addition, there is also an important potential private sector role for self-regulation as a mechanism for facilitating safe airspace sharing. Along these lines, there is a new startup company, AirMap, that has developed software to help UAS operators (both commercial and hobbyist) visualize the airspace around them, including the complexities associated with nearby restricted airspace.

An important complement to self-regulation is education. In late 2014, the Association for Unmanned Vehicle Systems International (AUVSI), Academy of Model Aeronautics (AMA) and the Small UAV Coalition partnered with the FAA to launch “Know Before You Fly,”¹² a campaign aimed at “inform[ing] consumers and businesses about what they need to know *before* taking to the skies” with an unmanned aircraft.¹³

Privacy is another vitally important UAS topic. The privacy challenge arises from the very legitimate concern that a small minority of UAS operators might misuse their platforms to obtain imagery from vantage points that create privacy violations. As I have written elsewhere, “[u]se of a UAS to invade an individual’s privacy could result in civil or criminal liability. With respect to civil liability, courts in most jurisdictions recognize the two forms of common law invasion of privacy most likely to arise in connection with UAS: intrusion upon seclusion and public

¹⁰ *U.S. Transportation Secretary Anthony Foxx Announces Unmanned Aircraft Registration Requirements: New Task Force to Develop Recommendations by November 20*, U.S. DEP’T OF TRANSP. (Oct. 15, 2015), <https://www.transportation.gov/briefing-room/us-transportation-secretary-anthony-foxx-announces-unmanned-aircraft-registration>.

¹¹ *Id.*

¹² <http://knowbeforeyoufly.org>

¹³ Press Release, Association for Unmanned Vehicle Systems International, AUVSI, AMA, Small UAV Coalition and FAA Launch “Know Before You Fly” Campaign, Dec. 22, 2014, *available at* <http://www.auvsi.org/mississippi/blogs/auvsi-membership/2014/12/22/auvsi-ama-small-uav-coalition-and-faa-launch-know-before-you-fly-campaign>, emphasis in original.

disclosure of private facts. In addition, some states also have civil or criminal statutes, or both, related to invasion of privacy.”¹⁴

There has been substantial debate regarding whether the existing non-UAS-specific statutory and common law privacy protections are sufficient. This has led to multiple UAS privacy bills in Congress, though none have yet been enacted into law. UAS privacy has also received attention from the White House. In February 2015, President Obama’s issued a Presidential Memorandum titled “Promoting Economic Competitiveness While Safeguarding Privacy, Civil Rights, and Civil Liberties in Domestic Use of Unmanned Aircraft Systems.”¹⁵

Among other things,¹⁶ the Memorandum directed the National Telecommunications and Information Administration (NTIA) to initiate a “multi-stakeholder engagement process to develop a framework regarding privacy, accountability, and transparency for commercial and private UAS.”¹⁷ The NTIA framework will not have the force of law, but will instead be a set of “best practices” that commercial and private UAS operators will presumably be encouraged to adopt. On March 5, 2015, the NTIA published a request for public comment¹⁸ and identified a set of 16 questions relating to privacy, accountability, and transparency in relation to commercial and private UAS. This was followed by a series of stakeholder meetings during the second half of 2015, with the goal of releasing a draft code of conduct for public comment in late 2015 or early 2016.¹⁹

In parallel with all of this, there have been many legislative initiatives at the state level. According to an October 8, 2015 posting from the National Conference of State Legislatures:

In 2015, 45 states have [as of October 2015] considered 168 bills related to drones. Twenty states—Arkansas, California, Florida, Hawaii, Illinois, Louisiana, Maine, Maryland,

¹⁴ John Villaseñor, *Observations From Above: Unmanned Aircraft Systems and Privacy*, 36 HARV. J.L. & PUB. POL’Y 457, 500 (2013), internal citations omitted.

¹⁵ The White House, Office of the Press Secretary, *Presidential Memorandum: Promoting Economic Competitiveness While Safeguarding Privacy, Civil Rights, and Civil Liberties in Domestic Use of Unmanned Aircraft Systems*, WHITEHOUSE.GOV (Feb. 15, 2015), available at <https://www.whitehouse.gov/the-press-office/2015/02/15/presidential-memorandum-promoting-economic-competitiveness-while-safegua>.

¹⁶ The Memorandum also addressed federal government UAS, providing a series of policies and procedures aimed at protecting privacy and civil liberties and ensuring transparency and accountability.

¹⁷ *Id.* at §2(b).

¹⁸ Privacy, Transparency, and Accountability Regarding Commercial and Private Use of Unmanned Aircraft Systems, 80 Fed. Reg. 11978 (Mar. 5, 2015), available at http://www.ntia.doc.gov/files/ntia/publications/rfc_uas_privacy_03052015.pdf.

¹⁹ Multistakeholder Process To Develop Best Practices for Privacy, Transparency, and Accountability Regarding Commercial and Private Use of Unmanned Aircraft Systems, 80 Fed. Reg. 41043 (Jul. 14, 2015), available at http://www.ntia.doc.gov/files/ntia/publications/fr_uas_meetings_notice_07142015.pdf.

Michigan, Mississippi, Nevada, New Hampshire, North Carolina, North Dakota, Oregon, Tennessee, Texas, Utah, Virginia and West Virginia—have passed 26 pieces of legislation.²⁰

Not all of this enacted state legislation addresses privacy, though privacy is a frequent theme. For example, a bill in Florida prohibits a person from using “a drone equipped with an imaging device to record an image of privately owned real property or of the owner, tenant, occupant with the intent to conduct surveillance . . . in violation of such person’s reasonable expectation of privacy”²¹ A bill enacted in California expanded the definition of physical invasion of privacy to encompass knowingly entering “into the airspace above the land of another person without permission”²² in order to capture an image that violates privacy. A Nevada bill allows property owners, subject to certain exceptions, to bring an action for trespass against the operator of a UAS who repeatedly overflies the property at less than 250 feet above ground level.²³

Consumer Protection and Unmanned Aircraft

One of the most pertinent UAS-related issues for the Subcommittee on Commerce, Manufacturing, and Trade concerns the extent to which UAS are consumer products that, in the event of a defect creating a safety hazard, fall under the jurisdiction of the Consumer Product Safety Commission (CPSC). UAS distributed purely for commercial/industrial applications clearly are not consumer products. However, for UAS that are marketed as consumer products, I believe that the CPSC will in some cases have a role in the event that a design or manufacturing defect that poses a safety issue.

The CPSC has jurisdiction, with some important exceptions, over consumer products distributed for “personal use, consumption or enjoyment of a consumer in or around a permanent or temporary household or residence, a school, in recreation, or otherwise.”²⁴ Notably, one of the statutory exceptions, in addition to those for motor vehicles, tobacco, drugs, foods, etc., is for “aircraft,”²⁵ which are defined very broadly: “[A]ircraft’ means any contrivance invented, used,

²⁰ *Current Unmanned Aircraft State Law Landscape*, NCSL.ORG (Oct. 8, 2015), <http://www.ncsl.org/research/transportation/current-unmanned-aircraft-state-law-landscape.aspx>.

²¹ C.S./S.B. 766, 117th Reg. Sess. (Fla. 2015), *available at* <http://www.flsenate.gov/Session/Bill/2015/0766/BillText/er/PDF>.

²² A.B. 856, 2015-2016 Reg. Sess. (Cal. 2015), *available at* https://leginfo.ca.gov/faces/billTextClient.xhtml?bill_id=201520160AB856

²³ A.B. 239, 78th Reg. Sess. (Nev. 2015), *available at* <https://www.leg.state.nv.us/App/RELIS/REL/78th2015/Bill/1672/Text>

²⁴ 15 U.S.C. § 2052(a)(5).

²⁵ See 15 U.S.C. § 2052(a)(5)(F): “aircraft, aircraft engines, propellers, or appliances (as defined in section 40102(a) of title 49).”

or designed to navigate, or fly in, the air.”²⁶ That definition clearly includes unmanned aircraft. And, notably, the wording of the definition (“any contrivance”) makes no distinction based on size.

Yet despite this language that could be read to place *all* “aircraft” outside CPSC oversight, precedent confirms that in practice, small, consumer-grade UAS, including but not limited to toy UAS, *have* in fact been treated as consumer products under CPSC jurisdiction. The CPSC web site lists numerous examples of recalls involving toy helicopters. Recalls have also targeted products used by hobbyists to control unmanned aircraft. In 2009, for example, the CPSC issued a recall for a radio transmitter²⁷ used to control certain model aircraft. The recall notice, which covered about 15,000 units, stated that “[t]he defective radio transmitters can cause model airplanes and helicopters they control to fall from the sky while in flight and crash into bystanders or property” and that the radio transmitters could cause the propellers on model aircraft to “spin unexpectedly injuring a person standing too close or working on the aircraft. This poses impact and laceration hazards to consumers and a risk of property damage.”²⁸

Of course, no one would suggest that the CPSC should have jurisdiction over a Global Hawk, or that the CPSC should be involved in developing regulations governing flight operations. But it would also be inconsistent to suggest that the CPSC should have absolutely *no* role in relation to UAS. Precedent makes it clear that with respect to product safety the CPSC will be in the mix—and in fact has already been in the mix—when it comes to consumer UAS.

As consumer UAS offerings continue to grow, there will be an increased need for coordination between the CPSC and FAA. For instance, there will be some UAS products that serve both consumer and non-consumer markets. A safety issue with one of those products might be initially reported to the FAA and not the CPSC, or vice versa. The good news is that the CPSC has proven adept at addressing an extremely broad range of products in the past, and there is every reason to believe it will be capable of addressing the growing number of consumer UAS product offerings that fall within its jurisdiction—and capable of coordinating effectively with the FAA when product safety issues arise with UAS that straddle consumer and non-consumer markets.

²⁶ 49 U.S.C. §40102(a)(6). The definition in 14 C.F.R. §1.1 is similarly broad: “a device that is used or intended to be used for flight in the air.” It is also worth noting that under the 2012 FMRA (see Pub. L. No. 112-95, § 331, 126 Stat. 11, 72 (2012)), “unmanned aircraft” have been defined as “an aircraft that is operated without the possibility of direct human intervention from within or on the aircraft,” and UAS have been defined to mean “an unmanned aircraft and associated elements (including communication links and the components that control the unmanned aircraft) that are required for the pilot in command to operate safely and efficiently in the national airspace system.” These definitions are both silent on any distinction related to size.

²⁷ Of course, a radio transmitter used to control an aircraft is not, itself, an aircraft, though it is certainly part of a UAS.

²⁸ Radio Transmitters for Model Aircrafts Recalled by Horizon Hobby Due to Impact and Laceration Hazards, CPSC.GOV (Apr. 2, 2009), <http://www.cpsc.gov/en/Recalls/2009/Radio-Transmitters-for-Model-Aircrafts-Recalled-by-Horizon-Hobby-Due-to-Impact-and-Laceration-Hazards/>.

Conclusion

In closing, I would like to express my appreciation to the subcommittee for holding this series of hearings on disruptive technologies, including the unmanned aircraft being discussed today. With rapidly changing technologies there can sometimes be a tendency to overregulate—and in doing so to inadvertently stifle innovation, impede future growth, or infringe civil liberties. To ensure a balanced approach when contemplating new policy solutions addressing these technologies, I think it is important to take a full accounting of existing frameworks, some of which can be more applicable than might initially be apparent.

Integrating unmanned aircraft into the National Airspace System will open up a host of socially and economically beneficial applications. In addition, UAS integration will help ensure continued American leadership not only in aviation but also in related sectors such as robotics. I am confident that with the proper mix of education, self-regulation, and government oversight, the overwhelming majority of commercial and hobbyist UAS operators will fly safely and in a manner respectful of privacy and property rights.

Thank you again for the opportunity to testify on this important topic.

Mr. BURGESS. The chair thanks the gentleman.

Professor Kaminski, you are recognized for 5 minutes for the purpose of an opening statement.

STATEMENT OF MARGOT KAMINSKI

Ms. KAMINSKI. Good morning, Chairman Burgess, Ranking Member Schakowsky and distinguished members of the subcommittee. Thank you very much for the opportunity to testify today on unmanned aircraft systems, or drones.

