UNMANNED AIRCRAFT SYSTEMS: EMERGING USES IN A CHANGING NATIONAL AIRSPACE

(115–30)

HEARING

BEFORE THE

SUBCOMMITTEE ON AVIATION

OF THE

COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE HOUSE OF REPRESENTATIVES

ONE HUNDRED FIFTEENTH CONGRESS

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November 27, 2017

SUMMARY OF SUBJECT MATTER

TO:	Members, Subcommittee on Aviation
FROM:	Staff, Subcommittee on Aviation
RE:	Subcommittee Hearing on "Unmanned Aircraft Systems Integration: Emerging Uses in a Changing National Airspace"

PURPOSE

The Subcommittee on Aviation will meet on Wednesday, November 29, 2017 at 10:00 a.m. in 2167 Rayburn House Office Building to consider technological, legal, and policy issues related to the use and integration of unmanned aircraft systems (UAS) in the national airspace system. The Subcommittee will receive testimony from the Federal Aviation Administration (FAA), a Professor of Aeronautics and Astronautics, Southern Company, AirMap and the Association for Unmanned Vehicle Systems International.

BACKGROUND

Overview

UAS have been a part of American aviation for nearly a century, primarily in military research, and operations.[1] The FAA first authorized UAS operations in U.S. airspace in 1990.[2] Most operations since that time have been confined to public uses, such as law enforcement and scientific research. However, commercial and other private uses of UAS have grown dramatically within the last several years. In 2017, the FAA estimates that approximately two million UAS are operated in the United States.[3]

[1] John David Blom, *Unmanned Aerial Systems: A Historical Perspective*, Occasional Paper 37, pp 46. Combat Studies Institute Press, US Army Combined Arms Center. Available at: http://usacac.army.mil/cac2/cgsc/carl/download/csipubs/OP37.pdf
[2] Federal Aviation Administration. "Fact Sheet – Unmanned Aircraft Systems (UAS)." Feb. 15, 2015. Available at: https://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=18297
[3] Federal Aviation Administration. "Unmanned Aircraft Systems." Available at: https://www.faa.gov/data_research/aviation/aerospace_forecasts/media/Unmanned_Aircraft_Systems.pdf

UAS Capabilities and Applications

Rapid advancements in technology have transformed UAS. Small unmanned aircraft are typically substantially less expensive, easier to acquire, and simpler to operate than manned aircraft.[4] In some cases, UAS offer capabilities that cannot be matched by manned aircraft, such as close inspections of oil rig flare stacks, bridges, and pipelines.

The number of potential applications for UAS continues to grow. Some companies use UAS as airborne cell phone towers that can ensure phone service after a natural disaster.[5] Others have plans for commercial delivery services with UAS. The long-term economic opportunities and impacts of UAS are expected to be substantial.[6] Emerging technologies, such as UAS traffic management (UTM), have the potential to advance UAS. Using similar technological concepts, some companies are developing highly-automated "flying cars" that would transport people over short distances.[7]

National Airspace System and Aviation Safety

UAS operate at a variety of altitudes. Small UAS typically fly within a few hundred feet of ground level but may climb to over 10,000 feet above sea level.[8] Other UAS may remain aloft for days at altitudes between 60,000 and 90,000 feet above sea level, which is above the altitudes at which most manned aircraft operate.[9] Yet other categories will operate primarily in altitudes used by manned aircraft.

The growing numbers of UAS flown in the NAS, in particular small UAS, have given rise to concerns about potential risks to aviation safety. In testimony given before the Senate Committee on Commerce, Science, and Transportation, Earl Lawrence, the director of FAA's UAS Integration Office, reported that manned aircraft pilots reported 1,800 sightings of UAS in 2016, an increase from 1,200 in the previous year.[10] Between January and March 2017, the FAA documented over 400 sightings of UAS, some of which required pilots to take evasive maneuvers to avoid a collision.[11]

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[4] "Small unmanned aircraft" are those weighing less than 55 pounds. Pub. L. 112-95, § 331, 126 Stat. 72.
[5] Nick Lavars, "Verizon trials drones as flying cell towers to plug holes in internet coverage", *New Atlas*, Oct. 7, 2016. Available at: https://newatlas.com/verizon-drones-internet-trials/45818/
[6] Bill Canis, "Unmanned Aircraft Systems (UAS): Commercial Outlook for a New Industry", *Congressional Research Service*, Sep. 9, 2015, R44192. Available at: https://fas.org/sgp/crs/misc/R44192.pdf
[7] https://www.uber.com/elevate.pdf
[8] Jay Bennett, "Drone Breaks Record (And the Law) By Allegedly Flying to 11,000 Feet", *Popular Mechanics*, Mar. 9, 2016. Available at: http://www.popularmechanics.com/flight/drones/a19854/drone-flown-11000-feet/. http://www.popularmechanics.com/flight/drones/a19854/drone-flown-11000-feet/
[9] Jonathan Vanian, "Facebook's Huge Drone Flies Again (and Doesn't Crash)", *Fortune*, Jun. 29, 2017. Available at: http://fortune.com/2017/06/29/facebook-drone-aquila-test-flight/
[10] Statement of Earl Lawrence, Director, Unmanned Aircraft Systems Integration Office, *Before the Senate Committee on Commerce, Science, and Transportation on Unmanned Aircraft Systems: Innovation, Integration, Successes, and Challenges*, Mar. 15, 2017. Available at: https://www.faa.gov/news/testimony/news_story.cfm?newsId=21494&omniRss=testimonyAoc&cid=105_Testimony
[11] Federal Aviation Administration. "UAS Sightings Report: Reported UAS Sightings (January 2017 – March 2017)." Available at: https://www.faa.gov/uas/resources/uas_sightings_report/

In 2017, there have been two confirmed collisions of UAS with manned aircraft. In the first event, which occurred on September 21, 2017, a UAS struck a United States Army UH-60 helicopter flying over New York City. The collision occurred along the eastern shore of Staten Island and caused the helicopter a significant amount of damage to the rotor and airframe.[12] The UAS was operating in the area illegally, and it is the Committee's understanding that the UAS operator, a non-commercial operator, has been identified by law enforcement.

On October 12, 2017, a UAS crashed into an airliner in Canada during its final descent into Jean Lesage International Airport in Quebec City, Canada. The airliner was less than two miles from the airport when the UAS struck the aircraft. The airplane was able to safely land despite some airframe damage.

In addition, firefighting efforts have been seriously disrupted as aircraft tanker crews have been forced to cancel or postpone missions because of UAS sightings in proximity to forest fires.[13] In 2016, the U.S. Forest Service reported 40 unauthorized unmanned aircraft incursions above or near wildfires; 20 of these events caused the Forest Service to temporarily suspend aviation operations which hindered firefighting efforts.[14] In the majority of cases, authorities have been unable to ascertain the identity of the unmanned aircraft operators.

At the same time, UAS can improve or enhance aviation operations and safety when used properly. For example, UAS can substantially reduce the time required to perform runway inspections, thereby minimizing operational impacts at busy airports.[15] UAS can also be used to enhance safety inspections of manned aircraft in several ways.[16] First, they reduce the safety risk to personnel who sometimes must visually inspect components that are dozens of feet off of the ground. Second, UAS equipped with sensors can detect aircraft damage and discrepancies that might escape human eyes. Finally, they can complete a visual inspection of certain aircraft in 15 minutes whereas a human inspection may last two or more hours.

Legislation and Executive Actions

FAA Modernization and Reform Act of 2012

The *FAA Modernization and Reform Act of 2012* (FMRA; P.L. 112-095) included a subtitle to promote the safe integration of UAS into our national airspace. Among other things, provisions include the designation of six test ranges throughout the United States by the FAA in

[12] "Drone Hits Army Helicopter Flying Over Staten Island", *CBS New York*, Sept. 22, 2017. Available at: http://newyork.cbslocal.com/2017/09/22/drone-hits-army-helicopter/
[13] United States Forest Service. "If You Fly, We Can't." Available at: https://www.fs.fed.us/managing-land/fire/aviation/unmanned-aircraft-systems-uas/if-you-fly-we-cant
[14] *Id.*
[15] Sam Whitehead, "How an Atlanta airport is using drones to help with runway maintenance", *Marketplace*, May 31, 2017. Available at: https://www.marketplace.org/2017/05/31/business/how-atlanta-airport-using-drones-help-with-runway-maintenance
[16] Jonathan Vanian, "Airbus is Using Drones to Inspect Airplanes", *Fortune*, Jul. 15, 2016. Available at: http://fortune.com/2016/07/15/airbus-intel-drones-airplane-inspection/

furtherance of UAS integration.[17] The FMRA also required the issuance of an integration plan, regulations, and established a process for the Secretary of Transportation to authorize certain UAS flights within six months of enactment.[18] Finally, the FMRA contained provisions related to the operation of UAS by government agencies and model aircraft operated in accordance with certain guidelines.

FAA Extension, Safety, and Security Act of 2016

The *FAA Extension, Safety, and Security Act of 2016* (Extension Act; P.L. 114-190) contained several provisions related to UAS.[19] One of the provisions addressed is the remote identification of UAS, which has become an increasingly important capability for purposes of safety and law enforcement.[20] The Extension Act also established a process to allow operators of certain facilities to petition for UAS flight restrictions in proximity to such facilities.[21] It also required the FAA to create guidance and regulations to expedite authorization of UAS flights in response to certain public emergencies.[22] Lastly, the Extension Act requires a UTM research and pilot program.[23]

National Defense Authorization Act of 2018

The *National Defense Authorization Act of 2018* (NDAA 2018; H.R. 2810) would restore the FAA's small UAS registration requirement. NDAA 2018 is pending. A U.S. Appellate Court previously overturned the FAA's small UAS registration program. Knowing who owns a UAS is critical for accountability when something goes wrong. With the NDAA, Congress has clarified its position on the need to identify and track all UAS operations in the NAS.

Executive Branch Actions

Rulemakings and Advisory Committees

The FAA has taken a number of actions related to UAS integration. On June 28, 2016, the FAA issued a final rule (Part 107) related to certification and operation of small UAS.[24] This rule of general applicability addresses areas including airman certification, operating rules, and weather minima. Part 107 includes a waiver process allowing the FAA to authorize, on a case-by-case basis, certain operations that are otherwise prohibited, such as night flying. The FAA also convened an Aviation Rulemaking Committee in 2016 to provide recommendations for

[17] *FAA Modernization and Reform Act of 2012.* Pub. L. 112-95 (Feb. 14, 2012), § 332. The test ranges are based in New York, Virginia, Texas, Alaska, North Dakota, and Nevada.
[18] *Id.* & section 333
[19] *FAA Extension, Safety, and Security Act of 2016.* Pub. L. 114-190 (Jul. 15, 2016)
[20] *Id.* § 2202.
[21] *Id.* § 2209.
[22] *Id.* § 2207.
[23] *Id.* § 2208.
[24] "Operation and Certification of Small Unmanned Aircraft Systems", 81 *Fed. Reg.* 42,064 (Jun. 28, 2016); 14 C.F.R. Part 107

standards for the flight of UAS over people who are not involved in the flight of the aircraft.[25] Those rules remain pending.

The FAA is a participant in the public-private "Know Before You Fly" campaign to educate users of UAS about aviation safety and regulation.[26] The FAA also developed a smartphone application known as B4UFLY to aid UAS operators with airspace information.[27] It established a Drone Advisory Committee (DAC) in 2016 to gather input from stakeholders on key issue areas.[28] The DAC is divided into "Task Groups" that addressed matters including the roles of different levels of government, airspace access, and funding for activities and services necessary for safe UAS integration.[29] The DAC most recently met on November 8, 2017.

FAA Low Altitude Authorization and Notification Capability

In late 2017, the FAA announced the prototype evaluation of the Low Altitude Authorization and Notification Capability (LAANC).[30] LAANC provides real-time automated notification and authorization to UAS operators. Because the existing air traffic control system is designed to primarily meet the needs of manned aviation, it proved unwieldy, untimely, and labor intensive for UAS operators as well as air traffic control personnel. The FAA has indicated that LAANC will provide operators with necessary information in a matter of seconds rather than days. The FAA will not provide LAANC services to users. Instead, LAANC will be initially be provided by two UAS Service Suppliers (USS) under FAA oversight. The FAA expects more USS to join the program as it expands.

UAS Pilot Program

In a Presidential Memoranda dated October 25, 2017, President Donald J. Trump announced a policy to promote the safe operation of UAS and enable technological development in various economic sectors.[31] The Memoranda also directed Secretary of Transportation to establish pilot program to evaluate, among other things, various models of state, local, and tribal government in the "development and enforcement of federal regulations. . . ."[32] The Secretary is soliciting applications from state, local, and tribal governments to participate in this program in

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[25] Federal Aviation Administration. "ARC Recommendations Final Report", *Micro Unmanned Aircraft Systems Aviation Rulemaking Committee (ARC)*, Apr. 1, 2016. Available at: https://www.faa.gov/uas/resources/uas_regulations_policy/media/Micro-UAS-ARC-FINAL-Report.pdf

[26] Know Before You Fly: http://knowbeforeyoufly.org/

[27] Federal Aviation Administration. "B4UFLY Mobile App." Available at: https://www.faa.gov/uas/where_to_fly/b4ufly/

[28] Federal Aviation Administration. "Press Release – Drone Advisory Committee to Hold Inaugural Meeting." Aug. 31, 2016. Available at: https://www.faa.gov/news/press_releases/news_story.cfm?newsId=20754

[29] Radio Technical Commission for Aeronautics: https://www.rtca.org/content/drone-advisory-committee

[30] Federal Aviation Administration. "FAA UAS Data Exchange." Available at: https://www.faa.gov/uas/programs_partnerships/uas_data_exchange/

[31] The White House. "Presidential Memorandum for the Secretary of Transportation." Oct. 25, 2017. Available at: https://www.whitehouse.gov/the-press-office/2017/10/25/presidential-memorandum-secretary-transportation

[32] *Id.*

partnership with private sector UAS operators.[33] In the *Federal Register* notice, the Secretary cites a number of private and public use cases that might be demonstrated in the pilot program.

WITNESS LIST

Panel I

Dr. Juan J. Alonso
Professor of Aeronautics and Astronautics

Mr. William O. "Billy" Ball
Executive Vice President and Chief Transmission Officer
Southern Company

Mr. William Goodwin
General Counsel
AirMap

Mr. Brian Wynne
President and Chief Executive Officer
The Association for Unmanned Vehicle Systems International

Panel II

Mr. Daniel K. Elwell
Deputy Administrator
Federal Aviation Administration
(*Accompanied by:* Mr. Earl Lawrence
Director, Unmanned Aircraft Systems Integration Office, FAA)

[33] "Unmanned Aircraft Systems Integration Pilot Program— Announcement of Establishment of Program and Request for Applications", 82 *Fed. Reg.* 51,903 (Nov. 8, 2017)

UNMANNED AIRCRAFT SYSTEMS: EMERGING USES IN A CHANGING NATIONAL AIRSPACE

WEDNESDAY, NOVEMBER 29, 2017

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON AVIATION,
COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE,
Washington, DC.

The subcommittee met, pursuant to notice, at 10:06 a.m. in room 2167, Rayburn House Office Building, Hon. Frank A. LoBiondo (Chairman of the subcommittee) presiding.

Mr. LOBIONDO. Good morning. The subcommittee will come to order. Thank you all for being here.

Before we begin I would like to ask unanimous consent that members not on the subcommittee be permitted to sit with the subcommittee at today's hearing and ask questions.

Mr. DEFAZIO. Who are we talking about?

Mr. LOBIONDO. We are talking about John Garamendi.

Mr. DEFAZIO. Oh, oh, all right. I thought it was Rodney, OK.

Mr. LOBIONDO. No, Rodney is on the committee.

[Laughter.]

Mr. LOBIONDO. I know sometimes it doesn't seem that way. We don't need to take a vote on Rodney, OK.

OK, so ordered.

Today the Aviation Subcommittee is holding its first hearing in the 115th Congress solely dedicated to the topic of unmanned aircraft systems, UAS. This hearing will consider technological, legal, and policy issues related to UAS. For new members of the committee, it will provide an overview of this very important topic. For returning members, this hearing will be an update on these issues.

The UAS, or drones, are a game-changing technology. While drones have been in existence for decades, they are now creating new industries and transforming others, such as agriculture.

The sheer volume of UAS now operating in the National Airspace System—about 2 million have been sold in the United States to date—and their unique features are causing policymakers and operators to rethink all aspects of airspace use.

Until recently we thought of aircraft as mainly flying miles above us carrying people and cargo between airports with runways. UAS, on the other hand, can take off and land literally anywhere. They fly a few hundred feet above the ground and easily operate around buildings, factories, utility lines, and farm fields.

The possibilities are exciting: our power companies can evaluate damage quickly after a storm, while keeping people out of harm's way. Farmers can more efficiently assess their crops. All kinds of

equipment and buildings can be inspected faster and safer than ever before. And drones are changing the way first responders conduct research operations and how they monitor disaster and activities.

In other countries, companies are beginning to use drones to deliver goods either directly or in combination with delivery vans. For example, Mercedes-Benz is using drones in Switzerland to deliver items such as ground coffee and cell phones in Switzerland on a trial basis.

These examples make clear how important it is to maintain American leadership in aviation. We cannot rest on our laurels; the benefits of technological advancement and the costs of complacency are too great. As such, we must continue to diligently move forward with UAS integration.

But, like with anything else, there are risks of which we must be mindful, as we learned earlier this year. In September over New York, a U.S. Army helicopter collided with an illegally operated drone causing hundreds of thousands of dollars of damage to that aircraft. In Canada, not long after, a drone struck an airliner as it prepared to land. We were lucky. No one was hurt or killed in those incidents. But we cannot count on luck to keep us safe the next time around.

Yesterday the FAA made public the results of research on collisions between UAS and manned aircraft. So far, the research shows that UAS can cause more severe damage to an airplane than a comparably sized bird. That is concerning. We will monitor the future of this research closely as they investigate the risks of ingestion of UAS into jet engines.

These incidents, the numerous sightings of drones, and the research reveal that a lot of work remains to be done to achieve safe and successful integration of UAS.

The witnesses on our panels today represent those who are pushing the boundaries of aviation technology and innovation. Only hard work and close collaboration between the Government, industry, aviation, labor, and Congress will allow the safe integration of UAS into the National Airspace System.

I note that some of that hard work and collaborative effort is taking place at the FAA Technical Center in my district. The technical center plays an important part in the partnership between Government and industry.

I look forward to hearing from our panel today about how Congress can enable the continued integration of UAS while meeting the safety challenges as they arise.

Before I recognize Ranking Member Larsen for his remarks, I ask unanimous consent that the record of today's hearing remain open until such time as our witnesses have provided answers to any questions that may be submitted to them in writing for the record, and unanimous consent that the record remain open for 15 days for additional comments and information submitted by Members or witnesses to be included in the record of today's hearing. And without objection, so ordered.

And I also ask unanimous consent that a written statement prepared by the Air Line Pilots Association, International, be entered into the record.

So, without objection, so ordered.

[The written statement of Air Line Pilots Association, International, is on pages 115–122.]

Mr. LOBIONDO. And now I would like to yield to Mr. Larsen.

Rick, it is all yours.

Mr. LARSEN. Thank you, Mr. Chairman. I want to thank you for holding today's hearing on unmanned aircraft systems integration and their emerging uses.

This subcommittee held a hearing earlier this year, where we discussed the FAA's readiness for new airspace users and technologies and the promise those technologies hold for our aviation system and our economy. Chairman LoBiondo and I have ensured UAS has been a focus of this subcommittee's oversight work in recent years, and our work will not slow down any time soon, as the UAS proliferate into U.S. airspace.

Mr. Chairman, as I was late getting to the hearing, I am not going to read my entire statement, and I am just going to apologize for being late, ask unanimous consent my entire statement be entered into the record, and beg for your forgiveness.

Mr. LOBIONDO. There might be an objection to that.

[Laughter.]

Mr. LOBIONDO. No, without objection, so ordered.

[The written statement of Hon. Rick Larsen of Washington is on pages 56–60.]

Mr. LARSEN. Thank you.

Mr. LOBIONDO. Now I would like to recognize the chairman of the full committee, Mr. Shuster.

Mr. SHUSTER. Thank you, Chairman LoBiondo, and thank you and Ranking Member Larsen for holding this hearing today.

The United States is a world leader in aviation. We are also the world leader in innovation, and one of the sectors that I want to see thrive is the use of unmanned aerial systems. UAS are the latest intersection of aviation and innovation and I am excited to see where this industry goes from here.

UAS have emerged as a strong growth sector in the aviation industry and are providing good-paying jobs here in the United States. As their numbers grow, more and more promising applications for UAS are being realized and planned. UAS have a variety of uses, ranging from assisting farmers surveying crops and croplands, to visual inspection of aircraft, railroads, pipelines, and bridges.

During the historic hurricane season we had this year, UAS played an important role in relief and the recovery efforts. They were used as airborne cell phone towers to ensure the continued phone service and Wi-Fi internet access after these natural disasters occurred. Without this technology, many survivors of the hurricanes would have been cut off from their families. UAS were used to survey damage from the storms, allowing for faster recovery efforts.

They are now being used for routine inspection of infrastructure, a function that cannot necessarily be matched by manned aircraft and often dangerous for human beings.

We are seeing industry and Government work closely together toward the common goal of UAS integration and keeping the United States ahead of the rest of the world in the development and integration of this new aviation technology. And that is very promising when you see collaboration occur between the private sector and Government. I believe this will move us forward faster and safer, rather than seeing these technologies being developed overseas.

So I look forward to today's hearing, and from the witnesses we have here today on the current state of UAS in our national airspace, and the emerging uses of those being developed, and what we in Congress can do to address those policy issues related to the use and integration of UAS.

So, with that, I thank Chairman LoBiondo, and I yield back.

Mr. LOBIONDO. Now I would like to recognize our ranking member, Mr. DeFazio.

Mr. DEFAZIO. Thank you, Mr. Chairman. Thanks for this hearing. This is critical.

You know, the commercial application of drones has incredible promise of benefits across a multitude of disciplines and applications, if it is well regulated. Now, what I mean by well regulated is that it is safe, but secondly, also, that we are not overly and—obsessively over a long period of time prescriptive to the point where we lose the lead—in fact, we already are losing the lead in this industry. So, you know, that is a cautionary tale that has to be weighed very carefully. Yes, absolutely safe.

The biggest problem so far has been with idiots who have toy drones, like the one in New York that are being operated illegally. And, for the life of me, why we allow any toy drone to be sold without geofencing that isn't easily hackable in this country is extraordinary to me. I guess it is the pressure of the toy industry or something.

So, you know, we have to get this straight. I asked quite some time ago for the FAA to—I said, "What happens when a drone hits a plane, or we ingest one into an engine?" Hmm, good question.

Well, they have been grinding away at this very, very slowly. But yesterday we got the work product of the first part of this study. And it turns out that they can be worse than birds, a small one. In fact, they found a failure of horizontal stabilizers in an impact with a little crappy quadcopter or something like that, because they are a dense mass, versus a bird, which kind of—when it hits.

So, this—you know, this is an accident waiting to happen. We are going to lose an aircraft. Whether it is going to be a smaller aircraft or a larger aircraft, we have to be sure that those who are operating these things illegally are dealt with. And there is technology out there to detect these things, detect where the operators are. You know, we need to pursue that. The FAA is working very slowly on that issue, too.

We need to be able to ground these things. We are not worried about their rights, as people who are operating something illegally. We have had forest firefighting in the West suspended because of these same kinds of people. We need to find them, prosecute them, and, after we put a few of them in prison for a while, then that will go away.

The commercial application should not be held back because we got these irresponsible people out there. The commercial needs to be well regulated, as I said earlier.

Finally, my—and to the FAA—and hopefully they can address this—you know, my critical concern, beyond that—well, that is pretty bad, level 4 damage, which is the worst for horizontal stabilizers—but an engine. We don't know. And why can't we do the engine? Engines are really expensive. Well, how about we get an old surplus engine? Well, the manufacturers don't want to donate one, because they will say, "Well, it was a GE engine that failed, that ingested a quadcopter, but maybe a Rolls-Royce wouldn't fail." I mean all the turbines are quite similar.

Maybe we can go out and get an old Ilyushin engine that nobody—I mean it is—the point is it is a turbofan. I mean I think they are all going to pretty much fail the same way, you know, and that—they are putting that off for another 2 years because of all these concerns. We need to know what is going to happen when one of these things gets sucked into a turbofan. And we don't. But we already know that they can cause, potentially, catastrophic damage to airframes.

So, you know, we have got to move ahead. And this committee should be—you know, I appreciate the fact we put in the—one of the extensions, a $20,000 fine. But you know, we haven't put in place the technology to find these people as they are operating them, track them down, and actually prosecute some of them.

And I think we got to go beyond a $20,000 fine. This is very, very serious and life-threatening, potentially.

So, with that, I yield back the balance of my time, and look forward to hearing from the experts here.

Mr. LOBIONDO. Thank you, Mr. DeFazio, and we thank our witnesses for being here today.

On our first panel we have Dr. Juan Alonso, professor of Aeronautics and Astronautics; Mr. William "Billy" Ball, executive vice president and chief transmission officer of Southern Company; Mr. William Goodwin, general counsel for AirMap; and Brian Wynne, president and chief executive officer of the Association for Unmanned Vehicle Systems International.

I would like to remind all of our witnesses to please limit their opening remarks to no more than 5 minutes. We will enter your remarks into the record if they go beyond that. We will now hear from our first panel.

Dr. Alonso, you are recognized.

TESTIMONY OF JUAN J. ALONSO, PH.D., PROFESSOR OF AERONAUTICS AND ASTRONAUTICS; WILLIAM O. "BILLY" BALL, EXECUTIVE VICE PRESIDENT AND CHIEF TRANSMISSION OFFICER, SOUTHERN COMPANY; WILLIAM GOODWIN, GENERAL COUNSEL, AIRMAP; AND BRIAN WYNNE, PRESIDENT AND CHIEF EXECUTIVE OFFICER, ASSOCIATION FOR UNMANNED VEHICLE SYSTEMS INTERNATIONAL

Dr. ALONSO. Chairman LoBiondo, Ranking Member Larsen, and members of the subcommittee——

Mr. LOBIONDO. Can you pull your mic a little closer, please?

Dr. ALONSO. Surely. First of all, thank you for the invitation to appear before you and discuss my thoughts, opinions, and ideas to ensure that the United States remains the worldwide leader in unmanned aircraft systems R&D, operations, and integration.

Even though I am a professor in the aeronautics and astronautics department at Stanford University and a current member of the FAA Drone Advisory Committee, I am actually appearing before you in a personal capacity, and speaking only for myself.

There are many technical obstacles that prevent more widespread development and integration of UAS in the United States. But I will not focus on those technical challenges today. In fact, I would like to talk about three areas of the regulatory environment that can further enhance capabilities and attempt to solve the policy technology dilemmas that this field is currently facing.

First, during these early days of the development of UAS capabilities—and we are in the early days—we will need more flight testing experiences, not fewer. We must try our ideas, fail, try again, succeed, because this is the iterative nature of the technology development process. The FAA UAS test sites, the Pathfinder programs, and the recently announced UAS Integration Pilot Program are all steps in the right direction that must be enhanced and significantly enlarged.

Second, it is critical that all these tests result in data of sufficient quality in the appropriate amount so they can be used to inform the regulations and requirements that are to come. It is critical that this data be made openly available to the community for better insights and understanding.

And third, we must set a regulatory environment that provides a reasonable expectation of periodic and timely updates to the levels of service available to UAS operators for those who can demonstrate compliance with stricter requirements to ensure safe operations.

The United States has been at the forefront of R&D of the very capabilities that are enabling such a bright future for UAS, but the rest of the world is not sitting on the sidelines. Multiple countries have already recognized the potential civilian and military applications of drone technologies, and the situation truly begs the following questions.

First, what must the U.S. do to retain leadership in the field that we had originally developed?

Secondly, how do we make sure that the situation in the United States encourages both U.S. and foreign companies to test and develop here, and not abroad?

How do we set up the proper regulatory environments, so that companies can plan ahead for both testing, development, and deployment of their UAS systems?

And last, but not least, and above all, how do we ensure that the jobs that are created by this new field actually stay here in the U.S., and not go abroad?

On these three areas I would like to begin the discussion by simply offering the following thoughts. Let me start with the topic of regulation.

I think we need to ensure that we embark on a yearly cycle of updates to the existing rules. Part 107 is a wonderful starting

point, and it provides a certain level of service with a minimum level of requirements to guarantee safety. But we need to do operations over people, beyond visual line of sight, at night, in proximity, or close proximity to buildings and infrastructure. And all of these are logical regulatory steps that need to be tackled. And, to its credit, the FAA has begun to go down this path.

We need to understand what are the minimum requirements that enable these new levels of service.

We need more testing, not less. This testing is needed to collect the data to inform the regulatory process. Because of the fundamental importance of safety, without the data the regulatory process is doomed to unnecessarily burdened future drone operators.

UAS test programs should be significantly enhanced. As we establish new UAS flight test programs, we must require that the operators share all the data about all the flights, and we must commit to ensuring that the data, appropriately identified, are open to the U.S. community at large, because you must remember that the value is not in the data itself, but rather in the interpretation of the patterns and the value of that data that can be enhanced by participation of others.

The only way to do this is to use a probabilistic risk-based analysis approach that uses data to understand safety.

I will finish my comments by saying that although I am talking about mostly small UAS in my testimony today, I would like to note that similar requirements for regulatory framework and data collection are important for larger vehicles. In the the country where I am from, we are developing electric VTOL [vertical takeoff and landing] aircraft that could revolutionize personal transportation in urban areas, and they can benefit from similar initiatives.

Thank you for your attention.

Mr. LOBIONDO. Thank you, Doctor.

Mr. Ball, you are recognized.

Mr. BALL. Chairman LoBiondo, Ranking Member Larsen, and members of the subcommittee, thank you for inviting me to testify today. My name is Billy Ball, and I am the executive vice president and chief transmission officer at the Southern Company. Southern provides electricity and natural gas to 9 million customers through our 11 utility subsidiaries. We operate nearly 200,000 miles of transmission and distribution lines, and more than 80,000 miles of natural gas pipeline.

Southern Company believes in leveraging innovation to keep energy safe, reliable, secure, and affordable. We were among the earliest energy industry adopters of unmanned aircraft systems, also known as drones.

Now, for many years—as long as I can remember—we have used helicopters and fixed-wing aircraft for the regular inspection of our assets. Drones are a critical part of our future strategy for these inspections. Today, however, manned aircraft often remain more effective because of regulatory constraints on drone usage.

Inspections with manned aircraft can be challenging, due to low-altitude flight near towers and wires. Sadly, I have experienced this firsthand when we lost a seasoned pilot and an inspector in a helicopter crash. Being able to displace the use of manned air-

craft with drones to inspect our facilities will reduce safety risks to our employees.

Now, I know this committee is particularly interested in disaster response and recovery. We work alongside first responders to restore service quickly and as safely as possible. Now, though still a relatively new technology, drones already have become an important part of disaster recovery. Human-based flights have to wait until the weather is acceptable to fly. But we can get drones up quicker, and begin the assessment sooner. A good damage assessment is the foundation to an effective recovery.

So, in the aftermath of Hurricane Harvey, earlier this year, Southern Company, our company, was able to provide mutual assistance to CenterPoint Energy in the Houston area by providing six UAS teams. We have never done this before. They were able to make multiple flights in the areas no longer accessible because of all the flooding. With fewer regulatory restrictions, we believe additional flights would have been possible.

After that, we utilized 16 drone teams in our own response to Hurricane Irma, which caused widespread outages for us in the State of Georgia. From our learnings in Texas, we precoordinated with the Georgia Emergency Management Agency, which enabled us to have improved access to make more flights. The use of drones really did improve our damage assessment.

Lessons learned during both of these recovery efforts are now being shared across the utility industry, and is being used to improve our efforts, going forward. This spirit of collaboration within the electric power industry sets us apart from many other businesses.

So, with that in mind, as Congress and the FAA continue to work on these issues, we ask that you would involve electric companies when you have pilot projects, task forces, advisory committees, and the like.

Without further loosening in the regulatory space, drones will not see their full potential. Imagine inspecting transmission lines by the miles, instead of only as far as you can see, which is what we are limited to today. The technology exists. The improvements in safety and efficiency are overwhelming.

Other places in the world are already doing it. We want to work with FAA to get projects like this green-lighted, get them moving on.

In closing, I urge you to continue to pursue policy that allows for the safe integration of UAS into the national airspace. Of particular importance we call on FAA to finish the guidance in rulemakings called for in the 2016 FAA bill, and work with end users like our company and other utilities to use part 107 waivers to advance drone technology.

Thank you again for the opportunity for me to be here, and thank you for your service to our country.

Mr. LOBIONDO. Thank you, Mr. Ball.

Mr. Goodwin, you are recognized.

Mr. GOODWIN. Thank you, Chairman LoBiondo, Ranking Member Larsen, and members of the subcommittee. It is a pleasure to speak with you today. My name is Bill Goodwin. I am the general counsel of AirMap, the world's leading airspace management plat-

form for drones, and we are currently deploying unmanned traffic management, or UTM solutions, that currently help millions of drones fly safely.

However, to realize the full economic benefit and efficiencies that drones can provide, we have to continue to challenge our own assumptions about airspace and airspace management. We have seen enormous leadership in that regard in recent months within the administration, with the FAA, and DOT, including the presenters that we will hear on the next panel, Dan Elwell and Earl Lawrence.

Internationally, however, there are countries competing with the United States, as we have heard, to integrate drones into their airspace more quickly, and other countries' openness to experimentation has now accelerated into regulatory action and standard-setting that threatens to leave American businesses behind. We really have no choice but to work harder and faster to safely integrate drones into the U.S. airspace.

In my testimony today I wanted to provide a few examples of how the U.S. airspace is evolving to accommodate drones, some of AirMap's experiences in other countries that are accelerating drone integration today, and suggest some recommendations for U.S. policy to build on the recent progress that we have seen here.

So, in the U.S., just within the last month, the FAA certified AirMap as one of two original providers of the low-altitude authorization and notification capability, otherwise known as LAANC, which enables operators to get instant authorization to fly in restricted airspace. This took a 90-day process with an uncertain outcome, often leading to a rejection, and turned it into instant access for safe commercial operations.

We perceive LAANC as a building block to a full UTM network, and we know that the FAA intends to roll out LAANC across the national airspace in 2018.

Also in the U.S., as we have heard from other members on the panel already, AirMap technology has assisted in the response to Hurricanes Harvey and Irma, just this fall. In the aftermath of each hurricane, AirMap supported vital hurricane response efforts by providing local emergency operation centers with a dashboard that allowed incident commanders to see flights and missions that were being planned and operated by operators performing search and rescue missions, and then communicate with them.

Another example of some domestic innovation that we have seen is our partnership with the State of Kansas, which is a leader in aerospace innovation. We have worked closely with the Kansas Department of Transportation to deploy and develop UTM technology across the State—again, with the goal of speeding the integration of drones safely, and accelerating productive commercial uses of drones.

But perhaps the most exciting development that we have seen here is the UAS Integration Pilot Program announced by President Trump and implemented by the FAA on November 2nd, which we expect to open the flood gates to expanded drone operations. By leveraging the unique insights of State, local, and Tribal governments, the UAS Integration Pilot Program will create numerous

laboratories of innovation and drive commercial drone activity here.