I am a professor of law at the Ohio State University Moritz College of Law and an affiliated fellow of the Information Society Project at Yale Law School.

However, as a fellow panelist, the views I am expressing today are my own. In my testimony I am going to focus primarily on the impact of drones on privacy, which is a crucial aspect, as many members recognize, of consumer protection.

For drones to be publically accepted and fulfill their economic potential, citizens must be able to trust that the surveillance powers drones have will not be abused.

Drones will be used for a wide variety of economically and socially beneficial activities ranging from infrastructure inspection to precision agriculture. In the best scenarios, drones will reduce risks to human actors and enable important information gathering at a low cost.

But it is precisely these beneficial aspects of drones that they enable low cost low risk information gathering that also raise the spectre of privacy harms.

While many uses of drones will have little to no impact on human populations, a wide variety of commercial applications will take place in residential environments where citizens' expectations of privacy have been recognized to be at their highest.

AUVSI, in its analysis of the first 1,000 commercial UAS exemptions granted by the FAA noted that over half of the exemptions were granted for general aerial photography, real estate uses, which quintessentially impact residential areas, followed with a third of the exemption, 350 exemptions.

Drones do raise privacy concerns on a spectrum with other technologies. Like smart phones, they make surveillance more pervasive by lowering its cost and raising the rate of social adoption.

Like GPS, they make surveillance more persistent—that is, able to follow individuals over longer periods of time. And like helicopters, they enable surveillance from disruptive vantage points.

Drones thus raise privacy problems both because of what they carry and where they carry it. Where a person used to be able to rely on a privacy fence, remote location or building height to manage their social accessibility, drones disrupt the use of these environmental management tactics that we all rely on.

These disruptions have real social costs. Not only may citizens fear drones or even shoot them down but they will alter their behavior in ways that can be truly socially harmful. Surveillance has been shown to cause conformity, and conformity has costs to both democracy and the economy.

Multiple states have, as a consequence, recently enacted privacy laws governing drones operated by nongovernmental actors.

These laws are often but not always technology specific, addressing drones but not other kinds of surveillance, and they typically govern the moment of actually surveillance when information is collected, not data privacy practices after the information has been gathered.

The content of these laws range widely. At this point, I counted nine or ten states that have enacted them. They range from protecting from the moment of gathering in any location to protecting only gathering information on private property, which is a limited value when you consider where drones can fly.

Privacy protection is crucially important but governing drones also implicates First Amendment interests. Drone journalism is a budding field. News gatherers will be able to and will use drones to gather information about droughts, land management and government actions, all information that enables democratic self-governance and raises significant First Amendment concerns.

A number of courts of appeals have now recognized a limited First Amendment right to record. The scope of that right is still very much up for question. And for this reason, I actually caution the federal government against enacting legislation that governs information gathering by drones by private actors.

Courts will need time to unravel the tension between the state privacy laws and countervailing First Amendment interests. In the meantime, federal energy can better be turned towards the data privacy issues that drones and similar new technology like the Internet of things raise.

Drone surveillance implicates not just information gathering but data privacy. State drone privacy laws do not attempt to govern this data and this, I believe, is the place for federal action.

The information privacy harms raised by drones sit, again, on a spectrum with other familiar technologies. It shares features with online surveillance. Information privacy harms will largely arise when large amounts of information are correlated, used out of context or used in a discriminatory fashion.

Drone surveillance crucially differs, however, from online surveillance in that the surveillance subject will not be the person who clicks through a user agreement.

Like the Internet of things, drones raise the question of how to govern information privacy when the surveillance subject has no relationship to the product manufacturer or service provider.

Our current data privacy regime based on requiring companies primarily to comply with their own privacy policies is ill equipped to address issues raised by the Internet of other people's things.

A federal data privacy regime based instead on the Fair Information Practice Principles, or FIPPs, embraced internationally would protect the privacy of citizens who are not subject to user agreements, would bolster FTC authority in this area and would provide a backdrop of encouraging industries to establish best practices even when they have few incentives based on consumer relationships.

To close, I support and have been participating in the Department of Commerce's efforts through the National Telecommunications Infrastructure Agency to establish and recommend best practices governing drone use and privacy.

In the absence of federal data privacy law, however, industry is unlikely to agree to meaningful protection for third parties and in the absence of meaningful privacy protections drones will not get off the ground.

Thank you very much for your time and attention and the opportunity to testify today.

[The prepared statement of Ms. Kaminski follows:]

PREPARED STATEMENT OF PROFESSOR MARGOT E. KAMINSKI

For the

**COMMITTEE ON ENERGY AND COMMERCE OF THE U.S. HOUSE OF
REPRESENTATIVES,
SUBCOMMITTEE ON COMMERCE, MANUFACTURING, AND TRADE**

On

**THE DISRUPTER SERIES:
THE FAST-EVOLVING USES AND ECONOMIC IMPACTS OF DRONES**

**Margot E. Kaminski
Assistant Professor of Law
Moritz College of Law
The Ohio State University
November 19, 2015**

Prepared Statement of Professor Margot E. Kaminski

Good morning Chairman Burgess, Ranking Member Schakowsky, and distinguished members of the subcommittee. Thank you very much for the opportunity to testify today on unmanned aircraft systems, or “drones.”

I am a professor of law at the Ohio State University Moritz College of Law, and an affiliated fellow at the Information Society Project at Yale Law School. The views I am expressing here today are my own.

In my testimony today, I will focus on the impact of drones on privacy, which is a crucial aspect of consumer protection. For drones to be publicly accepted and fulfill their economic potential, citizens must be able to trust that their surveillance powers will not be abused.

Drones in Residential Areas

Drones will be used for a wide variety of economically and socially beneficial activities, ranging from infrastructure inspection to precision agriculture.¹ In the best scenarios, drones will reduce risks to human actors and enable important information gathering at a relatively low cost. But it is precisely these beneficial aspects of drones—that they enable low-cost, low-risk information gathering through a variety of technologies—that raise the specter of substantial privacy harms. While many uses of drones will have little to no impact on a human population, a wide variety of commercial applications will take place in residential environments, where citizens’ expectations of privacy are at their highest.²

¹ Analysis of the First 1,000 Commercial UAS Exemptions, AUVSI, <http://auvsilink.org/advocacy/Section333.html>.

² *Kyllo v. United States*, 533 U.S. 27, 31 (2001)(citing *Silverman v. United States*, 365 U. S. 505, 511

AUVSI in its analysis of the first 1,000 Commercial UAS Exemptions granted by the Federal Aviation Administration observed that over half of the exemptions were granted for general aerial photography.³ Real estate uses, which quintessentially impact residential areas, followed with 350 exemptions.⁴ Uses that are less likely to impact residential privacy, by contrast, received fewer exemptions. Agricultural use accounted for 164 exemptions, with search and rescue and utility inspection each receiving under 100.⁵ And to briefly flag another consumer protection issue for the Committee: insurance-related uses received 25 exemptions.⁶

Drone Privacy Harms

Drones raise privacy concerns on a spectrum with other technologies. Like smart phones, they make surveillance more pervasive by lower its cost and raising the rate of social adoption.⁷ Like GPS, they make surveillance more readily persistent, able to follow individuals over long periods of time. Like helicopters, they enable surveillance from disruptive vantage points.

Drones raise privacy problems because of both what they carry, and where they carry it. Where a person used to be able to rely on a privacy fence, remote location, or building height to manage social accessibility, drones disrupt the use of the environmental management tactics we all rely on. These disruptions have real social costs. Not only may citizens fear drones—or even

(1961))(observing that the “very core” of privacy is “the right of a man to retreat into his own home”).

³ Analysis of the First 1,000 Commercial UAS Exemptions, AUVSI, <http://auvsilink.org/advocacy/Section333.html>.

⁴ *Id.*

⁵ *Id.*

⁶ *Id.*

⁷ *The number of drones expected to sell during the holidays is scaring the government*, Michal Addady, Fortune, <http://fortune.com/2015/09/29/drones-holiday-sales/> (Sep. 29, 2015)(citing an FAA estimate of 1 million drone sales this winter). For a quick overview of consumer drone prices, see *the Best Drone you Can Buy Right Now*, Ben Popper, The Verge, <http://www.theverge.com/2014/7/31/5954891/best-drone-you-can-buy>(Sep. 23, 2015).

shoot them down⁸—but they will alter their behavior in ways that can be truly socially harmful. Surveillance causes conformity, and conformity has costs to both democracy and the economy.⁹

Not all technological changes should drive legislation. But where a technology significantly lowers the cost of committing a harm, lawmakers often and justifiably step in to raise costs again. We saw this in the early days of online file sharing, and we are seeing it today in state regulation of drones.

State Drone Privacy Laws

Multiple states have recently enacted privacy laws governing information gathering by drones operated by nongovernmental actors. These laws are often, but not always, technology-specific, addressing drones, but not other kinds of surveillance. For the purposes of this committee, it is crucial to note that these state laws govern the moment of actual surveillance, rather than imposing a data privacy regime to govern the information after it is collected. State drone privacy laws build on the tradition of state privacy torts, an area where states are well-accustomed to governing. These drone privacy laws fill perceived gaps between the tort of intrusion, which has often been interpreted to require isolation or complete withdrawal for privacy protection, and Peeping Tom laws, which often require actual physical trespass or peeping through a window. State drone laws, by contrast, can govern surveillance even where there is no trespass, and may be used to govern persistently intrusive surveillance when it is conducted outside the home.

⁸ *Judge rules Kentucky man had the right to shoot down his neighbor's drone*, James Vincent, The Verge, <http://www.theverge.com/2015/10/28/9625468/drone-slayer-kentucky-cleared-charges> (Oct. 28 2015).

⁹ Margot E. Kaminski & Shane Witnov, *The Conforming Effect: First Amendment Implications of Surveillance, Beyond Chilling Speech*, 49 U. RICH. L. REV. 465, 483–93 (2014).

The content of state drone privacy laws varies widely. Texas, for example, has taken the approach of widely banning drone surveillance of individuals or real property, but has carved out a long list of permitted exceptions.¹⁰ The exceptions include carve-outs for real estate use and the inspection of oil pipelines, but interestingly not for newsgathering.¹¹

Oregon, by contrast, took a trespass-based approach, hewing closely to real property rights.¹² The Oregon drone trespass law creates a private right of action for anybody who “owns or lawfully occupies real property” against a person conducting drone flight over that property. The drone must have been flown over the property on at least one previous occasion, and the property owner or occupant must have notified the drone operator that she did not wish the drone to be flown again.

California took a more technology-neutral approach, amending its paparazzi law to include surveillance by drone, to protect individuals from a “constructive invasion of privacy” where a technology is used to invade a space that otherwise could not have been reached without physical trespass.¹³

Wisconsin’s approach to regulating drone surveillance delegates decision-making to its courts. Wisconsin has made it a misdemeanor to use a drone to “photograph, record, or otherwise observe another individual in a place or location where the individual has a reasonable expectation of privacy.”¹⁴ Courts will be responsible for interpreting what counts as a place

¹⁰ H.R. 912, 83d Leg., Reg. Sess. § 423.003 (Tex. 2013)(making it illegal “to capture an image of an individual or privately owned real property in this state with the intent to conduct surveillance on the individual.”).

¹¹ H.R. 912, 83d Leg., Reg. Sess. § 423.002 (Tex. 2013)(13),(18)(carving out exceptions for real estate and oil pipeline inspection).

¹² H.R. 2710, § 15, 77th Leg., Reg. Sess. (Or. 2013) (codified as amended by H.R. 2354, 78th Leg., Reg. Sess. (Or. 2015), at OR. REV. STAT. § 837.380 (2014)).

¹³ See Assemb. 2306, 2013–2014 Reg. Sess. (Cal. 2014), available at http://leginfo.ca.gov/pub/13-14/bill/asm/ab_2301-2350/ab_2306_bill_20140930_chaptered.pdf; DL Cade, California Updates Invasion of Privacy Law to Ban the Use of Camera Drones, PETAPIXEL (Oct. 14, 2014), <http://petapixel.com/2014/10/14/california-passes-law-banning-drones-protect-general-publics-privacy/>.

¹⁴ WIS. STAT. ANN. § 942.10 (West, Westlaw through 2015).

where a person has a reasonable expectation of privacy; but by targeting drone surveillance with no mention of property ownership, the Wisconsin legislature has signaled that protection is likely to span beyond the home.

Significant Countervailing First Amendment Interests

Privacy protection is crucially important, but governing drones also implicates important First Amendment interests. Drone journalism is a budding field.¹⁵ Newsgatherers will be able to use drones to gather information about droughts, land management, and government actions, all information that enables democratic self-governance and raises First Amendment concerns.

A number of courts have recognized a First Amendment “right to record.”¹⁶ The scope of that right is still uncertain. Courts thus far have limited the right to record to matters of public concern, or actions by government officials, knowing that too broad of a recording right threatens a number of privacy laws.¹⁷ It is against this backdrop that state drone privacy laws have been enacted. These laws will no doubt face First Amendment challenges, many of which will be appropriate. A law that allows real-estate photography but not newsgathering inappropriately targets some speakers, and favors others. The First Amendment does not permit that sort of favoritism.¹⁸

¹⁵ See, e.g., <http://www.dronejournalismmlab.org/about>.

¹⁶ *Glik v. Cunniffe*, 655 F.3d 78, 83 (1st Cir. 2011) (finding that “the First Amendment protects the filming of government officials in public spaces”); *Smith v. City of Cumming*, 212 F.3d 1332, 1333 (11th Cir. 2000) (finding that the “First Amendment protects the right to gather information about what public officials do on public property, and specifically, a right to record matters of public interest”); *ACLU v. Alvarez*, 679 F.3d 583, 586-87 (7th Cir. 2012) cert. denied, 133 S. Ct. 651, 184 L. Ed. 2d 459 (U.S. 2012).

¹⁷ *Id.*

¹⁸ *Sorrell v. IMS Health Inc.*, 131 S.Ct. 2653 (2011).

For this reason, I caution the federal government against enacting legislation governing information gathering by drones, by private actors.¹⁹ Courts will need time to unravel the tension between state drone privacy laws and countervailing First Amendment interests. In the meantime, federal energy can better be turned towards the data privacy issues that drones and other new technologies raise.

What the Federal Government Can Do: Technology-Neutral Data Privacy Law

Drone surveillance implicates data privacy. The information gathered by drones will be stored, analyzed, and used for a wide variety of purposes. When used out of context, this information has the potential to be socially disruptive or even discriminatory.²⁰ State drone privacy laws do not attempt to govern this data. This is the place for federal action.

The information privacy harms raised by drones again sit on a spectrum with harms raised by other technologies. Drones surveillance shares features with online surveillance, in that information privacy harms will largely arise because of massive amounts of information being used out of context or in a discriminatory fashion.²¹ Drone surveillance differs, however, from online surveillance, in that the surveillance subject often will not be the person who clicks through a user agreement. Like the Internet of Things, drones raise the question of how to govern information privacy when the surveillance subject has no relationship to the product manufacturer or service provider. However accurate or inaccurate our notions of consent are with

¹⁹ Margot E. Kaminski, *Drone Federalism: Civilian Drones and the Things They Carry*, 4 CALIF. L. REV. CIRCUIT 57, 57–59 (2013).

²⁰ See *Big Data: Seizing Opportunities, Preserving Values: Interim Progress Report* (Feb. 1, 2015), https://www.whitehouse.gov/sites/default/files/docs/20150204_Big_Data_Seizing_Opportunities_Preserving_Value_s_Memo.pdf.

²¹ *Id.*

respect to interactions in digital space, they are not applicable when it comes to real-world surveillance by third parties.

Our current data privacy regime, based primarily on requiring companies to comply with their own privacy policies, is ill-equipped to address the issue of the Internet of Other Peoples' Things.²² As the Federal Trade Commission has used the current regime to reach beyond privacy policies and target unfair data practices, it has faced significant challenges in court.²³ A federal data privacy regime based instead on the Fair Information Practice Principles (FIPPs) would protect the privacy of citizens who are not subject to user agreements, would bolster FTC authority in this area, and would provide a backdrop for encouraging industries to establish best practices even where they have few incentives based on consumer relationships.

I support and have been participating in the Department of Commerce's efforts, through the National Telecommunications Infrastructure Agency, to establish and recommend best practices governing drone use. In the absence of federal data privacy law, however, industry is unlikely to agree to meaningful protections. In the absence of meaningful privacy protections, drones will not get off the ground.

Thank you for your time and attention, and the opportunity to testify today. I would be pleased to answer your questions.

²² Meg Leta Jones, *Privacy without Screens and the Internet of Other People's Things* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2614066.

²³ *Third Circuit rules in FTC v. Wyndham case*, <https://www.ftc.gov/news-events/blogs/business-blog/2015/08/third-circuit-rules-ftc-v-wyndham-case>.

Mr. BURGESS. The chair thanks the gentlelady.

Mr. Wynne recognized for 5 minutes for an opening statement, please.

STATEMENT OF BRIAN WYNNE

Mr. WYNNE. Thank you, Chairman Burgess, Ranking Member Schakowsky. Thank you very much, members of the subcommittee for the opportunity to participate in today's hearing on unmanned aircraft systems.

I am speaking on behalf of the Association for Unmanned Vehicle Systems International, the world's largest nonprofit organization devoted exclusively to advancing unmanned systems and robotics.

UAS have a significant impact on our society and economy already and will continue to do so in the future. From inspecting oil pipelines and filming television shows and movies to providing farmers with aerial views of their crops, the applications of UAS are virtually endless and they enable researchers, public entities and businesses to do things safer and more cost effectively.

UAS industry is poised to be one of the fastest growing in American history. The AUVSI numbers have already been referenced by several of the speakers.

There is no question that under the right regulatory environment that these numbers could actually go higher. However, we are disappointed that the FAA missed the September 30th, 2015 congressionally mandated deadline for UAS integration and it still has yet to finalize a small UAS rule for commercial operations.

As we wait, American businesses and innovators are left sitting on the sidelines or are operating under a restrictive exemption process. Let me explain.

Under the small UAS rule, until the small UAS rule is finalized the primary way commercial operators may fly is through an exemption process.

In May 2014, the FAA announced it would consider granting exemptions for low-risk commercial UAS applications under Section 333 of the 2012 FAA Modernization and Reform Act.

Currently, the FAA has more than 2,400 pending requests and has granted more than 2,200 exemptions to businesses. According to AUVSI's report on the first 1,000 exemptions businesses in more than 25 industries representing more than 600,000 jobs are now using UAS.

These companies contributed about \$500 billion to the U.S. economy in 2014 and provide essential services to citizens across the nation.

For example, Texas businesses have received 82 approvals to fly commercially. More than a third of these companies are real estate businesses such as Austin-based Boyd & Boyd Properties.

The Associated General Contractors of America represents 26,000 member companies in the construction industry. Some are using UAS to improve project planning and execution.

These are only a couple of examples but it is easy to see the far reaching benefits UAS will add. But while some businesses are flying, the current system of case by case approvals isn't a long-term solution.

Meanwhile, some of the requirements under the exemption process are more onerous than those contemplated in the draft's small UAS rule.

For example, the exemptions typically require UAS operators to hold at least a sport pilot certificate. The draft's small UAS rule, however, would require commercial operators to pass an aeronautical knowledge test every two years.

In addition to helping the UAS industry thrive, putting the small UAS rules in place will provide the necessary tools and training to create a culture of safety around the use of UAS.

As more commercial operators are certified or certificated, they will join the long standing aviation community, which I have been part of for more than 20 years as an instrument rated general aviation pilot.

They will foster the aviation community's principles of airmanship and self-policing to promote safety and help thwart careless and reckless operations. And because safety is essential for all users, AUVSI, in partnership with the Academy of Model Aeronautics and the FAA, last year developed the UAS safety campaign Know Before You Fly to educate newcomers to UAS, many of whom have no aviation experience about where they should and shouldn't fly.

AUVSI also serves on the Department of Transportation's Task Force on Registration. This collaborative effort to develop an efficient process for UAS registration should lead to increased accountability across the entire aviation community.

Under the FAA's draft small UAS rule, commercial operators would be required to register their platforms. Extending this to consumer UAS users will help promote responsibility and safety.

UAS technology is at an exciting and pivotal stage. It is developing rapidly with new applications being introduced nearly every day and at a rate much faster than it takes to develop the necessary regulations.

We need to ensure that the FAA adopts the proper framework to keep up with the rapid development of U.S. technology and to maintain the safety of our airspace.

Thank you again for the opportunity to speak today.

[The prepared statement of Mr. Wynne follows:]



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

**U.S. House of Representatives
Committee on Energy and Commerce
Subcommittee on Commerce, Manufacturing and Trade
November 19, 2015**

Chairman Burgess, Ranking Member Schakowsky and members of the subcommittee, thank you for the opportunity to participate in today's hearing on unmanned aircraft systems (UAS). I am speaking on behalf of the Association for Unmanned Vehicle Systems International (AUVSI), 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 over 600 corporate members, from around the world.

UAS will have a huge impact on our society. From inspecting oil pipelines and surveying bridges to filming television shows and providing farmers with aerial views of their crops, the applications of UAS are virtually limitless and they enable researchers, public entities and businesses to do things safer and more cost effectively.

UAS will also have a significant impact on our economy, as the industry is poised to be one of the fastest-growing in American history. Our economic impact study found that during the first decade following UAS integration into the National Airspace System (NAS), the industry will create more than 100,000 high-paying jobs and provide more than \$82 billion in positive impact to the nation's economy.¹ Under the right regulatory environment, there's no question these numbers could go even higher.

¹ The Economic Impact of Unmanned Aircraft Systems Integration in the United States (AUVSI)

For years, AUVSI has been a leading advocate for the safe integration of unmanned aircraft into the national airspace. While some industries may try to avoid regulation, AUVSI and its members have been urging the FAA to use all available means to establish a regulatory framework, starting with finalizing the small UAS rule, immediately and without any further delays. We were disappointed that the FAA missed the September 30, 2015, congressionally mandated deadline for UAS integration, and the agency still has yet to finalize a small UAS rule for commercial operations. Meanwhile, American businesses and innovators are left sitting on the sidelines or operating under a restrictive exemption process. Let me explain.

Until the small UAS rule is finalized, the primary way commercial operators may fly is through an exemption process. In May 2014, the FAA announced it would consider granting exemptions for certain low-risk commercial UAS applications under Section 333 of the FAA Modernization and Reform Act of 2012. Currently, the FAA has more than 2,400 pending requests and has granted more than 2,200 exemptions to businesses looking to use UAS for a variety of applications.

According to AUVSI's report on the first 1,000 commercial UAS exemptions,² which was released earlier this year, businesses in more than 25 industries representing more than 600,000 jobs are now using UAS technology. These companies contributed about \$500 billion to the U.S. economy in 2014 and provide essential services to citizens across the nation.

Let me provide just a few examples:

1. Texas businesses have received 82 approvals to fly commercially. More than a third of these companies are real estate businesses, such as Austin-based Boyd & Boyd Properties. With the ability to now take aerial photos, this small business can capture unique perspectives for their listings, giving them an edge over their competitors. Real estate is also one of the fastest-

² Analysis of the First 1,000 Commercial UAS Exemptions (AUVSI)
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growing applications of UAS technology nationwide with more than 350 real estate businesses currently approved to fly, according to the National Association of Realtors.

2. Likewise, the construction industry is increasingly looking to use UAS. The Associated General Contractors of America (AGC) and its 26,000 member companies build everything from roadways and bridges to large-scale building complexes. These companies are using UAS to improve project planning and design, safety, efficiency, quality and environmental compliance. UAS are also documenting the progress of large construction projects, like the new Kings arena in Sacramento, to make sure each step is delivered properly and on time.
3. The insurance industry is also latching onto UAS as an essential tool for operations. According to the National Association of Mutual Insurance Companies, insurers are using UAS in risk assessments, especially in dangerous places like high-pitched roofs, and to speed up claims adjudication after disasters, when time is most important in helping victims recover from their losses. In Illinois, for instance, the State Farm Mutual Automobile Insurance Company in Bloomington uses UAS to help evaluate insurance claims, allowing them to get resolutions for customers more quickly.