Now, notwithstanding these innovations that I have highlighted, there are other countries, as I noted, that are working hard to integrate drones at a faster rate. And in some cases they are succeeding.

So today AirMap is working with other international partners to deliver UTM solutions next year in 2018 that we fear may take the United States until 2021 or later to achieve without congressional action.

So I will just highlight a few of those in the time that I have remaining.

In a joint venture with Rakuten, Japan's largest e-commerce company, AirMap is providing airspace management capabilities today to enable expanded drone operations in both suburban and exurban environments.

Another noteworthy demonstration occurred in September of 2017, when we participated in Switzerland in a demonstration of U-space, which is the European equivalent of UTM. This particular demonstration is worth calling out because multiple missions were occurring simultaneously over Lake Geneva in some of the most sensitive airspace in Switzerland, and the result of the demonstration and the deployment of the technology there is persistent approved beyond line-of-sight commercial operations that we heard a reference to earlier today.

So, given our experiences here and overseas, there are three things that we think Congress can do to accelerate the safe integration of drones into the airspace in the U.S.

First, Congress should expedite and prioritize the establishment of an operational UTM system by 2020.

Second, Congress should apply support and resources to the FAA's drone pilot program, and direct the FAA to exercise its authority to waive regulations that currently stand in the way of expanded operations.

And third, Congress should ensure that a remote identification system based on licensed spectrum is established to enable nationwide expanded drone operations.

Thank you again for convening this hearing to discuss the opportunities for drones here and abroad, and I would like to finish my remarks by thanking Chairman LoBiondo, in particular, for his commitment to the FAA and its employees. We know that your steady hand has helped guide the agency and, in particular, the FAA Tech Center. And we wish you the best of luck in your next chapter. Thank you.

Mr. LOBIONDO. Thank you, Mr. Goodwin.

Mr. Wynne, you are recognized.

Mr. WYNNE. Chairman LoBiondo, Ranking Member Larsen, and members of the subcommittee, thank you very much for the opportunity to address this hearing this morning, speaking on behalf of the Association for Unmanned Vehicle Systems International, the world's largest nonprofit organization devoted exclusively to advancing the unmanned systems and robotics community.

For years AUVSI has been urging the FAA to use all available means to establish a regulatory framework for UAS. Now we have

initial regulations governing civil and commercial UAS operations in the form of the small UAS rule, also known as part 107. Much has been accomplished so far because Government and industry have banded together to advance UAS. But I think my colleagues from the FAA would agree with me that there is still a great deal of work that needs to be done.

The continued adoption of this technology will require an expanded regulatory framework that incorporates rules for, among other things, night-time operations—flights over people, for example—and we were expecting a notice of proposed rulemaking for flights over people a year ago. But this next regulatory step has been indefinitely delayed over security concerns.

In trying to get this rulemaking back on track, industry stepped up and offered solutions for remote identification of UAS platforms. We expect the recommendations of the remote ID ARC [Aviation Rulemaking Committee] to be public soon, and industry looks forward to doing its part to implement a remote ID system that identifies any UAS flying in the airspace in real time.

We hope this measure alleviates the concerns of the security community. To the extent more needs to be done, we need broader engagement from our Government partners, notably those responsible for national security, to understand their specific concerns, and work collaboratively to address them.

Fundamental to remote identification, AUVSI has long supported a registration system for commercial and recreational UAS operators. We are glad Congress recently restored UAS registration for recreational operators. However, this piecemeal approach to solving issues regarding both commercial and recreational operators may slow progress and hinder efforts to move the industry forward.

It may, therefore, be necessary for Congress to reevaluate the role of section 336, the Special Rule for Model Aircraft, that was part of the FAA Modernization and Reform Act of 2012 to address security concerns and streamline the process for future regulations such as those governing remote identification standards.

The United States benefits from the safest airspace system in the world. This is largely thanks to uniform Federal aviation safety and operational regulations. Maintaining consistent regulations keeps our skies safe, and helps foster innovation. This authority resides and must continue to reside with the FAA. AUVSI also recognizes the need for non-Federal bodies such as States, municipalities, and Tribal governments to play a role in developing that Federal framework.

The White House's recent announcement of a UAS Integration Pilot Program is a positive step for that effort. This pilot program represents an opportunity for State, local, and Tribal governments to collaborate with the UAS industry and the FAA to further develop a Federal framework for integrating UAS into the skies above communities across the Nation.

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

Industry has partnered with Government to advance UAS traffic management concepts, beginning with the low-altitude authorization and notification capability, also known as LAANC, which Mr. Goodwin just referenced. Continuing collaboration will be necessary, as we work toward additional UAS-related airspace management tools, and further UAS integration efforts to include platforms above the small UAS threshold and for higher altitudes.

Before I conclude, I want to thank Congressman LoBiondo, Chairman LoBiondo, who has recently announced that he would retire at the end of his term. The chairman was one of the earliest champions of unmanned aircraft systems on Capitol Hill, and in his district in southern New Jersey, which has become an important center for UAS research and development. We look forward to working with Chairman LoBiondo and the rest of this subcommittee in the coming year on a long-term FAA reauthorization measure that will move the UAS industry forward and spur economic and job growth for the Nation.

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

Mr. LOBIONDO. Thank you, Mr. Wynne. Now I will turn to Mr. Shuster for questions.

Mr. SHUSTER. Thank you, Chairman LoBiondo.

My question deals with—Mr. Wynne, you hit right on it—the remote identification of UAS. It seems to me that a big part of this solution, the safety, security, to law enforcement is us being able to tell who is flying those systems in the airspace up there.

And so, in your view, what are the obstacles for us to get to a point where we are able to know who is flying them? Because, again, as we see these sightings and close events and near events that—and actual collisions that are occurring, again, knowing who is up there, knowing—be able to protect that airspace when it comes around, especially around airports or high-density aviation areas, what are the obstacles? Who opposes moving forward with some sort of a remote identification?

Mr. WYNNE. I am not aware of anyone that opposes it, sir. And that is a great question. We—of course, to get to the Holy Grail of this industry's potential, which is being able to fly beyond visual line of sight, as the gentleman from Southern Company mentioned——

[Disturbance in hearing room.]

Mr. WYNNE. So, to continue, the—we are all in favor of that. We knew that we would—as commercial operators, we would have to be identifying ourselves. I think it is extremely important, particularly in urban areas, that local law enforcement have the tools in real time, as I mentioned, to be able to do that.

The good news is that, increasingly, public safety, as we have already mentioned, is embracing this technology, and the more they use it as an everyday tool, the more they will be able to spot an unsafe operation or something worse.

So remote identification is key. Backing up one step from there was registration. So we need all aircraft registered, and the ability to remotely identify. That might be a layered system, et cetera. But we are working on it.

Mr. SHUSTER. Why do you think we haven't been able to get to that? I guess that is going to be a question, too, that I ask the folks from the FAA. Why haven't we been able to get to that? To me it seems like it is—if people are—today we pretty much know who is flying around up there, we can identify who is flying up there. So why hasn't it been—why hasn't the rulemaking been put in place at this point? Because we have been dealing with this now for 4, 5—several years now.

Mr. WYNNE. Fair question, sir. I think it has been elevated in priorities. It was on the list of things that we had to get to. But I think, because we have had people flying in the wrong places, and there is a greater need for accountability, we pushed forward with registration and now we have the ability once again for everybody to be registered. We need to push forward with this, as well.

If you think about most drones as flying cell phones, identification is not a difficult thing to get done. So I think we will get it done soon.

Mr. SHUSTER. And do you think this is one of the one, two, three most important pieces of——

Mr. WYNNE. Yes, I do.

Mr. SHUSTER [continuing]. The solution?

Mr. WYNNE. I absolutely do.

Mr. SHUSTER. And, Dr. Alonso, maybe you could address that in your thoughts, studying this.

Dr. ALONSO. I think it has been well said. I think the lack of regulation for remote identification is just a typical case of the technology changing very rapidly. Are we going to do it through cell phone towers? Are we going to use the work of some startup companies that are developing ADS–B [automatic dependent surveillance-broadcast] capabilities? Are we going to go in other means of doing this?

I think the FAA is probably trying to see what is developing before they issue a regulation as to what drones must have. But it is a technically solvable problem.

Mr. SHUSTER. Well, if we continue to do that, Mr. Goodwin, if the FAA keeps waiting to see about technology, technology changes every couple of months, probably, or at least every year. Is that accurate, in your view?

Mr. GOODWIN. I think there is room to not let the perfect be the enemy of the good. I do think that, ultimately, with existing technology, a lot of these problems can be solved. So I agree with Mr. Wynne in that regard, that I don't think we have to wait for the perfect technological solution.

Mr. SHUSTER. And, Mr. Ball, as an operator in the airspace, do you see the technology changing that—how many years—you said you were one of the earliest users of UAS. How quickly have you seen that technology change over the past several years?

Mr. BALL. Well, you know, for us, there is certainly—the technology has been improving every year. And for us it is—we are a very compliance-minded company. So whatever the rules are, we just need clarity. We will gladly comply, and I think you are asking a great question.

I also agree, I don't think you have to wait for the perfect solution to move ahead.

Mr. SHUSTER. That would go towards what Dr. Alonso said about put a—make a rule, and then every year review it to make sure that the technology hasn't grown past it or—so OK.

Mr. BALL. Yes.

Mr. SHUSTER. Well, thank you all very much. I appreciate the testimony and yield back.

Mr. LOBIONDO. Mr. DeFazio?

Mr. DEFAZIO. Well, thank you, Mr. Chairman. I would just like to follow up on that.

Again, as I expressed at the beginning, I—you know, responsible commercial operation is not a major concern, we just have to figure out, you know, what that endeavor is. But can anybody on this panel—since you have some expertise—why should we allow toy drones to be sold that don't have geofence software in them that prohibits any illegal operation? Anybody got a clue as to why we haven't done that? Do you think maybe the FAA doesn't think they have the authority, or we would need to give them specific authority?

I mean this is a major concern for me. Anybody got an idea? I mean is it technologically possible to do that to a toy drone, program it so it can't go into restricted airspace?

Mr. WYNNE. It is possible, sir. I think it is really more of a cost question than anything else. The more capable drones generally are geofenced.

Mr. DEFAZIO. Right. So then people, for these little junky drones, would have to pay more for them so that they won't ultimately get ingested into a jet engine because they wanted to fly it near an airport.

Mr. WYNNE. Well, we had that debate when we were working with the FAA on the registration process. What level do we call a toy?

Mr. DEFAZIO. Yes.

Mr. WYNNE. Because it literally could be a threat. And it is very difficult, as we saw——

Mr. DEFAZIO. Well, a toy is what—you know, there is a difference between a commercial operator and a hobbyist. And then, of course, we have the model airplane people, who are—you know, have a long tradition of operating responsibly and within the law. But now we are incorporating—there will be, what, 1 million of these things sold this Christmas or more? Who knows?

And, you know, there is—all we are going to do is we are going to register them. That is a step forward, but what would it take to put, you know, remote sensing technology on those, so we would be able to track them?

Mr. WYNNE. Well, I—not to be too fine on it, but I think you mentioned the AMA, which is a great partner of AUVSI and the FAA in our Know Before You Fly campaign, which is our educational effort to try and keep people from flying where they shouldn't be.

Mr. DEFAZIO. Right.

Mr. WYNNE. If everyone flew that was a hobbyist—was flying according to AMA rules——

Mr. DEFAZIO. Right.

Mr. WYNNE [continuing]. They wouldn't need to geofence, they——

Mr. DEFAZIO. Right. But when you go to 1 million people who just got one under the tree and go, "Wow, look at this, I am going to take it out and try it," they don't know——

Mr. WYNNE. Yes, sir.

Mr. DEFAZIO. So—but what would it take to put remote sensing technology on those things?

Mr. WYNNE. I would like to answer that question for the record, if I could, sir, because I think there is a cost equation that needs to get captured with that.

Mr. DEFAZIO. Right. OK. And I am not quite getting what I want here. But—OK.

How about the whole idea of the FAA? I mean sometimes the FAA gets way too prescriptive. Couldn't we just have, in terms of developing a system for—you know, so we can have remote identification for a UTM network, couldn't it be basically not prescriptive, but results-oriented? I mean it doesn't have to be—it has to be interoperable, obviously, but it doesn't have to be one particular prescribed technology, is that correct?

And, I mean, we are—we have got the technology today. It would work today. Yes, maybe there will be something, you know, more compact in the future, whatever, or different—but it would still be the same thing. We just want to be able to see it and track it. Isn't that—Dr. Alonso? Yes.

Dr. ALONSO. I mean I think what you are describing are performance-oriented regulations——

Mr. DEFAZIO. Right.

Dr. ALONSO [continuing]. Where you describe what you mean to achieve, but you——

Mr. DEFAZIO. Right.

Dr. ALONSO [continuing]. Don't impose the means by which you are going to achieve them.

Mr. DEFAZIO. Right.

Dr. ALONSO. So this is doable.

On your previous question of geofencing, it is a fairly easy technology. In fact, many drones already have this, but may not be activated at a particular moment. I think you have to worry about some legal issues that I am not an expert in regarding whether you require it absolutely from every toy, and how you define a toy. Is it this small or that small or a little bit bigger?

But it is certainly something that is going to have to be activated at some point, because most people don't do it out of malice, they simply have the lack of knowledge and they haven't been exposed to some of the limitations that are in the law for these types of vehicles.

Mr. DEFAZIO. All right. Well, and—of course the geofencing has to be dynamic, because we are—I mean the most—you know, the thing that has interfered most in my part of the country is people flying these things into active forest fires, and we have to take out all of the aircraft until it goes away.

Dr. ALONSO. Absolutely.

Mr. DEFAZIO. So—yes, Mr. Goodwin?

Mr. GOODWIN. To your comment about dynamic geofencing, that is exactly the kind of technology that AirMap is developing and deploying. And, in fact, that is one of the reasons we have partnered with the Department of the Interior, to get a more robust set of wildfires into our data sets so that those responsible manufacturers that are actually doing geofencing now would be able to avoid worrying about any consumer choice, but the drones wouldn't be able to even take off if they were within a certain proximity of a wildfire.

We have taken that a step further for local first responders, as well. So I just want to react on that. I don't think it is so much a technology problem as it is some of the line-drawing exercises that we have to go through as to what the threshold is where that technology should apply.

Mr. DEFAZIO. OK, thank you.

Thank you, Mr. Chairman.

Mr. LOBIONDO. I very unapologetically—at every opportunity I can—promote and highlight the work that the FAA's premier technical center, which is in my district, continues to do with engineers and laboratories that is unmatched anywhere, and the partnership that they have formed with the private sector.

So, for anyone on the panel, I believe, in many respects, that the technical center is somewhat underutilized, especially when it comes to their expertise with drones and unmanned aerial systems. Any ideas or suggestions on what can be done additionally to help validate what many of you are developing, you know, separately from the Federal Government?

Mr. WYNNE. I would say that many of the technologies that we are going to need to move on to advanced—beyond remote identification, which we have already discussed, and things of that nature, you know, the ability to sense and avoid is really, really critical, not just for small drones, but for larger drones that are going to operate in the flight levels.

These are the kinds of technologies that start to leverage, I think, the expertise that exist at the technical center, because they are going to—we want them—when we talk about true integration, we want the ability to interact with manned aircraft, both in an airport environment, as well as up in the sky. So I think the ability to get to true integration is going to require that kind of expertise. And the FAA, in its rulemaking, is going to need to require on data and research that is actually—you know, it is validating itself. So I think that is an extremely important role for the tech center.

Mr. LOBIONDO. Anyone else?

Yes, Doctor?

Dr. ALONSO. If I may, I think of where drones are going to have to get to in, let's say, 5 to 10 years in order to be pervasive. It is not a set of aircraft, but rather a network system. So the technologies that need to be understood in order to regulate them, to further their capabilities and goals, are really not just in the realm of aerospace engineering, but also information technology, computer science, perception, autonomy, so on and so forth.

So, if you ask the question what would I recommend that the FAA Tech Center is allowed to do in order to be more responsive to this new development environment, I think is the question of

trying to acquire the talent in all of these different fields that were not traditionally part of commercial aviation in order to be able to authoritatively say where we should go in the future.

Mr. LOBIONDO. Yes, Mr. Goodwin?

Mr. GOODWIN. And this is a theme I will probably revisit a number of times, but I do think that the UAS Integration Pilot Program reflects a unique opportunity to leverage some of the expertise at the tech center as part of a broader application to that program to test, in the real world, some of the developments that we are going to need to see happen over a longer term basis.

So I think that we are seeing opportunities for the tech center's abilities to be leveraged that didn't exist before, because there weren't the same opportunities to implement those technologies in real life and test that research in real-world situations.

Mr. LOBIONDO. Mr. Ball, I don't know if you are familiar with work at the tech center. Have any ideas in this area?

Mr. BALL. I am not specifically familiar with the tech center. But in general, in the utility business we are huge believers in piloting first. You know, we are generally a very conservative, risk-averse universe of companies. And so, working with centers like you have mentioned is kind of in our history.

You know, we work strongly, as a group of utilities, with the Electric Power Research Institute on drone research, really kind of playing out use cases. So anything we could do with the center in helping us validate use cases, as—and some of the things these men have mentioned, as well would be very helpful to us.

Mr. LOBIONDO. OK. Rick, you are up.

Mr. LARSEN. Thank you, Mr. Chairman. I will take my 5 minutes for my questions.

So Dr. Alonso, could you just start off by answering this question? What do you think specifically legislatively that we would need to do versus separating that from what FAA needs to do, from a regulatory perspective? What would be our job, on a committee, for—to facilitate further integration?

Dr. ALONSO. So in my written testimony I suggested that the regulatory process needs to proceed in a more regular cycle. So we need to see updates to things like part 107 every 6 months to 1 year, with the expectation that certain new regulations are going to be in place for the developers of drone systems to be able to plan ahead to deploy their systems according to those regulations.

So I would like to see more flights, as has been expressed here; more data, data informing these regulations; and these regulations happening in a more periodic cycle.

Mr. LARSEN. Yes, but that isn't necessarily a legislative action we need to take.

Dr. ALONSO. Well——

Mr. LARSEN. I mean we could direct FAA to do that. We direct agencies to do a lot of things, and they don't meet those timelines. Nothing against—that is just the history around here.

Dr. ALONSO. So I guess what I am implicitly suggesting is that, you know, a little bit more pressure may need to be applied to the FAA in order to try to get these regulations happening more frequently. Otherwise, other countries are going to overtake us. And they have a tremendously difficult job ahead of them.

Mr. LARSEN. Yes.

Dr. ALONSO. They are regulators for safety.

Mr. LARSEN. Right.

Dr. ALONSO. They don't want to be the first ones to actually issue a regulation that causes an accident.

But we must begin—and I don't know if you have the authority to do this—with regulatory updates for the things that pose extremely low safety risks. You know, we have gentlemen here that are talking about beyond-visual-line-of-sight operations in areas where there is no population whatsoever. Those things should be proceeding along almost immediately.

Mr. LARSEN. Yes. And I think on your second—one of your—I think it was your second—about data sharing. Is there anything—are there any obstacles to data sharing, either from testing and research from public to private sector, from private sector to public sector, from the data results?

Dr. ALONSO. Of course. You know, when we are talking about data, we are talking about data of all flights, but also the incidents and accidents that may occur during the operations of these UAS. So we may learn from them and avoid them proactively in the future. So there is a strong sensitivity to the data that may be provided, and something that was a near miss or a near accident, et cetera, et cetera.

But the FAA has tremendous experience with the ASIAS [Aviation Safety Information Analysis and Sharing] system for commercial aviation, where this data can actually be catalogued and databased with proper identification so you provide incentives for the operators to provide this data. And the data that can be made available to various parties, for them to mine it and to understand what situations led to certain risk of safety that then can be proactively managed.

Mr. LARSEN. Mr. Ball, other than inspections and—you know, routine inspections, as well as the inspections done during—in light of the disasters, what other roles are you finding for your UAS teams?

Mr. BALL. Well, we have got a lot of creative folks, and this has really been many unique opportunities, things as—we have hydroelectric dams we are responsible for. Drones make a great way to inspect the dams really efficiently and effectively.

Shoreline surveys around lakes behind those dams that we are responsible for that we have to do, a much more efficient process at some of our solar energy facilities, inspecting the panels. It can easily be done—that has been a great process.

Actually, in some of our coal plants we have to monitor the—you know, the volumetric amount of the coal there. We can do that with a drone, have done that.

Wind turbine inspections, any sort of tower inspection. I mean today, not only do we fly, say, the transmission lines on a regular basis, but on a—not as frequent, but we still have to do it, we have to visually inspect the actual structure itself, and that is done with people walking on the ground. And we can do that, preprogram it with the drone, and it works very, very well.

We have also been able to use drones, actually, inside of big boilers that we would normally have to let cool down, put in scaf-

folding, put people in there to inspect things. You can preprogram a drone to run in there. It is——

Mr. LARSEN. You are getting near my time. As a son of a man who spent his life climbing poles and climbing down poles, I appreciate what a drone in 1968 might have meant to my dad.

Mr. BALL. Absolutely, sir. Absolutely. It is amazing.

Mr. LARSEN. All right, thanks. I would like to do some followup with you all, if I could, Mr. Ball, and—further. Thanks.

Thank you.

Mr. LOBIONDO. Mr. Gibbs?

Mr. GIBBS. Thank you, Mr. Chairman.

Mr. Ball, in your testimony you talk about being able to displace the use of manned aircraft with drones to inspect our infrastructure, reduce the safety risk to our employees. I 150 percent agree with you on that.

And in Mr. Wynne's testimony he talks about under part 107 there has been—FAA has granted more than 1,300 waivers to expand operations.

Now, Mr. Ball, can you inspect transmission lines out of line of sight now, or do you get a waiver? Or what is the status here? I am trying to understand what is happening.

Mr. BALL. Yes. Actually, at our company, we do not yet have a waiver for that. We, along with another—a bigger set of utilities, have made a request and we are just waiting on that. But that is a very exciting opportunity for us.

Mr. GIBBS. Well, it would seem to me—and I have got—had transmission line coming across one of my farms, you know, in the easement, and I don't know how far it goes up above the power lines, but it ought to be a no-brainer to be able to fly a drone, you know, unmanned vehicle, within that—a commonsense, reasonable area of the easement. You know, if the easement is 100 feet, you know, across the surface, and however far up, that you ought to have some, you know—and it shouldn't—you know, and no planes are going to be flying there, anyway. So I don't understand what the issue is here.

Mr. BALL. Well, I don't think there is a technological issue, or even a safety concern. It is just a process opportunity that we need to get ironed out with the FAA.

Mr. GIBBS. So how long has it been that you have applied for the waiver, or the industry has?

Mr. BALL. I think it has been probably about a year now.

Mr. GIBBS. OK. So it is just bureaucratic redtape, is that what you are saying? I mean this should be a no-brainer, shouldn't it?

Mr. BALL. I would hope——

Mr. GIBBS. To be able to inspect transmission lines.

Mr. BALL. Yes.

Mr. GIBBS. Because, you know, it is obvious that I have seen where they have had helicopters and planes fly over my transmission line, and they fly low, and you know, there is always that danger there, because, you know, if you do it with a drone, it is just a lot of common sense, makes a lot of sense.

Mr. Wynne, your membership includes a lot of international companies. What have you really learned from—and, you know, and other—in other countries?

And I think I can tag that on with Mr. Goodwin has done a lot of drone work in multiple countries, you know, with, like, Switzerland and Japan. So I guess between the two, can you kind of maybe enlighten us a little bit what is happening in these other countries, and with the drone regulations, line of sight? I am really keen on this line-of-sight issue. So either one.

Mr. WYNNE. There are places overseas where things are—might be a little bit more—there are things that are allowed that aren't—we don't regulate here, we don't have regulatory authority or permission to do here yet. But I think it is fair to say that part 107, particularly with the waiver opportunity, has given us, you know, the path forward to getting to regulations.

The last exchange I think was really critical to understanding the difference between a waiver environment and a regulatory environment. Once we have identified how to do that operation over miles and miles and miles of utility line safely, we should regulate that, we should codify that and say, under these circumstances, you have the permission to do it. That way, all utility companies now know how to do that, or service providers know how to do that, rather than having to seek a waiver.

Mr. GIBBS. I just—to interrupt you——

Mr. WYNNE. We don't quite have that yet, a——

Mr. GIBBS. Mr. Ball, if we are looking to—out of line of sight, and transmission line inspection, and that easement, what would be the maximum height that you would need above a power line, or—you know, what——

Mr. BALL. You know, the—actually, it would be very close. Certainly, probably no more than 100 or so feet above. I actually think the—what we were seeking before was—well, maybe 200 feet, no more than that, something in that range. So it is—and all within the right-of-way.

Mr. GIBBS. All within the right-of-way. That is——

Mr. BALL. Yes.

Mr. GIBBS. So I guess Mr. Wynne and Mr. Goodwin would agree that that should be, you know, not really an issue.

Mr. GOODWIN. Yes, I think that there is a lot of room to set a threshold that is reasonably low, that allows operators to pursue these kinds of operations.

Just to your previous point about our experience overseas, what we have really seen is that what you just described with a plane flying low over your property or the issue that is specific to an easement, ultimately that is going to invite a lot of challenges that have to be resolved at a local level. You are going to have to have some kind of comfort level with either the landowner or either with the relevant authorities.

And what we have seen is some embracing in a variety of jurisdictions of solving those problems collaboratively, and getting the various levels of government in the same room. And I think that has given other jurisdictions an advantage for AirMap, where it makes more sense to partner.

I do want to call out the pilot program, again, as a mechanism that I think is forcing that collaboration to happen here. So a great opportunity for us to reclaim the lead.

Mr. GIBBS. Thank you.

Thank you, Mr. Chairman.

Mr. LOBIONDO. Ms. Johnson?

Ms. JOHNSON OF TEXAS. Thank you very much. And thanks to all of you for being here.

As I sit here and listen, I realize how much we need to be looking at safety. And considering the State of which I come, we have lots of wide open spaces and very little regulation. But I really do believe that the drones are going to present a real challenge in safety, unless we have some way to determine the number that should be in certain spaces at certain times, and what types that are toys and the real serious delivery systems.

And I realize that safety will be a prime concern. Just recalling the Black Hawk helicopter incident that happened, this is really the tip of what can happen. So I am just trying to determine where do we begin to look at the privacy, the challenges that we see emerging through this integration of the unmanned drones.

What steps are we taking now to address the privacy concerns, as we are handling consumer data, safety, the number? It seems to me that we could be pretty much encumbered with a number of regulations that could be somewhat troubling. But how do we get around it?

Anybody who would like to address it? Yes?

Mr. GOODWIN. Yes, I think your question goes to a point that you have heard echoed on the panel before, which is that a lot of these issues need data. And we haven't had access to a lot of data, because we haven't had the volume of operations, certainly not the volume of compliant operations that I think folks like the Southern Company could perform that would generate data that would help solve some of those hard questions around privacy, around security, which are legitimate.

And so I—you will hear me say this again—I think the pilot program is the prime mechanism that we have domestically today to start generating that data. And what Congress can do is ensure that the FAA does have the support necessary to make that program a success.

What we saw in previous examples where we adopted a waiver process is that a couple folks out of the gate get a waiver, and then the backlog becomes significant. So you have folks like the Southern Company waiting a year in order to get a waiver. So that is where I think, if we adopt a waiver-based approach, we are never going to generate the data that we need to actually come to that kind of granular level of problem-solving that you are describing.

So where Congress can act, I think, is to help support the pilot program and ensure that it has the resources necessary to start a lot of commercial operations in that mechanism.

Ms. JOHNSON OF TEXAS. Yes?

Mr. BALL. Just to follow on with Mr. Goodwin, I think the opportunity in the utility space is to allow us to start in areas that aren't as urban as we were talking about before. And there is a lot of information to be learned there.

So I actually think there is—and Dr. Alonso mentioned these types of things in his testimony—you know, there is a way to step into this, and—but we just need to get stepping.

Ms. JOHNSON OF TEXAS. Yes?

Dr. ALONSO. If I may, you mentioned safety, which is what we are most concerned with, in addition to privacy. But safety is really a product of the risk of something happening and the consequence of that thing that is bad happening.

So I think what Mr. Ball is saying is that there are plenty of opportunities where the consequence is very, very low. You are flying over unpopulated areas. We must get going with these types of test programs, acquiring all the data under those very low safety risk situations in order to be able to say something meaningful about situations where the safety risk is higher, or the privacy issues become significant.

Mr. WYNNE. Ma'am, thank you for your question. We are always somewhere on a continuum of safety, privacy, security in this industry. And the objective is clearly to get to scale. We don't see the value and the benefits that we have described until we are at scale. And we have seen this with other technology. So it is a bit of an iterative process, and data is extremely important. It has been indicated.

The FAA has the safety part, right? They don't have necessarily the privacy part. We have great collaboration with the FAA and other regulators around the world.

The privacy part we worked very, very closely with many civil liberties organizations in an NTIA [National Telecommunications and Information Administration] process the previous President asked us to participate in. We came up with volunteer guidelines on how to protect people's privacy. I am sure everyone in the room would agree privacy is paramount to getting to scale. We can't be violating people's privacy and expect to get to scale.

Similarly, with security, as I mentioned in my oral testimony, we are ready and are engaging with the national security agencies to talk about how to address those issues. And I also sit here representing the counter-UAS community, as well, which stands at the ready to help geofence and do things in an active way to keep airspace safe.

Ms. JOHNSON OF TEXAS. Thank you. My time has expired.

Mr. LOBIONDO. Mr. Davis?

Mr. DAVIS. Thank you, Mr. Chairman.

Mr. Ball, I would like to start with you, if I could. I want to kind of piggyback onto what my colleague, Mr. Gibbs, was talking about in regards to line-of-sight, visual-line-of-sight issues.

In section 2210 of the 2016 FAA bill, to work beyond a visual-line-of-sight flights for activities to inspect, repair, construct, maintain, or protect facilities, including critical infrastructure—to your knowledge, has the FAA made progress to implement this provision, and allow owners of critical infrastructure, like Southern Company, to maintain that infrastructure?

Mr. BALL. It is my understanding that we are still waiting on that guidance from the FAA on how—on basically what are the criteria we need to meet. And that, as I think Mr. Goodwin or Mr. Wynne mentioned before, that is really what we need. We are a very compliant type of company. We deal with compliance all the time. We just need some more clarity around the rules.

Mr. DAVIS. So hopefully we will get that clarity with the second panel, with the FAA coming up.

This is a question for any of the panelists who would like to answer. I introduced an amendment to the FAA bill to create somewhat of a micro-drone category, and I think it is—today's technology, we shouldn't have to have anyone climb a power pole again to inspect, and we shouldn't have to have any claims adjuster climb up on top of a roof anymore with today's technology that is in front of us.

My micro-drone category would have created—would have been created for drones that are 4.4 pounds or less, that travel no more than 40 knots, and can be used with individual line of sight. Now, would this classification promote innovation and actually help the safety of companies like yours, Mr. Ball, or those that make up your association, Mr. Wynne?

You know, would this new class be something that we could then get the FAA to then focus on those structures and critical infrastructure issues and waivers that we have already talked about?

[No response.]

Mr. DAVIS. Who wants to go?

Mr. WYNNE. It might. It is—you know, with miniaturization, there are going to be more and more drones that are smaller and smaller. And on the one hand they represent less of a threat, less of a security or a safety issue, I will say. You know, there are other things that are going on that sort of—I think when we started an ARC on flight over people, it was originally called a micro-UAS ARC with that thought.

Where this has gone—and companies like CNN are designing very, very small drones that can bring you the news, but if they come down on somebody's head, they are going to literally—they will not do any damage, they are literally—they break off, and you know, there is frangibility, and so forth, and they are very, very light drones—but I think, you know, the airspace, it is a, I think, fair debate to say that the airspace needs to be governed by regulation.

There might be a threshold below which the harm is so minimal that it is not worth regulating. But I—again, I reference our discussion at the registration ARC. There were a lot of aviation organizations represented in that room that almost no size is viewed as nonthreatening, right? So I think it is a very—it is an ongoing debate, as to whether or not the weight of something or the size of something reduces its threat and, therefore, makes it a candidate for—to not be regulated.

Mr. DAVIS. We are well aware of some of the initial opposition. However, I think, as we have clearly heard through your testimony and previous hearings here, that the FAA is just not doing its job to process waivers to actually allow for drone technology to be implemented in our airspace.

And frankly, size of drone technology, I think, does matter when it comes into question, especially when it is—we are talking about hopefully creating a tool that is a—used in a toolbox, versus a—something that requires an FAA waiver.

Would anybody else like to address the micro-drone issue?

Mr. BALL. Well, I actually would have to agree with Mr. Wynne. I don't know that I know a perfect answer to it. But again, whatever the size of the drone, for us it is just a matter of knowing

what the rules are, and having confidence in the rules. And then we will live within the rules.

You know, for me, you are right, a small drone is a tool. And it can be a very handy tool. And what we have found with our employees is once you give them a new tool, give them the ability to use it within some set of parameters, their creativity is unbelievable. And so we would enjoy having the ability to use, really, drones of all sizes. I understand the smaller ones could be of benefit locally. We are actually very excited, also, on the other end. I do that—I understand that has bigger implications, you know, for bigger payloads, using them for construction, and other things.

Mr. DAVIS. Well, as—my fear is that if we don't begin to separate out micro-drone technology, we are going to continue to be faced with the same problems within the regulatory environment that all of you mentioned in your testimony. And that, to me, would be a travesty.

So thank you, I yield back.

Mr. LOBIONDO. Mr. Lipinski.

Mr. LIPINSKI. Thank you, Mr. Chairman.

Mr. Wynne, you had briefly discussed remote ID in response to a question by Ranking Member DeFazio. I would like to go a little further into that.

First, if there is any update on the progress of rulemaking that you might be able to give us. But I would really like you to tell us why remote ID is so important.

Mr. WYNNE. The update, I think, would probably be from Mr. Elwell, but I am given to understand that the report from the remote ID ARC is imminent. So we will have that, and then hopefully followed quickly thereafter by an NPRM [notice of proposed rulemaking], and then we start that process.

I think it is extremely important, as is registration, to sort of build this process of visibility that we need in the airspace. And that—you know, that—there is a whole variety of ways that that can be done, ground-based, as well as platform-based, or some combination of those two things.

But suffice it to say that we, as an organization, are against anonymous flying. Today, if someone gets in an aircraft and takes off, generally speaking it is visible to everyone in the system, and it is visible because they are in a system of systems.

So similar to if you are waiting on someone to arrive, and you look up their flight number on FlightAware, I can now see on my iPad an aircraft that has been called for me by air traffic control. I can see its tail number, et cetera, et cetera, thanks to ADS–B.

This is just what we do in aviation. Aircraft need to be—they need to be visible to one another, so that we can avoid conflicts. It is going to be even more important when, for unmanned aircraft, when we have got UTM and those unmanned aircraft need to give way to manned aircraft—say an EMS [emergency medical services] helicopter that is coming through an urban area, et cetera, et cetera. They need to be detecting one another, they need to be identifiable to one another, and they need to be responsive to one another.

Mr. LIPINSKI. And as we have more operations of UAVs, how do we, you know, pay for the burden on the system?

Mr. WYNNE. I would defer to Mr. Goodwin, because I think he has—we have the beginnings of that, which I tagged up on in LAANC. His company, as well as Skyward, are the two organizations from the private side that are essentially bringing the tools to the operations community that tie into that system of systems that the FAA is providing, including basically automatic airspace authorizations, et cetera. Those are the building blocks for UTM.