These are only a few examples, but it is easy to see the far-reaching benefits UAS will add to the American workforce. Just as microprocessors and wireless telecommunications revolutionized our economy over the past decade, UAS are transforming the way industries operate and creating several new ones as well, from startups focused on developing new UAS platforms and components to entrepreneurs creating new business models that offer specific UAS services.

While some businesses have successfully navigated the complex Section 333 process, the current system of case-by-case approvals isn't a long-term solution for the many commercial operators wanting to fly. While some operators are flying, many are not. Meanwhile, some of the requirements under the Section

333 process are more onerous than those contemplated in the draft small UAS rule. For example, the Section 333 exemptions typically require UAS operators to hold at least a sport pilot certificate. The draft small UAS rule, however, would require commercial operators to pass an aeronautical knowledge test every two years – which is similar to a flight exam.

The lack of regulations isn't just limiting the economic potential of this industry; it is also causing states and municipalities to fill the void, at times with laws that they may not have the authority to enforce. In recent months, New York, California and New Hampshire have attempted to pass laws to regulate the national airspace.

While my industry supports the safe, non-intrusive use of UAS technology, we're concerned about creating inconsistencies with federal law. Only the FAA can regulate airspace; states and municipalities cannot. According to Title 49, Part A, Section 1 of the U.S. Code, "The United States Government has exclusive sovereignty of airspace of the United States."³

In the absence of FAA action, we may soon be facing a legal quagmire. Challenges to questionable state laws will tie up the courts and at a significant expense to U.S. taxpayers. It is critical for the federal government to assert its preemption authority over the National Airspace System.

In addition to helping the UAS industry thrive and avoid confusion over conflicting federal and state laws, putting the small UAS rules in place will provide the necessary tools and training to create a culture of safety around the use of unmanned aircraft. As more commercial UAS operators are certified, they will join the long-standing aviation community, which I have been part of for the last 20 years as an instrument-rated general aviation pilot. They will foster the aviation community's principles of airmanship and self-policing to promote safety and thwart careless and reckless operations.

³ <http://www.gpo.gov/fdsys/pkg/USCODE-2011-title49/html/USCODE-2011-title49-subtitleVII-partA-subpartI-chap401-sec40103.htm>

Because safe operations are essential for all users of the national airspace, AUVSI, in partnership with the Academy of Model Aeronautics and the FAA, last year developed a UAS safety campaign called "Know Before You Fly." This effort educates newcomers to the technology about where they should and shouldn't fly. Many retailers, manufacturers and distributors of UAS, as well as organizations representing the manned aviation community, have signed onto the campaign as supporters.

AUVSI also serves on the U.S. Department of Transportation's task force on UAS registration. This collaborative effort to develop an efficient process for UAS registration should lead to increased accountability across the entire aviation community. Under the FAA's proposed small UAS rule released earlier this year, commercial operators would be required to register their platforms. Extending this requirement to consumer UAS users will help promote responsibility and safety.

Finally, we need to start looking beyond the initial phase of UAS integration and lay the groundwork for more transformational uses of UAS technology through a deeper national commitment to UAS research and development. Specifically, AUVSI has highlighted the need for a comprehensive industry-government UAS research plan, more resources for the federal government to coordinate UAS research & development, and a UAS traffic management network that could be operational in the foreseeable future.

We need to make sure we are doing all we can to support the UAS industry's growth and development; otherwise we risk stunting a still-nascent industry and restricting the many beneficial uses of this technology. The longer we take, the more our nation risks losing its innovation edge, along with billions in economic impact.

UAS technology is at an exciting and pivotal stage. The technology is developing rapidly, with new applications being introduced nearly every day, and at a rate much faster than it takes to develop the necessary regulations. We need to ensure the FAA adopts the proper framework to keep up with the rapid

development of UAS technology and is sufficiently resourced to work with industry and other stakeholders to perform essential research to maintain the safety of our airspace.

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

Mr. BURGESS. The chair thanks the gentleman and there are votes on the floor.

I am happy that we made it through all the openings statements. We will take a recess until the conclusion of this vote series. So until then the subcommittee stands in recess subject to the call of the chair.

[Whereupon, the above-entitled matter went off the record at 10:56 a.m. and resumed at 11:43 a.m.]

Mr. BURGESS. I call the subcommittee back to order and once again thank you all for your testimony. Thank you for being patient with us.

We have moved into the question and answer portion of the hearing and I want to begin that by recognizing Mr. Harper from Mississippi 5 minutes for your questions, please.

Mr. HARPER. Thank you, Mr. Chairman.

Thank you to each of you witnesses that are here. This is such an important topic. Unmanned aerial systems, often called UAS, remotely piloted aircraft or drones or whatever the name, have certainly benefited the U.S. military immensely through surveillance, reconnaissance and combat missions.

As has been the case throughout history, technologies developed for the Department of Defense have tremendous potential for commercial and civilian applications as well.

However, to do so it will be essential that we safely integrate these systems into the national airspace, which is not an easy task, as you each know.

While UAS has applicability in almost all areas which require the collection of data, I believe that there are really three areas which justify specific mention. Specifically, these are support for critical transportation and logistics infrastructure, emergency response such as search and rescue and wildfires.

Finally, one area which is already showing I think possibly the greatest potential is precision agriculture. These are the applications.

With the use of the technology within these applications is staggering and each should be a reminder to us that the safe integration of UAS into the national airspace should be our highest priority.

I am pleased that the Federal Aviation Administration has chosen Mississippi State University, which is in my district, as the lead for its center of excellence for unmanned aerial systems relying on Mississippi State University and its 21 collaborating academic institutions along with over 100 industry partners to provide the research necessary for this integration.

It is critical that we move quickly to execute this research so that we can address such critical issues as sense and avoid technologies, airworthiness, remote sensing, beyond line of sight operations, cyber security and low altitude operations to enable this industry to thrive.

Following in that theme, I would like to focus my questions on FAA's role as we move forward and I will start with you, Mr. Wynne, if I may, and ask you do you believe that the FAA has adequately defined the roadmap for UAS integration.

Mr. WYNNE. Yes, sir. I think there is a good roadmap available and actually a tremendous amount of work that has been done in the unmanned aircraft systems, ARC, Aviation Rulemaking Committee.

So we know what the work is that needs to be done. I don't that it is properly funded today. I think the center of excellence is doing excellent work.

We have test sites as well that are not very well funded, not funded at all, indeed, by the federal government. I think it is going to be really important to move forward on that roadmap to identify equivalent level of safety.

There is going to be research and development that needs to be done. The center of excellence will do some of that through its partners. We are participating in that as well.

The test sites were essentially stood up for that purpose. But the FAA has to direct that. They have to—and in some instances they need to be able to fund some of that with, of course, appropriate industry resources as well.

Mr. HARPER. Great. Mr. Wynne, there are clearly research priorities that can enhance the safe integration of UAS into the national airspace.

What do you believe are the highest priorities in that regard that should be addressed?

Mr. WYNNE. Well, the two that come to mind immediately, of course, are sense and avoid. If I am not on the aircraft and I can't see it I need to miss it.

So the question is what kind of technologies can we use for that and, there is on board radar for things that are flying at the flight levels and the military has been utilizing very successfully to keep manned and unmanned aircraft separated from one another for quite some time now in theater.

But we need to be able to develop those technologies. There are some great technologies that are coming along for sense and avoid at the lower levels for smaller aircraft that are less energy intensive and less costly.

C2 communications also very important. Lost link procedures—these are the kinds of things that we need to work on first and are being worked on.

Mr. HARPER. Thank you very much, Mr. Wynne.

Mr. Villasenor, the FAA must define requirements for UAS integration into the national airspace without being so prescriptive as to stifle innovation. How might it do so?

Mr. VILLASENOR. Well, first of all, I think it is an extremely hard task so I have a lot of respect for the work that the FAA is doing.

I think it is important to take full account of the innovation in the ways of using unmanned aircraft that are going on not only in the commercial community but also in the hobbyist community as well because that is traditionally and I'm sure in the future where so much of our innovation comes from and it is important not to impede that community in terms of their innovation.

Mr. HARPER. Thank you very much, and my time is expired almost, Mr. Chairman, so I yield back.

Mr. BURGESS. The gentleman yields back. Chair thanks the gentleman. The chair recognizes the gentlelady from Illinois, Ms. Schakowsky, 5 minutes for questions please.

Ms. SCHAKOWSKY. Thank you.

Professor Kaminski, I wanted to ask you something. We are always trying to balance, for example, national security and privacy issues.

You also raised First Amendment versus privacy issues and you believe that there is a federal role for us to play. You did list, I think, four states in your written statement that have some laws that are technology specific, et cetera.

So if you could elaborate a bit on what are the arenas in which the federal government ought to consider regulating drones?

Ms. KAMINSKI. Absolutely. Thank you, Congresswoman.

So the state laws that are being put into place primarily govern the capture of information with the drone, best described as drone photography or drone videography, and that is the moment at which the information is recorded.

On the federal level, it would be useful to have in place a data privacy regime meaning a regime that deals with information that has already been recorded and addresses things along the lines of use specification, making sure that data that has been gathered for one use is not used for another purpose, trying to ensure transparency for consumers, trying to ensure some kind of auditing mechanism so the data is not taken out of context or used in a discriminatory manner.

So the place for federal government, I believe, is in the general purpose nontechnology specific data privacy regime that complies with the Fair Information Practice Principles, or FIPPs.

Ms. SCHAKOWSKY. Mr. Walden, in the demonstration you showed the safety feature so that they don't bump. But you also said it isn't saved.

But certainly that kind of thing in fact could be saved, right? And so we could have even better photographs of who is avoiding the drone and, what assurances do you think there are that that information isn't saved?

Mr. WALDEN. No, I think it's a great question.

The way that we designed this technology is really for, again, detection and avoidance for an operator that is flying a drone and so right now the technology is actually built specifically with a circuit that only does that three-depth mapping and does not save it.

So you'd actually have to go in and completely modify not only the camera but the interface that we provide for that.

Now, that said, drones clearly could have a camera that is attached to it that isn't part of the sense and avoid circuitry or technology. And so clearly, we as a company continue to advocate and support privacy.

I am quite proud of the IUs that Intel has among both privacy, security, as well as safety.

And so we have a very strict regimen of how we create, design and actually productize these things that have to go through a third party review board internal to Intel to ensure that we don't break any of those.

Ms. SCHAKOWSKY. A third party within Intel?

Mr. WALDEN. Correct.

Ms. SCHAKOWSKY. So, again, Professor Kaminski, is that a real concern?

Ms. KAMINSKI. I appreciate Intel's forthrightness on the programs that they have instituted and from conversation with them appreciate the amount to which they have taken privacy considerations to heart internally.

However, effective auditing mechanisms usually involve a third party outside of the company as opposed to a third party within a company.

Ms. SCHAKOWSKY. So that issue of—I guess it is immediate. When does that erasing happen? It is automatic?

Mr. WALDEN. It is actually not captured. It has a buffer in there. So it only lasts for a few seconds, essentially. So it doesn't even store that with regards to this camera, again.

And I do agree and we do utilize, by the way, third parties to come in and audit to ensure that we are doing safe practices and following that. So I absolutely agree with Professor Kaminski there.

Ms. SCHAKOWSKY. But some sort of a legislative regime, and I heard you, Professor, you are saying we want to be cautious or maybe that is not the right word even. We want to strike the right balance. I wondered if you wanted to comment on that.

Mr. VILLASENOR. Yes. I am fully appreciative of and share many of the concerns that have been raised about potential abuses of not only this technology but many others with respect to privacy. What I am adding is that I think that in addressing those we need to be careful not to inadvertently impede uses that have absolutely no privacy consequences at all inadvertently. So I think it is important to be aware of unintended consequences.

Ms. SCHAKOWSKY. What would that be?