It remains to be seen how that burden gets shared, but I can promise you it will be a shared burden between industry bringing its tools to the table, as well as the FAA providing its back-end systems.

Mr. LIPINSKI. So, Mr. Goodwin?

Mr. GOODWIN. Yes. Thank you, Mr. Wynne.

As Mr. Wynne noted, we do have experience with this in the public-private partnership model that the FAA established with LAANC and used there, both with our work, also domestically with cities and States, and then overseas with ANSBs [Air Navigation Services Boards] and other entities that we are working with. We have seen, really, a variety of models here.

So I think the—I am less concerned about the fact of how any burdens on the system are going to be paid for, and more that when we start to realize meaningful economic activity, you know, service providers or companies like the Southern Company, they are going to be able to rationalize any costs they have to bear, so long as they are adding meaningful value. And that is always going to be the burden on industry, to generate sufficient value that those costs are worth bearing.

Mr. LIPINSKI. Mr. Alonso——

Dr. ALONSO. And, if I may, I don't know if you are aware, but the FAA Drone Advisory Committee has set up three groups to investigate different things. The technical working group three is looking at the issue of how this whole process is going to be funded, and their recommendations are due to the spring 2018 meeting of the Drone Advisory Committee.

So studies are looking at various different options, and trying to figure out what is a fair way of distributing that burden.

Mr. LIPINSKI. Thank you. And I don't have much time left, and this is a more complicated question, but let me throw it out there.

Sense-and-avoid technology, where are we at right now? Who wants to take a stab at that one? All right. Mr. Goodwin seems to want to——

Mr. GOODWIN. Well, just to offer a small comment, I think that sense-and-avoid technology has to be complemented for commercial operations at scale with a UTM system. Generally, the more miniaturized drones get, the more challenging it is going to be to have an onboard sense-and-avoid that gives you the complete 360-degree awareness.

However, with a persistent, you know, wireless connection that is sufficiently high bandwidth, you can have a much higher visibility into the airspace around you. So I think we are going to see a blend of those technologies and with—connect to drones of the future.

Mr. LIPINSKI. Thank you. Nice, quick answer.

I yield back.

Mr. LOBIONDO. Mr. Lewis?

Mr. LEWIS. Thank you, Mr. Chairman, and thanks for this committee, and thanks to all the guests here. It is wonderful to see you all.

Mr. Wynne, you had said earlier that you thought that the State and local units of government should play a role in developing a Federal framework. I want to focus on that a little bit because, as you know, I have been trying to address the issue of federalism versus preemption, and trying to find a sweet spot there.

We have had a great experiment in this country, the concept of dual sovereignty, the idea that instances that affect two citizens of the same State would be governed by the State's police power, and if you have a Federal nexus or interstate commerce, the Federal Government would handle that. And it has worked quite well. It has worked quite well because we don't like the consolidation of power in this country. We like the idea of these great experiments and the several States arriving at good solutions.

So, as it pertains to this emerging and wonderful new technology, I do want to ask you if you think that the Tribal, State, local governments should have no ability whatsoever to directly create, say, a time, manner, place, or some sort of restriction on low-level, small UAS, as long as it doesn't interfere with interstate commerce. They should still have no say at all?

Mr. WYNNE. No——

Mr. LEWIS. Legally?

Mr. WYNNE. No, I did not say that. And I would not say that. Is the mic on? OK.

I think the question that that is begging, sir, is how. How would they have the ability to do that?

Mr. LOBIONDO. Excuse me, are you sure your mic is on?

Mr. WYNNE. The mic?

Mr. LOBIONDO. Are you sure your mic is on?

Mr. WYNNE. Yes, it is lit, so——

Mr. LOBIONDO. Pull it a little closer.

Mr. WYNNE. There we go, there we go. All right, I am going to start over again, sir.

Mr. LEWIS. You bet.

Mr. WYNNE. I did not say that. I—what—the question that is being begged here—and I am going to defer on the question of, you know, the way you contextualized it, which I think is very relevant, but I think it is probably a longer answer than you wish for—is that, at the end of the day, there is a workability question here, which I think the pilot project which we have been strongly supporting has the opportunity to help us solve.

And I hasten to say that I think that, in many instances, with a lot of the questions that we are discussing, we will be in a different place 6 months from now, and on different complexes of issues than we are today.

In this one in particular I have had numerous conversations with people who are responsible for public safety or municipal authorities. And the question that always comes up is how would I do that. How would I manage my airspace——

Mr. LEWIS. Well, OK, let me just interject, because in your statement you said that you thought State and local and Tribal govern-

ments should play a role in developing a Federal framework, a Federal framework, as though they would have no framework themselves.

And my question is simply if somebody is buzzing past a school, or hovering in my backyard, looking in, you know, the window upstairs, I am going to call the FAA? No. I am going to call the zoning board, I am going to call the police department, I am going to call a local authority. And that is where the police power comes into effect, isn't it?

Mr. WYNNE. Yes, it is.

Mr. LEWIS. Mr. Goodwin, you want to comment on that?

Mr. GOODWIN. Yes, happy to comment. I think we have seen, both here in the U.S. and then overseas, that safe commercial drone operations only happen at high volumes if you get every level of government involved to solve some of these really complicated questions.

I take the analogy of comparing, you know, the relative space of planes and automobiles. So in the automotive space, States and localities create time, manner, and place restrictions on cars. You have a highway speed limit that the State may set. You may make a street walkable, like where we work in Santa Monica, so no cars are allowed at all, and maybe trash trucks aren't allowed to come in the middle of the night. Those are reasonable restrictions that don't necessarily impede effective commercial activity, and they are implemented at the State and locality level.

And all those are, of course, available in real time through apps like Waze, which can tell me when I am speeding at times.

And so, comparing the volume of activity that that engenders, the FAA Air Traffic Organization provides service to more than 42,000 flights a day, which is a significant economic benefit to the country. But the Department of Transportation estimates that there are 1.1 billion car trips per day. So, comparing the relative scale, I think that we can say that that doesn't sound like a burdensome regulatory framework, it sounds like highly valuable economic activity.

Mr. LEWIS. And I would only add—and thank you, everyone on the panel, for your testimony today—this is a wonderful, brave new world. We have got to embrace this technology and this—and I want the best for the industry.

My concern, in all sincerity, is if we don't find a satisfactory statutory scheme here, something worse will come down the road in a court decision, or something worse for the industry. So I hope we can all work together and find this sweet spot I have been trying to work on, so we can embrace this new technology and still pride ourselves and still embrace that wonderful idea of local control.

I yield back.

Mr. LOBIONDO. Ms. Norton?

Ms. NORTON. Thank you, Mr. Chairman. And I certainly appreciate this very important hearing. It comes at a time when a lot of us are thinking about drones in connection with their commercial uses.

Now, I represent a unique district, to be sure. The Nation's Capital, the District of Columbia. It has been declared a—there is a word that is used, "no drone zone," so that if you live in the Na-

tion's Capital—almost 700,000 people do—I am interested, as the Nation prepares for commercial uses of drone, to have things delivered by drone—by the way, this includes parts of—near-in parts of Maryland and Virginia—whether you think this 15-mile ring—it is a 15-mile ring—where drones cannot fly, if that is what they do, without FAA authorization, I ask you whether you think that is—obviously, I have to think about safety first, and that is what I am thinking.

Now I am trying to think about the commercial uses of drones to deliver packages at Christmas, for example, whether you think this—something can be done to make sure that drones fly within this 15-mile zone, the Nation's Capital, safely for commercial purposes. I don't know if Mr. Alonso, Mr. Wynne, or any of you have any ideas on that, but I would be grateful to have them.

Dr. ALONSO. Well, I would say that a blanket prohibition of any type of drone, any size, any speed, any capabilities, without any particular specification of what requirements——

Ms. NORTON. It says without—and I am not going to be here when the FAA testifies—without specific FAA authorization. Do you believe what is envisioned is unique, a unique system for flying within this 15-mile radius?

And by the way, this could apply to everybody else's residential area, too, if that was considered to be a zone where there may be some kind of secure facility, as well.

Dr. ALONSO. But obviously, the current regulation in this area is one that is coming from issues of security. So I think we are being absolutely safe and secure. But I think there are many opportunities to enable commercial drone use, even within the Washington, DC, area with more logical regulations as to what is permitted and what is not.

Ms. NORTON. Yes, please.

Mr. GOODWIN. Yes, I think part of the challenge there is to actually find the right way to say yes to drones. And it is not just a commercial operation, it is to drones operated by first responders or helping provide situational awareness to police. There is a lot of different uses of drones that could be constructive. They don't have to be purely commercial and save lives, as we have seen.

In that context, how do you say yes to drones that you know are going to be compliant? And that is, I think, where the digital infrastructure of UTM is going to be so important. So I think there may be an opportunity to explore even places as sensitive as Washington, DC, through the pilot program by virtue of surfacing all the hard questions about how do you mitigate the security concerns, how do you have a combination of counter-UAS and compliant drones operating, so that you can discriminate between people who are flying with permission and flying—those who aren't. That is where I see the opportunity to actually stress test whether we could operate safely in, obviously, the most sensitive airspace in the U.S.

Ms. NORTON. I appreciate the notion of a pilot program. The right way to say yes may be encompassed in these words without specific FAA authorization. It does seem to me we ought to be able to get there that way.

Is—could—coordination being done with the Department of Defense is their concern in this age of terrorism, that drones not only here, but elsewhere could be used, or is this going on just with the FAA, which has the major responsibility? Does any of you know—have an answer to that question?

Mr. WYNNE. My organization works very closely with——

Ms. NORTON. Would you speak up, please?

Mr. WYNNE. Sure. My organization works very closely with the Department of Defense, particularly JIDO [Joint Improvised-Threat Defeat Organization], on how to handle the use of drones, particularly outside of the continental United States. There are things inside of the continental United States that make that a more challenging policy discussion. FAA, FCC regulations, rules that prevent the disablement of an aircraft, which I am in favor of, and so forth.

So there are some subtleties here that are being looked at on how to implement counter-drone technology in security-type—in a security-type context. Overseas it is a little bit easier, when our troops are directly threatened, or our allies are directly threatened. But we are, as an industry, working with them to develop those technology security solutions.

Ms. NORTON. Mr. Chairman, I would be interested, as well, in any involvement of the Department of Defense with this very important issue. Thank you very much, and I yield back.

Mr. LOBIONDO. Mr. Woodall?

Mr. WOODALL. Thank you, Mr. Chairman.

Mr. Ball, I wanted to start with you. I send you a check once a month, and I am grateful to you for keeping the lights on. Thank you for that.

I want to pick up where Mr. Davis left off. He asked you about a legislative change that we worked on together here. You have been waiting about that same period of time on your waiver request. Tell me what the impact is, in terms of operations, if we get guidance for the legislation first, or if you get approval on your waiver first.

Mr. BALL. Interesting. Well, number one, thank you for paying your power bill. We love all our customers.

Mr. WOODALL. To be fair, I get threatening notes when I don't.

Mr. BALL. OK, good, yes.

Mr. WOODALL. It is a relationship.

Mr. BALL. I am—you may—your question—I don't know that I have fully grasped it, but, you know, as soon as we—I mean right now, if we could get a waiver, that would be great. Just—but I would agree with some of the things that were kind of said earlier. If we can move to an environment, where instead of seeking waivers we have a clear set of rules that we can work under to allow us to do beyond-visual-line-of-sight operation, that is a much better environment than having to ask for waiver by waiver by waiver.

Mr. WOODALL. And so my expectation is, when the guidance comes out for the section that Mr. Davis references, we will no longer be talking about waivers for any critical infrastructure provider in the country.

Mr. BALL. That would be our hope. It's just give us the rules, and we will work within them.

Mr. WOODALL. We talked about revisiting rules every 6 months. I think that was you, Dr. Alonso, who said we need to be in the—in a rapid regulatory framework. Talk to me a little bit about that. Is that because technology is moving on a 30-day cycle, and so regulating on a 180-day cycle makes sense?

I worry about changing the rules every 180 days for folks who are trying to find some certainty in this space. I know you are supportive of performance-based standards, as opposed to prescriptive standards. But talk to me about the industry dangers of a frequent regulatory process, instead of a certain regulatory process.

Dr. ALONSO. In an industry where safety is paramount, you have to be extremely careful. And the wheels of Government move slowly when it comes to regulation for a reasonable reason, I would say.

But when I was talking about updates to the rules, I wasn't meaning changes to rules that permit the same thing with different requirements over time, but rather updates to the rule that enable certain services and keep those rules for a significant period of time until there is additional knowledge that informs us to change them.

So what I would like to see is more rules in the next 6 months to allow beyond visual line of sight when you are flying over unpopulated areas, right? Or rules for flights over people when you have drones that are relatively small and you are staying within visual line of sight, and those types of things, so that the periodic updates we were referring to, additional level of service with additional—of requirements, not to changing the requirements over time.

Mr. WOODALL. When we talk about the safety, those of you who are so intimately involved seem to talk about safety from the—from a drone level up. When you listen to folks here who may not have as much UAS experience, we talk about safety from the drone level down. I am less worried about it getting sucked into an engine; I am more worried about it falling on my head.

Where is the regulatory holdup there, as we struggle to balance safety and technological advancement? If I ask the same question to the FAA, are they going to tell me that what slows the process down is the inability to deal with safety going up, or a worry about safety going down?

Dr. ALONSO. I think the answer depends on the category of drone that you are talking about. Certainly for the larger ones, going up is a significant and maybe a more substantial risk. But for the smaller ones going down is a very important thing that we need to worry about, not to impact the public.

I—my take on this is that what is slowing things down is that we don't have enough data to know exactly where to set the thresholds for the requirements for either the ones going up or the ones going down. We are learning about it, but we need to accelerate that learning.

Mr. WOODALL. And so, when many of you have talked about folks like Mr. Ball and the work that Southern Company could do to generate that data—Mr. Goodwin mentioned that specifically—my assumption, when we talk about generating data is we are going to generate some failures in that space, that from an industry perspective the position is let's give Southern Company the tools to do

this, let's anticipate failures, and we are going to learn from those failures, and we are just going to be comforted by knowing that failure is going to occur in unpopulated, rural Georgia, as opposed to over New York City. Is that the answer that we have seen overseas, as well, Mr. Goodwin?

Mr. GOODWIN. I think it is. And I think also, just to reiterate the point I made earlier, the closer you get to the ground, and more specific the concerns of the people on the ground, the more you need to ensure that there is a voice for all the relevant folks, both at the State and local level, and then of course, obviously, the individual citizens.

So I think the pilot program is the first opportunity to generate that data, where all those voices are going to be heard, and I—hopefully it will generate a lot of that information that we haven't seen today.

Mr. WOODALL. I appreciate the nice words you all had to say about our chairman. My experience is sometimes folks get their very best work done, Mr. Chairman, after they have announced their retirement.

[Laughter.]

Mr. WOODALL. These next 14 months may be the most productive 14 months we have seen. I think our folks are in good hands here today.

Mr. LOBIONDO. I will reserve comment.

[Laughter.]

Mr. LOBIONDO. Ms. Brownley?

Ms. BROWNLEY. Thank you, Mr. Chairman. Mr. Alonso, I wanted to ask you a question. You have talked a lot today about accelerating learning, more data, more testing. I think in your testimony you said all of this must be significantly enhanced.

So I am just trying to get an idea from you what that means, exactly, in terms of where we are today, and what is "significant enhancement," in your mind?

Dr. ALONSO. Let me take a little detour. If you accept that drones today have 1 accident in every 1,000 flights, that means you must observe 1,000 flights before you see a single accident. Obviously, you don't want to see just one accident, you want to see tons of accidents, where there is no consequence. That means, instead of 1,000 flights, you have to look at tens or hundreds of thousands of flights and data points. This is the point I was trying to make in my testimony.

So, when I say significantly enhance—to your question—I mean that we cannot have pilot programs that have four participants, right, doing two or three flights a month or something. We have to have hundreds of participants doing hundreds of flights a month, and accumulate that data over a significant period of time.

Ms. BROWNLEY. And is that where we are today?

Dr. ALONSO. I think we are in a very, very small scale in these——

Ms. BROWNLEY. Very small scale.

Dr. ALONSO. There are excellent flight test programs, and I give kudos to both Congress and to the FAA for starting them, but I think we need to "significantly enhance" them.

Ms. BROWNLEY. And then, to compare what we are doing today to where others and Japan or Switzerland, other international communities, where you have expressed concern that we may be falling behind in terms of R&D?

Dr. ALONSO. So I think they are starting, but they are not significantly ahead of us. There are some simpler regulatory environments.

But I would like to make the analogy more to driverless cars. You know, when you look at the amount of testing that is actually being done to figure out when and how these cars should be allowed to go on the roads, we are talking of about millions of hours of driving, accumulated by a number of different companies. I think we need to go in autonomous drones in a very similar direction.

Ms. BROWNLEY. Thank you. And this is a question more for anybody, really, on the panel. And I am a little new in my learning around this issue. So—but there have been—you have previously talked about issues and our concerns around privacy, security, et cetera. And I think Mr. Ball or Dr. Alonso—I am not sure—responded by saying, well, we could start to learn more by simply flying in unpopulated areas.

So I am having a hard time understanding what we learn flying drones in an unpopulated area, just—it seems like, well, there is no safety issue, necessarily. I mean you are out in the open space. So if you could, enlighten me.

Mr. BALL. Well, I think what was being discussed was part of the learning is—to Dr. Alonso's point—is when you do have an accident, or when there is a failure of a piece of equipment, how does the equipment react to it? What do you see?

And if you have a failure like Mr. Woodall just said, in the middle of a field in Georgia, that is unfortunate. We don't like that. But we can learn from it, and then that can be a—you can take those learnings and then say, OK, if that had happened in the Washington, DC, area, you know, what would the impact have been?

So it is just something as simple as that, I believe.

Ms. BROWNLEY. Well, it seems to me that there are so many different types of UAS. I mean there are—there are lots of manufacturers. I guess you could group them into certain categories. But it seems like that is an inordinate amount of data points that I am not sure you can, you know, draw a line between them.

Dr. ALONSO. Well, take for comparison the commercial aviation system. It has got similar diversity. And the failures can be equipment, although they are very, very rare. But it can be operations. And normally it is a combination of effects that lead to a particular failure.

We have over 1 million drones, right, in the U.S. right now. We could expand the way in which we collect data as to when these things fail, or where they almost fail, in a much more large-scale way. I think this is the main point.

And yes, there will be a lot of data, but it is the best hope we have to actually impose logical regulations.

Ms. BROWNLEY. So is there another example of what we would learn flying in unpopulated areas, Mr. Goodwin?

Mr. GOODWIN. Yes, I will offer very briefly an example that touches upon what Mr. Woodall said. The number of stakeholders that you have to be concerned about when it comes to privacy and security are significantly fewer in relatively low-density areas, so it is easier to get them into a room, it is easier to talk to a handful of folks and find a technology means of addressing their solution than it would be, say, in an urban environment.

So I think that the—just from a simple crawl, walk, run kind of approach, a lot of those learnings are going to be applicable because, candidly, a lot of folks that we have encountered in some of the more rural environments do have a strong sense of private property and concerns about privacy, and they would be more than happy to participate in the benefits of technology, so long as their concerns are addressed.

So it is the right population to really try to get those learnings on, simply because of the scale, and the scale relative to the scale of the commercial opportunity, which is significant.

Ms. BROWNLEY. Thank you.

And thank you, Mr. Chairman. I yield back.

Mr. LOBIONDO. Mr. Duncan?

Mr. DUNCAN. Well, thank you very much, Mr. Chairman. Dr. Alonso, you serve on the key FAA advisory council on drones, and I have got an article that is a few months old that said that we had almost 800,000 U.S. drones registered in the first 15 months, and that that was going to go on up to an estimated—an estimate by the FAA that there would be 3½ million by 2021. I don't know if those estimates are still accurate, because that is a few months old.

But if we have 3½ million drones in 3 or 4 years, is there any realistic way that we can keep up with all of that, or that we could—it seems to me you would end up with millions, because this same article says we have got 320,000 manned aircraft registered after 100 years of registration. So what do you think about that?

I mean it seems to me we will end up with millions of unregistered drones.

Dr. ALONSO. Well, I think because the barrier to registration has been lowered so significantly, I think, you know, maybe we should require that these drones are registered at the point of purchase.

But I think this tremendous growth that you are talking about is really happening in the very small range of the UAS. So I think there has been some discussion already today as to various means that could actually get under control, that very large growth and the very small range of UAS that are now going to be flying beyond visual line of sight and above people, and that are mostly operated by you, myself, and maybe our kids doing relatively simple things.

Mr. DUNCAN. Well, just yesterday Bloomberg News reported and it says "the millions of small civilian drones plying the Nation's skies can cause significant damage to airliners and business jets in a midair collision, new research commissioned by the U.S. Federal Aviation Administration concluded. While most drones weigh only a few pounds, they include motors and other metal equipment that could cause significant damage to aircraft engines, windshields, or wings," and so forth. What—do you have concern about that?

Dr. ALONSO. Absolutely. But we talked about technologies like geofencing and others that may significantly reduce that risk if imposed on these small drones that you are discussing at the moment.

Mr. DUNCAN. Right.

Dr. ALONSO. So you want to make sure that none of these millions of drones that are going to be in the very small scale are going to be in the path of an airliner. And I think we have the technology to do that, so——

Mr. DUNCAN. Mr. Goodwin, you mentioned a key word to most people on this issue just a moment ago, and that is privacy. And I understood at another hearing that we had a few months ago on drones that they can make drones as small as an insect now, or as—you know, I don't know what that—how far that goes.

But do you—are you satisfied? Do you feel comfortable that we are doing enough to alleviate all the privacy concerns that are out there? I know in Los Angeles, when the Los Angeles Police Department was starting to increase its use of drones, there was quite an outcry from private citizens. What do you think about that?

Mr. GOODWIN. I think particularly with the increase in miniaturization, we are going to only see this grow as an issue. That being said, I do think there is room for a lot of privacy issues—and we should perhaps not lump them all together—to be solved by existing laws that are on the books that might apply to other technologies, as well.

So a lot of what we have seen in terms of, you can say, Google Glass or other technologies that allow you to record someone without necessarily them being apparent may apply some of the lessons learned from those technologies, may apply in the context of drones.

Just separately, I would call attention to the privacy concerns from Government operators, which I think we have a very healthy mechanism in this country for elevating those kind of concerns when it comes to Government action, and leading to best practices around those operations.

And I think that practice of finding the best practices for a Government operator, the way that they store the data, the way that it has to be accessible, there is a lot that can be learned from the high-skill commercial industry to solve some of those privacy concerns on the commercial side. That doesn't necessarily address some of the other types of concerns that go perhaps down to the recreational level, but I do think there is room to not let the perfect be the enemy of the good there.

Mr. DUNCAN. All right. Well, thank you. Thank you very much, Mr. Chairman. I see my time is about up. Thank you.

Mr. LOBIONDO. Mr. Johnson?

Mr. JOHNSON OF GEORGIA. Thank you, Mr. Chairman, and thank you, witnesses, for your testimony today.

Sometimes it is hard to see the forest from the trees. And I will just leave that like that. I will ask you if anyone on the panel has an opinion about the pervasive antiregulatory environment that has been perpetuated over the years, and whether or not it has had an impact on the FAA's ability to promulgate rules in this UAS environment. Does anyone have an opinion about that?

Mr. WYNNE. My opinion, sir, is it has not. We have——

Mr. JOHNSON OF GEORGIA. There is no antiregulatory environment that we exist under at this time? Are you——

Mr. WYNNE. We work very——

Mr. JOHNSON OF GEORGIA. Would you agree with me on that?

Mr. WYNNE. We work very closely with the regulators. If we don't have regulations under which we can fly, or permission to fly, we don't fly. This industry doesn't scale, society doesn't benefit from the technology.

Mr. JOHNSON OF GEORGIA. I understand. My question goes to the regulatory environment that exists at this time. And I guess you would disagree that we have an antiregulatory environment, but I am sure that others agree with me that we do have an antiregulatory environment, generally. And my question is how does that, if it does, impact the promulgation of rules in this space.

But let me—and you take your comments—you are well noted on that. What about the incessant budget cutting, including the FAA's budget, over the years? Has it—has that fact impacted the FAA's ability to promulgate rules in this UAS space? Anyone have an opinion on that?

[No response.]

Mr. JOHNSON OF GEORGIA. And I guess no one does.

Mr. WYNNE. Actually, sir, I will take the opportunity to thank the subcommittee, because we have seen, actually, additional resources provided to the FAA in order to move forward with this regulatory environment.

Mr. JOHNSON OF GEORGIA. After the budget——

Mr. WYNNE. And I thank the subcommittee for that.

Mr. JOHNSON OF GEORGIA. After the budget has been cut, you have seen resources added?

Mr. WYNNE. Yes, sir, and Mr. Elwell——

Mr. JOHNSON OF GEORGIA. To try to equalize——

Mr. WYNNE [continuing]. Or Earl Lawrence could speak to that. I would also be happy to provide information for the record.

Mr. JOHNSON OF GEORGIA. OK. Well, I would love to see it, and I am sure the American people who are thoughtful might want to see whether or not the resources we are providing to our agencies, including the FAA, during these times of austerity have any impact on its ability to keep up with progress. I don't see any way that it cannot have an impact. That is my personal opinion. But I will ask Mr. Ball.

Sir, you mentioned in your testimony that during a recent hurricane you were able to dispatch drones to Texas and help their utility with coming up with assessments as to damage. And you could have done more, if the regulations had allowed you to do so. What regulations, other than the—being able to see the drone in operation, what other regulations impacted your ability to not use drones as much as you would have wanted to down there?

Mr. BALL. Yes, I think it was just as—well, one thing, it was as simple as—this was one of the first times that drones were used in a mutual assistance since. So there is some learning there. That is when I said when we—in the following month, when we did the same thing in Georgia, we had learned from Texas.

But some of it was just waiting on waivers, waiting on permissions, and so——

Mr. JOHNSON OF GEORGIA. And these kinds of commonsense, practical realities are impacted by our budgeting decisions here in Washington, DC. I just wanted to make that point.

And does anyone have any idea whether or not the proposed tax cuts that are working their way through Congress will have any impact on the ability of the Federal agencies to operate efficiently and effectively in this area?

[No response.]

Mr. JOHNSON OF GEORGIA. I see no one is responding. I think that these are—when I said sometimes it is hard to see the forest from the trees, that is exactly what I was referring to. And with that, I will yield back.

Mr. LOBIONDO. Mr. Sanford?

Mr. SANFORD. Thank you, Chairman. Let me find my notes here.

Back in October of 2015, this subcommittee held a similar hearing on the same subject. And at that time I in essence asked this subcommittee how do we maximize safety, while minimizing Government involvement? And it was interesting that FAA Deputy Administrator Michael Whitaker at that time responded that he believed the best way to go down that path would be an industry-based standard, so we don't have to go down the regulatory path. And obviously, that is not, in large measure, the direction we are going.

But I will go back to the same question I asked back in 2015 of that committee, which is—yes, I think in part to what my colleague from Georgia, Mr. Woodall, was getting at, which is, in essence, you can't have riskless innovation. You can't have innovation without risk.

And so, the question I think we have to struggle with as policy folks is to say how do we have more in the way of innovation, given what we have seen happen in the wake of hurricanes and other natural disasters, the utility that might come in the wake of the way retailers operate, there are just a lot of big possibilities out there.

And so I guess one of the questions—it would seem to me that in answering that question—I was just talking again to Mr. Woodall, and there is a clear bifurcation in that when you talk about jet engines, you are clearly talking about Federal standard and the importance of operations around airports, interstate travel. But when you operate dealing with peeping Toms, local safety issues, rural power lines, fundamentally you are really operating at what has historically been handled at a local or State government level.

Is there a system by which—that you all could imagine operating in—particularly I would ask you, Mr. Ball—wherein you would have a bifurcation responsibility? If you are close to Hartsfield-Jackson Atlanta International Airport, you are going to be dealing with the FAA and all the appropriate Federal regulatory agencies. But if you are operating in rural Georgia at a low altitude, it really doesn't involve a big safety issue. Is there a way to cover that at a local level?

Give me your thoughts on that again, because I think what we need to end up at, as a place, is a spot where we maximize innovation in this unfolding field, while at the same time managing risk. And might that not be better done if you bifurcated responsibilities between Federal and State or local duties?

Mr. BALL. I do—I think, as Mr. Goodwin mentioned before, I agree with him, I do think there is an opportunity there to possibly do that. For a company like ours, whatever the structure is, we just need to know the rules. And so, in a multilayered regulatory environment—and we deal with that today in other areas—as long as we understand the rules, and the rules aren't so conflictive that it kind of leaves us wondering what we should do—that would be helpful.

And it has been mentioned before, this pilot effort that is—that people actually, I think, just now are making applications to, could be very helpful here. And I think Dr. Alonso mentioned, you know, the more of these pilots, where we are involving municipal and county and State-level folks in with the national rule, so we can learn how these things could coexist, I think that is going to be very helpful. Because I will be—I am not imaginative enough to imagine all of the unintended consequences we might get, but I think we can work through them.

Mr. SANFORD. Then I ask you, Mr. Goodwin, in other words, historically it has not been the purview of the FAA to worry about peeping Toms underneath a home in Hollywood, California. Are we trying to jam too much, in terms of jurisdiction, in at the Federal level? Or, for that matter, again, covering the rural power line in Georgia? Is there a best practice that you have seen in another country?

I would love to learn more about the mapping that has taken place in Kansas. Are there insights that you would offer from the standpoint of the Federal, State jurisdictional puzzle?

Mr. GOODWIN. Absolutely. Well, I think it is certainly the global trend that most national authorities have looked at this issue and recognized you have to get every level of government in the room in order to enable high-volume commercial operations. And so you see that in Germany, where there is a delegation of authority down to the State level. We see the U.K. just announced a city-based drone innovation program. And you are seeing that in a variety of other——

Mr. SANFORD. Well, and how have they done that in such a way so that, for Mr. Ball's organization, he is not having to contact five different, you know, governmental jurisdictions to go ahead and check the power line, or check the house that was damaged after a hurricane?

Mr. GOODWIN. Absolutely. So I think there is a number of different nascent approaches, and I won't go through them all, given the time constraints here. But I would call attention again to the formation of the pilot program requires people to solve for exactly that problem.

And by not isolating it to just be localities by themselves, but also the coordinating role that States can play, I am encouraged—so long as we have congressional action to help support that pilot program and direct the FAA in that regard—that we are going to

see those best practices emerge because of the volume of activity to solve those problems that we see accrue there.

Mr. SANFORD. I would ask other questions, but I see I am out of time. Thank you, Mr. Chairman.

Mr. LOBIONDO. Yes.

Mrs. Napolitano?

Mrs. NAPOLITANO. Thank you, Mr. Chair. There has been a lot of very interesting talk.

Mr. Goodwin, your company is in southern California, and leading the way in aerospace management of drones. In my district, San Gabriel Valley includes the foothills where we had multiple forest fires, due to the drought, threaten hundreds of homes and evacuated thousands of people. At one point the fire department was forced to stop the aerial firefighting due to the presence of private drones.

What can be done, or what is being done to stop the use of drones? Is it the responsibility of local cities, the—to institute local ordinances? And how would they get the information to the general public?

By the same token, are there any instructions in the sale of the drones to either register them or where they could be flown?

Mr. GOODWIN. Yes, so happy to answer the different parts of the question there.

I think focusing on the information-sharing side, that is where companies like AirMap play a role. There is a growing and thriving USS/UTM ecosystem of companies that are trying to aggregate that kind of data, and then service it for users.

Ideally, in a perfect world, what you have heard is that it is not a discretionary act, but responsible manufacturers set geofences on their drones. Once you have a dynamic, persistent connection, you have a connected drone, then the fact of a wildfire is—I don't want to say it is an insignificant challenge, but it is a challenge that technology can solve for.

We have computer-aided dispatch in our platform that people can automate their drones to not take off or to route around, and that includes things like local fires, not even just wildfires, which may be significantly larger. And I referenced it earlier, that was our partnership with the Department of the Interior, which became public and a number of other companies participated in to service that data.

So I think there is a lot that technology can do there, independent of any particular local action. In terms of what is the best practice, again I think there is an opportunity for—through the pilot program to really test out the right regulatory models, just like we will see companies testing out the right business models. And hopefully, from that, we will see a lot more—the data that gets directly on point.

I think——

Mrs. NAPOLITANO. Does the FAA prohibit cities from instituting their own ordinances?

Mr. GOODWIN. So I will direct that question to the FAA on the next panel. I think they have issued guidance, and that is obviously a balancing line between where the FAA's authority ends and where a city's authority begins.

Mrs. NAPOLITANO. Well, when you have the information, as Dr. Alonso was stating, who generates and who keeps and disseminates the information on the drones? And where is this stored? Who can have access to it?

Dr. ALONSO. You mean the information about ownership and location, or you mean information about flights——

Mrs. NAPOLITANO. All of it, all of it, because it is a new technology that we—although it wasn't really new. Twenty-some-odd years ago I spoke to a woman who was having drones for the movie industry.

Dr. ALONSO. Well, I think, in general, what you need is a credible, honest, and neutral broker of that information, so you know that it is going to be provided accurately, and that it is going to be represented accurately or portrayed accurately, as well, I think.

Mrs. NAPOLITANO. But so far who handles it?

Dr. ALONSO. Well, I imagine it would be the FAA in this particular case, right?

Mrs. NAPOLITANO. But the Government moves very slow.

Dr. ALONSO. Yes, although they——

Mrs. NAPOLITANO. This was pointed out.

Dr. ALONSO. They have been successfully shown that this can be done for commercial aviation. I think, with the aid of new information technologies with companies like AirMap and others, you may streamline the processes that led to the existing databases to make them much larger, and much more available. So——

Mrs. NAPOLITANO. And does the industry talk to academia and to the FAA? Do they work in concert?

Dr. ALONSO. Yes, I think so. I think all these pilot programs are essentially set up, such that these types of communications do take place.

Mrs. NAPOLITANO. Well, in a visit to the Port of Los Angeles recently with Chairman Graves, the port police highlighted the concern they have on authorized users interested in the landmark status of port complex flying drones unsafely through ships, cranes, and other equipment.

And I would like to know if you know what is being done to address unauthorized drones on those landmarks and the airports.

Dr. ALONSO. I don't think I can answer that.

Mrs. NAPOLITANO. Mr. Goodwin?

Mr. GOODWIN. Specifically in reference to the port, who we have chatted with—and I think there is a lot of really fascinating, forward-thinking folks there—I think this is a great opportunity to show a combined picture of the airspace, because on the flip side of the coin is the commercial operations that a number of folks within port facilities want to do to use drones.

But to do that you have to have a combined picture of the airspace. The good actors and the bad actors are just perhaps reckless folks——

Mrs. NAPOLITANO. Or unknowingly.

Mr. GOODWIN. Or unknowingly in that airspace.

Mrs. NAPOLITANO. Because you have an area where you have beaches and people decide to fly them, well, for recreation uses, and they fly by the ports.

Mr. GOODWIN. Absolutely. Absolutely. So it creates a complicated airspace. And that is where I think companies like AirMap and counter-UAS companies can provide a combined picture of the airspace to help start to solve some of those problems.

Mrs. NAPOLITANO. Thank you, Mr. Chair.

Mr. LOBIONDO. Mr. Payne?

Mr. PAYNE. Thank you, Mr. Chairman. And this is to the panel.

The FAA estimates that the hobbyists' UAS fleet will be more than triple the size in the next 4 years. On the commercial side, there will be a tenfold increase. You know, this is becoming a multibillion-dollar industry that will only grow in the future.

You know, I represent an area that was once a thriving industrial district. I would like to ask what does this mean for American manufacturing? I know DJI, the Chinese company, is one of the biggest manufacturers of drones. Does anyone on the panel see where we can move forward in the United States in this effort?

Mr. WYNNE. Yes, sir. That is a great question. We have been forecasting a lot of economic activity, not only in the industry itself, but also value added to companies such as Southern Company, et cetera, for their business models. So I think it is very, very good for the economy. You know, our estimates, which are in my testimony, are as we integrate into the airspace, more and more value accrues.

So there is—we have a shortage of pilots in this country for manned aircraft, and a growing number of unmanned pilots for the commercial sector. Those unmanned pilots increasingly, as we get to automatic airspace authorizations—and automation is a word I have been trying to get out here during this panel, and I haven't gotten to it yet, but automation is really, really key. And more and more of that automation will enable scale. More people will make a living doing this, whether it be adding value to particular industries or, you know, repairing drones and such nature.

Mr. PAYNE. OK.

Sir?

Mr. GOODWIN. So I think one of the themes that you have heard is not just scale, but also the particular applications that we have heard, say, that Southern Company want to pursue. When we have high volumes of particular applications, it is going to create a much more rich ecosystem, a larger pie that other manufacturers can participate in.

And that is where, I think, we are going to see some greater competition and greater opportunity for domestic industries when we see the airspace get unlocked to a whole variety of use cases, where building to a particular use case might give them a competitive advantage.

Mr. PAYNE. And so, also as this grows—as you were saying, Mr. Wynne—there would be opportunity for a larger market of pilots for these in industry, correct?

Mr. WYNNE. Absolutely. And we have been—we stood up our Remote Pilots Council earlier this year. Training is starting to come online. Trainers are starting to transition over to the unmanned space from the manned space, or to expand into that space.

So there is a lot of opportunity here, and I come back to we have a pilot shortage. This is a lower barrier to entry for pilots than, you

know—and a way to get people interested in aviation, whether it be actually flying drones, designing drones, designing the software, designing the middleware that goes into corporate and enterprise systems, all the way to the repair work that is going to be required.

Mr. PAYNE. Thank you, thank you.

Mr. Ball?

Mr. BALL. Well, I would just like to say, too, I think, as the industry expands and grows, it provides a great opportunity, too, for the men and women in the military who have learned how to fly unmanned aircraft there. This becomes a great job opportunity for them. And in the utility industry we have been very focused on really reaching out to veterans and those folks who are coming out of the military. So I think there is a win-win for just a whole lot of sectors here.

Mr. PAYNE. Mr. Alonso?

Dr. ALONSO. Yes, I think buried in your question is how we nurture the development of industries that utilize drones, develop drones, produce drones here in the U.S. And I think putting together—the best thing you can do is put together the infrastructure to enable large-scalability. So many hundreds of thousands of drones flying simultaneously, such that these business cases can actually be built.

Mr. PAYNE. Well, thank you. You answered my second question, so I will yield back.

Mr. LOBIONDO. OK. I would like to thank our panel, thank you for your expertise, thank you for willingness to work with us. We look forward to continuing the dialogue and continuing to try to find ways to move this forward so that we can best optimize the opportunities, so to speak. And this first panel, you are dismissed. Thank you.

[Pause.]

Mr. LOBIONDO. Mr. Elwell, are you ready? Thanks.

We are—we will now move to the second panel with Mr. Daniel Elwell, Deputy Administrator of the FAA.

Mr. Elwell, you are recognized for a statement.

TESTIMONY OF DANIEL K. ELWELL, DEPUTY ADMINISTRATOR, FEDERAL AVIATION ADMINISTRATION, ACCOMPANIED BY EARL LAWRENCE, DIRECTOR, UNMANNED AIRCRAFT SYSTEMS INTEGRATION OFFICE, FEDERAL AVIATION ADMINISTRATION

Mr. ELWELL. Chairman LoBiondo, Ranking Member Larsen, and members of the subcommittee, thank you for the opportunity to share what the FAA is doing to safely integrate unmanned aircraft technology——

Mr. LOBIONDO. Excuse me. Could you pull the mic a little closer, please?

Mr. ELWELL. Absolutely. Thank you for the opportunity to share what the FAA is doing to safely integrate unmanned aircraft technology into our Nation's airspace. And thank you, Chairman LoBiondo, for your years of public service. Your unfailing support of the FAA, and the work performed at the technical center has been critical to the advancement of U.S. aviation, and we owe you a great debt of gratitude.

Accompanying me today is Earl Lawrence, the Executive Director of the FAA's UAS Integration Office. Drones are the fastest growing field in aviation. What was once little more than a novelty is now used for commercial operations, public safety, law enforcement, and emergency response. There are 95,000 commercial drones operating in the United States going places that would otherwise be dangerous for people or other vehicles.

The influx of new casual drone users continues to escalate, even beyond our most aggressive projections. It is estimated that the full integration of drones could reach a national economic benefit of $82 billion and 100,000 jobs within the decade.

Within this context, the need for the United States to safely and fully integrate this technology into America's National Airspace System must be a national priority, which is why we are here.

Led by Secretary Chao, the Department of Transportation has developed an ambitious vision. The FAA, in close coordination with organizations across the U.S. Government, intends to fully integrate unmanned aircraft into the National Airspace System, with drones operating safely and seamlessly with manned aircraft. They will occupy the same airspace and use many of the same air traffic management systems and procedures.

Most countries seek only to accommodate drones, relying largely on operational segregation to maintain systemic safety. The vision of the United States is bigger and better. We seek to integrate, not segregate. We have made significant progress since our last appearance before this committee.

In August 2016 we implemented a rule to govern small drones called part 107. It provides a working foundation for UAS integration, while still providing flexibility to allow the FAA to keep pace with technological advances. Since then, the FAA has issued 70,000 remote pilot certificates, 1,100 operational waivers, and over 10,000 authorizations for controlled airspace operations.

We agree with Congress. The challenges remain. The FAA's 2016 extension pointed to physical security, cybersecurity, privacy, and enforcement. And recognizing these challenges, the President directed us to launch a UAS Integration Pilot Program last month. This program allows us to leverage the experience of our stakeholders, working in partnership with State, local, and Tribal governments.

This program will likely evaluate concepts like night operations, flights over people, flights beyond the pilot's visual line of sight, package delivery, detect and avoid technologies, and data links between pilot and aircraft. It will identify ways to balance local and national interests, improve communications with State, local, and Tribal jurisdictions, and accelerate the approval of operations that now require special authorizations.

Industry and stakeholder engagement remains the backbone for integration. Our UAS industry partners have demonstrated extended and beyond-line-of-sight operations to support upcoming rulemaking. We also chartered a Drone Advisory Committee to help prioritize integration activities. Furthermore, we formed the Unmanned Aircraft Safety Team with industry to identify risks and develop mitigation strategies.

Now, there is still much to do. Congress can support these efforts by ensuring that all UAS operators abide by the same requirements and certification standards that we apply to all aircraft that operate in the airspace. To that end, remote identification and tracking will be a key component to full integration, such as operations beyond visual line of sight and operations over people.

We deeply appreciate the National Defense Authorization Act that Congress passed 2 weeks ago that reinstates the registration rules for all small, unmanned aircraft.

All of us involved in integrating unmanned aircraft into our Nation's airspace are helping write a new chapter in aviation history. I believe we will recognize the full economic promise and technological advances unmanned aircraft represent.

Thank you, and I look forward to your questions.

Mr. LOBIONDO. Thank you for your statement.

So I was wondering if you could share with us your vision or priorities for the top several steps to be taken for integration of UAS into domestic airspace. And for me, very importantly, what additional role can be played at the tech center utilizing their expertise and their ability to go, I think, way beyond what they have been asked to do already?

Mr. ELWELL. Mr. Chairman, I agree that the tech center is going to be vitally important to the efforts that we have going forward. They have already contributed to much of the work that we have done in section 2206 with detection at airports. They have interacted with the COEs [Centers of Excellence], and we have gotten a lot of good work and data and analysis from the tech center.

The key to this endeavor is that collaboration has been the number-one most important thing, because this is an emerging industry. So we need, as you have heard, phenomenal brains and experts on the industry side. We have to coordinate and collaborate with local communities and municipalities.

And, of course, one of the bigger challenges, frankly, is to coordinate our activities and our incremental approach to regulating this emerging industry with our Government partners. And there are quite a few interests across Government in this endeavor.

So the idea is to do it incrementally. The idea is to use a soft touch where we can use a soft touch, but a firmer touch where it is needed. And we are currently in the process of finding out where that line is, and how to make that demarcation.

Mr. LOBIONDO. Thank you. And I would ask you to continue to look at better utilization of the expertise that we have at our fingertips at the tech center, which, as I think you know, I believe have an ability to go beyond where they have gone, and would welcome the challenge of working closer on this.

Mr. SHUSTER. Would you yield me the rest of your time?

Mr. LOBIONDO. Sure.

Mr. SHUSTER. Because I have just a quick question. I think I have previewed what I was going to ask. Would you yield?

Mr. LOBIONDO. I would think about it, yes. Yes.

Mr. SHUSTER. That is what happens when guys retire. They don't give a damn anymore about who their—the gentleman yields?

Mr. LOBIONDO. Yes.

Mr. SHUSTER. Thank you very much. The question, as I—I questioned the last panel about remote identification. What is the—why can't we get that rule in place? Because it seems to me to be the simplest thing to do, to be able to start to be able to monitor safety, security, law enforcement, and those things. So could you tell me what seems to be that—the holdup?

Mr. ELWELL. Of course the whole issue of ID and tracking is a—performance-based. There isn't—we are not looking to identify a specific technology. We are looking for industry's input on what is available, and then what is available, will it scratch the itch, will it get done what we need to have done in controlled airspace?

I don't know the technical, scientific specifics of it, but my colleague, Earl Lawrence, he was the designated Federal officer for the ID and tracking ARC, and I am sure he can——

Mr. SHUSTER. Sure.

Mr. ELWELL [continuing]. Give you more detail, sir.

Mr. LAWRENCE. So thank you very much——

Mr. SHUSTER. Microphone.

Mr. LAWRENCE. Thank you very much. And to build on Mr. Elwell's comments, I wanted to highlight the——

Mr. SHUSTER. Can you pull that mic a little closer to you?

Mr. LAWRENCE. Yes, sir.

Mr. SHUSTER. You have got to pull the whole box.

Mr. LAWRENCE. Pull the whole box. There we go.

Mr. SHUSTER. There you go.

Mr. LAWRENCE. A little better. Thank you very much.

And to build on Mr. Elwell's comments, I wanted to highlight the Aviation Rulemaking Committee that we did host this summer. And I think it was a matter of priorities, of which thing do we tackle first. And now that ID is at the top of our priority list, having the collaboration and the involvement of our partners, both public and—particularly public safety was a great benefit.

And what we were looking for them to do is, one, identify what the wants and needs were at the local level, what do our public safety officers need in the field to assist them. We understand what we need from an air traffic standpoint, but we also needed to have a good understanding of all the various technologies that are available to us.

As was highlighted in the panel previously, the technology is evolving so quickly, we wanted their assistance and their knowledge so that we were not identifying one particular solution, but getting their expertise and knowledge on how we could develop a performance-based standard. And now that we have their report, we are moving forward with—we will be moving forward with our rulemaking activity.

Mr. SHUSTER. So we will see something in short order, then? A matter of months?

Mr. LAWRENCE. Rulemaking is a very deliberative process——

Mr. SHUSTER. I know.

Mr. LAWRENCE [continuing]. Will take time to——

Mr. SHUSTER. And that seems to be sometimes the problem. So I will end it there, my time has expired. I don't want to cut into Mr. Larsen's time.

But I would say, you know, we have been dealing with the issue of distracted drivers. And the industry is coming forward, saying if you put this rule in place, it is not going to matter 6 months from now or 1 year from now, so why don't you work closely with the industry and, as our panel before said, put the rule in place, deploy the technology, deploy the rule, and then let's review it every 6 months, every year, to tweak it, to change it to the technology.

So again, I would encourage you to work as fast as you can on this, and it is something I am very interested in. So I would like to keep in touch with you as you move forward. Thank you very much.

Mr. WOODALL [presiding]. The chairman yields back.

Mr. Larsen?

Mr. LARSEN. Thank you, Mr. Chairman.

Mr. Elwell, yesterday was the deadline for the State, local, and Tribal governments to register their interests in participating in the Integration Pilot Programs, I understand. How many notices of intent did FAA receive?

Mr. ELWELL. I don't know the exact number, sir. But it is hundreds. It has been a—we have been very happy with the response.

Mr. LARSEN. At some point would the list of applicants be made public? How are you approaching that?

Mr. ELWELL. So I am not sure. Because it is an acquisition process that ends up with an MOU [memorandum of understanding] with the participants, I am not quite sure how much of the information can be made public. But we will get back to you on that.

Mr. LARSEN. Can you do that?

Mr. ELWELL. Yes, sir.

Mr. LARSEN. Yes, thanks. Earlier this year it was reported the Drone Advisory Committee had been divided with regards to determining proper roles of different levels of government and regulating UAS operations. What is the current status of the DAC's work? Is it—did you tell them to go back to the drawing board? Did you say thank you very much? Did—where are we at with that?

Mr. ELWELL. So I think you are referencing task group 1, the task group that was——

Mr. LARSEN. Yes.

Mr. ELWELL [continuing]. Charged with that question. And that was before my time.

In looking at it as I took over, I felt it was quite a bit to ask of that committee, quite frankly. And they briefed out at our last meeting in Seattle, and what we informed them is that, with the advent of the UAS Integration Pilot Program, we are going to retask that group to—as Dr. Alonso suggested, and I agree wholeheartedly, is that we need to retask task group 1 to be more narrow and more specific on the data we need to collect and the data we maybe don't need to collect, and how we can use the data, going forward. And that is data across everything that we are going to do with the IPP.

Mr. LARSEN. Yes. Getting back to Dr. Alonso's answer to my question on data sharing, do you have—we have any limitations on sharing data from different States, different interest groups as we move forward on the UAS Integration Pilot Program?

Mr. ELWELL. I think that the—our only limitation is what the participants are willing to provide.

Mr. LARSEN. OK.

Mr. ELWELL. And, of course, our hope is that it will be much like we have done with legacy aviation and CAST [Commercial Aviation Safety Team], ASIAS, is to get agreements with all providers so that, as Dr. Alonso said, we have a constant flow of data and information that helps us understand the technology, so we can better regulate it.

Mr. LARSEN. Yes. I just know that this is one of the hurdles we had when we set up the six or so test sites in the 2012 bill, I think, or whenever we last did it. But that one of the limitations that resulted in the test sites not being fully utilized was the issue of proprietary information and how it is being shared.

So you know, if that hurdle still exists, we are still going to have the same problem. If there is a way to reach that hurdle, get over that hurdle, then we would actually—if you find a solution, let us know on that.

Mr. ELWELL. Thank you. I agree, it is a hurdle, and we do need to get beyond it.

Mr. LARSEN. Earlier this year the administration—so they were—they have a two-for-one Executive order on eliminating regulations before adding regulations. As you are moving through this particular exercise and UAS, are you running into any of these two-for-one problems?

Mr. ELWELL. No. What we are trying to do is have a discussion, intergovernmentally, how we are going to treat emerging technologies because, of course, there is not a lot of regulation in existence. So within the confines of UAS, or another commercial space, for instance, where do you—where would you do the two-for-one? Or, you know, do we want to do two-for-one for something that could be so economically beneficial to the country?

Mr. LARSEN. Yes, great. That is all I have.

Mr. Lawrence, do you have anything you wanted to add?

Mr. LAWRENCE. No, sir.

Mr. LARSEN. Great. Thank you very much. Oh, yes?

Mr. ELWELL. I would add we do have a DOT regulatory task force, which is looking at this very issue, and meets regularly.

Mr. LARSEN. OK, great, thank you.

Mr. WOODALL. The gentleman yields back. The gentleman from California, Mr. LaMalfa.

Mr. LAMALFA. Thank you, Mr. Chairman. And my apologies to the committee and panelists for my not being able to be present earlier. We had a Natural Resources Committee hearing also at the same time on NEPA and possible reforms to that, which kind of dovetails with part of my conversations on the unmanned aircraft, drones, et cetera.

My district in the Western States have a lot of forestry, and a lot of remote areas and so the unmanned aircraft, the drones, would be very, very useful for a lot of aspects for inspection of infrastructure.

I am also working on a bill, bipartisan bill with Mr. Schrader from Oregon, on easing up the process to remove hazardous trees that would be around power lines on Federal lands. So that should

be pretty obvious. You got a dying tree or a hazardous tree that could fall against a power line, you get two bad things, blackouts to the city area that—where the line is generally going to, and blackened skies from the forest fires is probably going to happen in the immediate area.

So we believe that, especially given some of the rugged terrain you are dealing with, where transmission lines are going many miles across forested and other, you know, remote areas, that this is a very important tool for the inspection of those, very cost effective, and environmentally correct, and all that.

So with what we are looking at, does—Mr. Elwell, do you see that—well, just a brief answer—is that a pretty important aspect of what you are trying to promote in your policy, of course?

Mr. ELWELL. Absolutely.

Mr. LAMALFA. OK. And then, what we are also seeing is that everybody wants to jump in on the regulation of these aircraft. So—and I am a little torn on this, because, of course, I would like to have local jurisdictions have strong input, and the ability to have things tailored to what they need.

I have—you know, the Oroville Dam is right in my backyard of my district, as well, so there was a great amount of interest in what was going on with the dam, with the broken spillway, in the several months' worth of infrastructure repair to that. And they have been very successful at that. But, you know, a lot of aircraft work needed to be done with helicopters. And so you just don't always want drones running around the middle of that or in, you know, forest fire areas or other emergency situations.

So what is the balance, do you see, with local—you know, local jurisdictions, whether it is States or counties or cities having their own drone—and if this is a redundant question, my apologies for not being here earlier—but having their own jurisdictions they are setting up on that, their own rules, versus a—you know, the map of the U.S., the airspace doesn't really care about county lines, State lines, et cetera.

What is the best course on that for the right type of regulation? And what can local input have on that to dovetail well with a countrywide regulation?

Mr. ELWELL. Well, sir, that is a great question. And that is what we started talking about earlier with the Drone Advisory Committee test group 1's efforts to look at that issue.

But the UAS Integration Pilot Program that we started—and the early applications just ended—that is the nut we are trying to crack. We want to let local communities, States, Tribal authorities do time, use, and manner restrictions, present to us the time, use, and manner restrictions that they would like to impose, executing their application of their pilot project.

And as long as it doesn't interfere with the FAA's responsibility to keep the navigable airspace safe, then we ought to be able to do it, and we ought to gather a lot of data and a lot of information going forward. I mean that is the whole purpose, really, of the pilot project, in addition to, of course, enabling this technology to grow.

We need to find that sweet spot, I think was what somebody said about it in the first panel. We need to find that sweet spot.

Mr. LAMALFA. It can't be easy with, you know, the type of uses, you know, I was speaking of in infrastructure and rural areas. But then you have a complete opposite, where there is movement to have packages delivered home to home in neighborhoods like that, which, I guess, would be pretty amazing. But also, you know, concerns, as well.

Does that come down to privacy issues with delivering to the wrong neighbor? And what does that all feel like with, you know, the other stories you hear about privacy invasion by these things with cameras? How would you, in my remaining time, touch that side of it?

Mr. ELWELL. So that is an interesting concept that you are talking about, dense airspace versus rural airspace. And they each present unique problems. And the airspace you were talking about in your district is class G airspace. So it is uncontrolled.

But as a result, we don't always know what aircraft are in G airspace in any given time. It might actually be easier to do certain drone testing in the complex airspace, because only aircraft that are identified and being tracked and monitored by air traffic control are in that airspace. So, in a way, it is almost easier to allow that and permit that and to get data from that scenario. But they each have their own unique challenges, and we are hoping that the applications for the pilot project—that we get plenty from both regimes so that we can gather data.

Mr. LAMALFA. All right. Let us know how we can help.

Thank you, Mr. Chairman.

Mr. WOODALL. The gentleman yields back. Mr. Lipinski?

Mr. LIPINSKI. Thank you. I think everyone can agree that there are certain places that drones can't fly. So when we were doing the 2016 FAA extension, section 2209 envisioned a process by which operators of critical infrastructure facilities could seek approval to create no-fly zones for safety and security reasons.

But the process, unfortunately, envisioned by section 2209 remains unresolved. I know Mr. Davis had brought this up in the—during the first panel. And I have worked across the aisle with members of this committee, including Representative Sanford, to improve the language and create a system that works for the FAA, for UAS operators, and for critical infrastructure stakeholders.

It doesn't require facilities to apply for a designation, and it doesn't ask them to disclose any information about the facility that would compromise security. All it would do is make public the geographic location and boundaries of a critical infrastructure airspace designation.

I think it is only fair that stakeholders have the opportunity to comment on possible changes to the airspace, and will only work if these designations reside in a central repository, so that operators know where to look to find out where they can and can't fly.

So, Mr. Elwell, what role, if any, does the FAA see for section 2209 authorities under the new UAS integration, that pilot program?

Mr. ELWELL. So section 2209, we have been working diligently on section 2209 within the constructs of our own authority, authority that we have today in 997, I think it is. And, as a result, mostly working with DoD, we have over 900 of these sensitive facilities

that we have restricted drone use—to your point, they have created these spaces where drones can't go.

We do have some limitations on our authority to draw those lines. We have a couple of security locations that we have collaborated with Department of the Interior—right? I am going to let Earl take over the details on this, but we are conscious of it, and we are with you. We want to have a database of these places that we don't—we want to have a sort of no-drone activity, and we are working on it.

Earl?

Mr. LAWRENCE. Yes. So to build a little bit more on Mr. Elwell's comments, we have been working with the Department of Energy, the Department of Defense, and the Department of the Interior to designate additional areas as restricted areas for drone use at low altitude.

In addition to that, we have been working with DHS and meeting with their stakeholder groups to get the feedback from their infrastructure stakeholder folks that they have put together after 9/11 to understand what their needs are, and how we might categorize what facilities would need protection of these particular drone—no-drone zones.

One of the things that we are looking at is education, as well. Not only education of the users, and asking people to stay away from these facilities, but it is also a matter of education that, in many cases, most of these facilities are already in restricted airspace, where these operations are not supposed to be occurring as they are today.

So we are looking at their—other opportunities, such as our ID and tracking methods, so that we can identify the people who are already violating these, and then we can—to have additional counseling and education based on that.

Mr. LIPINSKI. Because this is very important that we do move forward on this, because I receive a lot of comments about the lack of clarity, and we need to move forward on this.

In the remaining time I have, I just want to throw this question out there quickly. With the UAS Integration Pilot Program, the issue of enforcement, how is that going to work, is there going to be local enforcement? It really lies with—enforcement really lies—the authority lies with the FAA. How is that possibly going to work?

So Mr. Elwell?

Mr. ELWELL. So, as I was talking about earlier, finding that balance—and as we go forward in the pilot project, and they get started, you know, we need to balance the needs of the localities with our responsibility to operate in—safely and manage the navigable airspace.

The pilot program is going to provide an opportunity for us to work with the local jurisdictions to understand their needs in managing their areas of responsibility. And of course, public safety, privacy, trespass, you know, those kinds of things within the low-level airspace that the applicant wants to use, and we will work with those communities on setting the time, place, and manner restrictions to meet their needs, and not disrupt the safe and efficient use of the airspace.

And those restrictions that would be in the pilot program enacted by the local government by legislation or regulation would be monitored and enforced locally, and FAA would just continue to enforce any Federal law.

Mr. LIPINSKI. I think this is going to be—as you alluded to—difficult to do. So it is going to be something important that this committee keep oversight over that.

Thank you, I will yield back.

Mr. WOODALL. The gentleman yields back. Mrs. Napolitano?

Mrs. NAPOLITANO. Mr. Elwell, one of the questions I had of the prior panel dealt with FAA. Were there any restrictions for local entities to provide ordinances prohibiting the flying of drones in that space?

Mr. ELWELL. So as we have been discussing——

Mrs. NAPOLITANO. I can't hear you, sir.

Mr. ELWELL. As we——

Mrs. NAPOLITANO. Just move it up, closer.

Mr. ELWELL. OK, sorry. As we have been discussing, the whole intent of the pilot project is to establish those lines of community involvement in their time, use, and manner restrictions that make sense for localities, many of which they have today, and they use today.

You know, the—we are in charge of the navigable airspace, so we are in charge of aircraft and taking off and landing. And, of course, as Administrator Huerta has said many times, what drones in effect do is make every rooftop, every backyard, you know, every corner, a potential airport, a potential takeoff and landing spot.

So what we are going to do is we are going to work out where the local interests and the FAA's navigable airspace interests come together, and——

Mrs. NAPOLITANO. Well, excuse me, but in southern California that is going to be very hard, because you have airports right in the middle of communities. And as I explained, in the ports there is beaches that are adjacent to the water ports. And so it is going to be hard to determine exactly where the line can be drawn.

Mr. ELWELL. Right. Yes, and as I said, in the pilot project we are hoping and looking for communities to present to us where local——

Mrs. NAPOLITANO. Have you asked them yet?

Mr. ELWELL. Yes. That is the—it is in the SIR [Screening Information Request] and it is online, and—all of the requirements of the pilot project and what we are asking.

Mrs. NAPOLITANO. OK, sir. The FAA was prepared to propose new regulations for unmanned aircraft operations over people in January, but pulled back at the last minute due to national security concerns. Since then there has been an informal hold on all UAS rulemakings. In the meantime, other countries are moving aggressively and ambitiously towards the regulations to attract investment in the technology.

Have the law enforcements and national security communities communicated to FAA or to the industry or—what will it take for the agency to lift the hold?

Mr. ELWELL. So we are in constant communication with our Government colleagues in the national security area.

In fact, I think, Earl, we had a number of representatives from law enforcement on the ID ARC, discussing exactly——

Mrs. NAPOLITANO. Federal and local?

Mr. ELWELL. Federal, and we had local representation talking about what they would need for that comfort level that they didn't have when we were getting ready to do the over-people rule last year.

So yes, we are in consultation, we are finding out what we need to do to give them comfort in——

Mrs. NAPOLITANO. And how long will it take to process that—to go into rulemaking?

Mr. ELWELL. That is a hard prediction to make, because of the intergovernmental review process. But our hope is to get it done with—efficiently and as quickly as possible.

Mrs. NAPOLITANO. OK. The rulemaking on small UAS has made tremendous strides toward the safe integration of commercial drones into the national airspace. However, commercial drones cannot operate beyond the operator's visual line of sight or over people, unless permitted by FAA, like commercial delivery.

You have issued more than 1,000 waivers. Can you please explain what the criteria of FAA is?

Mr. ELWELL. So that question is—the man who has done 1,000 waivers——

Mrs. NAPOLITANO. All yours.

Mr. ELWELL [continuing]. To best answer that question, Earl.

Mr. LAWRENCE. All right. Thank you, Mr. Elwell.

Most of the criteria that we outline and the waivers that—we try to be performance-based. And when we issued the final rule for part 107, the small UAS rule, we included in its preamble information of what were the safety issues that an individual would have to address when they applied for a waiver.

When we received waiver applications, we look for that information, because they need to address the safety of the operation that they are conducting. And obviously, every operation is different. An operation rural would have a different set of safety risks versus in a city.

In addition, we work very closely and collaboratively with our industry partners. I have personally conducted multiple webinars with AUVSI and educating applicants of this is the type of information that they should be bringing forward.

We have updated our website where we provide instruction right on our website of here is the information that we need in order to obtain these waivers.

Again, this is a new environment. We are learning, as well as the operators. So we don't have the answers to everything for every circumstance. And, because of that, it is a bit of a deliberative process, as we work with the applicants to advance their operations.

I am happy to say we—you know, night operations have become almost commonplace, because it was clearly understood how to comply with that. We now have CNN operating over people, and they have shown how they could safely operate an aircraft over people. And we do have some beyond-line-of-sight operations with our partners, as well.

Mrs. NAPOLITANO. Well, with the indulgence of the chair, I want to ask one more question, and that regarding personnel that is equipped or ready or trained. Do you work with the universities to attract people who have an interest in the technology?

Mr. ELWELL. And the STEM program, of course, has national interests way beyond DOT and FAA. But Secretary Chao just announced a few weeks ago a program called Forces to Flyers, where we are going to focus on working with educational entities to bring veterans who are coming off their service to our country, and getting them into——

Mrs. NAPOLITANO. Well, that is for veterans. I am talking about students who understand the technology and can help FAA upgrade their knowledge.

Mr. ELWELL. We—and I don't know, Earl, if we have an active recruitment process in that area.

Mr. LAWRENCE. So I will just build a little bit on what Mr. Elwell said. Per—under the direction of this committee we have our Center of Excellence. And part of the Center of Excellence, not only is it partnering with the universities, it has also included a STEM program for education.

Mrs. NAPOLITANO. But is it directly——

Mr. LAWRENCE. And we are——

Mrs. NAPOLITANO [continuing]. Addressing FAA and drones?

Mr. LAWRENCE. Yes, specifically FAA and drones. It is the drone—it is the Unmanned Aircraft Systems Center of Excellence partnering with the universities who are doing a lot of our basic research. And part of that legislation included science—you know, math and technology learning, and we do look for them—I like hiring from them as much as I can——

Mrs. NAPOLITANO. I would like to know what the needs of the universities are, so we can share them with the rest of the committee.

Thank you, Mr. Chair.

Mr. LAWRENCE. OK.

Mr. WOODALL. The gentlelady yields back. With that reference to—from Mr. Lawrence of the direction of a committee, I will pick up—from the committee, I will pick up right there. I want to talk about section 2210 for a moment.

We have talked a lot about pilot projects and how quickly folks are getting ramped up on the President's request we move forward there. I want to talk about the committee's request from July of 2016.

We heard testimony from the previous panel, from the Southern Company and a consortium of utility providers, to say they had applied both for part 107 waiver more than 12 months ago, as well as they are waiting on a guy that is from section 2210, passed almost 18 months ago. You all have limited resources with which to do your work, you are having to work for the exact same goal for this consortium under—on two separate tracks right now.

I would be interested to know, number one, which track do you expect to yield fruit first and, number two, what we can do, as your partner here, partner in innovation, to keep you from having to go through the same process twice, as this ever-changing dynamic continues to grow in speed.

Mr. Elwell?

Mr. ELWELL. Thank you, sir. First of all, we absolutely appreciate the diligence of this committee and the work that you have done to help us in our efforts to assimilate this technology. And I will pass section 2210 on to Earl.

I will say, however—and I need to follow up with Billy and his—I think I am aware of the application he is talking about. And if it is the one I think he is talking about, we actually denied that request about 4 months after it was made. So we will follow up with him, and we will make sure that we are all on the same page.

Earl, section 2210?

Mr. LAWRENCE. So thank you. And just to build on that, on 2210, I would like to—I am happy to say we have two companies we are partnering with now on 2210. Specifically, they are Xcel Energy—so it is a power line company that we have what we call a safety partnership with, and we have outlined a program with them to get them to be online as site operations, as well as BNSF has recently applied under that legislation, as well.

And I am happy to say that we are working, and more recently we received a request from the Southern Company to do a similar thing as those other two companies, and we have just started our discussions with them to add them into that program, as well.

So again, we don't have it all laid out, because it is new, and we are also understanding what section 2210 offers us and what does that give us, as far as additional authorities. But it does prioritize it. We take it very seriously. And infrastructure patrol is something very important, and we know you—it is your—top on your list.

Mr. WOODALL. Help me to understand what that means, Mr. Lawrence. Two partnership companies, eighteen months' worth of legislation, I know if I go and look at a part 107 waiver the FAA will say, "We are going to try to get you an answer back in 90 days." And to Mr. Elwell's point, no is actually an answer. And so that counts in that timeframe.

I make application under section 2210. I am also on a 90-day clock? I am on a 120-day clock? What do I expect, as an applicant?

Mr. LAWRENCE. So what we are doing with those companies was we actually sit down with representatives that—across the FAA, so we have our aircraft certification folks, we have our flight standards folks, we have our Air Traffic Organization, and we sit down with them, face to face, and we work out a schedule and say, OK, what do you want to do?

They first tell us what their concept of operation—what aircraft are they using, what airspace are they going to be operating, and they lay all that information out for us, and we identify the rules that are already in existence that they can comply with, and the additional rules that we may need to do a waiver or an exemption to, identify those things, and then we go on and we do a joint schedule with them to identify what the time would be to achieve their objective, because, as we know, quite often they have to bring testing data, they have to bring design data and information to the discussion, as well.

And, in some cases, we have to include the Air Force and other organizations because the airspace that they are operating in is

joint use, and we need to bring in those other authorities to have this——

Mr. WOODALL. So if you were to ballpark that for me, that doesn't sound like 90 days. About the third collaborative agency you had in there—I went ahead and ticked this up to 120, 180. What would you ballpark——

Mr. LAWRENCE. Yes, sir. So we meet immediately with them. And then we let them identify to us what the timeline—help identify what the timeline would be.

If you are asking how long does it take, it depends on their project. But we are there, physically meeting face to face, answering those questions at that point, not 6 months—we are not taking data and a letter and then coming back 6 months later. We are sitting down with them, answering those questions, and identifying what needs to be done in order to do that operation safely.

Mr. WOODALL. Thinking about that collaborative process, tell me about the Drone Advisory Committee, Mr. Elwell. What is it that the FAA sees as the best way to utilize the expertise on the DAC?

Mr. ELWELL. So I am still getting to know the committee. My first reaction is that one of the best things we are getting from the Drone Advisory Committee is the socialization of a inhomogeneous group of people. I mean you have got brilliant technocrats who don't know a thing about aviation. You have got folks that are used to doing technological iterations in days, talking to regulators who—we don't do change in days.

So one of the best things about the DAC is the ability of those two communities to come together and—really, we are learning from them and they are learning from us. We are learning ways that we can think faster, we can work faster. You know, our performance-based, risk-based regulatory philosophy now is much closer to how they look and do things and move out.

So that is just sort of the philosophical side that the DAC is benefitting us. But they are also providing some, you know, tremendous guidance. And we have people like Dr. Alonso on the DAC, and we have the heads of many of aviation's top trade associations. So it is a brain trust that is providing a great amount of information to us. So it is—they are very valuable.

Mr. WOODALL. I am glad to hear that very positive review of who we have there.

What should we expect in terms of new taskings from the FAA, whether to RTCA or to DAC? What do you envision being requested of those folks, going forward?

Mr. ELWELL. As I said, we are developing a new tasking for task group 1 to align with the pilot project, so that we can get their expertise in helping us gather data and implement the project.

We are waiting. In March, task group 3 is going to give us their recommendations on funding. Task group 2 gave us some interesting recommendations. In fact, the one I mentioned earlier about we want FAA—task group 2 says FAA should go after operations in class B airspace. That is that counterintuitive—really, that is the most dense airspace, but that makes sense, because it is the most rigidly controlled airspace that we have.