Mr. VILLASENOR. Well, for example, if there is a state law that prohibits photography of private property, does that mean if I am, 3,000 feet up and I want to just take a picture out of an airplane as it is coming in for landing at an airport, I am sitting in a commercial plane, I can certainly do that and no one has a problem with that.

If that same picture is acquired by an unmanned aircraft it would seem inconsistent for that to be unlawful. In fact, it is probably First Amendment violation to make that unlawful. So those are some of the examples of some of the constraints I worry about.

Ms. SCHAKOWSKY. OK. This is a really interesting area that we have to navigate to get it right. Thank you very much.

Mr. BURGESS. Gentlelady yields back to chair.

Thanks to the gentlelady. The chair recognizes the gentleman from New Jersey, Mr. Lance, 5 minutes for questions.

Mr. LANCE. Thank you. Good morning to the panel.

To the law professors, are there state laws currently on the books regarding all of this?

Ms. KAMINSKI. There have been—I listed it in my written testimony. I believe there have been 9 or 10 states that have enacted privacy laws regarding private actor use of drones but they vary greatly depending on which state you are in.

Mr. LANCE. And to the distinguished law professors, do you believe that we should take action here and should that action supersede state law or should there be a regimen where there is both state law and some law here at the federal level?

Ms. KAMINSKI. I believe that on the information gathering front, the moment at which information is captured, that is appropriate for states to experiment with legislation in large part because it is similar to areas in which states have legislated in the past such as the privacy torts or related torts or misdemeanor such as the peeping tom torts.

When you are talking about privacy governance, however, that's an appropriate place for the federal government to step in and those two regimes could absolutely be complementary to each other rather than preemptive.

Mr. LANCE. I was taught tort law by John Wade, who was the reporter for the restatement and he is deceased. I think what would he have done in this situation. It just shows the advancing nature of American society, world society and how a new tort might actually come into play.

Professor?

Mr. VILLASENOR. Yes, and just to make sure the record is straight, my primary affiliation is actually not in the law school at UCLA and I think there is express federal preemption in Title 49 that says that the air space of the United States is under the exclusive control of the United States.

Mr. LANCE. Of the United States, yes.

Mr. VILLASENOR. Right. And so I do have some concerns to the extent that state laws, in some cases, would purport to create a bit of a conflict there.

One of the most important and interesting questions, and it relates very directly to the privacy question, is this tension in some sense between where a property owner's control over the space enveloping his or her property—where that stops and then where the control of the federal government starts.

I don't really think there is much of a role for state airspace in there. I think it is really between the property and the federal government.

But the complexity is the trespassing and the invasion of privacy torts and common law of the torts and the criminal and civil statutes are, of course, at the state level and that would be where you worry about things right on your property.

So it's a complex mix of federal and state laws.

Mr. LANCE. Thank you. Does the panel have any recommendations regarding what I mentioned in my opening statement, that there were recently violations near sensitive sites, oil refineries and one of the major airports in this country?

And of course there have been violations as has been mentioned by the ranking member here in Washington including at the White House? Does the panel have any recommendations for us in that regard?

Mr. WALDEN. So let me start.

Mr. LANCE. Mr. Walden, yes.

Mr. WALDEN. Absolutely. I think that technology, as it continues to progress and you utilize that such as geofencing, which enables

you to use altitude GPS as well as other sensors, you can actually create no-fly zones and implement them into drones or into other—

Mr. LANCE. That can be built into the technology?

Mr. WALDEN. Correct. And it exists today in some drones.

Mr. LANCE. Very good. And then I guess it does not exist in the drone that is here on the table?

Mr. WALDEN. Actually, it does because what you do is you program out certain areas. So, for example, in Santa Clara where we are we happen to be located within the San Jose Airport—

Mr. LANCE. I see.

Mr. WALDEN [continuing]. Space. I cannot fly a drone. It won't allow me to start the drone.

Mr. LANCE. I see. So that drone could not fly over the White House?

Mr. WALDEN. This particular drone is a prototype so this one isn't even for sale. But as far as the commercial drones that we—

Mr. LANCE. I was going to ask my wife to buy me that for Christmas.

Mr. WALDEN. Sorry. Not available yet.

Mr. LANCE. Not available.

Mr. WALDEN. There may be other ones.

Mr. LANCE. I see. Anyone else? Mr. Wynne.

Mr. WYNNE. Yes, thank you.

I am a big fan of technology and but I don't think it takes the place of airmanship which I mentioned in my testimony and I think we have a big challenge right now. I am not fond of the distinction but there is a big challenge between hobbyists, producers, consumers, and commercial operators.

I represent predominantly the commercial operators here and right now we are restricted from flying except by exemption. So we want to change that in a big hurry.

My point simply is the sooner we have certificated operators up and running, much like in all of aviation it's a self-policing community.

If my ticket is at stake because someone who is doing something that is putting the use of UAS at risk because of being careless or reckless, I am going to want to say something about that and the FAA will never have enough enforcement personnel to be everywhere nor do they need to be for general aviation or for commercial aviation.

We are a self-policing community.

Mr. LANCE. My time has expired. Thank you very much to the entire panel.

Mr. BURGESS. Chair thanks the gentleman. The gentleman yields back.

Chair recognizes the gentleman from Oklahoma 5 minutes for questions, please.

Mr. MULLIN. Thank you, Mr. Chairman, and I may be going at this a little bit different than most because the thought of more regulations just hurts my head.

But at the same time what is the point of more regulations if you can't enforce it. And sir, you just made a point of that—it's self-regulated almost.

But there has got to be something done. Mr. Walden, I hear what you say that it is built in but any technology that can be programmed in can also be programmed out. And unfortunately that may not be that particular unit but you can get it online. I can Google right now online and get a kit to build myself.

I couldn't build it but there's a lot of people out there that could. So how do we actually enforce it? How do we actually police it? Because in our communities, and I come from very rural communities, they are useful.

We can check pastures. We can check cattle. We can check fires. We can check areas that we couldn't even normally get to. We'd have to horseback into it and we can go into. And so they are very useful, but at the same time very dangerous.

And so I guess my first question would be how would you guys propose even looking into legislation that would be reasonable to enforce?

Mr. WYNNE. Well, just for clarification I was arguing in favor of regulation.

Mr. MULLIN. Well, I know what you're saying but it doesn't do any good to just self-police. A guy isn't or a gal isn't born a robber and it's an opportunity that creates them to be a thief, right. And the first time you break the rule you'll break the second one too. The hardest lie is the first lie.

Mr. WYNNE. I agree with you and there is no technology that can be devised for mal-actors.

So I think my point simply is that there has to be consequences to flying recklessly and carelessly and right now there—up until now, until very recently when we started talking about registering hobbyists, all drones essentially below or above a certain cut line that we would call toys, which is what's currently being contemplated and worked on by a very good task force, there was no consequence essentially to flying other than careless and recklessly. And it is very difficult for the FAA to enforce that.

What I am arguing is that as a community we stand for safe and responsible flying but we need rules under which—

Mr. MULLIN. I get that. So from the community what do you propose? If the lawmakers get involved in this, come on, we're going to screw this up.

None of us are experts in the field. What we're wanting is outside information. What the chairman is doing here is holding a hearing to find out information for us to build safely and reasonably an act, some type of regulation to be proactive and not reactive.

We're asking professionals like you to come in and help us find this out so we don't pick winners and losers because that's what we do.

Mr. WYNNE. The first thing is we need the small UAS rule finalized and implemented as quickly as possible. That is the lowest risk possible flying imaginable.

Under 500 feet away from people, away from airports, within visual line of sight by a certificated operator. There is no reason why we can't get that done soon and we need to get it done—

Mr. MULLIN. So how would that be enforced?

Mr. WYNNE. I am arguing that basically people will, that are certificated, will be economically incentivized to enforce their own rules and as is currently the case with—we are not going to be doing things that essentially put our livelihood at risk.

Mr. MULLIN. Yes, but not everybody works with them. They are a toy. I mean—

Mr. WYNNE. I am talking about commercial operations.

Mr. MULLIN. I understand that. But I am talking about the commercial operator is going to be affected by the few bad apples that is going to be in it.

And is there technology that exists? Is there even a way to create the technology to self-monitor that? Professor?

Ms. KAMINSKI. Yes. So technology is not my area of expertise but I have talked to a number of technologists working on this issue including at my own university and I think that the geofencing technology that was raised by Intel is something that is a potential solution for good actors.

There are concerns that geofencing, if applied too broadly, is going to end up restricting use of technology that would be beneficial. So keep that in mind.

When you are talking about bad actors, however, then the kind of technological solutions you're going to look for are going to have to do with traceability on the one hand to try to identify the actor who is operating the drone.

There are a variety of possible technical solutions for making drones traceable and writing on the side of a drone with a sharpie is not a technological solution.

And the other point I'd make is that I believe there is significant of money going into counter drone technology that is supposed to try to stop bad actors safely when we're talking about those that don't integrate geofencing or traceability into their own operations.

Mr. MULLIN. Thank you. My time has expired.

Mr. Chairman, I yield back.

Mr. BURGESS. Chair thanks the gentleman. Gentleman yields back.

I will now recognize myself for 5 minutes for questions. And Mr. Walden, just very briefly, do you at Intel have cyber security solutions to prevent unauthorized users from controlling your device?

Mr. WALDEN. Yes, we do, and once again, security is another area where we hold that very highly as part of our values together with privacy.

From a cyber security perspective it's connected technology such as UAVs, clearly, will be subject to cyber tax and we know that is going to happen and we just need to be one step ahead and continue innovating.

We haven't implemented a security development life cycle which is subject to technologies to industry best practice testing.

It is important that UAVs are subject and then tested alike and we are committed to doing that and working with agencies and others to help move that forward.

Mr. BURGESS. Well, thank you for that. I would remind you I try to stay one step ahead of very clever and very nimble people who have no end of great ideas on how to thwart things that we think are good safeguards to put in place.

Mr. WALDEN. Yes, sir.

Mr. BURGESS. Mr. Wynne, I just wanted to ask you, like you I am no longer current but I am a licensed general aviation pilot, instrument rated.

I appreciate your comments in some type of certification and knowledge of airspace maps. And I guess if I'm understanding some of the other testimony it's possible to program one of these drone devices so that it could not enter, say, Class B airspace.

And where I live in Lewisville, Texas, the southern part of the city of Lewisville, is in the area that is regulated from the surface to 10,000 feet around DFW Airport. So do I understand that concept correctly?

Mr. WYNNE. Yes, sir. And prohibited airspace and restricted airspace and there was an announcement yesterday of one of the solutions that would do that literally real time with the drone.

Mr. BURGESS. Now, when you first start flying you fly under visual flight rules, see and avoid and what Mr. Walden has shown us this morning is kind of a new take on that.

There is see and avoid technology that they have built into this, something that looks enormously helpful and beneficial if I'm understanding it correctly. Would that be your take also?

Mr. WYNNE. Absolutely, sir. To the extent that we can perfect sense and avoid, detect and avoid technology I don't know why we wouldn't deploy that on all aircraft.

Mr. BURGESS. I wondered the same thing.

And then Professor Kaminski and Mr. Walden, a question for both of you. We do spend a lot of time up here talking about privacy and it is important but in this situation in particular comes to mind whose privacy is it.

Professor Kaminski, you referenced a First Amendment right to record. Did I hear that correctly?

Ms. KAMINSKI. Yes.

Mr. BURGESS. So you have a right to record, and I understand that has been challenged sometimes. People have gotten into some difficulty recording just with an iPhone on the street recording an altercation or police activity. But there is that right to record.

Ms. KAMINSKI. It's a developing right. A number of circuits have recognized it in a restricted way. So generally it's been recognized as a right to record matters of public interest or public officials, yes.

Mr. BURGESS. So then this pushes the boundary of public access, I guess. You fly a drone over your neighbor's back yard and take a picture of their barbecue to see who's there, perhaps a political figure, perhaps whoever, criminal figure, and who has the right of privacy in that instance? Is it the backyard owner or is it the drone owner?