So, going forward, it is hard to predict, because it is such a dynamic and changing technological environment. But we promise to keep you guys absolutely informed on our work, going forward.

Mr. WOODALL. When we are talking about funding, do you have the funding tools that you need, as we sit here today, to make that happen?

Mr. ELWELL. Yes, sir. Funding is not an issue.

Mr. WOODALL. Well, thank you both for being here, and thank you for what you are doing. As—when panel 1 suggests that we should revisit the regulatory environment every 180 days because things are moving so fast, clearly you have your work cut out for you in staying that nimble. I look forward to our next meeting, Mr. Elwell, where you tell me again about the folks you work with who expect change in 3 days, about how we, as regulators, are now catching up to them in that model.

With that, this hearing stands adjourned.

[Whereupon, at 12:56 p.m., the subcommittee was adjourned.]

Talking Points for
Ranking Member Rick Larsen

Aviation Subcommittee Hearing on
"Unmanned Aircraft Systems Integration:
Emerging Uses in a Changing National Airspace"

- Thank you, Chairman LoBiondo, for holding today's hearing on unmanned aircraft systems (UAS) integration and their emerging uses.

- This Subcommittee held a hearing earlier this year where we discussed the Federal Aviation Administration's readiness for new airspace users and technologies, and the promise those technologies hold for our aviation system and economy.

- Chairman LoBiondo and I have ensured UAS have been a focus of this Subcommittee's oversight work in recent years. And our work will not slow down any time soon as UAS proliferate in U.S. airspace.

- According to a leading research firm, UAS unit sales increased by 60 percent in 2016. They are estimated to have another 39 percent increase this year.

- Projecting a bit further out, the FAA has forecast the commercial UAS fleet will increase tenfold by 2021.

- Given that UAS can be purchased easily and at low costs, the hobbyist UAS fleet will grow by about 2 to 3 million units during that same period.

- Beyond flying for fun, we cannot deny the extensive public and commercial benefits of unmanned aircraft. This industry is particularly important to my home state of Washington—a thriving hub of aviation R&D.

- As UAS have multiplied, so too have their applications.

- Most recently, we saw how UAS played a vital role in recovery and rescue efforts following the hurricanes that ripped through parts of the United States and its territories.

- A variety of users in Texas, Florida, Puerto Rico, and the Virgin Islands operated UAS to inspect the extent of damage to neighborhoods and local infrastructure. Several insurance companies used them to assess and verify insurance claims, expediting the processing of such claims.

- We also saw how helpful UAS can be in wildfire mitigation and response during and following the several fires that swept across multiple Western States, including my home state of Washington and the Full Committee Ranking Member's, Oregon.

- I look forward to hearing from Verizon today about the work it is doing to help the residents of Puerto Rico whose homes and infrastructure were devastated by Hurricane Maria. And also from the FAA about how the agency was able to process and approve expeditiously applications to fly UAS to assist in such efforts, while ensuring the highest level of safety during those operations.

- With growing prominence, the UAS industry has great potential to drive economic growth and create jobs here in the United States, too.

- Industry groups have estimated by 2025, the UAS industry can generate more than 100,000 jobs and billions of dollars in economic activity.

- However, with the continued growth of the UAS industry, we must ensure both commercial and recreational users operate their aircraft in a safe and responsible manner.

- The FAA receives more than 100 drone sighting reports each month. This reflects a continuing risk of collisions with manned aircraft, incursions with airports and other critical infrastructure, and mishaps over populated areas.

- In fact, just this fall, a UAS collided with and damaged a U.S. Army UH-60 Black Hawk helicopter near Staten Island, New York; another UAS struck a commercial plane with 8 passengers in Québec City, Canada.

- Thankfully, no one was injured during these events. However, the events serve as strong reminders of the inherent risk associated with introducing new users into our airspace system.

- I look forward to hearing today from our witnesses about how this Subcommittee can be proactive in assuring skies crowded with UAS remain safe for conventional aircraft and the 800 million people who fly each year.

- Our task, in short, is to give the FAA the proper authorities and resources necessary to accommodate, safely, the capabilities of this burgeoning industry.

- Again, Chairman LoBiondo, thank you for calling this hearing, and I look forward to hearing from our witnesses.

Testimony of Juan J. Alonso
Professor of Aeronautics & Astronautics
Stanford University
on

Unmanned Aircraft Systems Integration: Emerging Uses in a Changing National Airspace

before the Subcommittee on Aviation
Committee on Transportation and Infrastructure
U.S. House of Representatives

November 29, 2017

Chairman LoBiondo, Ranking Member Larsen, and Members of the Subcommittee:

Thank you for the invitation to appear before you to discuss my thoughts, opinions, and ideas to ensure that the United States remains the worldwide leader in Unmanned Aircraft Systems (UASs, also referred to as "drones" in this testimony) R&D, operations, and integration. Our ability to solve the complex problems that UASs face today depends heavily on a carefully-balanced combination of technology development, pilot programs, data collection, and on the use of probabilistic risk-based approaches for the right amount of regulation, while meeting privacy concerns.

I am a professor in the Department of Aeronautics and Astronautics at Stanford University and a current member of the FAA Drone Advisory Council (DAC). In this testimony, I am appearing in a personal capacity and speaking solely for myself. I am therefore not representing the views of either Stanford University or the FAA DAC.

Since I became a professor at Stanford University over 20 years ago, I have worked on the development of computational analysis and design methods to enable the creation and development of realizable and efficient aerospace systems. My research has involved advanced low-speed, transonic, and supersonic aircraft, launch and re-entry vehicles, jet engines, and drones. I began teaching drone courses at Stanford in 2001, long before they were perceived as the next new thing, and have designed a variety of drone vehicles under the sponsorship of both industry and the federal government (NASA and NSF). Together with my students and research staff in the Aerospace Design Laboratory, we are responsible for open-source tools such as SUAVE (http://suave.stanford.edu) and SU2 (http://su2.stanford.edu) that are being used around the world for many new aircraft developments, including drones and electric Vertical Take-Off and Landing (VTOL) aircraft for personal air transportation.

I have served in the FAA Management Advisory Council (2011-14), the Secretary of Transportation's Future of Aviation Advisory Committee (2010-11), and the NASA Advisory Council (2005-06). I am currently a member of the FAA DAC and an Independent Expert in the ICAO/CAEP Integrated Review for Technology Goals in aviation noise, fuel burn, and emissions. I have received a number of awards and recognitions, including the NASA Exceptional Public Service Medal (2009) for my role as the Director of the Fundamental Aeronautics Program at

NASA (2006-09), where I was responsible for all of the agency's vehicle technology R&D programs.

Just as with many advanced technologies in aerospace engineering in the past 100 years, UASs find their origins in military technology investments and requirements. But a remarkable technology convergence that began in the early 2000s with the advent of miniaturized sensors, more powerful real-time computing capabilities, and a strong interest in research in perception, automatic control, and autonomy, has opened up the possibilities for the use of drones to a very large number of applications that have the potential to generate new capabilities and open new markets. Precision agriculture and infrastructure monitoring, fire-fighting, disaster recovery, package and medical supply delivery, law enforcement and border patrol, mapping and surveying, search and rescue, even journalism and aerial photography are but a few of the possible uses of this incredible new technology.

Retaining US Leadership in UAS Technology and Integration

Arguably, the United States has been at the forefront of R&D of the very capabilities that are enabling such a bright future for UASs. But this is just the beginning: much work remains to continue to nurture these new capabilities and to allow them to develop into the systems that will impact our society in many profound and beneficial ways. The rest of the world has not been sitting in the sidelines: multiple countries have recognized the potential civilian and military value of drone technologies and companies that produce small and medium-sized drones have been created and are thriving. These foreign companies are laying the foundation for more complex vehicles and uses and have come to dominate this market. The question I try to address in this written testimony is "what must the US do to retain leadership in a field that we had originally developed?"

There are many technical obstacles that prevent more widespread development, integration, and acceptance of UASs in the United States and abroad. These can all be resolved through diligent and inspired technical breakthroughs that our engineering and scientific base is used to pursuing and accomplishing. With this comment, I do not intend to minimize the magnitude of these endeavors, but I will not focus on them in this testimony, given that the Subcommittee has already heard from my colleagues Prof. Mykel Kochenderfer (Department of Aeronautics & Astronautics, Stanford University) and Prof. Nicholas Roy (Department of Aeronautics & Astronautics, MIT) and they have made a compelling case for technology development to enhance the reliability, safety, communication, navigation, air traffic control, and manufacturing cost of future drone systems.

Instead, in this testimony, I would like to focus on three separate areas of the regulatory environment that can further enhance capabilities and attempt to solve the policy-technology dilemmas that we are currently facing. First, during these early days in the development of UAS capabilities, we will need more flight testing experiences, not fewer; we will need more opportunities, with low barriers to entry, to try out new ideas, fail, try again, and eventually succeed: such is the iterative nature of most technology development programs and, in this case, these iterations will necessarily involve interactions with other stakeholders beyond the technology-based ones. The FAA UAS Test Sites, the FAA Pathfinder programs, and the recently-

announced UAS Integration Pilot Program are all steps in the right direction. Second, it is critical that all tests result in data of sufficient quality and in the appropriate amount so that they can be used to inform requirements / regulations for different levels of service in the NAS. Moreover, it is critical that this data be made openly available to the community for better insights and understanding. Third, we must setup a regulatory environment that provides a reasonable expectation of periodic and timely updates to the levels of service available to UAS operators for those who can demonstrate compliance with stricter requirements, as appropriate, to ensure safe operation in the NAS.

There is ample evidence that multiple US companies are seeking a more predictable regulatory environment to conduct the testing of their UAS prototypes (see for example, WSJ, May 17, 2017 "Welcome to the Jungle: Amazon's Australian Expedition to Rattle Retailers", and NYT, Oct 25, 2017, "Trump to Open Skies to More Drone Testing".) How do we make sure that the situation in the United States encourages both US and foreign companies to develop and test here and not abroad? How do we setup the proper regulatory environment so that companies can plan for both the testing and deployment of their systems? How do we train and retain the technical talent that will be needed to realize this vision? How, above all, do we ensure that the jobs created by this new field stay here in the US?

A Nimbler and More Rational Regulatory Process for UASs

On the topic or regulation, and more importantly the predictability of upcoming regulatory requirements, it would be beneficial to ensure that the FAA embarks on a yearly cycle of updates to the existing rules. It would be useful to ensure that the FAA views updates to the UAS regulations like the standard software development cycle with periodic releases that update the regulatory framework. Take Part 107 - Small Unmanned Aircraft Regulations, for example. Part 107 covers commercial uses of drones weighing less than 55 lbs for non-hobbyists and provides a certain level of service (daylight and twilight operations, under 400 ft of altitude, within visual line of sight, with a pilot certificate) with a minimum level of requirements: the safety implications of operations in compliance with this rule are virtually non-existent. This level of safety is achieved by directly avoiding circumstances that may expose the uninvolved public to any level of risk.

There are several small steps forward that will be required to realize the full potential of UASs that many organizations are clamoring for today. In particular, flights over people, operations beyond visual line of sight (BVLOS) and/or at night, and flights in the proximity of buildings and structures all require the operators to follow a waiver process that is neither scalable nor conducive to understanding what might be possible (from the regulatory point of view) in the future. In the future, I would prefer to see a steady rhythm of updates to Part 107 that enable operators to receive a higher level of service by complying with a clearly articulated set of increasingly stricter requirements to guarantee the desired level of safety. Such a process could begin with the increased services that have smaller safety impacts and progress towards scenarios where safety does become a major concern. The FAA is already conducting a series of Pathfinder Programs that have these precise objectives in mind. I would recommend that (a) these kinds of programs are significantly enhanced (perhaps through the UAS Pilot Integration Program or by enlisting additional participants into the existing programs), and that (b) a more concerted effort to learn from such experiences and disseminate the results is pursued.

Note that I mention "required level of safety" in my comments above. The truth of the matter is that, at present, no technologist knows what this required level of safety ought to be for different kinds of vehicles and operations in the airspace. The "required level of safety" must be arrived at from direct involvement of policy makers such as yourselves, in consultation with experts in government, industry, and academia, as well as local governments and the public at large. The FAA has a key role to play in this area and has been able to navigate complex regulatory matters such as these ones in the past.

Risk-based Probabilistic Safety Analyses and the Availability of High-quality Data

The focus on a "required level of safety" that we must arrive at as a community, begs the question of how we measure the level of safety that a UAS / operator combination can achieve given the equipment that is available on board the vehicle and the amount of training that the operator has completed. This is truly a hard question and there are no easy answers. I personally believe (and given recent briefings I have received from the FAA in the context of the DAC, it appears that the FAA is in full agreement) that the only way to assess whether the combination of a given UAS and operator meets a "required level of safety" for a particular mission is by using a probabilistic risk-based analysis approach. Such an approach would control for the main variables of the problem and provide confidence intervals based on significant amounts of data collected during extensive flight trials. Let me state that again more clearly: we can only reach conclusions about levels of safety attained and the level of requirements in new regulations with significant amounts of high-quality data. Notice that, in addition, we must focus not only on the risk but also the consequences of accidents/incidents that occur. With a combination of risk and consequence we can truly make progress in setting regulations that make sense.

This discussion begs two fundamental questions: how much data are needed and where will these data come from? The simple answer is that we will need lots of data and that we should collect these data (and should have been collecting them for some time) from every opportunity we have. This includes the recently-announced UAS Integration Pilot Program, the FAA Focus Area Pathfinder Program, and many other flight tests being conducted within the seven FAA UAS Test Sites. My colleagues from AirMap (and from other companies developing similar infrastructure) will probably tell you that we have the software system prototypes that can help collect, catalogue, classify, and mine the data for useful information that can influence regulations. I believe this to be the case. But we are far behind in setting up the proper data collection plans: what data should be collected? How do we make it easy for every operator to provide these data for further analysis? How do we maintain the anonymity of the operators to encourage truthful reporting of accidents and incidents?

As far as data are concerned, I believe we are missing out on two key opportunities that should be addressed in the very near term:

1. With the establishment of new UAS flight test programs we must require, as a condition for approval, that the operator share all data about all flights, and that this data-sharing process be an integral part of the learning from these flight test activities, and

2. We must commit to ensure that all data (appropriately de-identified) are open to the UAS community at large: the value of data is not in the data per se but, rather, in the interpretation of patterns and values contained in the datasets. By opening the data to a larger number of interested parties, new methods and ideas will be applied that will lead to better safety estimates and to identifying situations that are precursors to unsafe outcomes, thus improving the quality of the regulatory requirements that are eventually imposed. We cannot underestimate the importance of open data sources and crowd-sourcing the data analysis process.

The FAA jointly with NASA have a rich history, in the commercial aviation context, of collecting and cataloguing data about incidents and accidents in the Aviation Safety Information Analysis and Sharing (ASIAS) system and it seems that many of the lessons learned there could be directly applicable to the UAS context.

The Potential Role of the FAA DAC

As a member of the FAA DAC that has observed its discussions and interactions since the first meeting, I would like to make some comments about the very positive impact that a well-balanced and diverse consensus body such as DAC can have in improving the eventual integration of UASs in the NAS. It is my opinion that we face some complex interdisciplinary problems that will only be solved by timely action on the part of the FAA if proper advice from all participating stakeholders is provided. Since the DAC is at a point where some of its early efforts are being completed and new directions for its work are being discussed, it would be beneficial for the FAA to task the DAC with specific issues (e.g. definition of datasets to be collected, architecture of database to be used, probabilistic risk-based analyses to be pursued, etc.) and let it come back to the FAA with recommendations on these and other subjects within a reasonable time period.

Note that the DAC can be helpful in also recommending what not to pursue. Where should we invest and where should we not? Finally, it is also important to understand that a deliberative body such as the DAC may not be well positioned to pursue certain tasks that are of a highly political nature.

Final Comments / Thoughts

As I was writing this testimony, I read about six laws written by a technology historian, the late Prof. Melvin Kranzberg, to better understand the interactions between technology and society and the significant consequences that misuse of technology can bring about (*WSJ, "The 6 Laws of Technology Everyone Should Know", Nov. 26, 2017*). Two of these laws are particularly relevant to our discussion. Firstly, he stated that *technology is neither good, nor bad; nor is it neutral.* Rather, new technology must be viewed in context: although UAS technology has the potential to improve our lives in many ways, we have a responsibility to anticipate unintended consequences and preempt them as much as possible through both knowledge/data generation and an appropriate regulatory framework. Secondly, he stated that although *technology might be a prime element in many public issues, nontechnical factors take precedence in technology-policy decisions.* The benefits of technology cannot be considered independently of issues of safety, privacy, public perception, local regulations, and noise. Better sources of information lead to better decision

making and, ultimately, to more coherent regulations that responsibly minimize the burden on UASs and their operators.

Although I am directing my comments to small UASs in this testimony (as the most urgent need at this very moment) I would like to note that the requirement for a similar regulatory framework for larger vehicles is just as pressing: electric VTOL aircraft are being developed today that could enable large-scale personal air transportation in congested urban areas. In some senses, these larger vehicles are easier to regulate and integrate into the NAS since the FAA and NASA have been conducting research on this topic for a number of years, and these larger vehicles can carry the necessary equipment to satisfy stricter requirements. In other senses, though, these vehicles are harder to integrate into the NAS as they will pose significant challenges in air traffic control (regardless of how it is achieved) and the safety implications will be vastly more significant. If we lump all UASs under a single category, we will fail to understand the profound differences between vehicles at the larger and smaller ends of the spectrum.

Congressional Testimony

"Unmanned Aircraft Systems: Emerging Uses in a Changing National Airspace"

William O. "Billy" Ball
Executive Vice President and Chief Transmission Officer
Southern Company

Testimony before the
Subcommittee on Aviation
Committee on Transportation and Infrastructure
United States House of Representatives

November 29, 2017

Chairman LoBiondo, Ranking Member Larsen, and Members of the Subcommittee, thank you for inviting me to testify today. I am Billy Ball, Executive Vice President and Chief Transmission Officer at Southern Company. Southern provides electricity and natural gas to 9 million customers through our subsidiaries: electric operating companies in four states and natural gas distribution companies in seven states. We operate nearly 200,000 miles of electric transmission and distribution lines and more than 80,000 miles of natural gas pipeline. We support a full portfolio of energy resources, including carbon-free nuclear, 21st century coal, natural gas, and renewables.

Southern Company believes in leveraging innovation to keep energy safe, reliable, secure, and affordable. We are among the earliest adopters in the energy industry, or any other industry, of unmanned aircraft systems (UAS), also known as drones.

Our company, and the electric power industry at large, is committed to building smarter energy infrastructure that is reliable and resilient to all hazards—from natural events like storms to manmade malicious attacks. Drones are a critical part of our strategy, both for inspecting and maintaining our infrastructure to prevent outages and for our efforts to respond and to recover following incidents. Drones can also go places where planes cannot. From the inside of a boiler or a stack to flying in wide-open transmission rights of way, drones provide a valuable service.

As far as infrastructure inspection, we are much like our counterparts in other industries. We would like to make greater use of drones because they are a flexible platform and a safe, efficient way to gather data. For many years, we have used helicopters and fixed wing aircraft for the regular inspection of our generation, transmission, and distribution assets. Drones can be used in all of those cases. Today, however, manned aircraft are often more effective because of regulatory constraints on drone usage. Inspections with manned aircraft can be challenging due to low altitude flight near towers, wires and other fixed objects. Sadly, I have experienced this first hand when we lost a seasoned pilot and inspector in a helicopter crash during an inspection of a transmission line after a severe thunderstorm event. Being able to displace the use of manned aircraft with drones to inspect our infrastructure will reduce the safety risk to our employees.

I know that disaster response and recovery are important to this Committee, given your oversight of the Federal Emergency Management Agency. In that role, electric companies are not like every other company. We work alongside first responders to restore service as quickly and safely as possible. Today's hearing follows a historically destructive series of storms: Hurricanes Harvey, Irma, Maria, and Nate, as well as wildfires in the western United States. Though still a new technology, drones already have become an important part of disaster recovery. The ability to gain situational awareness during times when many areas are inaccessible by other means allows our crews to develop a more informed restoration strategy. Human based flights have to wait until the weather is acceptable but we can get drones up quicker and begin the assessment process sooner. Drone flights, when approved, during low light or dark hours could also further reduce the time required for initial damage assessments, ultimately getting the power back on faster.

There are yet-to-be-implemented provisions in the 2016 Federal Aviation Administration (FAA) law that would improve our use of drone technology. In particular, Section 2207 requires the FAA to publish guidance for emergency certificates of authorization or waivers for the use of UAS in response to a catastrophe, disaster, or other emergency to facilitate emergency response operations, such as firefighting, search and rescue, and infrastructure restoration efforts.

Since weather is an unavoidable part of our business, we constantly work to get better and to prepare during "blue sky" days. In this space, a strong partnership with the public sector—federal, state, and local governments—is key.

Fortunately, such a collaboration exists: the Electricity Subsector Coordinating Council (ESCC) is comprised of the CEOs of 21 electric companies and nine major industry trade associations. The ESCC includes all segments of the electric power industry, representing the full scope of electricity generation, transmission, and distribution in the United States and Canada. Southern Company's Chairman, CEO and President Tom Fanning serves as one of three co-chairs of the ESCC.

During incidents, the ESCC helps to coordinate efforts across industry and government in response to all hazards. During the most recent storms, the ESCC worked with partners like the Departments of Energy and Homeland Security and with the FAA to remove temporary flight restrictions for both manned and unmanned aircraft quickly to assist with aerial damage assessments.

Southern used UAS in our service territory and also responded to our fellow companies that needed the technology and associated operators. Our industry has well-established mutual assistance programs that leverage lineworkers and other resources and equipment. In the aftermath of Hurricane Harvey, Southern Company was able to provide mutual assistance to Centerpoint by providing six UAS teams. These UAS teams included drones and employees skilled in piloting and analyzing data from drones. These six teams were able to make multiple flights in areas no longer easily accessible due to flooding. Additional flights would have been possible with fewer regulatory restrictions. Providing drone teams through mutual assistance was a first for Southern Company and lessons learned from this effort will be used to develop policies across the sector that will allow companies to share drones and drone operators more efficiently and to integrate UAS into our existing mutual assistance programs more formally and systematically.

Internal to Southern Company, we utilized 16 drones in our own response to Hurricane Irma which caused wide spread outages in the state of Georgia. Coordination with the Georgia Emergency Management Agency provided improved access to making UAS flights. The use of drones improved our damage assessment process and provided us with more valuable experience in using this technology after storms.

That spirit of collaboration also sets the electric power industry apart from other businesses. We do not compete against one another, and we welcome sharing best practices. In fact, through our trade association, the Edison Electric Institute, we have formed a UAS Executive Task Force to

do just that. With that in mind, we urge Congress and the FAA to consider electric companies to be an important drone end-user and stakeholder.

When pilot projects, task forces, advisory committees, and the like are created, critical infrastructure sectors, and particularly electric companies, should be involved. The lessons learned by one pilot company will be shared industry wide—to the benefit of all customers. The electric power industry is critical to life, health, and safety. Electricity runs our economy. As such, we need the best tools at our disposal.

Congress and the Administration also can advance drone technology for the benefit of smarter, stronger energy infrastructure by promulgating regulatory and legislative policies that encourage innovation without sacrificing safety. Few would disagree that regulation does not move as fast as technology. This is particularly pronounced in the drone space.

It is clear that the FAA plans to regulate in a crawl, walk, run mode. For a new technology, that approach makes sense. But the quicker we can get to "run" safely with drones, the better. Southern was an early recipient of a Section 333 exemption, and, while it was helpful to get our drone program off the ground, it still was limited. Once the Part 107 rulemaking was finalized, we also were an early recipient of a waiver to fly at night.

Without further loosening in the regulatory space, drones will not see their full potential. Southern is part of an industry consortium that submitted a Part 107 wavier to demonstrate beyond visual line of sight (BVLOS) inspection of energy infrastructure. The group filed the applications shortly after the effective date of the Part 107 rule. However, like many BVLOS waivers, it has not been acted upon. We support the Part 107 waiver transparency provisions in the House and Senate FAA reauthorization bills; showing what applications are successful will lead to more successful applications.

It is important to note, Congress already has called on the FAA to prioritize these kinds of applications. Section 2210 of the 2016 FAA law allows for an application to the FAA "to operate an unmanned aircraft…beyond the visual line of sight… and during the day or at night" for "activities to inspect, repair, construct, maintain, or protect covered facilities," including natural gas pipelines, electric generation, transmission, and distribution systems, and "any other critical infrastructure facility." We agree that when innovative drone flights are being allowed, critical infrastructure should be at the front of the line.

My experience is in transmission. Across the industry, there are more than 380,000 miles of transmission lines in the United States: enough to wrap around the Earth 15 times. Much of these lines are in remote locations where there should be no manned aircraft and where there are clear rights of way present. Imagine inspecting those lines many miles at a time instead of mile by mile as is the case now with drones. The improvements in safety and efficiency are overwhelming. Other places in the world already are doing this. Indeed, our technology partner in the demonstration project did this exact kind of BVLOS inspection in Europe. We want to work with the FAA to get projects like this green-lighted.

During this time, we are working with others in the industry through the Electric Power Research Institute (EPRI) to undertake research on multiple UAS use cases. We want to be ready when more regulatory flexibility is available to use this new technology to the fullest benefit of our customers. This research includes BVLOS uses as well as possible uses for drones to take measurements from and make repairs on electric infrastructure. As mentioned before, the uses for this new technology are very broad.

Drones are a game-changing technology for companies like Southern. The use and usefulness of drones only will continue to grow. Congress and the FAA have the power to control that growth. In closing, I urge Congress and the FAA to continue to pursue policy that allows for the safe integration of UAS into the National Airspace. Of particular importance, we call on FAA to finish the guidance and rulemakings called for in the 2016 FAA bill, and to work with end users like my company to use Part 107 waivers to advance drone technology while continuing work on the next phase of regulation. For the benefit of millions of American electric and natural gas customers, we encourage Congress and the Administration to move forward swiftly and safely.

Testimony of

William Goodwin

General Counsel, AirMap

Before the

House Transportation & Infrastructure Committee

Subcommittee on Aviation

Hearing on

"Unmanned Aircraft Systems: Emerging Uses in a Changing National Airspace"

November 29, 2017

Chairman LoBiondo, Ranking Member Larsen, and Members of the Committee, it is a pleasure to speak with you about the emerging uses of unmanned aircraft systems (UAS) in the changing national airspace.

I am the General Counsel of AirMap, the world's leading airspace management platform for drones. We are building and improving unmanned traffic management solutions that currently help millions of drones fly safely.

To realize the full economic benefit and efficiencies that drones can provide we must continue to challenge our own assumptions about airspace and airspace management. Leaders within the Administration, such as Michael Kratsios, Elaine Chao, Michael Huerta, Earl Lawrence and Parimal Kopardekar (PK), are working as change agents promoting a spirit of innovation and collaboration between government and business.

See Appendix A (UTM)

Internationally, countries are competing with the United States to integrate drones into their airspace more quickly. Other countries' openness to experimentation has accelerated into regulatory action and standards-setting that threatens to leave American businesses behind. We have no choice but to work harder and faster to safely integrate drones into the U.S. national airspace.

In this testimony, I will provide you with 1) examples of how the U.S. national airspace is evolving to accommodate drones, 2) AirMap's experience in other countries that are accelerating drone integration, and 3) recommendations for U.S. policy to build on recent progress in the United States.

U.S. Airspace Innovations

In the United States, AirMap has been working at the federal, state, local, and tribal government levels to help adapt the airspace to safely integrate drones.

Low Altitude Authorization and Notification Capability

Recently, the Federal Aviation Administration (FAA) certified AirMap and Skyward as LAANC providers to grant instant authorizations to operate in restricted airspace that has been identified as safe for low-altitude drone operations. This program is called the Low Altitude Authorization and Notification Capability or LAANC program. Prior to LAANC, it could take up to 90 days to secure an authorization to operate in restricted airspace. The AirMap LAANC solution is active at 49 airports through 10 FAA air traffic control facilities. AirMap has already granted more than 500 approved authorizations in the U.S. national airspace. LAANC creates the first building block to a full UTM network.

Learn more at airmap.com/laanc or see Appendix B (LAANC)

Kansas UTM Pilot

Another example of AirMap's work to enable expanded drone operations in U.S. airspace is our partnership with the State of Kansas, a leader in aerospace innovation. We worked closely with the Kansas Department of Transportation to develop and deploy UTM technology across the state to speed the integration of drones. As a part of this project, Kansas will use AirMap's platform to communicate local, safety-critical information to drone operators, including other drone operations, manned aircraft operations, wildfire locations, and major events on the ground.

Learn more at airmap.com/kansas or see Appendix C (Kansas Case Study) and Appendix D (First Responder Activity)

Hurricane Response

AirMap technology also assisted in managing the U.S. national airspace in the response to Hurricanes Harvey and Irma. In the aftermath of each hurricane, the FAA restricted drone operations in the recovery area. AirMap supported vital hurricane response efforts by providing the local Emergency Operations Center (EOC) with a dashboard that allowed incident commanders to plan and observe their missions, deconflict manned and unmanned air assets, and communicate directly with their teams. AirMap provided essential airspace intelligence services including weather data, infrastructure locations, and manned traffic alerts, to ensure emergency operators' manned and unmanned assets remained safe while conducting search and rescue and surveying efforts.

See Appendix E (Hurricane Response)

Drone Integration Pilot Program

Finally, the UAS Integration Pilot Program announced by President Trump and implemented by FAA on November 2nd is expected to open the floodgates to expanded drone operations. By

leveraging the insights and expertise of state, local, and tribal governments into their low-altitude airspace, the UAS Integration Pilot Program will create numerous laboratories of innovation. This program is expected to enable package delivery, beyond visual line of sight operations, and flights over people, as well as accelerate the testing of enhanced human mobility. AirMap is assisting state, local, and tribal governments prepare applications that manage the safety of expanded operations in their areas of jurisdiction, while providing solutions to commercial partners through our developer platform and manufacturer integrations.

Learn more at airmap.com/ipp/ or see Appendix F (Developer Platform)

International Airspace Innovations

Outside the United States, other countries are working hard to integrate drones at a faster rate and, in some cases, are succeeding. Unfortunately, there are still reasons that companies need to go overseas to conduct transformative drone work today. AirMap is working with other international partners to deliver UTM solutions next year that may take the United States until 2021 or later to achieve, absent Congressional action.

See Appendix G (Timeline)

Japan

Two years ago, Japanese Prime Minister Shinzo Abe committed the Japanese government to enabling drone deliveries as early as November 2018. To enable these deliveries, he directed his government to form public-private councils to collaborate and review drone regulations. Thanks in part to his leadership, commercial drone delivery already exists in limited form and is expected to expand over the course of next year. In a joint venture with Rakuten, Japan's largest e-commerce company, AirMap is providing airspace management capabilities to enable expanded drone operations.

Learn more at airmap.com/rakuten or see Appendix H (Rakuten)

Switzerland

In September 2017, in Geneva, Switzerland, AirMap participated in a robust demonstration of U-space. Defined by SESAR J.U., the Single European Sky ATM program, U-space is a collaborative effort to enable situational awareness, data exchange, and digital communication for the drone ecosystem, much like the UTM initiative in the United States In partnership with skyguide, SITAONAIR, senseFly, Intel, px4, and AirMap, and with support from FOCA and GUTMA, Switzerland demonstrated an operational UTM system, including registration, authentication, ATC integration and approval, dynamic flight planning, and real-time geofencing.

In missions flown by senseFly's albris and eBee Plus drones and a drone with a pre-programmed Intel / PX4 flight controller, partners demonstrated how drones can be easily announced to the air navigation service provider through e-registration and e-identification. AirMap provided integration with air traffic control, managed flight plans and enabled electronic airspace authorizations. Additional technology was used to transmit live telemetry of drones and

manned-aviation over LTE through the ground control stations to inform drones and drone pilots of manned aviation traffic as well as dynamic updates of airspace restrictions related to rescue helicopter missions. Finally, ATM radar feeds were made available to the UTM system though technology powered by AirMap. This has since enabled BVLOS missions for package-delivery over densely populated areas.

The entire demonstration occurred over and around Lake Geneva, in close proximity to Geneva Airport in some of the most complex and sensitive airspace in Switzerland. This successful U-space demonstration is a model for UTM around the world, proving that the air navigation services are available today and ready for the next stage of drone integration worldwide.

Learn more at airmap.com/u-space or see Appendix I (U-space)

Recommendations

There are three things Congress can do to accelerate the safe integration of drones into the complex U.S. national airspace:

First, Congress should expedite and prioritize the establishment of an operational UTM system by 2020. UTM is necessary for expanded operations, such as package delivery and beyond visual line of sight operations. Congress should expand on Section 2208 of the FAA Extension to support the leaders within NASA and FAA that are developing a national, federated UTM network. Congressional action with clear direction, mandatory deadlines, and consistent oversight is the only way to ensure that our infrastructure and agencies keep pace with innovation. Without Congressional action, America will fall behind other nations and businesses will cast their eyes abroad.

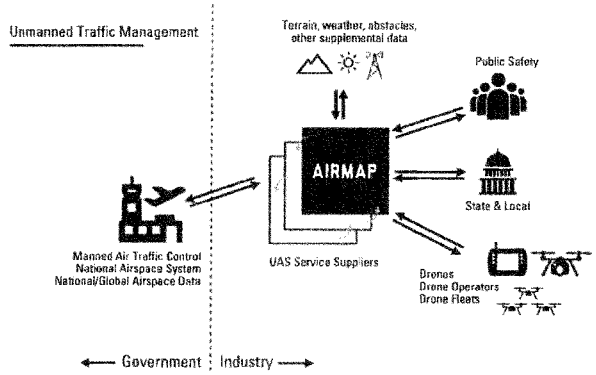
Second, Congress should apply support and resources towards the FAA's UAS Integration Pilot Program to leverage state, local, and tribal governments to enable expanded drone operations. Congress should ensure that FAA has all the necessary authority to waive regulations to allow local authorities to authorize expanded operations that can be conducted safely within geographically defined areas. Congress should ensure that the UAS Integration Pilot Program serves as a permanent pathway for the United States to enable an unlimited number of expanded operations by using state, tribal, and local governments as laboratories of innovation.

Third, Congress should ensure that a remote identification and tracking system based on licensed spectrum is established to enable nationwide expanded drone operations. Remote identification and tracking is an essential component to ensure responsible operations and serves as another building block to an operational UTM network.

Thank you again for convening this hearing to discuss the exciting emerging uses of drones across the United States and abroad. We appreciate the committee's leadership on these critical issues and believe that working together we will ensure that the United States remains a leader in drone innovation.

Appendix A: Unmanned Traffic Management (UTM)

OBJECTIVE: AirMap is a UTM Service Supplier (USS), collaborating with regulators and industry partners to develop the infrastructure to enable the safe integration of drones into the national airspace system.
IN COLLABORATION WITH: NASA, the Federal Aviation Administration, Rakuten
STATUS: AirMap is part of NASA and the FAA's ongoing research in data exchange, remote command control, beyond visual line-of-sight operations, telemetry, and deconfliction.



Situational Awareness
The AirMap UTM platform allows drone manufacturers like DJI, Sensefly, and Intel to deliver AirMap's airspace information and services to their end users directly from the drone's flight control software.

Real-Time Deconfliction
AirMap partners with the FAA for RTCA DO-200A aviation data and PASSUR, the aviation intelligence provider trusted by airlines and airports worldwide, to deliver real-time collision avoidance capabilities to drones.