Ms. KAMINSKI. Right. So I'm going to actually add in the right to privacy for the drone owner is implicated by a registration system, right, so the national registration system that the FAA is putting in place ostensibly makes it hard to operate a drone in private, right.

So in the scenario that you gave California has an anti-paparazzi law that creates a constructive invasion of privacy.

When you look into an area you previously could not have accessed but for physical trespass. So there are these attempts at the state level to define privacy in those scenarios that it will stand up against any assertive First Amendment right to record.

Mr. BURGESS. Because that actually has happened with recording celebrity wedding and then that type of things.

So Mr. Walden, are you looking at technology that would fit with that paradigm or is that just too hard and we'll have to leave that up to the local sheriffs and enforcers?

Mr. WALDEN. I'd say that we don't have the answer. We are developing our technologies in ways to protect consumer privacy.

We are working with the NTIA on privacy best practices. We do agree that it's an issue and we don't have the answer right now but we absolutely are open to working together in finding a technological solution.

Mr. BURGESS. Unlike anything else, the technology is proceeding much more rapidly than this humble subcommittee. But we do welcome the opportunity to hear from all of you.

We want to keep this conversation going because this is obviously, not a completed product.

Are there any other members that wish any additional time for questions?

Seeing that there are no further members wishing to ask questions, I do want to thank each of our participants.

Yes. Absolutely. The gentleman is recognized.

Mr. MULLIN. I just want to follow up real quick. Maybe not follow up, kind of change directions just a second.

First of all, I got to brag a little bit on our state. University of Oklahoma—actually, I'm sorry, Oklahoma State University—I apologize. That's where I went to school. I should have got that right. There's a little bit of a game coming up in a few weeks.

Anyway, they have been the leader in this for quite some time. In fact, they offered the first graduate degree for UAS and we're proud of that.

I also, at the University of Tulsa, which—give me a second here, I got to brag on my nephew, he plays football for them, Kyle McLaughlin—they have an advanced study going in right now—and Mr. Walden, this is for you—that at the University of Tulsa they are in the process of looking at cyber security space.

Is there a concern with cyber security? I know they have been looking into vehicles lately. But now they switched it to the UAS and I am concerned about it from some of the briefings that we've received.

Have you have any reason to raise concerns on this yet?

Mr. WALDEN. So we are actually working with multiple universities in cyber security. We actually have sponsored the chair at University of Florida where they have set up a cyber security—

Mr. MULLIN. Why Florida? Why not Oklahoma?

Mr. WALDEN. Pardon? We might be working with Oklahoma. I'm embarrassed to say I'm not sure.

But yes, I think that, we have recognized years ago that cyber security is an area where you need to continually stay ahead and, as I think Mr. Burgess mentioned, the bad guys are going to continue trying to go fast than we are and we are looking to univer-

sities and partnering with them on ways of preventing cyber security attacks.

Mr. MULLIN. Good.

Mr. VILLASENOR. I was just going to add that, one, cyber security is an extremely important theme and one that is applicable to the Internet of things in its entirety and what I often say is that connectivity has outpaced security.

So in the rush to create things that are highly connected sometimes we find that there are unintended linkages that—no one intentionally left these holes there but they're there nonetheless and they are always found and they are always exploited.

So it's an incredibly important thought and one that we should do our best to stay in front of. But even then it's going to be impossible to get 100 percent correct.

Mr. MULLIN. OK. That's it. I yield back. Thank you.

Mr. BURGESS. The chair thanks the gentleman.

Oh, gentleman from Vermont recognized for 5 minutes.

Mr. WELCH. Thanks very much, Mr. Chairman.

Thanks for that flight, by the way. After the committee is over let's get those things revved up.

Thanks so much for coming in. One of the things that we had recently was an incredible natural disaster in Vermont—tropical storm Irene, nearly a billion dollars worth of damage. A lot of folks stranded.

And it just seems—I'm sorry, I missed some of the hearing but it seems obvious that drones could be very useful in an emergency situation getting some information that's really relevant to first responders to families.

I'll start with you, Mr. Walden, if you want to comment on how you see drones as being a useful tool in the wake of catastrophic events.

Mr. WALDEN. I agree 100 percent, and not only for catastrophic events but also the ability for a single operator to fly multiple drones in a safe manner to also help. Otherwise, you're going to have lots and lots of people doing it.

So I think back to—we need to, with the regulatory committees in enabling single operators to fly multiple drones as well as line of sight—out of line of sight because in the case of natural disasters you're going to need that technological capability.

Mr. WELCH. OK. Professor, how do I say—Villanor? No, no, I'd like to do it right.

Mr. VILLASENOR. Villaseñor.

Mr. WELCH. Villaseñor. Thank you.

Professor Villaseñor, are there any legal impediments to being able to exploit the drone technology in the situation of the catastrophic—

Mr. VILLASENOR. Well, certainly, there is regulatory impediments. For example, beyond line of sight, autonomous flight is something which is nowhere near being—there is not a regulatory framework for doing that any time that I can see in the immediate future.

And that is, as Mr. Walden pointed out, that is going to be essential, for example, to deploy a set of unmanned aircraft to sweep

through an area that might be miles away from the people controlling it. So that's an important area.

Mr. WELCH. All right. Is that something that would—I guess we can talk about that after. Thank you.

In addition a lot of folks like the recreational use of drones but they can be, as you pointed out, I think, benefits to consumers in many contexts such as real estate surveying, property maintenance, farming, insurance claims management. The drones could minimize potentially the time and cost for consumers and businesses in all of those sectors.

Has any one of you studied the economic benefit of drones to consumers? Mr. Wynne.

Mr. WYNNE. It's difficult to actually capture it. The forecast that we're operating with today, which is currently being updated, of \$82 billion in economic impact over the first 10 years, once we have integration into the national air space system, does not contemplate the value added to consumers specifically.

That is just specifically in our community. So the value to the agricultural sector to existing business models, whether it's insurance or utilities or construction, et cetera, that's on top of that economic forecast.

If I might, sir, I'd also thank you for your question about disaster relief. We currently have Global Hawks flying off the east coast of Africa collecting data for hurricanes and doing hurricane hunting that—a little bit safer and a little bit more comfortable to be on the ground and actually penetrate—

Mr. WELCH. Thank you. I've got one more minute so thank you very much for that. I thought I'd ask Professor Kaminski a question.

There is great commercial and consumer interest in drones. That interest has surged. There's a number of questions that have come up about what the limits are, what the regulations need to be.

Do you have any opinion as to whether it makes sense for the GAO to study current and potential commercial benefits of drones?

Ms. KAMINSKI. I think that would be useful, especially if there is some way of categorizing what the different kinds of uses are and how the uses impact or don't impact human populations.

Mr. WELCH. I thank you all. I thank you, Mr. Chairman, and yield back.

Mr. BURGESS. Chair thanks the gentleman. Gentleman yields back.

Seeing no other members wishing to ask questions, again, I want to thank each of you on the panel for participating in today's hearing.

Before we conclude, I would like to include the following documents to be submitted for the record by unanimous consent—a statement for the record from the Motion Picture Association of America. Without objection, so ordered.

[The information appears at the conclusion of the hearing.]

**Motion Picture Association of America Statement for the Record
in the House Subcommittee on Commerce, Trade and Manufacturing Hearing
“The Disrupter Series: The Fast-Evolving Uses and Economic Impacts of Drones”**

November 19, 2015

The Motion Picture Association of America is excited to be on the forefront of small unmanned aircraft system innovation. The MPAA has worked closely with the Federal Aviation Administration and sUAS operators to secure cinematography as among the first approved commercial applications of unmanned aircraft in the United States. Incorporating sUAS in domestic film and television production is not only safely advancing aerial photography and helping tell stories in new and exciting ways. It is also starting to generate the economic benefits that the technology can bring our country by reducing costs and advancing the domestic aviation industry.

As the voice of the motion picture, home video and television industries, the MPAA submits this statement on behalf of its members: Paramount Pictures Corp., Sony Pictures Entertainment Inc., Twentieth Century Fox Film Corp., Universal City Studios LLC, Walt Disney Studios Motion Pictures, and Warner Bros. Entertainment Inc. The film and television industry is currently employing sUAS under exemptions the FAA granted vendors to use the aircraft in scripted, closed-set filming. The controlled nature of our sUAS use greatly limits exposure to the general public, minimizing any safety or privacy concerns.

When the first handful of sUAS operators received exemption approval from the FAA last fall, Senator Dodd, MPAA's Chairman and CEO, called the announcement “a victory for audiences everywhere as it gives filmmakers yet another way to push creative boundaries and create the kinds of scenes and shots we could only imagine a few years ago.” The MPAA and its members look forward to the continued development of this budding sector of the film industry as we work with the FAA to establish formal rules allowing use of sUAS in domestic movie and television production.

Filming with sUAS is already authorized abroad and we have now built a positive track record here at home, having completed a growing number of successful flights. One of the small businesses we work with that received an exemption from the FAA in September 2014, Aerial MOB, has already completed more than 60 film projects to date totaling more than 1,200 successful flights. Advancing such domestic use will help keep production revenues from leaving our shores, promote jobs, expand the U.S. aviation industry, and provide real-world experiences in controlled environments to help pave the way for other uses of sUAS.

Looking ahead, we asked the FAA earlier this year in the formal rulemaking proceeding to allow additional flexibility, such as night flying, for filming in controlled environments as technology advances. We are in the initial stages of sUAS cinematography in the United States and, as use grows, the capabilities of the systems will likely evolve rapidly.

We thank Chairman Burgess and Ranking Member Schakowsky and all members of the Committee for their attention to this matter. We look forward to continuing our work to further integrate the use of sUAS into domestic film and television productions, and are eager to see

how the creative minds of our industry use the technology to the benefit of audiences around the world.

Mr. BURGESS. Pursuant to committee rules, I remind members that they have 10 business days to submit additional questions for the record and I ask the witnesses to submit their responses within 10 business days upon receipt of the questions.

Without objection, the subcommittee is adjourned.

[Whereupon, at 12:18 p.m., the subcommittee was adjourned.]

[Material submitted for inclusion in the record follows:]

PREPARED STATEMENT OF HON. FRED UPTON

When innovative ideas become popular, they can be scary. They can threaten old ways of doing business and they usually conjure worst-case scenarios in public discourse.

Drones are no exception. And we are now seeing just the tip of the iceberg.

People across the nation are discovering new ways of putting drones to work at a rapid pace.

Over 2,000 drone waivers have been approved and by all appearances the vast majority are small businesses. Many of these small businesses are in Michigan. One applicant from Kalamazoo, in my district, was able to get his application approved to use a drone because doing so would significantly enhance safety for his employees.

Inspecting machinery and equipment or capturing video in high places is dangerous, and drones are taking over these tasks. As we tackle the safety risks with drones in the National Airspace System, we should be mindful that they are likely to improve safety for workers from wind farms to utilities.

Silicon Valley is working hard to engineer new software specifically for drones that will make them useful in ways previously unimagined. These innovations on top of innovations are America's strong suit and they can't happen if we overreact and overregulate.

This is why we are hosting the Disrupter Series. As new technologies emerge, they create issues of first impression that must be dealt with thoughtfully and with an eye toward the actual harms.

However, many of the issues that arise have been seen before. And history can be instructive.

Many of us think of the impacts drones will have on our privacy. We are accustomed to people walking around with cameras and being able to capture us at our worst, but what about drones?

Cameras were in use in the early 1800s, but they really only presented privacy concerns after 1888, when the Kodak camera was introduced. This placed the power to take unauthorized pictures in the hands of the person holding the camera.

Since then, American courts developed tort laws to protect against privacy intrusions, which are constantly updated to account for technology-driven contexts. In many ways, drones are raising the same fundamental questions as the Kodak camera.

I encourage those in the drone industry to make safety and privacy a priority, but I also encourage policymakers to think about the actual harms presented and the unintended consequences of overly restrictive regulation.

By imposing bureaucratic solutions in a growing and evolving market, we risk shutting down more cost-efficient and effective ways of addressing the very harms we seek to eliminate.

I thank the witnesses for their participation today and look forward to the discussion.