Remote Identification
The AirMap platform includes a suite of security solutions for remote identification, encrypted communications, and the protection of critical infrastructure for the safe integration of drones worldwide.

Route Optimization
Today, millions of drones rely on AirMap's airspace data to navigate safe and efficient routes, including controlled airspace, nearby traffic, temporary flight restrictions, local weather, and more.

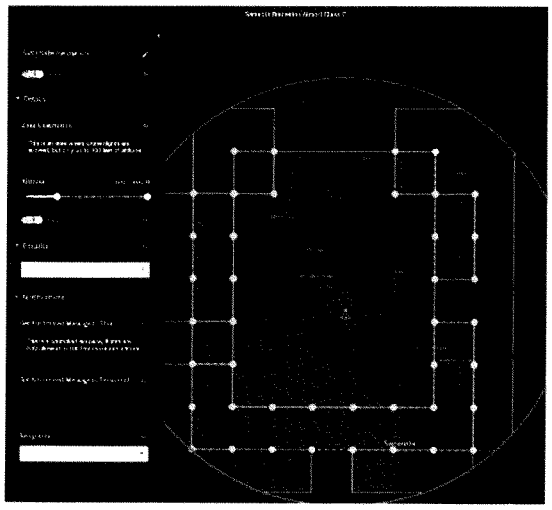
Automated Airspace Authorization
AirMap's notice and authorization technology empowers airspace authorities to automate authorization when conditional requirements are met and to interact directly with operators in real time.

Dynamic Geofencing
AirMap makes it easy for drone manufacturers to incorporate geofencing and authorized unlocking directly into a drone's firmware. For example, the DJI GEO flight control app is powered by AirMap to provide the safest operating environment possible.

AIRMAP
www.airmap.com

Appendix B: Low-Altitude Authorization & Navigation Capability (LAANC)

OBJECTIVE: Propose and develop an easy and reliable digital system for providing authorized access to controlled airspace areas for commercial drone operations.
IN COLLABORATION WITH: The Federal Aviation Administration
STATUS: AirMap is one of the selected industry partners working directly with the FAA to demonstrate operational LAANC to advance commercial drone operations and decrease administrative workload.

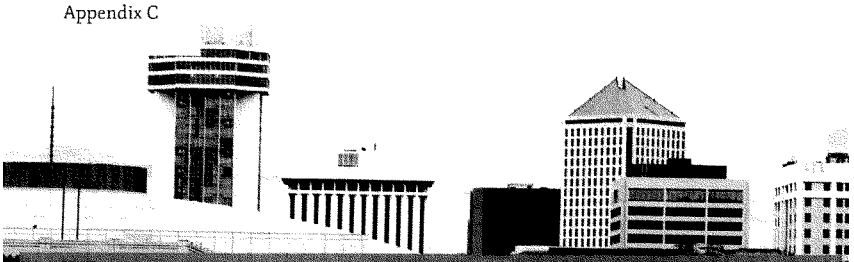


Low-Altitude Authorization and Notification Capability (LAANC) describes a digital system that allows for the instant authorization of commercial drone operations in controlled airspace by third party UTM Service Suppliers (USS) like AirMap based on contextual airspace rules designated by the Federal Aviation Administration. LAANC authorizes commercial flight plans taking place in controlled airspace that match up to ATC-approved airspace grids that are identified as low-risk or pre-approved for drone flight

LAANC streamlines and digitizes the current authorization process for commercial operations in controlled airspace. Today, FAA authorization is a manual process that takes up to 90 days. With LAANC, authorization is automatic and instantaneous. LAANC drives efficiency while removing the need for administrative work by human resources.

AIRMAP
www.airmap.com

Appendix C



CASE STUDY

Kansas Department of Transportation launches statewide "unmanned traffic management" initiative to support commercial drone operations

A new collaboration between the **Kansas Department of Transportation (KDOT)** and airspace management platform **AirMap** is deploying technology for unmanned traffic management, or UTM, across the state of Kansas.

The initiative will create a digital infrastructure capable of communicating local, safety-critical information to drone operators about conditions in the surrounding airspace and on the ground. By implementing technologies that will one day be part of a nationwide UTM framework, Kansas is the first U.S. state to take a proactive approach to protecting the privacy, safety, and security of Kansas residents - while empowering drone entrepreneurship statewide.

According to PricewaterhouseCoopers, commercial drones will create more than $127 billion in economic benefits and 100,000 jobs over the next several years – presenting tremendous opportunities for Kansas and other U.S. states. The KDOT-AirMap partnership will foster a thriving drone economy with the potential to contribute billions in economic impact and create thousands of jobs in the state.

The KDOT-AirMap partnership will make the AirMap platform available to state agencies, airports, and colleges and universities, deploying technology that is capable of:

- Delivering safety-critical information from state and local agencies to drones for situational awareness and flight planning
- Facilitating collaboration, communication, and data exchange between state and local authorities and drones and their operators
- Fostering public awareness about drone regulations and airspace requirements
- Automating airspace notification and authorization at Kansas airports
- Demonstrating sophisticated solutions that safeguard public safety and personal privacy, including technologies for geofencing and remote identification
- Enabling high-scale and complex operations beyond visual line of sight

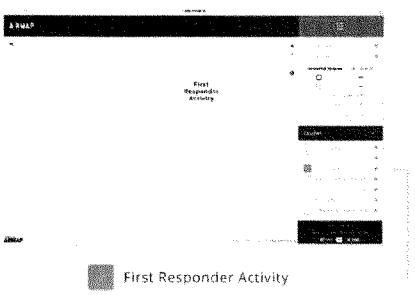
The UTM initiative represents the next step in Kansas' long history of aviation innovation, allowing the state to mobilize drones for disaster recovery, search and rescue, agriculture, construction, package delivery, and other community benefits.

By opening Kansas skies for sophisticated drone operations and deploying AirMap airspace management technology across the state, Kansas will be uniquely positioned to capture a significant share of the drone opportunity.

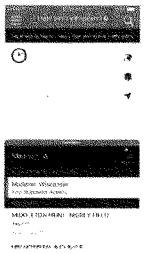
AIRMAP www.airmap.com

Appendix D: First Responder Activity

OBJECTIVE: Empower drone operators to plan safer routes and ensure that flights do not interfere with the efforts of firefighters and emergency responders.
IN COLLABORATION WITH: U.S. Department of the Interior and 2,100 U.S. Communities
STATUS: Thousands of drone operators receive real-time information about nearby first responder activities today through the AirMap app for Android, and iOS.



First Responder Activity



Madison, Wisconsin
First Responder Activity

Wildfires

AirMap makes FAA-published temporary flight restrictions available to millions of drone operators. However, the vast majority of wildfires start and spread faster than the time it takes to communicate and post the hazard.

In July 2016, the U.S. Department of the Interior partner with AirMap to wildfire information from the Department's s incident command system as it happens and immediately push it to drone pilots through AirMap's iOS, Android and web apps, AirMap's API, and the GEO geofencing system in the DJI GO flight control app.

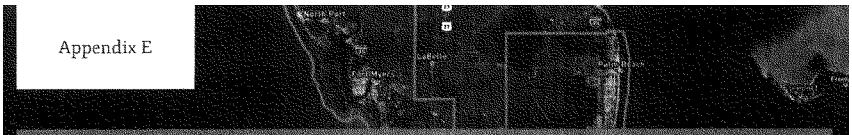
First Responder Activity

AirMap also enhances situational awareness for drone pilots and safety for everyone through the availability of First Responder Activity, which provides data about fires, electrical and gas hazards, medical emergencies, tornados, tsunamis, rescue operations, and more.

Drone operators can see first responder activity from more than 2,100 U.S. communities. For safety and security of first responders, the exact location and category of emergency is not disclosed to drone pilots. Drone operators use this information to plan safer routes that won't interfere with the efforts of firefighters and emergency responders – prohibited by law in most states.

AIRMAP
www.airmap.com/first-responder-activity

Appendix E



CASE STUDY

AirMap deploys unmanned traffic management in Texas and Florida to support Hurricane Harvey and Hurricane Irma relief efforts

The United States experienced one of the most devastating hurricane seasons on record in 2017. Hurricanes Harvey and Irma were category four storms that left destruction across communities in Texas and Florida.

In the aftermath of Hurricane Harvey, the FAA issued a disaster TFR (temporary flight restriction), charging the Texas Emergency Operations Center (EOC) with managing the local airspace during disaster relief efforts. Both manned and unmanned (drones) aircraft became essential components to these efforts. AirMap supported vital response efforts by providing a dashboard that allowed incident commanders to visualize and manage their airspace.

In the wake of Hurricane Irma, AirMap worked with the same team of emergency operators deployed on behalf of the State of Florida and provided them with the same airspace management services.

AirMap provided essential airspace intelligence services including weather data, infrastructure locations, and manned traffic alerts, to ensure emergency operators' manned and unmanned assets remained safe while conducting search and rescue and surveying efforts. This intelligence was visualized on a screen which allowed the EOCs to monitor and manage where their teams were operating. AirMap's technology provided the Florida and Texas EOCs with the information required to plan and observe their missions, deconflict manned and unmanned air assets, and communicate directly with their teams.

How did AirMap help?

AirMap provided the Texas and Florida teams with an airspace management dashboard and airspace intelligence services that allowed them to:

- Create flights and provide notice of intended flight to command centers
- Accept flight notices by relief operators active in disaster TFR areas
- Visualize and monitor hundreds of flights being conducted by the EOC to support relief efforts
- Remain abreast of manned aircraft traffic and unmanned flights submitted through AirMap within the TFR
- Notify drone operators logging flights with AirMap that they had entered airspace covered by a disaster TFR managed by the EOC
- Contact drone operators who were flying in violation of the TFR and urge them to keep their UAS grounded until the TFR was lifted

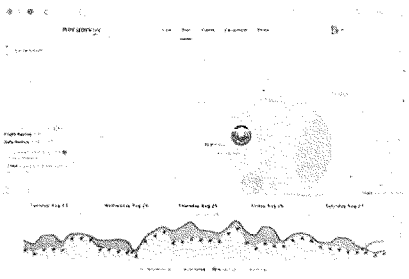
By providing the EOCs with a suite of tools and and an airspace management dashboard, AirMap helped support safe and efficient relief efforts that we hope to replicate for emergency operators across the country.

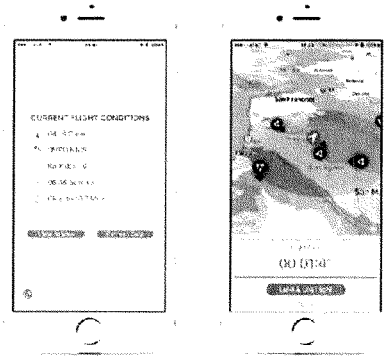
"Essentially, every drone that flew meant that a traditional aircraft was not putting an additional strain on an already fragile system. I don't think it's an exaggeration to say that the hurricane response will be looked back upon as a landmark in the evolution of drone usage in this country."

FAA Administrator Michael Huerta
"InterDrone" Speech, Las Vegas, NV
September 6, 2017

Appendix F: Developer Platform

OBJECTIVE: Empower the hundreds of innovators that are building software for drones, apps, and the Web with easy-to-use APIs and SDKs for complete airspace intelligence.
IN COLLABORATION WITH: Hangar, Kittyhawk, DroneLogbook, KnowBeforeYouFly, DroneDeploy, ANRA Technologies, Hover, NVDrones, the Intel Aero Platform, AeryonLabs, and more.
STATUS: More than 300 developers are building tools for drones on the AirMap platform.





Status API
Is it safe to fly? Integrate AirMap's low-altitude airspace intelligence platform into third party software to inform end users of airspace requirements, including advisories, and notice requirements.

Airspace API
Bring AirMap's robust, trustworthy, and accurate low-altitude airspace intelligence to your software. Includes RTCA DO-200A data as well as information about critical infrastructure, obstacles, weather, TFRs, and more.

Flight API
Empower end users to create and query flights, verify that flight requirements are met, and provide digital notice to or request authorization from designated airspace authorities.

Pilot API
Let end users manage their pilot profile, including contact details, registration number, and preferences, and verify pilot identity for added security.

Aircraft API
Includes metadata about a pilot's drone, including manufacturer, model, weight, speed, performance, and type.

Maps API
Customize the look/style of your AirMap-powered application with a TileJSON spec for use with Mapbox GL.

Platform SDKs
AirMap makes it easy for software developers to get up and running with interactive airspace data for applications built for Javascript, Android, iOS, & Apple Watch.

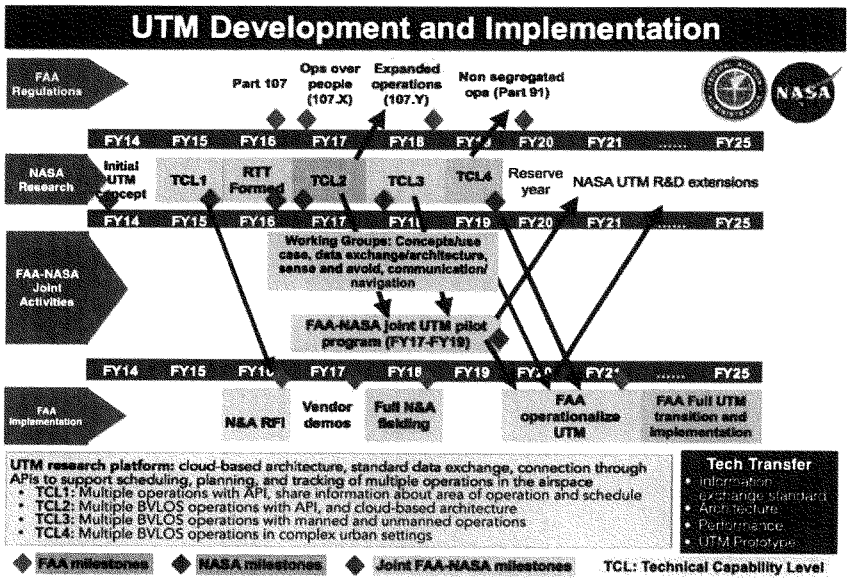
AIRMAP
www.airmap.com/developers

Appendix G: Timeline

OBJECTIVE: Develop and operationalize a complete UTM infrastructure for the safe integration of drones for VLOS and BVLOS operations into the national airspace system.

STATUS:

- 2017: Airbus to begin flying car trials.
- 2018: Rakuten Sora Raku to begin regular drone deliveries in Japan.
- 2025: Federal Aviation Administration to complete UTM transition and implementation.



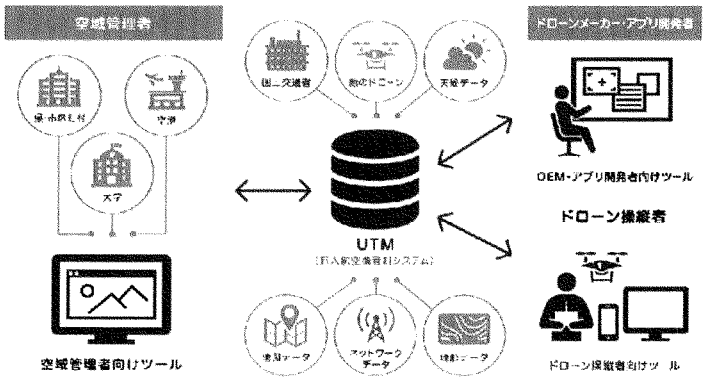
The diagram above outlines NASA and the FAA's proposed timeline for the full development and implementation of Unmanned Traffic Management (UTM), with complete UTM implementation planned for 2025.

Important progress has been made towards critical UTM milestones, and AirMap continues to be a partner in the NASA-FAA UTM project, testing UTM technologies and participating in the development of UTM standards.

Airbus is projected to begin flying car trials in 2017 and companies across the drone ecosystem, including AirMap, are already offering technologies for UTM. U.S. regulators have the opportunity to harness innovation to realize a fully operational UTM system in alignment with progress industry-wide.

Appendix H: Rakuten AirMap, Inc.

OBJECTIVE: Bring Unmanned Traffic Management (UTM) solutions to Japan to support and empower drone ecosystem for economic development.
IN COLLABORATION WITH: Rakuten
STATUS: Launched Rakuten AirMap, Inc., joint venture in March 2017 to serve Japan's growing drone ecosystem.



BVLOS Flights
Solutions to help Japan's regulators open the skies for drones, even in "densely inhabited districts" where drone flight is currently prohibited. Rakuten AirMap Inc. helps commercial drone operators fly safely and securely beyond visual line of sight in a variety of environments, from rural agricultural sites to densely populated urban areas in major cities.

Drone Delivery
Rakuten launched its Sora Raku Rakuten Drone delivery service in April 2016, including a successful LTE-powered test with support from Chiba City and NTT Docomo. Rakuten AirMap's UTM platform will support airspace managers seeking to open surrounding airspace for drones and innovations like drone delivery by 2018.

Airspace Authorization
Designate sensitive areas requiring authorization before flight. Airspace managers – which in Japan includes owners of critical infrastructure, universities, airports, municipal governments, and other stakeholders – can specify digital authorization requirements, accept digital flight notices, and communicate safety-critical information directly to drones and drone operators in real time.

Situational Awareness
Delivering real-time airspace intelligence to recreational and commercial drone operators in Japan. Drone pilots rely on the Rakuten AirMap UTM platform to learn about the rules and condition in their flight area, create flight plans, and share them with nearby airports, authorities, and other stakeholders.

AIRMAP
www.airmap.com/rakuten

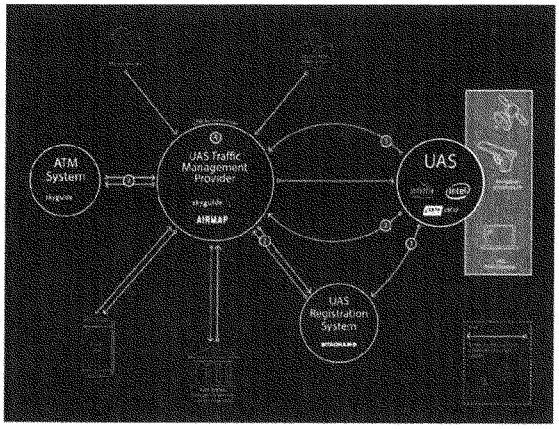
Appendix I: U-space Demonstration

OBJECTIVE: Provide U-space (UTM) services, including flight planning, geofencing before and during flight, tracking, and live telemetry, during three live drone missions in Europe's first live demonstration of U-space (UTM) capabilities.

STATUS: In September 2017, Skyguide, AirMap, SITAONAIR, senseFly, Intel, and PX4 demonstrated how drones can be safely, efficiently integrated into existing airspace infrastructure in urban environments.

ADVANTAGES:

- U-space (UTM) capabilities are available today, ahead of SESAR's anticipated 2019 delivery.
- U-space (UTM) can be replicated in other cities and countries worldwide.
- Supported by existing and competitive ecosystem of hardware and software providers.
- Provides dynamic situational awareness of low-altitude airspace in urban environments.



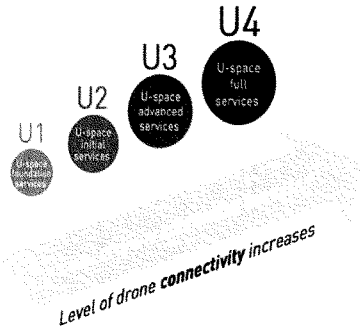
The European Commission expects that the global marketplace for unmanned aircraft or drones will create more than 10 billion Euros in economic impact each year by 2035. U-space is a set of new services and procedures designed to support safe, efficient, and secure access to airspace for a large numbers of drones.

Defined by SESAR J.U., the Single European Sky ATM program, U-space ensures the smooth operations of all categories of drones, all types of missions and all drones users in all operating environments. Much like the U.S. "Unmanned Traffic Management" initiative, U-space is a collaborative effort to enable situational awareness, data exchange, and digital communication for the drone ecosystem. U-space provides not only the framework for routine drone operations, but also an effective interface to manned aviation, ATM/ANS service providers, and authorities. The services are based on a high level of digitilization and automation, on board the drone itself or on the ground.

AIRMAP

www.airmap.com/u-space

Appendix I: U-space Demonstration (cont.)



Levels of U-space services based on increasing levels of technological capability are as follows:

U1: U-space foundation services provide e-registration, e-identification and geofencing.

U2: U-space initial services support the management of drone operations and may include flight planning, flight approval, tracking, airspace dynamic information, and procedural interfaces with air traffic control.

U3: U-space advanced services support more complex operations in dense areas and may include capacity management and assistance for conflict detection. The availability of automated DAA functionalities, in addition to more reliable means of communication, will lead to a significant increase of operations in all environments.

U4: U-space full services, particularly services offering integrated interfaces with manned aviation, support the full operational capability of U-space and will rely on very high level of automation, connectivity, and digitalization for both the drone and the U-space system.

In September 2017, project partners performed a live demonstration of **U1** and **U2** services. In three live missions flown by senseFly's albris and eBee Plus drones and a drone with pre-programmed Intel / PX4 flight controller, partners demonstrated how drones can be easily announced to the air navigation service provider through e-registration and e-identification. AirMap provided integration with ATC, managed flight plans and enabled electronic airspace authorizations. Additional technology was used to transmit live telemetry of drones and manned-aviation over LTE through the ground control stations to inform drones and drone pilots of manned aviation traffic as well as dynamic updates of airspace restrictions related to rescue helicopter missions. ATM radar feeds were made available to the UTM-system though technology powered by AirMap. This enabled BVLOS missions for package delivery over densely populated areas.

The successful U-space demonstration in Geneva, Switzerland, is a model for UTM around the world, proving that the air navigation services are available today and ready for the next stage of drone integration worldwide.

Hon. Daniel Lipinski, a Representative in Congress from the State of Illinois, Questions for the Record to William Goodwin, General Counsel, AirMap

2. Airspace management technology

QUESTION: Mr. Goodwin: I understand AirMap recently entered into a contract with the State of Kansas through which you provided unmanned traffic management technology.

The Drone Federalism Act in the Senate and the Drone Innovation Act in the House would provide new authority to states and cities to regulate UAS operations below 200 feet. As I'm sure you are aware, concerns have been expressed that this approach will lead to a confusing and inconsistent patchwork of local laws, and therefore a less safe operating environment.

Should such legislation be enacted, from an implementation standpoint, do you believe that states or cities have the technological capabilities to manage the airspace themselves, or would they need seek partnerships to support airspace management (like in Kansas)?

If so, how would you envision those agreements being structured?

Would services be provided for free as a public good or would there be a cost to states and localities?

RESPONSE: States and cities play an important role in manned aviation and will be required to play a role with unmanned aviation. In AirMap's experience, we have seen that safe commercial drone operations only happen in high volumes when all levels of government are working together.

Consider the analogy of comparing the relative space of planes and automobiles. In the automotive space, states and cities create time, manner, and place rules with respect to automobiles. States and local governments set speed limits. States and local governments may make a street walkable, like where AirMap is headquartered in Santa Monica, California, so no cars are allowed at all. States and local governments may prohibit trash trucks from residential neighborhoods in the middle of the night. Most people believe these are reasonable rules that do not necessarily impede effective commercial activity.

And all of those rules are available in real time through common apps, like Waze, which are dynamic and can tell a driver when he or she is speeding, for example.

Comparing the volume of activity that engenders, the FAA Air Traffic Organization provides service to more than 42,000 flights a day, which is a significant economic benefit to the country. But, the Department of Transportation estimates that there are 1.1 billion car trips per day that are handled by state and local regulators. On a relative scale, that should not be considered a burdensome regulatory framework, but instead a highly valuable economic activity.

Hon. Daniel Lipinski, a Representative in Congress from the State of Illinois, Questions for the Record to William Goodwin, General Counsel, AirMap

QUESTION: Do you believe that states or cities have the technological capabilities to manage the airspace themselves, or would they need to seek partnerships to support airspace management (like in Kansas)?

RESPONSE: In the last two months, the FAA certified AirMap as one of two original providers of the Low Altitude Authorization and Notification Capability (LAANC) program. With this program, the FAA has established a public-private partnership that allows for airports and government to partner with industry to surface and automate important information for drones.

For expanded drone operations, an unmanned traffic management (UTM) network is necessary. A UTM framework has been developed jointly by NASA and FAA and is envisioned as a federated network in states or regions. As with LAANC, a UTM network will help improve safety and generate economic growth by enabling expanded drone operations. Section 2208 of the FAA Extension, Safety, and Security Act of 2016 (Public Law 114-190) included bipartisan language that required NASA and FAA to create a research plan and a pilot program for UTM development.

A UTM network will ensure that state and local governments have access to the technological capabilities to manage drone operations in its jurisdiction.

QUESTION: If so, how would you envision those agreements being structured? Would services be provided for free by contractors as a public good or would there be a cost to states and localities?

RESPONSE: The FAA UAS Integration Pilot Program is a prime mechanism to test different models that will allow state, local and tribal governments to access the necessary UTM services they need to enable expanded drone operations. As in manned aviation, expanded aviation operations will require government and technology companies to work together. We have seen success with the public-private partnership model that the FAA established with the LAANC program. We have been involved in variations on a public-private partnership model through our work domestically with cities and states and overseas with Air Navigation Service Providers (ANSPs) and other governmental entities.

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

U.S. House of Representatives
Committee on Transportation and Infrastructure
Subcommittee on Aviation
"Unmanned Aircraft Systems: Emerging Uses in a Changing National Airspace"
November 29, 2017

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

Many of our members are exploring new and expanded ways that unmanned aircraft systems (UAS) of all shapes and sizes can help American businesses and individuals across the United States realize the potential of this technology. My comments today will focus on emerging uses for UAS in the National Airspace as we seek to take the industry higher and farther.

From inspecting pipelines and newsgathering to inspecting critical infrastructure during disasters such as Hurricanes Harvey, Irma and Maria, UAS help save time, save money and, most importantly, save lives. It is no wonder why thousands of businesses – small and large – have already embraced this technology, and many more are considering integrating UAS into their future operations.

For years, AUVSI has been urging the FAA to use all available means to establish a regulatory framework for UAS. And now, we have initial regulations governing civil and commercial UAS operations. On August 29, 2016, the FAA implemented the small UAS rule, also known as Part 107. The rule was the result of years of collaboration between government and industry that established a flexible, risk-based approach

to regulating UAS. This regulatory framework helped reduce many barriers to low-risk civil and commercial UAS operations, allowing businesses and innovators to harness the tremendous potential of UAS and unlock the many economic and societal benefits the technology offers.

The demand for commercial UAS has since exploded. As of September 2017, more than 79,000 platforms have been registered for commercial use and currently, more than 66,000 remote pilots have been certified to fly in the United States. The FAA expects more than 400,000 UAS to be flying for commercial purposes over the next five years, which is a five-fold increase from today.

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

To date, the FAA has granted more than 1,300 waivers for expanded operations under Part 107. An AUVSI analysis of the first 1,000 found that companies in 47 states are already taking advantage of the process to operate at night, as well as to operate in certain airspace, beyond line of sight and over people. More than 90 percent of these are small businesses with fewer than 10 employees. The FAA has granted about 74 percent of the waivers to operators who had not previously flown UAS under the Section 333 exemption process, demonstrating how having regulations and rules in place has helped increase the adoption of this emerging technology. High profile use of these waivers includes this year's Super Bowl halftime show, which featured an aerial light show made possible by Intel's waivers to operate multiple UAS at night. BNSF Railway also received a waiver to conduct inspections of its sprawling rail network beyond line of sight.

Much has been accomplished so far because government and industry have banded together to advance UAS. The collaborative process in which we have engaged, and the goals we share of supporting innovation and ensuring the safety of the national airspace, have made for a working relationship that is defined by both productivity and mutual respect. This has led to a more flexible and nimble approach to regulating UAS as well as to more businesses adopting the technology. The Unites States was once falling behind the rest of the world in embracing UAS; now our country is leading the way.

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

Facilitating interstate commerce is the responsibility of the federal government, but government investments in infrastructure didn't originate solely from a sense of obligation; it came from necessity coupled with vision and an embrace of what's possible. Technology is advancing at lightning speed, especially in the realm of UAS. The promise of UAS is not held back by innovation, imagination or technology, but by a lack of regulatory clarity.

We need a new national imperative in unmanned systems that, like the air traffic control system and interstate highway system before it, creates greater capacity, fulfills consumer demand and facilitates the future of commerce. Industry is bringing the technology; government needs to do more to support it and advance innovations.

Part 107 and its waiver process were just the first steps in creating a regulatory framework for UAS integration into the airspace. There is still a high and, as yet, unmet demand for expanded UAS operations that will pave the way for these future innovations. An economic analysis by AUVSI projects that the expansion of UAS technology will create more than 100,000 jobs and generate more than $82 billion to the economy in the first decade following integration into the national airspace. After witnessing the growth of the industry over the last few years and now with Part 107 in place, these figures could be even higher under the right conditions.

These "right conditions" will require a regulatory framework that incorporates rules for expanded uses such as nighttime operations and flights over people. However, this progress has been delayed while stakeholders assess whether the right accountability measures are in place as more users gain access to this technology.

UAS registration, for instance, is strongly supported by the national security community. AUVSI has also

long supported a registration system for commercial and recreational UAS operators. We believe that a UAS registration system promotes responsibility by all users of the national airspace and helps create a culture of safety that deters careless and reckless behavior. We are glad Congress recently restored UAS registration for recreational operators as part of the National Defense Authorization Act. This was an expedient way to resolve a sensitive matter across the UAS operator community, but this piecemeal approach to solving issues regarding both commercial and recreational operators may slow progress and hinder efforts to move the industry forward. It may therefore be necessary for Congress to reevaluate the role of Section 336 – the Special Rule for Model Aircraft that was part of the FAA Reauthorization Act of 2012 –to address security concerns and streamline the process for future regulations, such as those governing remote identification standards.

Additionally, Congress must appropriately fund the FAA so it can meet the employment and staffing needs required for the future, including the federal rulemaking processes for UAS integration. Equally as important is additional federal investment to update the FAA's information technology infrastructure. This will allow the agency to automate its UAS processes in collaboration with industry to meet the growing demand for UAS services and enhance the safety and security of the national airspace.

Congress and the FAA must also engage state and local governments in conversations regarding UAS regulations. Maintaining federal sovereignty of the airspace keeps our skies safe and helps foster innovation, but soliciting input from non-federal bodies such as states, municipalities and tribal governments will be integral to moving federal regulations forward. The White House's recent announcement of a UAS Integration Pilot Program is a positive step in that direction. It represents an opportunity for these state and local governments to collaborate with the UAS industry and the FAA to further develop a federal policy framework for integrating UAS into the skies above communities across the nation.

The pilot program will offer a data-driven approach to allow for expanded UAS operations, including beyond line of sight, and UAS traffic management concepts. Importantly, it will also provide a mechanism for state, local and tribal officials to contribute their views to the UAS policy framework, without infringing on the U.S. government's jurisdiction over the national airspace.

Of course, the UAS industry is not relying on the FAA and government alone to advance this technology.

Industry currently shoulders many of the research and development costs to spur innovation, finding solutions to make UAS fly higher and farther, more safely and efficiently.

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

The RTCA's Drone Advisory Committee (DAC), of which I am a member, also provides a key forum for the FAA and industry to work together to "facilitate the resolution of issues affecting the efficiency and safety of integrating UAS into the NAS."[1] Through its Drone Advisory Subcommittee and three Task Groups, the DAC is working to provide consensus-based recommendations to the FAA. I am also honored to represent the UAS community on the FAA Management Advisory Council (MAC), where I provide input to the FAA on policy and regulatory matters relating to all aviation matters. These important collaborative measures will continue to be important to the growth and security of the UAS industry.

Industry-government collaboration on outstanding issues will be necessary as we work towards further UAS integration, to include platforms above the small UAS threshold and in higher altitudes. This will require dialogue between industry stakeholders and additional federal agencies, such as NASA and DoD, and will help ensure a holistic approach to airspace integration.

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

Before I conclude, I want to take a moment to offer the UAS industry's thanks to Chairman LoBiondo, who

[1] https://www.rtca.org/content/drone-advisory-committee

recently announced that he would retire at the end of this term. The Chairman was one of the earliest champions of unmanned aircraft systems on Capitol Hill, and in his district in southern New Jersey, which has become an important center for UAS research and development thanks to work at the FAA Technical Center. He has been a tireless advocate for the UAS community, supporting policy that has helped expand the adoption of commercial UAS across dozens of business sectors. We look forward to working with Chairman LoBiondo and the rest of this subcommittee in the coming year to continue to move the UAS industry forward and spur economic and job growth for the nation through a long-term FAA reauthorization measure.

Thank you, again, for the opportunity to speak today. I look forward to answering any questions from the committee's members.

QUESTIONS FOR THE RECORD

RESPONSES ON BEHALF OF BRIAN WYNNE
PRESIDENT AND CEO, ASSOCIATION FOR UNMANNED VEHICLE SYSTEMS INTERNATIONAL

U.S. House of Representatives
Committee on Transportation and Infrastructure
Subcommittee on Aviation
"Unmanned Aircraft Systems: Emerging Uses in a Changing National Airspace"
November 29, 2017

Questions Submitted on Behalf of Congressman Jason Lewis (MN-02)

1. **In your oral testimony, you agreed that state, local, and tribal governments have a role to play using their police powers. In light of that, can you clarify and describe how the Association for Unmanned Vehicle Systems International (AUVSI) envisions these levels of government creating and enforcing temporary flight limitations or restrictions using their traditional powers?**

The United States benefits from the safest airspace system in the world. This is largely thanks to uniform federal aviation regulations and restrictions. Maintaining consistent regulations keeps our skies safe and helps foster innovation. This authority resides and must continue to reside with the Federal Aviation Administration (FAA). AUVSI also recognizes the need for non-federal bodies such as states, municipalities and tribal governments to play a role in developing that federal framework.

The White House's recent announcement of the UAS Integration Pilot Program (UAS IPP) is a positive step for that effort. This pilot program represents an opportunity for state, local, and tribal governments to collaborate with the UAS industry and the FAA to further develop a federal framework for integrating UAS into the skies above communities across the nation.

We are hopeful that in addition to helping unlock the full potential of UAS technology, enforcement issues will be another key component of the UAS IPP, in order to explore the specific issues that you highlighted.

In the meantime, as is noted in the FAA's "State and Local Regulation of Unmanned Aircraft Systems (UAS) Fact Sheet" that it released on December 17, 2015, "laws traditionally related to state and local police power – including land use, zoning, privacy, trespass, and law enforcement operations – generally are not subject to federal regulation."

2. **I think we both agree limitations put in place by or at the request of various levels of government need to be easy for the public to monitor and understand. Do you believe technology can properly address this?**

Through technology that industry has already brought to the forefront and future research and development, advances in UAS-related technology will continue to spur innovation, finding solutions to make UAS fly higher and farther, more safely and efficiently.

As an example, industry is working with government to advance technologies for UAS Traffic Management (UTM) concepts, beginning with Low Altitude Authorization and Notification Capability (LAANC). LAANC is an industry developed application with the goal of providing drone operators near real time processing of airspace notifications and automatic approval of requests that are below approved altitudes in controlled airspace.

3. **On September 10, 2015, you testified before the House Committee on the Judiciary stating: "Only the FAA can regulate airspace; states and municipalities cannot... It is critical for the federal government to assert its preemption authority over the National Airspace System. 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. The Judiciary Committee is positioned to deal with the issue of federal preemption. If the FAA feels that it needs clarification of its authority, I would urge Congress to provide such clarity and legislatively settle this issue."**

I too am concerned that without legal clarity the drone industry will see significant setbacks as tribes,

counties, cities, states, and property owners go to court to protect their traditional interests. In light of your statements on November 29, 2017 and considering the lack of interest in pursuing federal preemption, do you believe Congress will need to provide clarity in order to provide certainty to the drone community and put an end to the "legal quagmire"?

The FAA's UAS IPP will allow for a data-driven process, within a controlled operational environment, to explore the best options for states, tribes, and municipalities to address their needs, as it relates to different types of UAS operations. Additionally, the UAS IPP is the best option for informing future regulatory and congressional action that will help enhance innovation and increase economic impact.

Therefore, congressional action on this issue prior to the conclusion, findings, and recommendations of the FAA's UAS IPP would be premature.

Subcommittee on Aviation Hearing
"Unmanned Aircraft Systems Integration: Emerging Uses in a Changing National Airspace"
November 29, 2017

Follow-Up Questions for the Record

Mr. Brian Wynne, President and CEO,
Association for Unmanned Vehicle Systems International (AUVSI)

Questions submitted by Ranking Member Peter A. DeFazio

Question 1:
With expanded commercial drone operations on the horizon, such as those beyond visual line of sight or covering long distances, drones will require access to appropriate and stable spectrum to perform those operations safely.

How will spectrum allocation affect the full integration of drones and their emerging uses, such as those uses discussed during the hearing?

Brian Wynne:
The availability of spectrum to UAS is paramount for the safety of our skies and for the success of expanded operations, as drone operators require a communications link or radio frequency spectrum in order to maintain control of their aircraft. Proper spectrum allocation may be needed to accommodate the growing number of UAS operating below 400 feet and to avoid spectrum congestion.

In addition to dedicated spectrum for command and control at higher altitudes, the anticipated development of sophisticated sense-and-avoid technology, beyond-line-of sight operations and the transmission of payload data represent functionalities that will require significant spectrum resources.

A key component of safe operations will be the integration of communications links into vehicles, and the ability of those links to meet applicable performance standards appropriate to various altitudes, vehicles, and types of operations.

Question 2:
I am concerned that toy drones flown for non-commercial purposes introduce safety risks into the national airspace system. The Federal Aviation Administration (FAA) projects that the hobbyist drone fleet will more than triple in size in the next four years, to more than 3.5 million (and potentially as many as 4.5 million) units by 2021.

Equipping toy drones with various safety-enhancing technologies, such as remote-sensing or geofencing capabilities, may be a method of reducing the number of unauthorized or unsafe drone operations, regardless of the operator.

What would it take to require that toy drones sold in the United States are equipped with such technologies?

Do you believe the FAA has the authority to require that drones be equipped with such technologies?

Brian Wynne:
A number of manufacturers, including those that make drones highly popular with consumers, are already voluntarily equipping their platforms with safety-enhancing technologies, such as geo-fencing. AUVSI is also working collaboratively with government partners to develop remote identification solutions that will enhance security as well.

However, AUVSI believes that the FAA may need additional authority to require all appropriate UAS be equipped with such technologies, given the limitations outlined in Section 336 in the FAA Reauthorization and Modernization Act of 2012. It is worth noting that the FAA's registration requirement applies to any UAS over 0.55 lbs., which may cover some drones considered "toys," thanks to recent Congressional action in the FY18 National Defense Authorization Act.

While technological solutions can provide additional situational awareness and enhance safety, they are no substitute for training and education. Ultimately, the operator is responsible for the safety of an aircraft – whether it's manned or unmanned.

That's why AUVSI, in partnership with the Academy of Model Aeronautics and the FAA, developed the Know Before You Fly campaign to educate UAS operators on safety guidelines. Know Before You Fly works with manufacturers to put educational materials in product packaging and online to provide consumers with the information they need to fly their UAS safely and responsibly.

STATEMENT OF DANIEL K. ELWELL, DEPUTY ADMINISTRATOR, FEDERAL AVIATION ADMINISTRATION, BEFORE THE HOUSE TRANSPORTATION AND INFRASTRUCTURE COMMITTEE, SUBCOMMITTEE ON AVIATION: UNMANNED AIRCRAFT SYSTEMS INTEGRATION: EMERGING USES IN A CHANGING NATIONAL AIRSPACE, NOVEMBER 29, 2017

Chairman LoBiondo, Ranking Member Larsen, Members of the Subcommittee:

I appreciate the opportunity to appear before you today to discuss a subject that is at the forefront of aviation; Unmanned Aircraft Systems or UAS. UAS—also referred to as drones—are the fastest growing field in aviation. They are being used today to examine infrastructure, survey agriculture, provide emergency response support, examine damage caused by time or disaster, and to go places that would otherwise be dangerous for people or other vehicles. Entrepreneurs around the world are exploring innovative ways to use drones in their corporate activities. And we have witnessed a significant influx of new, casual users of UAS—people who fly drones for recreation or entertainment—into the National Airspace System (NAS). The need for us to fully integrate this technology into the NAS continues to be a national priority.

Accompanying me today is Earl Lawrence. Earl is the Executive Director of the FAA's UAS Integration Office and is responsible for facilitating all of the regulations, policies, and procedures required to support the FAA's UAS integration efforts. The Department of Transportation and FAA's vision is ambitious. We intend to fully integrate UAS into the NAS, with UAS operating harmoniously, side-by-side with manned aircraft, occupying the same airspace and using many of the same air traffic management systems and procedures. Our vision goes beyond the accommodation practices in use today by most countries, which largely rely on operational segregation to maintain systemic safety. As we work to realize this vision, UAS must be introduced to the NAS incrementally to ensure the safety of people and property both in the air and on the ground.

Two years ago, we appeared before this committee to discuss the status of the safe, incremental integration of drones into the NAS. In that time, we have made significant progress toward our goal of fully integrating this new class of aircraft and their operators. Today, I would like to highlight for you some of our accomplishments, our challenges, and our ongoing work to build upon our successes as we move forward with the next phase of UAS integration.

Small UAS Rule

At the outset, the FAA recognized that managing the safe integration of drone technology into the world's busiest and most complex airspace system would require the participation of all stakeholders—the FAA, industry, aviation groups, and our public safety and security partners, to name just a few. The FAA adopted an approach of engagement and collaboration with these stakeholders in the development of the first set of operating rules for small UAS, which forms the bedrock of the regulatory framework for full UAS integration. Because UAS technology is changing at a rapid pace, a flexible regulatory framework is imperative. Our goal is to provide the basic rules for operators, instead of specific technological solutions that could quickly become outdated. We've met this goal with the final small UAS rule (14 CFR part 107), which went into effect on August 29, 2016.

Part 107 introduces a brand new pilot certificate specific to UAS—the Remote Pilot Certificate. Unlike an airman certificate for manned aircraft issued under part 61, which necessarily has more stringent requirements, an individual can obtain a Remote Pilot Certificate under part 107 by passing an aeronautical knowledge test at an FAA-approved testing center. Alternatively, if the individual already holds a current non-student part 61 airman certificate, the individual may complete an online UAS training course in lieu of the knowledge test. Remote pilots must be 16 years of age, be able to read, speak, write, and understand English, and be in a

physical and mental condition to safely operate a small UAS. The certificate is valid for two years, after which the remote pilot must take a recurrent knowledge test. Since this rule went into effect, the FAA has issued almost 70,000 remote pilot certificates and 92% of the people who take the remote pilot certificate knowledge exam pass it.

The provisions of part 107 are designed to minimize risks to other aircraft and people and property on the ground. Among other things, the regulations require pilots to keep an unmanned aircraft within visual line-of-sight. Operations are allowed during daylight and twilight hours if the drone has anti-collision lights. The new regulation also addresses altitude and speed restrictions as well as other operational limits such as prohibiting flights over unprotected people on the ground who are not directly participating in the UAS operation.

In keeping with our goal of a flexible framework, some provisions of part 107 may be waived. Operators may apply on our Web site for a waiver to allow drones to fly in controlled airspace or at night, for example. Applicants must demonstrate that their proposed operation can be conducted safely outside of the provisions of part 107. Part 107 allows for operations in Class G airspace without prior air traffic control authorization. Operations in Class B, C, D, and surface area E airspace, all of which exists primarily around airports, may be permitted with authorization from the Air Traffic Organization (ATO) using the online waiver portal. To date, the FAA has issued 1,200 operational waivers and 11,000 authorizations or waivers for controlled airspace operations. Consistent with our risk-based approach, we are increasingly able to grant waivers for more complex operations, including one recently granted to CNN for operations over people. And we are taking steps to further streamline the waiver and authorization process.

The small UAS rule provides UAS operators with unprecedented access to the NAS while also ensuring the safety of the skies. However, it is only the first step in the FAA's plan to integrate UAS into the NAS. Consistent with our incremental approach to integration, we are using a risk-based analysis to facilitate expanded UAS operations, including operations over people, operations beyond visual line-of-sight, and transportation of persons and property.

Supporting Emergency Response

UAS have been invaluable in supporting response and recovery efforts following the widespread devastation brought about by recent hurricanes. When winds and floodwaters damaged homes, businesses, roadways and industries, a wide variety of agencies and companies sought FAA authorization to fly drones in the affected areas. We responded quickly, issuing a total of 355 airspace authorizations to ensure that those drones could operate safely.

Drones played a critical role in performing search and rescue missions; assessing damage to roads, bridges, and other critical infrastructure; and helping insurance companies act more quickly on claims coming in from homeowners. And in Puerto Rico, the FAA quickly approved the first UAS operation of its kind to provide essential communication services. We granted AT&T an exemption from part 107 to operate a 60-pound tethered drone to provide temporary voice, data, and internet service while construction crews rebuild a tower to restore permanent service on the island.

The FAA's ability to quickly authorize UAS operations after these storms was especially critical because most local airports were either closed or dedicated to emergency relief flights, and the fuel supply was low. As Administrator Huerta recently said: "Essentially, every drone that flew meant that a traditional aircraft was not putting an additional strain on an already fragile

system. I don't think it's an exaggeration to say that the hurricane response will be looked back upon as a landmark in the evolution of drone usage in this country."

UAS Integration Pilot Program

The FAA's commitment to the safe and efficient integration of UAS and the expansion of routine UAS operations requires resolving several key challenges to enable this emerging technology to safely achieve its full potential. Congress recognized a number of these challenges in the FAA Extension, Safety, and Security Act of 2016. Technical issues to ensure that a drone maintains a safe distance from other aircraft and that the pilot retains control of the drone and can comply with air traffic instructions must be addressed before UAS operations beyond visual line-of-sight can become routine. And there are additional policy questions raised by UAS use, including security, both physical and cyber, privacy, and enforcement.

To address these challenges and leverage the experience of our stakeholders, on October 25, 2017, President Trump directed the Department of Transportation to launch an initiative to safely test and validate advanced operations for drones in partnership with state and local governments in select jurisdictions—the UAS Integration Pilot Program. The results of this program will be used to improve the safe and secure integration of UAS into the NAS and to realize the benefits of this technology in our economy.

The pilot program will help tackle the most significant challenges in integrating drones into the NAS while reducing risks to public safety and security. Ultimately, it is expected to help the Department of Transportation and the FAA develop a comprehensive regulatory framework that will allow more complex low-altitude operations; identify ways to balance local and national interests; improve communications with local, state, and tribal jurisdictions; address security and

privacy risks; and accelerate the approval of operations that currently require special authorizations.

As stated in the Federal Register Notice announcing the pilot program application process, the deadline for Lead Applicants—state, local, or tribal government entities—to submit a notice of intent to participate in the program was yesterday, November 28, 2017. Private sector companies or organizations, UAS operators, public sector entities, and other stakeholders may submit a request to be on the Interested Parties List by December 13, 2017. After evaluating the applications, the Department of Transportation will invite a minimum of five government/private sector partnerships to participate in the pilot program.

UAS Airspace Authorizations and Traffic Management

Starting in spring 2017, the FAA began publishing UAS facility maps, which indicate safe UAS flight altitudes in areas of controlled airspace around airports. Part 107 operators can use these maps to submit better airspace authorization requests. This was a first step toward setting up a data exchange program with external stakeholders, and on October 23, 2017, the FAA launched a prototype evaluation of the Low Altitude Authorization and Notification Capability (LAANC). LAANC is a joint public-private initiative for the FAA to work with industry to develop the requirements for an application that automates the process for UAS operators to get authorization to fly in certain classes of airspace. In the future, operators will also be able to use LAANC to notify airports and Air Traffic Control when they want to fly within five miles of an airport, as required by the Special Rule for Model Aircraft. The initial LAANC prototype evaluation will cover 10 air traffic facilities and nearly 50 airports. A list of these facilities and airports can be found on the FAA's Web site at: www.faa.gov/uas/programs_partnerships/uas_data_exchange/airports_participating_in_laanc/.

LAANC is the first step toward implementing UAS Traffic Management (UTM). The FAA is working with NASA and industry to develop and eventually deploy a UTM concept, which will enable more routine beyond line-of-sight operations. NASA's concept specifically addresses small UAS operations, primarily below 400 feet above ground level, in airspace that contains low-density manned aircraft operations, where air traffic services are typically not provided. NASA has developed a phased approach for their UTM platform, building from rural to urban and from low- to high-density airspace. In April 2016, NASA coordinated with six FAA-selected test sites to perform phase one testing of the UTM research platform. A Research Transition Team has been established between the FAA and NASA to coordinate the UTM initiative, as the concept introduces policy, regulatory, and infrastructure implications that must be fully understood and addressed before moving forward with technology deployment.

Security and Enforcement

As Congress recognized in the 2016 FAA Extension, the security challenges presented by UAS technology require a layered and integrated government response. Addressing one challenge, the Department of Homeland Security is leading an interagency coordinated effort by federal partners, including the FAA, the Department of Justice and the Department of Defense, to identify and evaluate technologies that help detect and track unmanned aircraft movement through the NAS. We continue to work closely with our government and industry partners to evaluate these drone-detection technologies, including evaluations around airports in New York, Atlantic City, Denver, and Dallas-Fort Worth.

The potential for conflicts between manned and unmanned aircraft has become a very real challenge in integrating these new technologies into the NAS. We are seeing an increased number of drone-sighting reports from pilots of manned aircraft. This year, we've received an

average of almost 200 reports from pilots each month—over 2,000 to date—which is significantly higher than the number received in 2016 and 2015. In 2016, we received approximately 1,800 complaints, compared to 1,200 complaints the year before.

As the Federal agency responsible for the safety of the flying community, the increasing number of these reports is of great concern. As a result, the FAA has actively engaged in public education and outreach efforts, such as "Know Before You Fly" and the small UAS registration process. Sometimes, however, education is not enough. To be clear, if an unauthorized UAS operation is intentional, creates an unacceptable risk to safety, or is intended to cause harm, strong and swift enforcement action will be taken. Earlier this year, we announced a comprehensive settlement agreement with a UAS operator that flew drones in congested airspace over New York City and Chicago, and violated airspace regulations and aircraft operating rules.

One of our ongoing challenges in this area, however, is the limited amount of information available to our inspectors when they need to contact a UAS operator or take action to address a potential violation of our regulations. As Congress has recognized, identification and tracking of UAS is critical to the full integration of this technology in the NAS. As discussed further below, the FAA established an Aviation Rulemaking Committee (ARC) to develop standards and provide recommendations for remote identification and tracking of UAS this year.

Engagement with the law enforcement community also is paramount to ensuring that our airspace remains the safest in the world. In January 2015, the FAA published guidance for the law enforcement community on the UAS Web site, and has been actively engaging with law enforcement agencies at local, State, and Federal levels through a variety of channels. The goal of these efforts is to reduce confusion in the law enforcement community about how to respond to UAS events. The FAA encourages citizens to call local law enforcement if they feel someone

is endangering people or property on the ground or in the sky. Local law enforcement will then work with local FAA field offices to ensure these safety issues are addressed. We have also started a webinar series specifically geared toward educating law enforcement and other public safety officials about how to enforce unsafe or unauthorized operations, and how to fly UAS safely and legally when they need to.

Moving Forward

As we move forward with UAS integration, we need to continue to involve all stakeholders in framing challenges and finding solutions. By leveraging this expertise, we will continue to ensure that the FAA maintains its position as the global leader in aviation safety. This month, I attended a meeting of the Drone Advisory Committee (DAC). Our main goal with the DAC moving forward is to harvest the collective technical and operational expertise of its members, which include representatives from industry, government, labor, and academia. With the announcement of the UAS Integration Pilot Program, we will ask the DAC to provide us with the technical and operational recommendations we need to implement the program. In addition, the DAC will continue to assist us with determining what the highest-priority UAS operations are and how we can enable access to the airspace needed to conduct these operations.

We are also making headway with two Aviation Rulemaking Committees (ARC) tasked with making recommendations for the next critical steps in the pathway to full UAS integration: remote identification and tracking of UAS and integrating larger UAS into the NAS. This past spring, we established the UAS Identification and Tracking ARC to make recommendations about technologies that can be used to remotely ID and track UAS, and that would address some of the concerns of the law enforcement and security communities. The ARC recently concluded

its work and submitted its report to us last month; we are now reviewing the committee's recommendations and expect to publish this report in the coming weeks.

In addition, we recently convened a UAS in Controlled Airspace ARC, which will provide recommendations on integrating larger UAS into the NAS. It will develop and recommend scenarios that will encompass the most desired operations, identify gaps in research and development needed to successfully integrate larger UAS into controlled airspace, and develop and recommend up to five prioritized changes to policies and procedures that will spur integration. The ARC held its second meeting at the end of October 2017 and will continue to hold regular meetings over the next 15 months.

Before I conclude my remarks, I would be remiss if I did not acknowledge the support that Chairman LoBiondo has provided to the FAA and, in particular, the William J. Hughes Technical Center in Atlantic City, New Jersey. In its role as the core facility for sustaining and modernizing the air traffic management system, the Technical Center has been instrumental in the FAA's efforts to facilitate new entrants and users to the NAS. I thank Chairman LoBiondo for his leadership and wish him well as he retires from Congress.

Conclusion

The FAA's progress in accommodating new technologies and operations demonstrates that the agency is well positioned to maintain its status as the global leader in safe and efficient air transportation. The progress we have made would have seemed unimaginable not long ago. We know, however, that these accomplishments are only the first step. There are many important issues yet to be addressed and we will continue to work with our stakeholders as we write the next chapter in aviation history.

This concludes my statement. I will be glad to answer any questions you have.

Unmanned Aircraft Systems Integration:
Emerging Uses in a Changing National Airspace
Wednesday, November 29, 2017, 10:00 a.m.
2167 Rayburn House Office Building
Washington, D.C.

Daniel K. Elwell, Deputy Administrator, Federal Aviation Administration,
Responses to Questions for the Record

Submitted on behalf of Congressman Paul Mitchell (MI-10)

Efforts to date from the Federal Aviation Administration (FAA) and stakeholders have rightly focused on getting the regulatory framework as well as licensing and registration requirements right. While that work continues, at a certain point enforcement of whatever the standards may be becomes necessary.

1. What steps has the FAA taken on the enforcement front? Forward looking, what do you anticipate that will look like?

   ANSWER: The FAA investigates all complaints involving possible regulatory violations and, based on the results of the investigation, determines a course of action. Non-enforcement responses, known as compliance actions, include educational outreach and counseling. The FAA has taken over 350 compliance actions for regulatory deviations involving a UAS operation. However, in cases that involve intentional, reckless or criminal violations or that pose an unacceptable risk to the National Airspace System, enforcement action will be pursued. Enforcement action may include suspension or revocation of FAA certificates, civil, or criminal penalties. To date, more than 65 enforcement cases have been initiated by the FAA for non-compliant UAS operations.

   In the future, the FAA anticipates that as more UAS operators become aware of the regulatory environment in which they are operating through FAA and industry outreach, the FAA will be able to focus its enforcement resources on operators unwilling or unable to comply with regulatory standards. These efforts will be aided by the restoration of the 14 CFR part 48 registration requirements, as well as ongoing efforts regarding remote identification and tracking.

2. Can you describe what the FAA is doing to work with state and local governments and law enforcement agencies to enforce Unmanned Aircraft Systems (UAS) rules and regulations? How will the FAA partner with these stakeholders?

   ANSWER: The FAA works closely with state and local governments and law enforcement to share information regarding apparent unsafe or unauthorized UAS operations. In particular, the FAA works with local law enforcement in gathering information about unsafe or unauthorized UAS operations. The FAA pursues enforcement actions based on information provided by law enforcement and also provides law enforcement with technical expertise to assist with local criminal enforcement actions.

To further educate state and local governments and law enforcement, the FAA holds regularly scheduled webinars to discuss UAS enforcement issues and offers other educational opportunities as well. Specifically, we have published guidance for law enforcement and for state and local governments on our website.

We have also recently announced the UAS Integration Pilot Program, which is intended to enable more advanced drone operations and collect relevant operational data from those operations, while also providing a forum for the FAA to work with state, local, and tribal governments to understand their needs in managing drone operations within their jurisdictions. The FAA will be signing agreements with the selected participants, all of whom will be a state, local, or tribal government entity, and we anticipate this program will better inform all parties about balancing federal airspace authority with the traditional interests and authorities of states, tribes, and localities.

Submitted on behalf of Congressman Jason Lewis (MN-02)

Deputy Administrator Elwell, I thank you for participating in this hearing. I have a few questions for you as this Committee considers policies around drone technology.

1. With regard to the recently announced pilot program, does the FAA intend to accept applicants that are looking at unique ways to encourage drone operations while simultaneously applying their traditional police powers in order to better inform any future action as it pertains to applying the traditional interests of states, tribes, and localities to drone technology?

   ANSWER: The UAS Integration Pilot Program is intended to enable more advanced drone operations and collect relevant operational data from those operations, while also providing a forum for the FAA to work with state, local, and tribal governments to understand their needs in managing drone operations within their jurisdictions. The FAA will be signing agreements with the selected participants, all of whom will be a state, local, or tribal government entity, and we anticipate this program will better inform all parties about balancing federal airspace authority with the traditional interests and authorities of states, tribes, and localities.

2. Earlier this year we saw a drone collide with a Blackhawk in New York and then a drone collide with a commercial aircraft in Canada. Do you have any recommendations for this Committee as we consider proposals addressing how unmanned small drones integrate at low and high altitudes in order to maintain a safe National Airspace System for manned aviation?

   ANSWER: The restoration of the 14 CFR part 48 registration requirements in the National Defense Authorization Act was a necessary first step in ensuring appropriate accountability for flying in the National Airspace System (NAS). While the FAA will continue our education and outreach initiatives to help operators understand the regulatory environment in which they are operating, ongoing efforts regarding remote identification and tracking of UAS will become increasingly important as we continue our integration efforts. Knowing who is flying where is important from both a security perspective (i.e. helping security partners distinguish "good guys" from "bad guys"), and also from an integration standpoint, as a foundational aspect of

UAS traffic management is the ability for all aircraft in the system to have situational awareness of others. Moving forward, it will be vital that all unmanned aircraft flying in the NAS, regardless of the type of operation, be subject to some manner of regulatory oversight to ensure overall system safety, and we appreciate this Committee's continued support for these important building blocks to full integration.

3. Is the FAA equipped to monitor all current and future users and enforce regulations on all UAS flights that are local in nature? These could include operations that are five feet above the ground in my back yard, over a crime scene, or near a school. If not, what resources or assistance would be needed?

ANSWER: The future success of the United States' UAS integration efforts depends on all unmanned aircraft flying in the NAS, including model aircraft flown by hobbyists, being subject to some manner of regulatory oversight to ensure overall system safety. Our ongoing efforts regarding remote identification and tracking will be crucial to moving forward with integration, which is why the FAA convened an industry committee in Summer 2017 to provide recommendations on implementing remote ID and tracking requirements.

At the local level, the FAA works closely with local and state governments and law enforcement agencies to enforce regulations. We host regularly scheduled webinars to discuss UAS enforcement issues and have published guidance for law enforcement and for state and local governments on our website to help inform them about their authorities with regard to unsafe or unauthorized UAS flights. As more UAS operators become aware of the regulatory environment in which they are operating coupled with identification and tracking requirements, the FAA will be able to focus its enforcement resources on unsafe or unauthorized operators and operations.

SUBCOMMITTEE ON AVIATION HEARING ON "UNMANNED AIRCRAFT SYSTEMS INTEGRATION: EMERGING USES IN A CHANGING NATIONAL AIRSPACE" NOVEMBER 29, 2017

RANKING MEMBER PETER A. DEFAZIO QUESTION FOR THE RECORD

For Mr. Daniel K. Elwell, Federal Aviation Administration:

With expanded commercial drone operations on the horizon, such as those beyond visual line of sight or covering long distances, drones will require access to appropriate and stable spectrum to perform those operations safely.

How will spectrum allocation affect the full integration of drones and their emerging uses, such as those uses discussed during the hearing?

Answer:

Drones require access to appropriate and stable spectrum to meet the required performance requirements that assure the safety of their operations in the National Airspace System (NAS). Assessing the full impact of spectrum allocation on the emerging drone industry requires additional input from both the Federal Communications Commission (FCC) and the industry itself. The FAA is focused on setting the performance standards necessary for the industry to meet for the safe operation of their products; these standards are primarily limited to requirements for the command and control link. Industry is free to use the full commercial spectrum to meet their needs, provided they meet these performance requirements to ensure safety, and can work with the FCC and others to procure the needed spectrum.

Hon. Daniel Lipinski, a Representative in Congress from the State of Illinois,
Questions for the Record to Daniel K. Elwell, Deputy Administrator,
Federal Aviation Administration

1. Global Competitiveness of the UAS Industry

Mr. Elwell: There is a growing number of manufacturers building electric vertical takeoff and landing aircraft for short distance travel now being called Urban Air Mobility.

As co-chair of the public transportation caucus, I have heard from stakeholders across all modes of transportation about the changing paradigm of mobility. We need to need to think big, and we need agencies that are nimble enough to respond to a changing technology landscape.

Yet many of these companies are being attracted to other countries for initial deployment because of a difficult regulatory regime here in the United States. What is the FAA doing to ensure that the US will lead the world on certification and airspace integration for these promising new aircraft?

ANSWER:
Most other countries are pursuing a segregated approach to UAS operations, meaning they carve out a segment of airspace solely for UAS to fly. While this enables more testing in the short-term, it does not necessarily provide long-term flexibility. The FAA is focused on the more difficult, but ultimately more efficient, task of integrating UAS into our airspace system. We are taking an incremental approach to this objective by developing a performance-based regulatory framework, and also through working with industry to build a firm foundation for a scalable and automated UAS traffic management system.

The FAA's Small UAS Rule (14 CFR part 107) represents the base framework of regulations for small UAS operations, and we are building on this base with upcoming proposed rules for routine operations at night and over people. At the same time, the recently announced UAS Integration Pilot Program (IPP) enables the FAA to facilitate more complex UAS operations like beyond line-of-sight and package delivery while working with state, local, and tribal government entities to manage airspace requirements in their jurisdictions. To assist industry in developing viable Urban Air Mobility Concepts, the FAA is exploring the establishment of an internal team that will meet regularly and work directly with industry to provide guidance and direction. For UAS traffic management, we are in the midst of a prototype evaluation of our Low Altitude Authorization and Notification Capability (LAANC), which is a joint data exchange effort with industry partners to enable near real-time authorization and notification of UAS operations in controlled airspace. Finally, we recently received recommendations from an industry committee for remote identification and tracking requirements for unmanned aircraft. These recommendations will be used to inform the development of future regulations that will enable other airspace users and public safety officials to know who is flying where in the airspace, a foundational element for future UAS traffic management.

Hon. Daniel Lipinski, a Representative in Congress from the State of Illinois,
Questions for the Record to Daniel K. Elwell, Deputy Administrator,
Federal Aviation Administration

3. Emergency waivers for disaster response

Mr. Elwell, could you provide a brief overview of the FAA's work with UAS operators in the immediate aftermath of Hurricanes Harvey, Irma, and Maria? Did operators request, and did the FAA issue any Part 107 waivers for beyond visual line-of-sight or over people in the context of disaster response efforts? Are such waivers available for public view?

ANSWER:
The FAA used contingency airspace management measures to expedite UAS operations in support of disaster response efforts for Hurricanes Harvey, Irma, and Maria. The FAA issued a total of 345 Special Government Interest (SGI COA)/Waivers, 18 of which were for beyond visual line-of-sight (BVLOS) operations – 12 in Florida for Next Era/Florida Power & Light, and 6 in Texas to Insitu and Customs and Border Patrol (CBP). These authorizations were largely granted within a matter of hours of being received by the FAA's System Operations Team, and allowed first responders quick access to support emergency response efforts. Because these SGI COAs are granted to support activities which answer significant and urgent governmental interests, including national defense, homeland security, law enforcement, and emergency operations objectives, they are generally not made public.

In addition to the SGI COAs, the FAA approved a Section 333 exemption for AT&T to use a Flying COW (Cell on Wings) to provide cell phone service to Puerto Rico in the aftermath of Hurricane Maria. This approval was issued within a couple days of receiving the request. Section 333 exemptions are posted on the public docket at https://www.regulations.gov/docket?D=FAA-2017-1069)

WRITTEN STATEMENT OF

AIR LINE PILOTS ASSOCIATION, INTERNATIONAL (ALPA)

TO THE

SUBCOMMITTEE ON AVIATION

COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE

U.S. HOUSE OF REPRESENTATIVES

NOVEMBER 29, 2017

"UNMANNED AIRCRAFT SYSTEMS: EMERGING USES IN A CHANGING NATIONAL AIRSPACE"

Air Line Pilots Association, International
1625 Massachusetts Avenue, NW
Washington, DC 20036
(202) 797-4033

The Air Line Pilots Association, International (ALPA), represents more than 58,000 professional airline pilots flying for 33 airlines in the United States and Canada. ALPA is the world's largest pilot union and the world's largest non-governmental aviation safety organization. We are the recognized voice of the airline piloting profession in North America, with a history of safety and security advocacy spanning more than 85 years. As the sole U.S. member of the International Federation of Airline Pilots Associations (IFALPA), ALPA has the unique ability to provide active airline pilot expertise to aviation safety issues worldwide, and to incorporate an international dimension to safety advocacy.

Safe Integration of Unmanned Aircraft Systems

With the rapidly growing use of Unmanned Aircraft Systems (UAS) for any number of applications and uses, the safety risks to airline operations needs to be monitored very closely. Clearly, at some point in the future, UAS will be integrated into the national airspace system (NAS), interacting with other aircraft in a manner similar to "pilot on board" aircraft today.

However, it seems at times that the FAA is struggling to keep pace with the expansion of the UAS industry. We must not allow pressure to rapidly integrate UAS into the NAS to rush a process that must be focused on safety as the highest priority. Risk mitigation plans, which have yet to be fully developed, combined with consensus-based technology standards that will ensure interoperability with manned aircraft, must be in place before

a UAS can occupy the same airspace as manned aircraft or operate in areas where it might inadvertently stray into airspace occupied by airliners. When UAS operate in the same airspace as airline aircraft, the pilots will need to be able to see them on cockpit displays, and air traffic controllers will also need to see them on their displays to safely separate air traffic. Further, the UAS must be equipped with active collision-avoidance technology. We will oppose any integration that does not include collision avoidance systems that are interoperable with airline collision avoidance systems.

If a UAS operator does not intend to fly in the same airspace as airliners, then limitations that ensure the UAS stays out of the airspace must be programed into the UAS in a way that cannot be overridden.

FAA Authority to Fully Regulate all UAS

The FAA has established 14 CFR Part 107, which are rules for small UAS (sUAS). The regulatory framework created is limited to commercial operations only. This is because Congress prohibited the FAA from promulgating any new rules on "hobbyists" operators in Section 336 of P.L. 112-95 of the FAA Modernization and Reform Act of 2012. This law was cited in an appeals court decision earlier this year that struck down the FAA regulatory requirement that requires all operators of sUAS that weigh more than .55 pounds to register with the FAA. Fortunately this committee's bill - HR-2997-- includes a provision that would legislate the FAA's authority to require registration of all sUAS above the minimum weight threshold of 0.55 pounds.

The prohibition against the FAA's regulation of model/hobby sUAS also creates an interesting situation where commercial sUAS pilots who are certified by the FAA have more operational restrictions on them than the hobbyist operators. While commercial sUAS operators must obtain explicit approval from air traffic control to operate in the vicinity of an airport with an operating control tower, model/hobby sUAS operators merely need to advise ATC. This seems somewhat counter-intuitive from a safety perspective. The operators who are not trained, and who have not been issued a certificate from the FAA should have more safety restrictions than commercial operators.

As has been widely reported, a drone recently collided with a U.S. Army helicopter one mile east of Midland Beach in Staten Island, New York. The investigation into the cause of the collision is still ongoing, but we know that the aircraft was not registered with the FAA, nor was it equipped with any type of identification or tracking technology. ALPA has learned that pieces of the sUAS were found lodged in the aircraft, and using the information from these pieces the hobbyist pilot of the sUAS was identified and located. The individual operating the sUAS routinely operated his hobby aircraft in the vicinity of the collision site, which was beyond his visual line of sight. After losing control of the aircraft, and because it failed to return to his position, he indicated that he simply believed his aircraft had "gone down" and that he was unaware that it had been involved in a mid-air collision.

ALPA, along with many aviation industry stakeholders, strongly urges the committee to remove the current restrictions that Congress has placed on the FAA's ability to fully regulate all UAS, including hobby sUAS. We are not calling on congress to apply overly restrictive and burdensome regulations on the recreational segment of the sUAS industry. However, we are calling on Congress to allow the FAA to use its regulatory authority to address the known and constantly increasing risk to airline safety.

sUAS Identification and Tracking Technologies are Needed

ALPA also encourages congress to work closely with the FAA to implement mandatory identification and tracking capabilities as quickly as possible. An aviation rulemaking committee (ARC) recently concluded its work in this very important area, and provided the FAA with recommendations that should result in a regulatory framework that increases safety and addresses security concerns as well. ALPA participated on the ARC, and I can tell you that a very diverse group of participants worked very well together to achieve excellent results.

If an identification and tracking system had been in place prior to the October collision with the Army helicopter, much more information would have been immediately available to accident investigators and law enforcement. Such a system would likely have prevented the collision in the first place, because law enforcement may have

observed the sUAS operating on a previous flight, and proactively contacted the hobbyist about the illegal use of the aircraft.

UAS Integration Pilot Program Safety Review

There is no doubt that the UAS industry is growing quickly and there are beneficial uses of the technology emerging all the time. Recently, sUAS were successfully and safely used to assist in search and rescue operations after natural disasters. Inspections of bridges or other infrastructure is another example of a safe and useful application.

The safety risk of each type of operation needs to be examined by the FAA, with industry by its side. The recent announcement of a UAS Integration Pilot Program by the administration has greatly increased this immediate need for safety risk analysis. The FAA has indicated that the integration pilot program proposals will not be available for public comment. This generates concerns for ALPA, partly because the FAA intends to designate safety oversight of the pilot program's operations to the lead organization to manage.

In order to ensure a high degree of confidence that safety levels can be adequately maintained, the planned operations by each of the pilot program participants needs to be publicly reviewed from a safety perspective. Safety organizations, such as ALPA, should have the opportunity to review and comment on the proposals.