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FRED UPTON, MICHIGAN
CHAIRMAN

FRANK PALLONE, JR., NEW JERSEY
RANKING MEMBER

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Majority (202) 225-2927
Minority (202) 225-3841

December 10, 2015

Mr. Joshua M. Walden
Senior Vice President
General Manager, New Technology Group
Intel Corporation
2200 Mission College Boulevard
Santa Clara, CA 95054

Dear Mr. Walden,

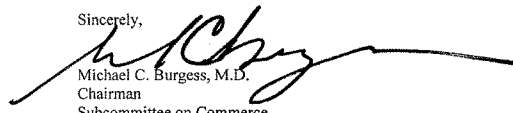
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Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,


Michael C. Burgess, M.D.
Chairman
Subcommittee on Commerce,
Manufacturing, and Trade

cc: Jan Schakowsky, Ranking Member, Subcommittee on Commerce, Manufacturing, and Trade

Attachment

Questions & Answers to the Honorable Michael C. Burgess, M.D.

1. Mr. Walden, as news reporters have highlighted, there are a lot of people out there who are pretty oblivious to no-fly zones and restricted areas.

2. What are manufacturers doing to ensure that their customers are aware of all the available tools such as “Know Before You Fly?”

We are participating in a NTIA initiative to derive best practices for providing individuals with information on when and where UAVs are operated. We are also investing in companies that will have direct access to consumers and will work to support the implementation of best practices.

3. Does packaging include resources on where consumers can go to find a map of restricted areas and instructions on safe flying?

Intel has not created packaging for UAS sold to consumers, but with the December 28 acquisition of Ascending Technologies, we are invested in making sure that best practices are implemented and we are supporting the UAS ecosystem in consumer education.

Questions & Answers to the Honorable Tony Cardenas

1. How can technology be utilized to prevent UAVs from flying into no-fly zones around sensitive areas, such as airports stadiums, or nuclear facilities, whether intentional or unintentional?

Technology can help mitigate no-fly zone concerns. No Fly Zones will be determined by GPS, and in the future, having real time updates via LTE to the drone can create dynamic no-fly zones for emergency purposes. This is an area of important future innovation.

2. What types of technologies has Intel developed, or do you plan to develop, to ensure UAVs can be operated safely if a regulatory framework is adopted that allows the number of drones operating in the national airspace to increase exponentially?

Technology can improve drone safety. Today, we are working to address UAV safety through a variety of innovations. We are actively creating the silicon architecture and computing power that will create an onboard drone platform that has outstanding speed, performance and functionality. Intel hardware powers the cloud, where unmanned air traffic management systems being designed by NASA in partnership with several leading companies (including Intel) are likely to be sited. Intel also brings its data analytics, communications platforms, vision and depth based computing technology to UAV

software and to the data that such software will create. Drones in the future will have sense and avoid abilities with auto landing and re-charge capability and provide real time communication and data links to ground stations and cloud infrastructures securely. But, our most important contribution to date involves our RealSense technology, an onboard sensor application that represents a key ingredient for best-in-class collision avoidance. It provides real time depth sensing capability for a flying drone and combined with GPS, altitude and other onboard sensors, can prevent flying into no-fly zones and other restricted areas.

3. Should regulations require the use of certain technologies to ensure safe operations of UAVs? If so, how should regulations be drafted so that they are flexible enough to adapt to new technologies as they develop?

Intel believes that it is critical for the United States to develop a regulatory framework for UAVs that role models innovation for the rest of the world. Intel supports a regulatory framework that is risk-based and flexible enough to change as technology evolves so that it does not hinder innovation and economic growth. This flexibility can be achieved through adopting a streamlined certification and approval process, and through exemptions and waivers under existing FAA authority. Simultaneously, regulations should encourage the use of computing to meet the key challenges to safe integration of UAVs in the National Airspace System: sense and avoid collision avoidance, secure geo fencing and command and control technology. Also, this flexible regulatory framework should recognize that there are a wide variety of devices that fall under the definition of UAVs, with multiple categories of UAV categories considered by the FAA based on their size and functionality. Modernized regulations will help the UAS advance in a safe and responsible fashion.

FRED UPTON, MICHIGAN
CHAIRMAN

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COMMITTEE ON ENERGY AND COMMERCE

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Majority (2021 225-2027
Minority (2021 225-3641

December 10, 2015

Mr. John Villasenor
Professor of Public Policy and Electrical Engineering
Luskin School of Public Affairs
University of California, Los Angeles
337 East Charles E. Young Drive
Los Angeles, CA 90095

Dear Mr. Villasenor,

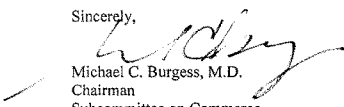
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Sincerely,


Michael C. Burgess, M.D.
Chairman
Subcommittee on Commerce,
Manufacturing, and Trade

cc: Jan Schakowsky, Ranking Member, Subcommittee on Commerce, Manufacturing, and Trade

Attachment

“The Disrupter Series: The Fast-Evolving Uses and Economic Impacts of Drones”
House of Representatives Committee on Energy and Commerce
Subcommittee on Commerce, Manufacturing, and Trade

Questions for the Record: Responses from John Villasenor
December 12, 2015

Responses to questions from the Honorable Michael C. Burgess, M.D.

1. There has been some concern expressed over forcing casual drone users into a bureaucratic registry process. What impact do you think the FAA’s drone registration requirement will have on the growth of the UAS market?

I will note at the outset that I am not convinced that a registration process for casual users on the scale apparently sought by the FAA is needed. For example, model aircraft hobbyists have operated for decades without FAA registration, and with zero negative impact on the safety of manned aircraft operations. That said, I also understand that at this point the decision has already been made to require registration, and that the only thing left to decide is what *type* of registration system to implement.

With the above caveat, and provided that the FAA effectively implements the registration system in the form recommended in November 2015 by the UAS Registration Task Force, I think the overall impact on the market has the potential to be minimal. The UAS Registration Task Force has done a very good job in designing a system that responds to the FAA’s decision to require registration in association with recreational/hobby UAS uses, while also, to the extent possible, avoiding placing an unreasonable burden on UAS operators.

For example, structuring the registration to be free and owner-based (as opposed to fee-based and/or UAS platform-specific) will make it easier for operators to comply. As a result, I do not expect the introduction of the registration requirement to significantly reduce the number of recreational UAS users. Accordingly, I expect the market demand for UAS products to generally be similar to what it would have been in the absence of the registration requirement.

However, one exception is that I think there will be some interesting market impacts for platforms just above and below the 250-gram (0.55 pound) weight for registration cutoff. Toy UAS manufacturers will offer greater numbers of products just under this cutoff, since that will make it possible to market them with tag lines like “No FAA Registration Needed.” By contrast, there will probably be relatively few product offerings weighing just over 250 grams, since, due to the registration framework, the potential market size for a 255-gram toy UAS is significantly smaller than for a 245-gram toy UAS.

One issue that the UAS Registration Task Force addressed only tangentially is penalties and enforcement. The Task Force noted, correctly, that the current penalties available to the FAA were designed to deter crimes such as the use of unregistered manned aircraft in

drug trafficking, and are far too high to make sense in the context of casual UAS users. However, beyond recommending that the FAA establish a “reasonable and proportionate penalty schedule,” the task force did not recommend any specific approach.

Like many other people, I am concerned with over-criminalization in the U.S. Code and regulations. To the extent possible, I recommend that any new UAS registration regulations be written to include a *mens rea* requirement, so that penalties (which should be very modest) for failure to register would apply only to those who “knowingly” disregard registration regulations, and not to those who in good faith were simply unaware that those regulations existed.

2. As you know, companies like Google, Amazon and Verizon, among others, are playing leading roles in a public-private partnership to establish reliable unmanned aerial systems traffic management (UTM) structures for commercial drone use.

a) In your opinion, what potential benefits and/or challenges are presented by private-sector leadership in this area?

I think that private sector participation in UTM system development is not only beneficial, it is essential. The private sector is extremely well positioned to understand the range of UAS applications and operations that should be accommodated in a UTM system, and to make the investments in time and resources to team with NASA to perform the testing aimed at ensuring that all the relevant operational scenarios are accommodated.

b) What is the role of the FAA where the private sector is in charge of air traffic control?

While I am a strong believer in the potential value of private sector leadership in UTM system development, I think the FAA will bring enormous value to the process as well. While the FAA has sometimes been criticized for its work generally as well as in the context of UAS, I think it is important to appreciate the complexities involved in managing the NAS, which, according to an FAA “Fact Sheet” published in 2010, “encompasses an average of more than 100,000 aviation operations per day, including commercial air traffic, cargo operations, and business jets.”¹

Thus, even *without* UAS, managing the NAS is no easy task. And, thanks in significant part due to the work of the FAA, manned aircraft operations (including commercial air travel) in the United States are extraordinarily safe. With UAS now set to enter the picture in much more significant numbers than in the past, the FAA is in a difficult position: If it proceeds too slowly, it is criticized as impeding innovation and economic

¹ *Fact Sheet: Unmanned Aircraft Systems (UAS)*, FED. AVIATION ADMIN., https://web.archive.org/web/20110802192920/http://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=6287 (last visited Dec. 12, 2015)

growth. Yet if a manned aircraft were to be involved in an accident attributable to a UAS, the FAA would be criticized for moving too hastily on UAS integration.

With this context, the best approach is one that combines innovation and investment coming from the private sector with the decades-long experience of the FAA in safe airspace management. Concretely, this means that we should look to the private sector to develop new approaches to air traffic management using technologies such as cloud computing and novel communications and collaboration approaches among aircraft. But in deploying those technologies we should look to the FAA to ensure that there is no negative impact on the safety of manned aircraft operations, and no increase in risks to persons and property on the ground.

c) Given that this apparatus is being developed by NASA and the private sector, what is Federal Aviation Administration's (FAA) role in its development? Should there be more coordination with the FAA?

I think it is important for UTM development efforts to be done in close coordination with the FAA. Having the FAA as a regular and active participant in the dialog can help ensure that the resulting solutions will maximize the safety of an airspace that will increasingly be shared between manned and unmanned aircraft. This is particularly important under circumstances when a manned aircraft (e.g., a helicopter making a medical evacuation after an automobile accident) is transitioning through airspace that is also being used by UAS.

d) How important is it to develop a system like the UTM? Is it essential to integrating commercial drones into the national airspace system?

A good UTM system will be essential to the successful integration of commercial UAS into the NAS.

The traditional approach to managing the NAS, which was developed under a set of assumptions associated with manned aircraft traffic relating to platform sizes, speeds, and operational characteristics, is in some ways ill suited to the traffic management challenges that will arise with sUAS in the low-altitude airspace. Among other challenges, the traditional air traffic management approach doesn't "scale" well in an environment where the number of UAS in a given volume of airspace could be much higher than what occurs with manned aircraft. The traditional approach also assumes an ability to easily communicate with aircraft operators that may not always be available with UAS. To address these differences, the UTM system can be designed to leverage and enable a collection of innovative approaches including cloud-based processing, cooperation among UAS, autonomous operation, and operation beyond the visual line of sight.

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Minority (202) 225-3641

December 10, 2015

Ms. Margot Kaminski
Assistant Professor
Moritz School of Law
Ohio State University
55 West 12th Avenue
Columbus, OH 43210

Dear Ms. Kaminski,

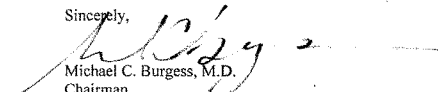
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cc: Jan Schakowsky, Ranking Member, Subcommittee on Commerce, Manufacturing, and Trade

Attachment

Margot E. Kaminski, Assistant Professor of Law, The Ohio State University
Response to Additional Questions for the Record from The Honorable Tony Cárdenas

From: Margot E. Kaminski

Assistant Professor of Law

Moritz College of Law

The Ohio State University

To: The Honorable Tony Cárdenas

House of Representatives

Committee on Energy and Commerce

Re: The Disrupter Series: The Fast-Evolving Uses and Economic Impacts of Drones

- 1. Would you agree that the largest companies have the greatest ability to acquire the most sophisticated unmanned aircraft and thus also to engage in the most far-reaching surveillance?**

Large companies are likely, depending on their business model, to pose significant threats to privacy. They will not necessarily, however, be the sole or even the main source of surveillance harms. A lot depends on business model, and the development of companies that aggregate information gathered by smaller drone operators.

Surveillance tends to cause harms in the following situations: when it is persistent (it follows a particular person around for a long period of time); when it is pervasive (it follows everyone, everywhere); when it is disruptive (the information gathered is used out of context); and when it

Margot E. Kaminski, Assistant Professor of Law, The Ohio State University
 Response to Additional Questions for the Record from The Honorable Tony Cárdenas

gathers sensitive information about a person. The largest companies are most likely to contribute to pervasive surveillance (following everyone, everywhere), depending on the scope and purpose of their operations. Large companies that have the goal of profiling particular individuals will also contribute to persistent surveillance. But even small companies and individuals can easily cause multiple kinds of surveillance harms. And small companies and individuals are likely in the aggregate to contribute to a pervasive surveillance environment, absent further regulation. One can imagine a business model that aggregates data gathered by individuals or smaller companies; that aggregation could be as harmful to privacy as actions by a larger company acting alone.

Larger companies arguably have greater incentives to self-regulate, since they are the biggest targets for regulators. A company that primarily wants to use drones to deliver packages, for example, does not want to be a visible privacy violator, for fear that Congress will enact legislation targeting its practices, or the FTC will pursue a Section 5 complaint. This is not to say that larger companies will effectively self-regulate; just that given their higher profiles, they are likely to avoid the most visibly egregious offenses.

- 2. Could Congress condition authorization to fly on a pledge to respect privacy? For example if the FAA insists that before receiving permission to operate an unmanned aircraft, a business or individual first would have to commit to observing applicable privacy laws?**

This is a fascinating idea. Congress already conditions airman certificates (pilot licenses) on

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 compliance with federal airborne hunting laws.¹ If a pilot is convicted of violating section 13(a)
 of the Fish and Wildlife Act of 1956, the FAA may issue an order revoking his or her license.

There are four points worth considering, however. First, the FAA's expertise is largely concentrated on aircraft safety; it has explicitly disavowed involvement in privacy regulation concerning drones.² Imposing this requirement could have high costs for the FAA, both in monitoring for compliance and in developing agency expertise in this area, since presumably not every privacy violation would result in the revocation of a license.

Second, this model of requiring a business to make a privacy promise and enforcing compliance is largely the model of regulation pursued by the FTC (although there, the privacy promise usually extends beyond legal requirements). It would better comport with agency expertise to involve the FTC in a proposal like this.

Third, state laws may not adequately protect privacy, and are not consistent across states (which in fact can be one of their benefits—this allows for experimentation). While some states have enacted drone-specific legislation, many others have not, and older state privacy laws such as intrusion upon seclusion and Peeping Tom laws will not reach many of the types of privacy violations people fear from drones.³ A citizen in one state could end up with far more protections than a citizen in another.

¹ 49 U.S.C. §44709(b)(2); 16 U.S.C. §742j-1(a).

² See letter dated November 26, 2014, dismissing EPIC's petition for rulemaking on the threat of privacy and civil liberties that will result from the deployment of aerial drones. <https://epic.org/privacy/drones/FAA-Privacy-Rulemaking-Letter.pdf>.

³ Margot E. Kaminski, *Drone Federalism: Civilian Drones and the Things They Carry*, 4 Cal. L.Rev. Cir. 57, 68 (2013).

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Fourth, there may be First Amendment concerns raised by this proposal. Inasmuch as Congress wishes to keep the FAA away from First Amendment issues, it should keep this in mind. State privacy laws largely address the moment of recording information, and courts, as mentioned in my testimony, have begun explicitly recognizing a First Amendment right to record.

When a licensing regime involves speech, courts subject it to First Amendment scrutiny, asking whether it is narrowly drawn and restrictive of undue regulatory discretion.⁴ Giving the FAA the discretion to revoke pilot licenses due to privacy violations might trigger these concerns—the more discretion an official has regarding hinging a licensed privilege on speech, the more likely a First Amendment licensing problem will be found. However, your model supposes that courts themselves will initially make the decision that there has been a privacy violation. This may help avoid a First Amendment problem, because presumably the courts themselves will consider the First Amendment when addressing the underlying privacy action.

3. Would this give the FAA the discretion to rescind the operators' flight credentials, upon submission of proof that a court or similar body has faulted the operator for serious privacy violations under state law?

Yes, Congress could structure FAA credentialing this way. However, see the concerns raised above. As long as the FAA licensing regime is restricted to legitimate safety issues, it will avoid First Amendment scrutiny. Adding privacy to the mix could subject FAA discretion to First

⁴ See http://www.slate.com/articles/technology/future_tense/2014/11/faa_s_attempts_to_regulate_drones_could_have_first_amendment_problems.html.

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 Amendment analysis.

- 4. Since violations occur under state law, this would mean that states would do the regulating. State regulators would do the litigating and state courts the adjudicating. The FAA would only get into the mix in extreme cases, correct?**

This would depend on how much discretion Congress gives to the FAA. The current regime for governing illegal airborne hunting permits but does not require the FAA to revoke a pilot's license.⁵ If Congress gives the FAA similar discretion here, presumably the FAA would exercise that discretion and get involved only in extreme cases.

- 5. Would this system of litigation be effective given that the violating companies with the most sophisticated unmanned aircrafts are best situated to withstand—injunctions, and money damages?**

More sophisticated companies would be less troubled by damages; that is correct. However, more sophisticated companies may be relatively good actors, given the potential that their actions will be highly visible, and fear of public backlash resulting in restrictive legislation. Drones face significant public acceptance hurdles, if state laws are any indicator. More sophisticated companies likely are aware of this. The worry is that this system would fail to deter smaller bad actors, whose cumulative impact on privacy could be huge. It would also fail to deter data privacy violations, as states do not regulate the reuse or misuse of data—just the initial gathering of it.

⁵ 49 U.S.C. §44709(b)(2).

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6. Would this proposal deter privacy violations—in advance of wholesale domestic drone integration, and in advance of long and uncertain litigation in state courts?

This proposal is intriguing. It could deter privacy violations by reminding companies that they are already subject to state privacy laws, and could make stickier companies' promises to respect privacy, by employing FAA enforcement on top of state enforcement.

My response to Question 2, above, raises some possible concerns with this proposal. An additional worry is that state laws do not address data privacy violations, so this proposal would have little impact on the reuse or misuse of data gathered by drones—hence my suggestion of technology-neutral federal data privacy law, enforceable by the FTC. Some have alternatively but similarly suggested requiring drone operators to submit a data privacy plan to the FAA, and allowing the FTC and state AGs to enforce the plan.⁶

Another point to keep in mind is that many drone users will not have traditional pilot's licenses—and thus may not feel the pain of having a license revoked. Model aircraft operators, for example, are not required to have a pilot's license;⁷ and the FAA is contemplating creating a less stringent unmanned aircraft operator certificate with a small UAS rating for operation of drones weighing less than 55 pounds, and an even less stringent unmanned aircraft operator certificate with a micro UAS rating for operation of drones weighing less than 4.4 pounds.⁸ The

⁶ http://www.markey.senate.gov/imo/media/doc/2015-03-03-Drone_Legislation_Markey.pdf

⁷ https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_91-57A.pdf.

⁸ https://www.faa.gov/regulations_policies/rulemaking/media/021515_suas_summary.pdf;

<https://www.federalregister.gov/articles/2015/02/23/2015-03544/operation-and-certification-of-small-unmanned->

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FAA is contemplating rules requiring only a signed statement to obtain the micro UAS operator certificate.⁹

If Congress decides to enforce privacy compliance through the FAA licensing process, it should be aware of these largely justified attempts to loosen aircraft operator certification requirements with respect to small drones. A privacy enforcement regime that operates on top of FAA certification would likely have the least impact on the actors using the smallest drones, for better or for worse.

Thank you for your questions, and again for the opportunity to testify. I hope these answers will be helpful to you.

Best,

Margot Kaminski

<http://www.forbes.com/sites/gregorymneal/2015/02/14/the-faa-may-get-drones-right-after-all-9-insights-into-forthcoming-regulations/>

⁹ <https://www.federalregister.gov/articles/2015/02/23/2015-03544/operation-and-certification-of-small-unmanned-aircraft-systems#p-347> ("No knowledge test would be required in order to obtain an unmanned aircraft operator certificate with a micro UAS rating; instead, the applicant would simply submit a signed statement to the FAA stating that he or she has familiarized him or herself with all of the areas of knowledge that are tested on the initial aeronautical knowledge test that is proposed under part 107.")

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December 10, 2015

Mr. Brian Wynne
President and CEO
Association for Unmanned Vehicle Systems International
2700 South Quincy Street, Unit 400
Arlington, VA 22206

Dear Mr. Wynne,

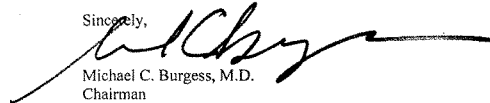
Thank you for appearing before the Subcommittee on Commerce, Manufacturing, and Trade on Thursday, November 19, 2015, to testify at the hearing entitled "The Disrupter Series: The Fast-Evolving Uses and Economic Impacts of Drones."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached. The format of your responses to these questions should be as follows: (1) the name of the Member whose question you are addressing, (2) the complete text of the question you are addressing in bold, and (3) your answer to that question in plain text.

To facilitate the printing of the hearing record, please respond to these questions by the close of business on Thursday, December 24, 2015. Your responses should be mailed to Dylan Vorbach, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, DC 20515 and e-mailed in Word format to Dylan.Vorbach@mail.house.gov.

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,


Michael C. Burgess, M.D.
Chairman
Subcommittee on Commerce,
Manufacturing, and Trade

cc: Jan Schakowsky, Ranking Member, Subcommittee on Commerce, Manufacturing, and Trade

Attachment



November 19, 2015 Hearing: “The Disrupter Series: The Fast-Evolving Uses and Economic Impacts of Drones”

Committee on Energy and Commerce’s Subcommittee on Commerce, Manufacturing, and Trade

Questions for the record, Brian Wynne, President and CEO, Association for Unmanned Vehicle Systems International (AUVSI)

Question submitted by The Honorable Michael C. Burgess, M.D.

1. Mr. Wynne, the Department of Transportation has set June 2016 as its goal for a final rule on commercial drones. Do you think this timeframe is realistic? How is the delay impacting your business?

The FAA’s small UAS rulemaking has been beset by several delays. Considering that safety is at stake, we cannot afford to continue waiting. The FAA needs to make UAS integration a top priority.

With that said, in May 2014, the agency announced it would consider granting exemptions for certain low-risk commercial UAS applications under Section 333 of the FAA Modernization and Reform Act of 2012. Since then, the FAA has granted more than 2,600 exemptions to businesses looking to use UAS for precision agriculture; inspecting infrastructure; mapping and surveying; film, photo and video production; public safety or emergency response; and environmental inspection and regulation.

The FAA continues to approve about 50 new commercial operations a week, a process that has been recently streamlined and expedited. However, this current system of case-by-case approvals – whether streamlined or not – isn’t a long-term solution for the many small businesses wanting to fly. In addition, the requirements for UAS operators are generally more onerous under the section 333 exemption process than the operator requirements contemplated in the draft UAS rule. It’s our view that a Realtor or a wedding photographer who wants to fly a lightweight platform for aerial photography shouldn’t have to master stalls in a manned aircraft or learn how to land a 2,000 pound Cessna.

As an industry, we want to see the integration of UAS proceed and without any further delays. Once this happens, we will have an established framework for UAS operations that will allow anyone who follows the rule to fly. It will do away with the case-by-case system of approvals that currently exists, reducing the barriers to UAS operations. And importantly, the integration will establish a rule for the commercial use of UAS so that small businesses from every industry sector can take advantage of this innovative technology.

Given the technology's potential, it is important that the FAA finalize the small UAS rule as quickly as possible.