Seeking public comment would be consistent with the FAA's solicitation of public comments before awarding designations for other activities such as special conditions for airworthiness, waivers on airmen training, and other diversions from standard regulations and policy. Given the fact that the Pilot Program will include operations beyond visual line of sight and other deviations from the current regulations, the public should be given the right to review and provide comment.

Conclusions

1. Incorporating UAS into the NAS must be done in a safe and timely manner to ensure the safety of the system as a whole. New and emerging technologies need to be incorporated into existing designs for UAS to prevent the catastrophic consequences that could occur from airplanes colliding with UAS.
2. Requiring registration and tracking capabilities is critically necessary to hold non-compliant UAS operators accountable for their actions.
3. FAA should have the ability to fully regulate all aspects of the NAS and this includes hobbyist UAS operations. Section 336 needs to be repealed.
4. Public input on the planned operations from the forthcoming UAS Pilot Program is necessary and is consistent with FAA standards and practices.

On behalf of the more than 58,000 pilots whose top priority is safe transportation, we thank the committee for the opportunity to provide testimony on this important subject

and look forward to working together to ensure the safety of our air transportation system.

ConsumersUnion®

POLICY & ACTION FROM CONSUMER REPORTS

November 29, 2017

The Honorable Frank LoBiondo, Chairman
The Honorable Rick Larsen, Ranking Member
U.S. House Committee on Transportation and Infrastructure
Subcommittee on Aviation
2165 Rayburn House Office Building
Washington, D.C. 20515

Dear Chairman LoBiondo and Ranking Member Larsen:

Consumers Union, the policy and mobilization division of Consumer Reports, writes regarding the safety of unmanned aircraft systems, or drones, which the Subcommittee examines at a hearing today. We are concerned about the potential for drones with product defects to create a substantial risk of injury to the public—including if drones were to stall and drop out of the sky or if a drone battery were to catch fire—and the regulatory gap that would allow this potential risk to continue unabated. We urge you to require stronger federal oversight of drones' safety.

Consumer drone sales in the U.S. more than doubled from 1.1 million units in 2015 to 2.4 million units in 2016, and industry observers expect the market to continue expanding over the next several years.[1] Consumer Reports has covered issues related to drones and tested various models so that consumers can have comparative information about them.[2] During the current holiday season—and throughout the year—it is important for shoppers to know that products in the marketplace are safe.

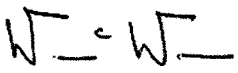
Unfortunately, in the case of drones, consumers do not have that assurance. When a GoPro drone model was found to contain a safety defect in November 2016, no federal agency—neither the Federal Aviation Administration (FAA) nor the Consumer Product Safety Commission (CPSC)—wielded oversight of the recall.[3] As Consumer Reports noted at the time, the CPSC lacks jurisdiction over drones due to a statutory carve-out for aircraft,[4] even though many of these systems are marketed and purchased in a manner similar to toys and other consumer products. The FAA has authority over how drones are flown, and has set standards for when small unmanned aircraft must be registered, but does not have policies and procedures with respect to product safety and declined to meaningfully engage on the GoPro defect.

In 2016, GoPro did the right thing: it voluntarily took its products off the market and publicized the recall. But there is no guarantee that other companies will follow its lead, and it is not clear that any government agency would take action to remove dangerous products from the marketplace in the event of a future defect. A lack of protections and clear regulatory authority leaves consumers at risk of being hurt or killed by defective drones.

The CPSC is well positioned to oversee the safety of consumer drones as produced and distributed in commerce while the FAA handles their in-use operation. Ultimately, federal law should reflect this division of oversight. However, unless and until the CPSC gains jurisdiction over consumer aircraft, the FAA should make sure that drones are built to be safe. We urge the Subcommittee to clarify without delay that the FAA has this responsibility.

Thank you for your attention to this important subject.

Sincerely,



William Wallace
Policy Analyst
Consumers Union

cc: The Honorable Bill Shuster, Chairman
The Honorable Peter DeFazio, Ranking Member
U.S. House Committee on Transportation and Infrastructure

Members of the U.S. House Committee on Transportation and Infrastructure

The Honorable Greg Walden, Chairman
The Honorable Frank Pallone, Jr., Ranking Member
U.S. House Committee on Energy and Commerce

The Honorable Bob Latta, Chairman
The Honorable Jan Schakowsky, Ranking Member
U.S. House Committee on Energy and Commerce
Subcommittee on Digital Commerce and Consumer Protection

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[1] *See, e.g.*, Recode, "U.S. drone sales have more than doubled from last year" (Apr. 10, 2017) (online at www.recode.net/2017/4/10/15245234/us-drone-sales-doubled-from-last-year); Business Insider, "Drone market shows positive outlook with strong industry growth and trends" (Jul. 13, 2017) (online at www.businessinsider.com/drone-industry-analysis-market-trends- growth-forecasts-2017-7).

[2] Based on the results of independent product testing, Consumer Reports recently recommended several drone models as part of a Holiday Gift Guide with the Washington Post. Washington Post, "Holiday Gift Guide" (online at www.washingtonpost.com/graphics/2017/lifestyle/gift-guide/?tid=consumer-reports).

[3] Consumer Reports, "GoPro Drone 'Recall' Raises Oversight Questions" (Nov. 11, 2016) (online at www.consumerreports.org/safety/go-pro-drone--recall--raises-jurisdictional-questions).

[4] 15 U.S.C. §2052.

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November 29, 2017

The Honorable Frank A. LoBiondo, Chairman
The Honorable Rick Larsen, Ranking Member
U.S. House Committee on Transportation & Infrastructure
Subcommittee on Aviation
2251 Rayburn House Office Building
Washington, DC 20515

Dear Chairman LoBiondo and Ranking Member Larsen:

We write to you regarding the upcoming hearing on "Unmanned Aircraft Systems: Emerging Uses in a Changing National Airspace."[1] As the deployment of drones in the United States continues to increase, meaningful privacy safeguards should be established.

EPIC is a public-interest research center established in 1994 to focus public attention on emerging privacy and civil liberties issues. EPIC has documented the unique privacy problems of Unmanned Aerial Vehicles (UAVs or "drones"), and has sued the FAA for its failure to establish privacy safeguards to protect Americans.[2] EPIC is now proceeding in the D.C. Circuit Court of Appeals to establish drone privacy safeguards.[3] In comments to the FAA, EPIC has also recommended mandatory identification requirements so that individuals could easily determine the location, course, purpose, payload and ownership of drones. [4]

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[1] *Unmanned Aircraft Systems: Emerging Uses in a Changing National Airspace*, 115th Cong. (2017), H. Comm. on Trans. & Infrastructure Subcomm. on Aviation (Nov. 29, 2017)., https://transportation.house.gov/calendar/eventsingle.aspx?EventID=402013.

[2] *EPIC v. FAA*, No. 15-1075 (D.C. Cir. Filed Mar. 31, 2015); *See also Domestic Unmanned Aerial Vehicles (UAVs) and Drones*, EPIC, https://epic.org/privacy/drones/; *See also* EPIC, *EPIC v. FAA, Challenging the FAA's Failure to Establish Drone Privacy Rules,* https://epic.org/privacy/litigation/apa/faa/drones/

[3] JD Supra, *EPIC Continues its Fight Against FAA for Drone Privacy Regulations* (Mar. 6, 2017) ("The Electronic Privacy Information Center (EPIC) filed its 65-page brief in its case against the Federal Aviation Administration (FAA) this week"), www.jdsupra.com/legalnews/epic-continues-its-fight-against-faa-71113/; *EPIC v. FAA*, No. 16-1297 (D.C. Cir. Filed Mar. 2, 2017, https://epic.org/privacy/litigation/apa/faa/drones/1664208-EPIC-Amended-Brief.pdf; *EPIC v. FAA: Challenging the FAA's Failure to Establish Drone Privacy Rules*, EPIC, https://epic.org/privacy/litigation/apa/faa/drones/.

[4] EPIC Comments, *Aircraft Registration System of Records Notice*, Docket No. DOT-OST-2015-235 (Jan. 14, 2016), https://epic.org/apa/comments/EPIC-Drone-Registration-SORN-Comments.pdf; *See also Billy Steel, FAA considers remote identification system for drones in the US: To be effective, the registration requirement would likely need to be reinstated*, Endgaget, July 1, 2017, https://www.engadget.com/2017/07/01/faa-remote-identification-system-for-drones/.

EPIC has also pursued several open government matters regarding the FAA's decision making process, which appears intended to purposefully avoid the development of meaningful privacy safeguards.[5] As we learn more about drones, we also recognize growing risks to public safety and aviation security.[6]

EPIC believes that strong drone privacy rules and identification requirements are vital for the safe integration of commercial drones in the National Air Space. The present course is simply not sustainable.

Aerial Drones: A Unique Privacy Threat

Drones pose a unique threat to privacy. The technical and economic limitations to aerial surveillance change dramatically with the advancement of drone technology. Small, unmanned drones are already inexpensive; the surveillance capabilities of drones are rapidly advancing; and cheap storage is readily available to maintain repositories of surveillance data. A Pew Research Center and Smithsonian Magazine survey found that 63% of Americans objected to the idea of giving personal and commercial drones permission to fly through most U.S. airspace.[7] However, in recent years individual drone use has soared, and the FAA predicts that 7 million drones will be sold by 2020.[8] As drone use increases so do the risks to privacy and safety.

Drones are now regularly equipped with high definition cameras that increase the ability of a user to conduct domestic surveillance.[9] The DJI Inspire 2 is a high-end, commercially available hobbyist drone about the size of a small desktop printer and weighs less than eight pounds, yet it can transmit high definition video to an operator over four miles away and can live-stream that video.[10] Even lower-end hobbyist drones costing less than $100 can stream live video. The Hubsan X4 H502E DESIRE, a drone that can fit in the palm of your hand, utilizes a front facing high definition camera with 720P resolution that can stream live video up to 200

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[5] *EPIC FOIA: Drone Industry Cozied Up to Public Officials* (Dec. 21, 2016), EPIC, https://epic.org/2016/12/epic-foia-drone-industry-cozie.html. EPIC v. DOT, No. 16-634 (D.C. Cir. Filed Apr. 4, 2016), https://epic.org/foia/dot/drones/taskforce/1-Complaint.pdf; *EPIC v. Department of Transportation - Drone Registration Task Force*, EPIC, http://epic.org/foia/dot/drones/taskforce/.

[6] Sherisse Pham, *Drone hits passenger plane in Canada*, CNN (Oct. 16, 2017), http://money.cnn.com/2017/10/16/technology/drone-passenger-plane-canada/index.html.

[7] Aaron Smith, *U.S. Views of Technology and the Future,* Pew Research Center, Apr. 17, 2014, http://www.pewinternet.org/2014/04/17/us-views-of-technology-and-the-future/.

[8] Sally French, *Drone Sales in the U.S. More Than Doubled In The Past Year,* Market Watch, May 28, 2016, http://www.marketwatch.com/story/drone-sales-in-the-us-more-than-doubled-in-the-past-year-2016-05-27; *FAA Aerospace Forecast: Fiscal Years 2016-2036*, FAA, 2016, https://www.faa.gov/data_research/aviation/aerospace_forecasts/media/FY2016-36_FAA_Aerospace_Forecast.pdf.

[9] Petition for Rulemaking Submitted by EPIC, Mar. 8, 2012, https://epic.org/apa/lawsuit/EPIC-FAA-Drone-Petition-March-8-2012.pdf; Univ. of Wash. Tech. and Pub. Policy Clinic, *Domestic Drones: Technical and Policy Issues* 12 (2013), https://www.law.washington.edu/clinics/technology/reports/droneslawan policy.pdf.

[10] DJI, *Inspire 2*, http://www.dji.com/inspire-2/info#specs.

meters away.[11] Drones can be used to view individuals inside their homes and can facilitate the harassment and stalking of unsuspecting victims.[12] Drones can also be modified with tools that can enable them to gather personal information using infrared cameras, heat sensors, GPS, automated license plate readers, and facial recognition devices.[13]

Drones also pose risks to security and cybersecurity. Close calls between drones and traditional aircraft have risen significantly as their use becomes more widespread.[14] Furthermore, the very features that make drones easy to operate also make them susceptible to cyberattacks.[15] Hackers have the ability to exploit weaknesses in drone software to take over operation of a drone and access the camera and microphones.[16]

The privacy risks of drones, as well as the safety and security vulnerabilities, underscore the need for the FAA to develop drone privacy regulations. *We urge the Committee to question why the FAA has not yet taken steps to issue regulations on drone privacy despite prior Congressional directives to do so.*

The FAA Has Failed to Implement the Requirements of the FAA Modernization Act

The FAA has failed to take the action mandated by Congress. The FAA Modernization Act required the FAA to create a Comprehensive Plan to integrate drones into the National Airspace and subsequently conduct a notice and comment rulemaking. In the Plan, the FAA identified privacy as an important issue to address, acknowledging that "as demand for [drones] increases, concerns regarding how [drones] will impact existing aviation grow stronger, especially in terms of safety, privacy, frequency crowding, and airspace congestion."[17]

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[11] Hubsan, *X4 H502E DESIRE*, https://www.hubsanus.com/shop/h502e.html.
[12] Petition for Rulemaking Submitted by EPIC, *supra* note 6.
[13] *Id.*; Ciara Bracken-Roche et al., Surveillance Studies Centre, *Surveillance Drones: Privacy Implications of the Spread of Unmanned Aerial Vehicles (UAVs) in Canada* 46, Apr. 30, 2014, http://www.sscqueens.org/sites/default/files/Surveillance_Drones_Report.pdf; Mary Papenfuss, *Utah Couple Arrested Over 'Peeping Tom' Drone,* Huffington Post, Feb. 17, 2017, http://www.huffingtonpost.com/entry/peeping-tom-drone_us_58a6847fe4b045cd34c03e56.
[14] Alan Levin, *Drone-Plane Near misses, Other Incidents Surge 46% in U.S.*, Bloomberg, Feb. 23, 2017, https://www.bloomberg.com/news/articles/2017-02-23/drone-plane-near-misses-other-incidents-surged-46-in-u-s; Steve Miletich, *Pilot of Drone That Struck Woman at Pride Parade Gets 30 Days in Jail,* The Seattle Times, Feb. 24, 2017, http://www.seattletimes.com/seattle-news/crime/pilot-of-drone-that-struck-woman-at-pride-parade-sentenced-to-30-days-in-jail/.
[15] Kacey Deamer, *How Can Drones Be Hacked? Let Us Count the Ways,* Live Science, Jun. 10, 2016, http://www.livescience.com/55046-how-can-drones-be-hacked.html.
[16] Wang Wei, *You Can Hijack Nearly Any Drone Mid-Flight Using This Tiny Gadget,* The Hacker News, Oct. 27, 2016, http://thehackernews.com/2016/10/how-to-hack-drone.html.
[17] Joint Planning and Dev. Office, Fed. Aviation Admin., *Unmanned Aircraft Systems (UAS) Comprehensive Plan: A Report on the Nation's UAS Path Forward* 4 (2013), https://www.faa.gov/about/office_org/headquarters_offices/agi/reports/media/UAS_Comprehensive_Plan.pdf.

Under the FAA Modernization Act, Congress required the FAA to implement the recommendations of the Comprehensive Plan via a public rulemaking within 46 months of the enactment of the Act. The FAA identified privacy as an important issue directly related to domestic drones, yet the agency has failed to address privacy in the agency's only public rulemaking on drones in the National Airspace.[18] Indeed it has been over 65 months and the FAA has failed to implement the rulemaking that addresses the issues identified in the Comprehensive Plan, including privacy, as required by Congress.[19]

The FAA Has Failed to Conduct the Required Drone Privacy Report

Soon after the FAA's Comprehensive Plan identified privacy as an important drone integration issue, the agency was ordered by Congress to conduct a drone privacy report, which the agency failed to do. In the 2014 Consolidated Appropriations Act, Congress required the FAA to conduct a drone privacy study, stating:

> Without adequate safeguards, expanded use of UAS and their integration into the national airspace raise a host of concerns with respect to the privacy of individuals. For this reason, the FAA is directed to conduct a study on the implications of UAS integration into national airspace on individual privacy.[20]

The report specifically required the FAA to study "how the FAA can address the impact of widespread use of UAS on individual privacy as it prepares to facilitate the integration of UAS into the national airspace."[21] The report was to be submitted to Congress within 18 months of enactment of that appropriations bill and completed "well in advance of the FAA's schedule for developing final regulations on the integration of UAS into the national airspace."[22] Nearly 47 months since the bill was enacted, the FAA has failed to produce the report. Furthermore, EPIC obtained documents through a Freedom of Information Act request that suggested that the FAA has no intention of complying with Congress' directive to produce a report.[23]

EPIC's Lawsuit, EPIC v. FAA

Immediately after the passage of the FAA Modernization Act, EPIC and more than one hundred legal experts and organization petitioned the FAA to undertake a rulemaking to establish privacy regulations prior to the deployment of commercial drones in the National Airspace.[24] More than two years later, the FAA responded to the petition by refusing to conduct a separate drone privacy rulemaking but said privacy would be considered in an upcoming

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[18] Operation and Certification of Small Unmanned Aircraft Systems, 81 Fed. Reg. 42,063 (June 28, 2016) (codified at 14 C.F.R. pts. 21, 43, 61, 91, 101, 107, 119, 133, and 183).
[19] FAA Modernization and Reform Act of 2012, Pub. L. 112-95 § 332, 126 Stat. 73-75.
[20] 160 Cong. Rec. 1186 (2014), https://www.congress.gov/crec/2014/01/15/CREC-2014-01-15-bk2.pdf.
[21] *Id.*
[22] *Id.*
[23] https://epic.org/privacy/litigation/apa/faa/drones/EPIC-16-07-20-FAA-FOIA-20160921-Production.pdf.
[24] Petition for Rulemaking Submitted by EPIC, *supra* note 6.

rulemaking on small drones.[25] However, the FAA later stated that privacy issues were "beyond the scope of the rulemaking"[26] and did not consider privacy in its final rule,[27] prompting EPIC to file suit.[28] EPIC is challenging the FAA's refusal to consider privacy and to conduct a comprehensive drone rulemaking as required by Congress. The FAA has failed to explain why the agency did not evaluate privacy in their final rule despite the requirements of the FAA Modernization Act, EPIC's petition calling for the agency to address privacy, the FAA's own statements establishing privacy as an important issue to address, and the hundreds of comments that raised privacy issues in the small drone rulemaking.

EPIC urges this Committee to ask the FAA why the agency has failed to take steps to protect the public from the privacy risks posed by drones. Any privacy and security risks are no longer hypothetical and the longer the FAA waits to issue comprehensive privacy rules, the longer the public is at risk.

Conclusion

We ask that this letter be entered in the hearing record. EPIC looks forward to working with the Committee on these issues of vital importance to the American public.

Sincerely,

/s/ *Marc Rotenberg*
Marc Rotenberg
EPIC President

/s/ *Jeramie Scott*
Jeramie Scott
EPIC National Security Counsel

/s/ *Caitriona Fitzgerald*
Caitriona Fitzgerald
EPIC Policy Director

[25] Letter from Fed. Aviation Admin. to EPIC (Nov. 26, 2014), https://epic.org/privacy/drones/FAA-Privacy-Rulemaking-Letter.pdf.
[26] Operation and Certification of Small Unmanned Aircraft Systems, 80 Fed. Reg. 9,544 (proposed Feb. 23, 2015).
[27] Operation and Certification of Small Unmanned Aircraft Systems, 81 Fed. Reg. 42,063 (June 28, 2016) (codified at 14 C.F.R. pts. 21, 43, 61, 91, 101, 107, 119, 133, and 183).
[28] EPIC v. FAA, No. 16-1297 (D.C. Cir.); https://epic.org/privacy/litigation/apa/faa/drones/.

Aircraft Owners and Pilots Association

Statement for the Record

Subcommittee on Aviation

House Transportation and Infrastructure Committee

Hearing on: "Unmanned Aircraft Systems: Emerging Uses in a Changing National Airspace"

Submitted by:

Mark Baker

President and CEO, Aircraft Owners and Pilots Association

November 29, 2017

SAFE INTEGRATION OF UNMANNED AIRCRAFT

The Aircraft Owners and Pilots Association (AOPA) represents more than 300,000 of America's pilots and aviation enthusiasts and we believe that nothing better represents the foundational spirit of freedom than taking to America's skies. Unmanned aircraft systems (UAS) are the fastest growing segment in aviation and represent tens of thousands of pilots flying aircraft from small systems operated for fun to large drones used in many missions across the country. AOPA, the largest community of pilots in the world, recently welcomed these new pilots to the organization. In keeping with our mission of advocacy, education, safety, and fighting to keep general aviation accessible, AOPA is focusing a great deal of attention on the efforts to promote the safe integration and operation of unmanned aircraft systems (UAS) within the National Airspace System (NAS).

General aviation has an excellent safety record with an estimated 500,000 pilots flying approximately 200,000 aircraft as part of an industry that supports a total annual economic output of $219 billion in the United States. Over the last several decades, the total accident rate has decreased by more than 85%, down to just seven accidents per 100,000 flight hours.

UAS are now a rapidly growing and important part of general aviation. Whether performing a search and rescue operation, helping a commercial farmer improve crop yields through precision agriculture, or enjoyed as a personal hobby, UAS have many existing and emerging uses. They are also another effective, efficient, and affordable

way to enjoy the benefits of aviation. The value of these benefits is reflected by the more than 100,000 jobs and $82 billion in economic impact estimated to be created within the first 10 years of UAS operations in the NAS.

Given their potential benefits, UAS must be integrated into the NAS in a manner that maintains the level of safety to people and property in the air and on the ground that general aviation currently provides. Guided by the understanding that many factors must be considered when determining how to best maintain the safety of the NAS, AOPA continues to assess the merit of technological and regulatory proposals from the government and industry.

AOPA'S ROLE IN SAFE INTEGRATION

As an organization representing the freedom of flight for all users of the NAS, AOPA believes that safely including UAS operations within the NAS can be achieved by engaging collaboratively with the entire aviation community, ensuring all users have an appropriate level of aeronautical knowledge, and using technology to minimize safety risks. With safety as our first priority, AOPA is working with and supporting ongoing efforts by the FAA and the aviation community to integrate UAS into the NAS.

Engaging with Industry. AOPA appreciates the UAS community's need for a regulatory framework which allows pilots to more routinely take advantage of the existing and emerging uses of UAS. As a result, AOPA has collaborated and engaged with industry to unlock these technological opportunities. AOPA has served on the

Small UAS Aviation Rulemaking Committee (ARC), which laid the foundation for enabling the commercial use of small UAS under 14 CFR part 107. AOPA participated in the UAS Registration Task Force (RTC) ARC, and has supported the requirements for UAS registration as a means of promoting accountability and the safety of UAS operations of the NAS. AOPA also worked with industry on the Micro UAS ARC to lay the groundwork for allowing small UAS operations over people.

AOPA is now engaged and collaborating with all stakeholders to address the challenges in enabling advanced UAS operations in the future, such as beyond visual line of sight (BVLOS) operations and commercial package delivery. AOPA is a member of the Drone Advisory Committee (DAC), which recently recommended that the FAA could accelerate integration by prioritizing the enablement of BVLOS operations in low-altitude areas where manned aircraft are already broadcasting their positions. In October, AOPA joined 28 other groups in a letter to President Donald Trump, urging the Administration to implement a pilot program which would help determine the roles and responsibilities of the federal, state, local, and tribal governments for safe UAS integration while not compromising the federal government's sovereignty of the national airspace. The UAS Integration Pilot Program announced earlier this month is expected to provide critical data on how local interests can be addressed while unlocking the benefits of these new technologies.

Technology for Safe Integration. As numerous factors contribute to safe operations in the NAS, AOPA is evaluating the merit of a wide range of technological

measures to assist the industry in that effort. First, AOPA is tracking developments occurring with airspace design, the low altitude UAS traffic management system, and the FAA's Low Altitude Authorization and Notification Capability (LAANC). LAANC is expected to deliver faster airspace authorizations for commercial UAS pilots, thereby enabling more operations. Second, AOPA has participated in the UAS Identification and Tracking ARC, which is developing recommendations for digital drone identification technologies and how those technologies may address security concerns and public safety needs. And finally, UAS manufacturers are working to help limit airspace incursions by adding geo-fencing features to their flight management software, restricting unmanned aircraft from entering certain airspace by creating a geographical boundary based upon GPS or radio frequency identification.

Education. AOPA continues to maintain leadership in ensuring that all pilots, regardless of their aircraft, are safe, well trained, and able to enjoy their aircraft. AOPA, in partnership with local flight schools, has been conducting drone seminars across the entire country, educating all UAS pilots and the public on the new part 107 to increase the safety of these operations. AOPA is also actively participating in the Unmanned Aircraft Safety Team (UAST), a joint FAA-industry effort which uses data to develop and recommend voluntary measures for all UAS pilots to operate safely in the NAS.

Furthermore, AOPA believes education is critical for hobby and recreational users of UAS, who should be provided with clear, comprehensive operational guidelines, as well as a community-based educational program concerning the safe

operation of an unmanned aircraft in the NAS. As many people are likely to be introduced to aviation through building or operating a UAS, they may be unfamiliar with the categories of airspace and other important aeronautical information. To help educate these recreational and hobby users of UAS about operating safely in the NAS, AOPA officially supported the "Know Before You Fly" campaign, which was developed by the Association of Unmanned Vehicle Systems International (AUVSI) and the Academy of Model Aeronautics (AMA) in partnership with the FAA.

"Unmanned Aircraft Systems: Emerging Uses in a Changing National Airspace"

Prepared Statement of Denis J. Mulligan
General Manager
Golden Gate Bridge, Highway and Transportation District

Subcommittee on Aviation
Committee on Transportation and Infrastructure
United States House of Representatives

December 11, 2017

Chairman LoBiondo, Ranking Member Larsen and members of the subcommittee, the Golden Gate Bridge, Highway and Transportation District (Bridge District) strongly urges Congress to pass legislation to allow for the regulation of unmanned aircraft systems (drones) flown for recreational use. This is an urgent matter of public safety and national security that should be addressed in any reauthorization of FAA programs or as stand-alone legislation. This issue arises from the *FAA Modernization and Reform Act of 2012, Sec. 336. Special Rule for Model Aircraft*, which states:

> "...the Administrator of the Federal Aviation Administration may not promulgate any rule or regulation regarding a model aircraft, or an aircraft being developed as a model aircraft if – (1) the aircraft is flown strictly for hobby or recreational use; (2) the aircraft is operated in accordance with a community- based set of safety guidelines and within the programming of a nationwide community-based organization[.]."

The Bridge District respectfully requests that this section be repealed, as it has had the unintended consequence of establishing a "wild west" where recreational drones are virtually unregulated while there remains uncertainty in those places where a state or local government does wish to regulate their use.

Recreational drone users should not be exempt from sensible FAA safety regulations otherwise applicable to drones. Moreover, the quaint concept of "community-based" standards that were previously applied to hobbyist users of model aircraft is outdated, especially given the prevalence and sophistication of drone usage today; a utilization that can be expected to increase and be enhanced in the future. Indeed, repeal of this statutory language is necessary precisely so as to distinguish modern hi-tech drones from the model aircraft commonly associated with twentieth century hobbyists.

The Bridge District owns and operates the Golden Gate Bridge that serves not only as a symbol of our community and country, but as a vital traffic artery in our region. Completed in 1937, an older facility, roadway lanes on the Bridge are ten feet wide or less, rather than the standard 12 foot width of most highway lanes. It has a high volume of traffic and changing lane configurations depending on the time of day and traffic volumes. The scenery around the Bridge is breathtakingly beautiful.

Unfortunately, this attracts recreational drone users who, in the absence of regulations, cause concern. In this busy environment, we commonly observe drones flying directly over vehicles and near the toll plaza. Ominously, on several occasions recreational drones have crashed on the Golden Gate Bridge roadway, and those drone operators have walked away without identifying themselves or claiming responsibility. It is only through incredibly good fortunate that none of these incidents caused a major traffic accident which would likely result in a chain-reaction collision. Someday, in the absence of common sense regulation, it seems apparent that such tragedy will occur. Based on what the Bridge District has witnessed, recreational drone users do not always demonstrate common sense.

In addition to safety issues that fall naturally within the purview of the FAA, the increased presence of drones also poses a significant security threat, and is of substantial concern to those of us charged with the security of the Golden Gate Bridge. Camera-bearing drones have been witnessed flying into security-restricted areas, such as behind security fences, beyond intrusion detection sensors, and near the Bridge towers and anchorages. If the Bridge District discovered an individual with a camera in any of these restricted areas, they would be cited and arrested immediately. However, recreational drone operators are not subject to similar restrictions when operating their devices within security sensitive areas.

There is no way to discern friend from foe when it comes to such drones, and no reason why recreational drones should be free from regulation where security of critical infrastructure and national landmarks is at issue. A clear regulatory framework needs to be authorized to protect critical infrastructure from potentially nefarious drone operators who may currently escape regulation by invoking a "hobbyist" designation that does nothing to assure the safety and security of the Bridge and its users. Certainly, there is no "community- based set of safety guidelines" that could ever justify such potentially dangerous and threatening use of drone technology.

The ability to regulate the safety and security of <u>all</u> drone use should surely be a key part of the FAA's mandate. Unfortunately, under current law, the FAA is barred from doing its job when it comes to recreational drones. To make matters worse, and despite the absence of federal regulations, entities such as the Bridge District generally lack the legal authority to prohibit the hazardous and dangerous operation of non-commercial drones near their facilities, and even the municipalities in which they are located may be prohibited from offering suitable protections.

There is no more noble, or generally less controversial, task for government than saving lives. So, the Bridge District respectfully asks Congress to pass legislation providing authority to the FAA to regulate recreational drones. If given such authority, the FAA will be able to promulgate rules that distinguish recreational operators of technologically sophisticated unmanned aircraft from hobbyists flying model airplanes of yore, without limiting the ability of professionally

trained, certified, and insured commercial drones from operating in the national airspace system for interstate commerce.

Public safety necessitates a clear regulatory framework for recreational drones. Today a completely inexperienced individual can order a drone online, have it delivered within a day, and then say to a friend, "here hold my beer and watch this" and fly that drone over the Golden Gate Bridge. If that drone crashes on the roadway causing an accident, we will all, in hindsight, wish that federal law had not blocked the adoption of sensible regulations of recreational drones that could have prevented a tragedy.

Thank you for your consideration of our concerns.

Statement

of the

National Association of Mutual Insurance Companies

to the

United States House of Representatives

Hearing on

"Unmanned Aircraft Systems: Emerging Uses in a Changing National Airspace"

November 29, 2017

The National Association of Mutual Insurance Companies (NAMIC) is pleased to provide comments to the Transportation and Infrastructure Committee Subcommittee on issues surrounding the growing use of unmanned aerial systems.

NAMIC is the largest property/casualty insurance trade association in the country, with more than 1,400 member companies. NAMIC supports regional and local mutual insurance companies on main streets across America and many of the country's largest national insurers. NAMIC members represent 39 percent of the total property/casualty insurance market, serve more than 170 million policyholders, and write more than $230 billion in annual premiums.

NAMIC has been a leader at the intersection of insurance and UAS/drones, and the Federal Aviation Administration (FAA) has estimated that by 2020, insurance will be one the four top markets for unmanned aerial systems. NAMIC was a stakeholder in the Commerce Department's National Telecommunications and Information Administration program to develop i best practices for privacy issues regarding commercial and private UAS use, is a member of the FAA/Industry Unmanned Aircraft Safety Team, and is member of the Steering Committee of the NUSTAR - National UAS Standardized Testing and Rating alliance.

As the Committee's hearing will examine public policy issues related to the safe integration of unmanned aircraft systems in the national airspace system, including privacy and safety implications, NAMIC is providing the attached white paper on action that we believe is necessary to define private airspace.

As detailed in the attached document, serious question regarding the regulation of unmanned aircraft systems continues to evolve, and recent developments with respect to UAS and private property airspace have resulted in fundamental questions being raised about private property and private airspace that will impact UAS use and insurance coverage.

While the FAA maintains that the FAA can regulate navigable airspace from the ground up, NAMIC has serious question as to whether this position can survive as a legal or a political matter. We believe that a strong policy position is needed to help navigate this debate, as it is almost certain that the existence of private airspace will eventually be questioned and confirmed by some courts, regulatory agencies, or legislatures. NAMIC believes addressing this predicate question sooner rather than later will result in clear rules for the continued proliferation of UAS.

The FAA's decision to reject the concept of private airspace has drastically changed property rights and exposed virtually every American's back yard to unwanted drone intrusion. Historically, common law doctrine was that ownership of the land extends to the periphery of the universe, with owners said to own the land, everything below it, and all the airspace. In the age of commercial air traffic the heavens became a public highway. The Supreme Court rulings have established a safe and effective floor for airplane flights, but the FAA has gone far beyond, concluding that – with few exceptions – the navigable airspace for drones under FAA supervision includes all airspace that is not indoors. This means that there is no longer private airspace.

The elimination of private airspace equates directly to a lack of privacy, given current statutes. In general, if you are legally permitted to be where you are, it is not a violation for you to see what you can see or even photograph or record what you can see. If an FAA-compliant drone can fly in what the FAA has determined is navigable airspace, including over your yard, five feet from your window, then that drone has every right to be where it is and every right to see or record whatever it can see.

While the FAA has claimed not to have authority on the issue of privacy, local and state governments have taken action. As a result, concurrent efforts at the state and local levels threaten to create a patchwork of varying standards that would hamper the legitimate use and development of drone technology.

While property/casualty insurance companies see the benefits in using unmanned aircraft systems to serve policyholders, as well as to provide coverage for policyholders that use UAS, the industry is stymied by a smorgasbord of differing and often competing standards of privacy. Questions surrounding private airspace must be resolved in order to define how insurers will use and insure UAS, as well as to determine what regulations are needed to facilitate both. If the FAA won't take action, then it's up to Congress.

The leading role insurers will play as commercial users of UAS, coupled with the need for policyholders to obtain adequate insurance for hobby and commercial use, makes it certain that insurers must help develop standards of good practice for operating UASs, particularly where there is a lack of regulatory specification. To facilitate the ongoing development of commercial operation of UASs for their own use and for policyholder use, insurers will look to cover

responsible operators. "By requiring proof from the insured of a safety and privacy conscious mind-set, insurers can help protect against cases of misuse, which at the formative stage of the market could set back UAS acceptance considerably," according to Lloyd's. By applying business sense and hazard expertise, insurers will be critical to earning the trust of the public, regulators, and opinion leaders in a UAS field, where both risks and opportunities will continue to be defined.

When damage or injuries result from a UAS, a key question will be who is responsible and liable for damages. NAMIC member companies want to provide comprehensive policyholder protection, but many serious questions continue to go unanswered about UAS regulations and civil liability. If the regulation of drones remains unclear and incomplete, it will be very difficult for insurers to meet policyholder needs.

There will always be risks in the commercial use of drones, and property/ casualty insurance will be a critical consideration. Responsible insurance coverage for this emerging area will require more development of federal, state, and local regulations, as well as related standards of liability, negligence, and property rights.

NAMIC is committed to working with its members and federal, state, and local regulators to promote responsible UAS development that protects aircraft, people, businesses, and property. As UAS regulations and civil liability standards evolve, NAMIC will work to ensure that these regulations provide the necessary clarity and breadth that its members need to provide policyholder protection. As these legal and regulatory gaps are addressed, NAMIC wants to ensure that its members can be in the business of providing effective protection and compensation.

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